ISSN 1346-1192

Annual Report of the National Astronomical Observatory of Japan

Volume 12 Fiscal 2009

NAOJ
National Astronomical Observatory of Japan

Cover Caption

The total solar eclipse on July 22, 2009, observed on the pacific ocean near Kita-Iwo Jima by H. Fukushima, A. Miyachi, and M. Katayama. It became topical because the path of totality covered a part of the land of Japan for the first time in 46 years.

Postscript

Editor Publications Committee
HANAOKA, Yoichiro
UEDA, Akitoshi
OE, Masafumi
SÔMA, Mitsuru
NISHIKAWA, Jun
MIYOSHI, Makoto
YOSHIDA, Haruo

Publisher National Institutes of Natural Sciences
National Astronomical Observatory of Japan
2-21-1 Osawa, Mitaka-shi, Tokyo 181-8588, Japan
TEL: +81-422-34-3600
FAX: +81-422-34-3960
http://www.nao.ac.jp/

Printer **Hobunsha Co., Ltd.**
2320 Kisomachi, Machida-shi, Tokyo 194-0033, Japan
TEX: +81-42-792-3100
FAX: +81-42-792-3162

Annual Report of the National Astronomical Observatory of Japan
Fiscal 2009

TABLE OF CONTENTS

Annual Report of the
National Astronomical Observatory of Japan
Fiscal 2009

Shoken MIYAMA
Director General of NAOJ

PREFACE

I am pleased to present the Annual Report of the National Astronomical Observatory of Japan (NAOJ) for fiscal 2009.

The year 2009 was a year full of exciting events that drummed up the national interest in science. This is because of the International Year of Astronomy 2009 (IYA2009) that was declared by the United Nations to celebrate the 400th anniversary of the first use of an astronomical telescope by Galileo Galilei in 1609. A variety of IYA2009 events were held on a local level in Japan and throughout the world, raising great interest in astronomy and astrophysics. In the year of IYA2009, Japan was blessed with an opportunity of the total eclipse, which came to national attention. Unfortunately, bad weather on the day of the eclipse prevented people with high expectation for the astronomical event from seeing it in the main land. On the other hand, a spectacular eclipse was fully observed on the ocean of the Ogasawara Islands' area, about 1,000 km south of Tokyo. For this event, NAOJ sent a group of researchers to one of the Ogasawara Islands, Iwo Island to successfully conduct a spectrum observation of the Sun's corona. The sun drew attention in 2009 for another reason: the number of sunspots on its surface. The sun has an active phase and a quiet phase in turn in its 11-year activity cycle. The phase is identified by the number of sunspots, which are observed more in the active phase and less in the quiet phase. The sun was expected to enter the active phase from the quiet phase in 2009, but it had been quiet without increasing the number of sunspots. Experts suspected the sun might be in the maunder minimum where the number of sunspots was abnormally low for several decades in the 1600s. It is said that, back then in Europe, the temperature became so low the Thames River got frozen. The quiet sun this time seems not as abnormal as in the maunder minimum in the 1600s because the number of sunspots has been on the rise since around the end of 2009. Solar physicists are studying this unusual solar event as an intriguing phenomenon to figure out what is behind it.

In Mitaka Campus of NAOJ, Mitaka Picture Book House in the Astronomical Observatory Forest was opened to the public on July 7, 2009. The house was one of more than 40 wooden, one-story Japanese-style houses built in the Campus during the period from 1915 through 1951 for researchers and their families. Those houses were demolished a few years ago, except the first house constructed before the others, as considered too dangerous to live in due to their old age and poor earthquake resistance. The first house was a luxurious historical structure built in 1915 for professors and their families, having a study, living room, kitchen, an apprentice room, and even a maid room. The house came to be known to Mitaka City, which proposed an idea to NAOJ to collaboratively renovate and transform it into a facility where children can enjoy picture book story sessions. Located next to the cutting-edge space research center and surrounded by lush forest, Mitaka Picture Book House in the Astronomical Observatory Forest has been attracting many children and their parents since its opening, thanks to proactive efforts by the municipal office staff of Mitaka City dedicated to the operation of this House.

In addition to those described above, we steadily make best efforts through public outreach and educational activities by Public Relations Center of NAOJ in order to be an institute open to and introduce up-to-date scientific information and astronomical findings to the public. Mizusawa Campus of NAOJ, Nobeyama Radio Observatory, Okayama Astrophysical Observatory, and the Subaru Telescope are also making the same efforts by regularly opening the facilities to the public and having a special open house day where visitors can have close contacts with researchers.

NAOJ continuously released research findings in 2009 that intrigued interest from scientific communities and the public. The year 2009 marked the 10th anniversary of the reception of the first light with the Subaru Telescope that keeps achieving amazing scientific results. In the exploration of extrasolar planets, it discovered a planet orbiting counter to the direction of a fixed star's rotation and succeeded in taking the world's first, direct picture of a star that is considered a planet of a sunlike central star. The direct picture taking itself is the second success in the world following the first by a North American team of astronomers in 2008, but taking a direct picture of a planet with a sunlike host star is the first success in the world. The discovery of these planets poses challenges to the current view of planet formation theory. The Subaru Telescope also produced world-acclaimed results for the study of cosmology and in the field of galaxy physics. In October, a symposium to introduce the results by the Subaru Telescope was held in Tokyo, followed by a party where persons involved were invited.

The ALMA Project, an international project among East Asian, North American and European countries and regions, marked its 6th year of construction. Japan has started the construction of 7-meter-diameter antennas following that of 12-meter-diameter antennas. At the ALMA's high site of 5,000 meters asl, interferometry experiments were conducted with three antennas constructed by Japan and the United States to confirm the appropriate operability of the antennas. As to the antenna receivers, a Band-10 cartridge assembly with highest frequencies among the ALMA bands was successfully fabricated. This significant milestone proves that the NAOJ's capability of cartridge development is the world' s highest level as the cartridge fabrication requires ultraprecision machining at a level never before achieved. The ALMA Project is steadily advancing the process to the completion of the ALMA Observatory, making further efforts necessary for the inception of the early and full-scale operation.

Each Observatory of NAOJ is also producing remarkable scientific results. Okayama Astrophysical Observatory made a world record by successfully spotting the gamma-ray burst that detonated 13.1 billion light years from Earth and is the most distant burst in the universe overall. Nobeyama Radio Observatory successfully observed ”monster galaxy” that is actively forming stars and obtained data suggesting the presence and distribution of “dark matters” around the galaxy. The lunar explorer Kaguya, in which the RISE Project Team of Mizusawa Campus of NAOJ participated, completed its mission when it fell onto the moon in May 2009. NAOJ released the groundbreaking study results obtained with the explorer such as the gravity map and detailed topographic map of the moon. Of all the results, the precise data of the nearside and farside of the moon drew a great deal of attention.

NAOJ is an inter-university research institute operating an array of the researches described above. These researches are conducted in response to requests from researchers of universities throughout Japan, and most of the research results are shared by NAOJ and the researchers of these universities participated in the research. For further development, education of and provision of research guidance to young researchers are indispensable elements. NAOJ is continuously making significant efforts in postgraduate education at the Graduate University for Advanced Studies and through collaboration with other universities. Your continued support will be greatly appreciated.

Shoken Miyama

Shoken MIYAMA
Director General of NAOJ

I Scientific Highlights

(April 2009 – March 2010)

Potassium Abundances in Red Giants of Globular Clusters

TAKEDA, Yoichi
(NAOJ / GUAS)

KANEKO, Hiroyuki, MATSUMOTO, Naoko, OSHINO, Shoichi, ITO, Hiroko, SHIBUYA, Takatoshi
(GUAS)

Given the confusing situation regarding the [K/Fe] ratio of metal-poor stars in the halo, where some work suggests a fairly tight tendency (such like disk stars) while others report a considerably large diversity amounting to ~1 dex, we carried out a spectroscopic study on 15 red giants of three mildly to very metal-poor globular clusters (M 4, M 13, and M 15) along with two reference stars (ρ Boo and α Boo) based on the high-dispersion spectra obtained with Subaru/HDS (cf. Figure 1), with a purpose of clarifying the behavior of [K/Fe] at the relevant metallicity range of $-2.5 \lesssim$ [Fe/H] $\lesssim -1$.

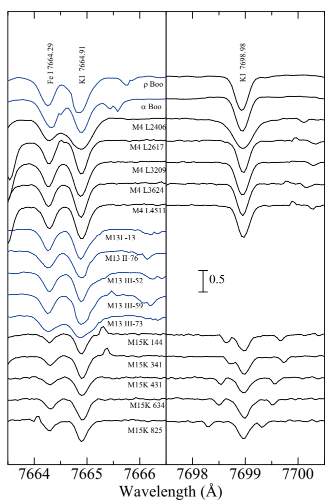


Figure 1: Spectra of 17 stars in the neighborhood of the K I 7665 line and the K I 7699 line.

The atmospheric parameters ($T_{\rm eff}$, log g, $v_{\rm t}$, and [Fe/H]) were spectroscopically determined by using Fe I and Fe II lines, and the abundance of K was derived from the K I resonance lines at 7664.91 and 7698.97 Å while taking the non-LTE effect into account.

We confirmed that [K/H] (as well as [Fe/H]) is almost homogeneous within each of the three clusters to a precision of <~ 0.1 dex, though superficially large deviations are exceptionally seen for two peculiar stars which show signs of considerably increased turbulence in the upper atmosphere.

The [K/Fe] ratios of these cluster stars turned out mildly supersolar by a few tenths of dex, tending to gradually increase from ~ +0.1–0.2 at [Fe/H] ~ −1 to ~ +0.3 at [Fe/H] ~ −2.5, which is a fairly tight and clean trend. We thus consider that the previously reported large diversity of [K/Fe] in halo stars is not real, which we suspect to be due to some improper treatment in the analysis.

This result is quite consistent (i.e., smoothly connecting) with the [K/Fe] trend of disk stars ($-1 \lesssim$ [Fe/H]) and that of extremely metal-poor stars ($-4 \lesssim$ [Fe/H] $\lesssim -2.5$). That is, [K/Fe] appears to continue a gradual increase from [Fe/H] ~ 0 toward a lower metallicity regime down to [Fe/H] ~ −3 (cf. Figure 2), where a broad maximum of [K/Fe] ~ +0.3–0.4 is attained, possibly followed by a slight downturn toward a further lower metallicity at [Fe/H] $\lesssim -3$.

This investigation is based on the data obtained by the observation with the Subaru Telescope, which was carried out during the practical training of observational astronomy for graduate students as a coursework of The Graduate University for Advanced Studies (SOKENDAI). More detailed results of this study are described in [1].

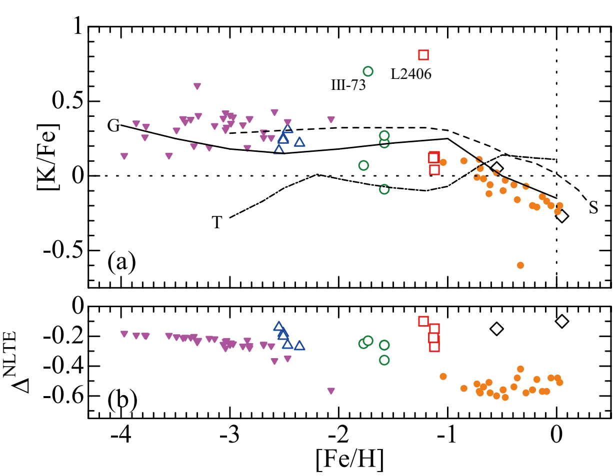


Figure 2: (a) The [K/Fe] vs. [Fe/H] plots constructed from the metallicity and the NLTE potassium abundances determined by us. The results for the 17 program stars are shown in large open symbols (diamonds for ρ Boo and α Boo, squares for M 4 stars, circles for M 13 stars, and triangles for M 15 stars). The two stars (M 13 III-73 and M 4 L2406) showing exceptionally large deviations from the main trend are also indicated. Meanwhile, the smaller filled symbols represent the results for disk stars and extremely metal poor stars presented here for comparison. Lines show the three kinds of theoretical predictions (b) The NLTE corrections for K abundance determinations ($\Delta^{\rm NLTE}$ is the average of $\Delta^{\rm NLTE}_{7665}$ and $\Delta^{\rm NLTE}_{7699}$ in case that both lines are available), plotted against [Fe/H].

Reference

[1] Takeda, Y., et al.: 2009, *PASJ*, **61**, 563.

The Circumbinary Outflow: A Protostellar Outflow Driven by a Circumbinary Disk

MACHIDA, Masahiro N.
(NAOJ)

INUTSUKA, Shu-ichiro, MATSUMOTO, Tomoaki
(Nagoya-University)

The protostellar outflow is star's first cry at the moment of birth. Since Snell discovered an outflow from a protostar in 1980, over 300 outflows have been observed in many star-forming regions. The protostellar outflow is believed to be driven from the circumstellar disk by release of the gravitational energy mediated by the Lorentz and centrifugal forces [1]. In general, the star is formed in gravitationally collapsing cloud cores. The binary frequently appears through the fragmentation of the collapsing cloud core [2]. With the proto-binary formation, the collapsing gas forms a circumbinary disk that is frequently observed. Thus, outflow may be driven also by the circumbinary disk.

In this study, the evolution of a magnetized rotating cloud is investigated using three-dimensional resistive MHD nested-grid code that covers over five orders of magnitude of spatial scale [3]. After the adiabatic core formation in the collapsing cloud core, the magnetic flux is significantly removed from the center of the cloud by the Ohmic dissipation. Since this removal makes the magnetic braking ineffective, the adiabatic core continuously acquires the angular momentum to induce fragmentation and subsequent binary formation. The magnetic field accumulates in the circumbinary disk where the removal and accretion of magnetic field are balanced. The outflow is driven by the circumbinary disk, while no outflow appears in the proximity of the proto-binary because of the deficit of strong field.

Figure 1 left panel shows the configuration of the outflow, which indicates that the outflow driven by the circumbinary disk, not by the protostar (or proto-binary). Figure 1 upper right panel shows the configuration of magnetic field lines that are strongly twisted by the rotation of the circumbinary disk. The outer region of circumbinary disk has a density of $n < 10^{12}$ cm^{-3} and is well coupled with the magnetic field that can drive the outflow. On the other hand, the magnetic field is too weak to drive outflow in the region around protobinary. Figure 1 right lower panel shows B_z on the $z = 0$ plane with the same scale of left panel, and indicates that the magnetic field is weak around protobinary but strong in the circumbinary disk.

This result explains the morphology of some specific young stellar objects such as L1551 IRS5. We can infer that most of the bipolar molecular outflows observed by low density tracers (i.e., CO) would correspond to circumbinary or circum-multiple outflows found in this letter, since most of the young stellar objects are supposed to be multiples. We expect that the circumbinary outflows is verified by future observations such as ALMA.

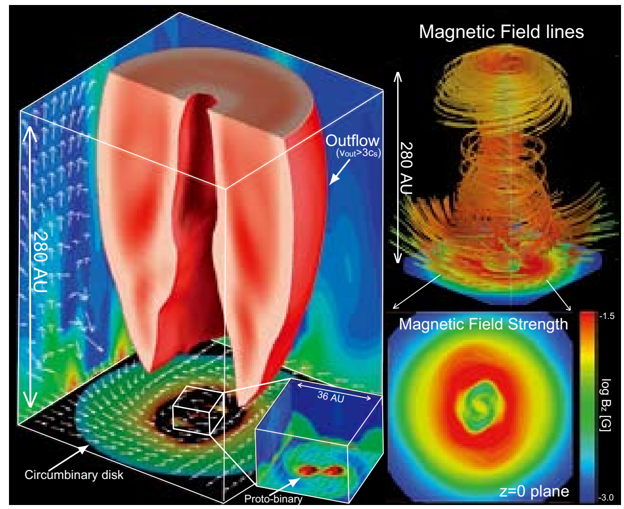


Figure 1: Large-scale structure of l = 10 grid in three dimension. *Left panel*: The configuration of circumbinary outflow is shown by red-volume, in which color means the outflow speed. The density contours (*colors*) and velocity vectors (*arrows*) are projected in each wall surface. The square at lower right corner shows the close-up view around the protobinary, in which color means the density distribution, and the high-density region (i.e., the protobinary) is represented by the red iso-density surface. *Right upper panel*: The magnetic field lines integrated from the circumbinary disk are plotted. The bottom panel indicates the strength of B_z by the color. *Right lower panel*: The strength of B_z on $z = 0$ plane is represented by the color.

References

[1] Machida, M. N., Inutsuka, S.-i., Matsumoto, T.: 2008a, *ApJ*, **676**, 1088.
[2] Machida, M. N., Tomisaka, K., Matsumoto, T., Inutsuka, S.-i.: 2008b, *ApJ*, **677**, 327.
[3] Machida, M. N., Inutsuka, S.-i., Matsumoto, T.: 2007, *ApJ*, **670**, 1198.

Buried active supermassive blackholes as a function of galaxy infrared luminosity revealed through Spitzer infrared spectroscopy

IMANISHI, Masatoshi (NAOJ)
MAIOLINO, Roberto. (Rome Observatory)
NAKAGAWA, Takao (ISAS)

Ultraluminous infrared galaxies (ULIRGs) radiate huge infrared luminosities ($L_{IR} > 10^{12} L_{\odot}$), originating from thermal emission from dust heated by energy sources hidden behind dust. The energy sources can be energy generation by nuclear fusion reaction inside stars (star-formation) and/or the conversion from gravitational energy produced by accreted material onto a compact supermassive blackhole, to radiative energy (AGN activity). Since the ULIRG population contributes importantly to the cosmic infrared radiation density at $z > 1$, distinguishing the energy sources of ULIRGs is closely coupled to clarifying the connections between star-formation and supermassive blackhole mass growth in the dust obscured galaxy formation of the early universe.

Since a large amount of dust and gas concentrates to the nuclear regions of ULIRGs, spatially-compact AGNs can easily be buried (= obscured by dust in virtually all directions) and become very difficult to find through optical spectroscopy, because of large dust extinction. Infrared 5−35 μm spectroscopy is a powerful tool to study such optically elusive buried AGNs in ULIRGs, because of much reduced effects of dust extinction. Furthermore, PAH (Polycyclic Aromatic Hydrocarbons) emission features, found in this wavelength range, are detected in starbursts, but not in pure AGNs, making the features a good tool to distinguish the energy sources. Finally, the optical depths of rest-frame 9.7 μm silicate dust absorption features can also be used to differentiate between normal star-formation (stellar energy sources and dust are spatially well mixed) and buried AGNs (the energy source, a compact mass-accreting supermassive blackhole, is more centrally concentrated than dust) [1].

We have extended Spitzer 5−35 μm infrared spectroscopy to ULIRGs at $z > 0.15$ (Figure 1), and found that (1) optically-elusive, bur intrinsically luminous buried AGNs are common in ULIRGs, and (2) the importance of buried AGNs increases with increasing galaxy infrared luminosity (Figure 2), suggesting that the AGN-starburst connections are luminosity dependent [2,3]. We quantitatively estimated that the relative energetic importance of buried AGNs is higher in more infrared luminous galaxies, and these galaxies have currently higher star formation rates, and will evolve into more massive galaxies with larger stellar masses in the future. Our results may be observationally related to the widely-proposed AGN feedback scenario as the possible origin of the galaxy down-sizing phenomenon, where currently more massive galaxies have finished their major star-formation in an early cosmic age.

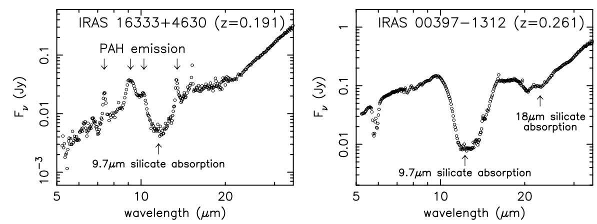


Figure 1: (Left): Spitzer infrared 5–35 μm spectrum of a starburst-dominated ULIRG, with strong PAH emission features. (Right): Buried AGN, with non-detectable PAH emission and strong silicate dust absorption features.

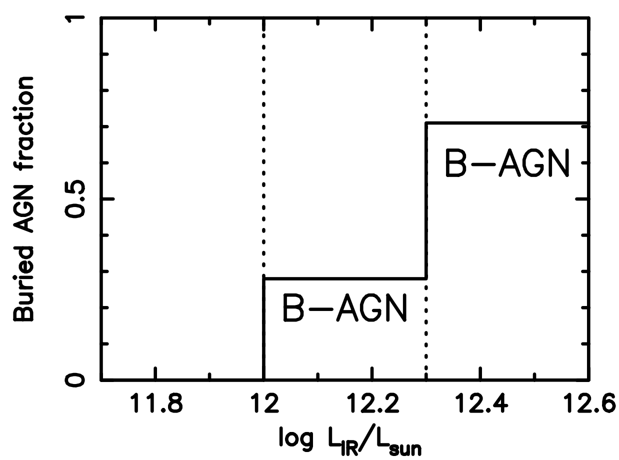


Figure 2: Detected buried AGN fraction as a function of galaxy infrared luminosity. The abscissa is the decimal logarithm of infrared luminosity in units of solar luminosity.

References

[1] Imanishi, M., Dudley, C. C., Maiolino, R., Maloney, P. R., Nakagawa, T., Risaliti, G.: 2007, *ApJS*, **171**, 72.
[2] Imanishi, M.: 2009, *ApJ*, **694**, 751.
[3] Imanishi, M., Maiolino, R., Nakagawa, T.: 2010, *ApJ*, **709**, 801.

Direct Imaging of Bridged Twin Protoplanetary Disks in a Young Multiple Star

MAYAMA, Satoshi
(The Graduate University for Advanced Studies [SOKENDAI])

TAMURA, Motohide, HAYASHI, Masahiko, ISHII, Miki, PYO, Tae-Soo
SUTO, Hiroshi, NAOI, Takahiro, KUDO, Tomoyuki, HASHIMOTO, Jun
(NAOJ)

HANAWA, Tomoyuki
(Chiba University)

MATSUMOTO, Tomoaki
(Hosei University)

NISHIYAMA, Shogo
(Kyoto University)

KUZUHARA, Masayuki
(University of Tokyo)

Studies of protoplanetary disks in multiple systems are essential for describing the general processes of star and planet formation because most stars form as multiples [1]. However, such circummultiple disks and spiral arms in multiple systems have rarely been directly resolved to date. Here, we present the direct image of an interacting binary protoplanetary system [2]. We investigate the geometry of a young (a stellar age of 4 million years) multiple circumstellar disk system, SR24, to understand its nature based on observations and numerical simulations. SR24 is a hierarchical multiple, located 160 pc away in the Ophiuchus star-forming region.

We obtained an infrared image of SR24 with CIAO [3] mounted on the Subaru 8.2-m Telescope. (Fig. 1, left). The emission arises from dust particles mixed with gas in the circumstellar structures scattering the stellar light. Both circumprimary and circumsecondary disks are clearly resolved. Both disks overflow the inner Roche lobes (dotted contours in Fig. 1), suggesting that the material outside the lobes can fall into either of the inner lobes. There is a bridge of infrared emission connecting the two disks and a long spiral arm extending from the circumprimary disk. A spiral arm would suggest that the SR24 system rotates counter clockwise. The orbital period of the binary is 15,000 yr. The arm would also imply replenishment of the twin disk gas from the circumbinary disk.

We performed 2D numerical simulations of accretion from a circumbinary disk to identify the features seen in the coronagraphic image(Fig. 1, right). Although the gas flow was not stationary, especially inside the Roche lobes, the stage of the 2D simulations shown in Fig. 1 shared common features with the observed image. These agreements between observation and simulation suggest that the bridge corresponds to gas flow and a shock wave caused by the collision of gas rotating around the primary and secondary stars. The arm corresponds to a spiral wave excited in the circumbinary disk.

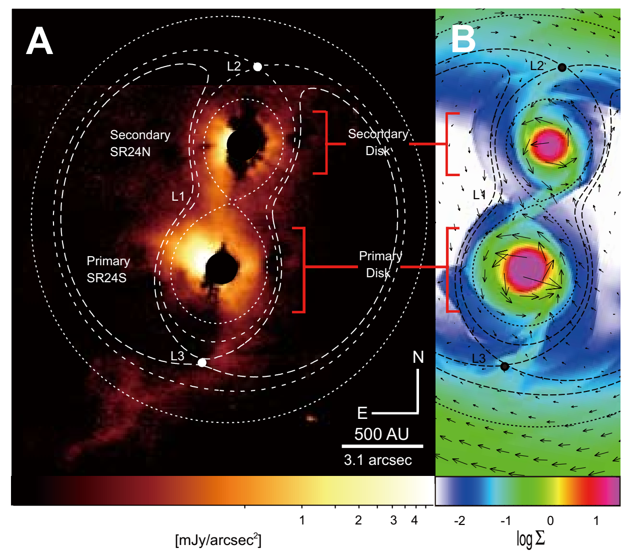


Figure 1: Observed and simulated images of the young multiple star, SR24. (a) H-band (1.6 μm) coronagraphic image of SR24. The total integration time was 1008 s. The PSFs of the final images have sizes of 0.1 arcsecond (FWHM) for the H-band. The inner and outer Roche Lobes are overlaid on the Subaru image as dotted and dashed lines, respectively. L1, L2, and L3 represent the inner Lagrangian point, outer Lagrangian point on the secondary side, and outer Lagrangian point on the primary side, respectively. (b) Snapshot of accretion onto the binary system SR24 based on 2D numerical simulations. The color and arrows denote the surface density distribution and velocity distribution, respectively.

References

[1] Ghez, A. M., Neugebauer, G., Matthews, K.: 1993, *AJ*, **106**, 2005.
[2] Mayama, S., et al.: 2010, *Science*, **327**, 306.
[3] Tamura, M., et al.: 2000, Proc. SPIE, **4008**, 1153.

HI-selected galaxies and quasar absorption systems

OKOSHI, Katsuya
(Tokyo University of Science)

NAGASHIMA, Masahiro
(Nagasaki University)

GOUDA, Naoteru, MINOWA, Yousuke
(NAOJ)

The quasar/GRB absorption systems provide us with a unique probe of galaxy formation and evolution processes. In particular, the HI absorption systems have been investigated extensively to place stringent constraint on the physical condition of the galactic gas. However, the origin of the absorption systems (e.g., damped Lyα absorption system; DLA) are still unclear because the optical counterparts are handful. For a purpose to revealing the origin of DLAs, we focus on the HI emission galaxies detected in blind radio surveys (e.g., the HI Parkes All Sky Survey; HIPASS), and investigate a link between the HI-selected galaxies and DLAs.

We employ a semi-analytic model for galaxy formation [1, 2] which incorporates basic processes of galaxy formation (e.g., merging process and SN feedback). The models, where the star formation rates (SFR) are high (the HS model) and low (the LS model), reproduce the HI mass functions (HIMFs) of the galaxy population based on the radio observations (Figure 1(a)).

We find that the number fractions of DLAs relative to galaxies are almost unity at $M_{\rm HI} > 10^8 M_\odot$ at redshift $z = 0$ [3], which suggests a trend that gaseous disks of galaxies have HI column densities as high as those in DLA systems. The HI-selected galaxies at $M_{\rm HI} > 10^8 M_\odot$ correspond to DLA hosts. By contrast, in the low-mass range $M_{\rm HI} < 10^8 M_\odot$, the number fractions begin to decrease toward the low-mass end. This indicates that a small amount of HI gas of the less massive systems does not produce high enough HI column densities to detect as DLAs. More specifically, at the low-mass end, another population, sub-DLAs, becomes dominant instead of DLAs. The predicted number fractions of sub-DLAs reaches 30% – 80% for $M_{\rm HI} \sim 10^7 M_\odot$ (Figure 1(b)).

The study of HI-selected galaxies (e.g., the SFRs (Figure 2)) can offer *statistically* valuable information about quasar absorption systems and opportunities for revealing the origins that place stringent constraints on galaxy formation and evolution.

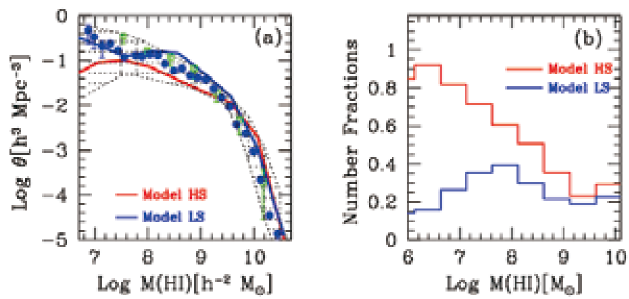


Figure 1: (a) The HI mass functions of galaxies for models. The shaded region represents the region of HIMFs given by various blind surveys. The points are the observational data provided by the HIPASS (*circles*) and the Arecibo Dual-Beam Survey (*squares*). The observations are consistent with the HIMFs for the models. (b) The histogram of number fractions of *sub-DLAs*. In the low-mass range $M_{\rm HI} < 10^8 M_\odot$, the number fractions are obviously higher than those at $M_{\rm HI} > 10^9 M_\odot$.

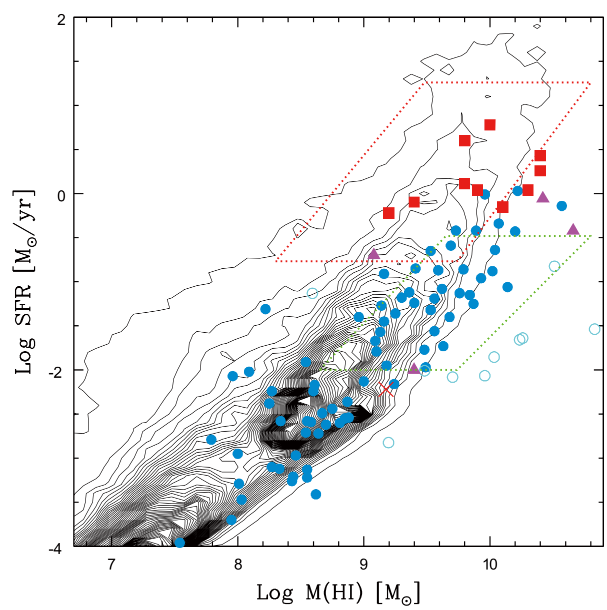


Figure 2: The contour map for the SFR vs the HI mass $M_{\rm HI}$ in galaxies for the LS model. The SFRs of optical/infrared counterparts of HI-selected galaxies are shown as *points* and *boxes*. A star formation rate in an optical counterpart of a DLA system is also plotted as *cross* (for details, [3]).

References

[1] Okoshi, K., Nagashima, M., Gouda, N., Yoshioka, S.: 2004, *ApJ*, **603**, 12.
[2] Okoshi, K., Nagashima, M.: 2005, *ApJ*, **623**, 99.
[3] Okoshi, K., Nagashima, M., Gouda, N., Minowa, Y.: 2010, *ApJ*, **710**, 1295.

Global Radiation-Magnetohydrodynamic Simulations of Black Hole Accretion Flow and Outflow: Unified Model of Three States

OHSUGA, Ken
(Graduate University for Advanced Studies / NAOJ)
MINESHIGE, Shin
(Kyoto University)
MORI, Masao
(University of Tsukuba)
KATO, Yoshiaki
(JAXA)

Black-hole accretion, the most powerful energy-production mechanism in the Universe, is known to exhibit several distinct modes (or spectral states), such as low-hard state, high-soft state, and so on. Onedimensional models for each mode were proposed. However, the α-viscosity is assumed, although its physical basis is not clear (for a review, see [1]). Since the disk viscosity is likely to be of magnetic origin [2], dynamics of magnetized accretion disks has been extensively studied via multi-dimensional MHD simulations [3, 4]. Nevertheless, our understanding of the accretion disk today is far from being satisfactory, since the radiative processes were neglected or restrictively treated in the previous simulations.

Here, we report the results of our new simulations that would open a new era of the accretion disk research. We performed global, two-dimensional radiation-MHD (RMHD) simulations, in which radiation processes as well as MHD processes are fully considered, we demonstrate three distinct modes of accretion with the same code by varying mass density normalizations. When the density is large, a thick, very luminous (super-Eddington) disk forms (model A). When the density is moderate, the accreting gas can effectively cool by emitting radiation, thus generating a thin disk, i.e., the highsoft state disk (model B). When the density is too low for radiative cooling to be important, a disk becomes hot, thick, and faint; i.e., the low-hard state disk (model C). The magnetic energy is amplified within the disk up to about twice, 30%, and 20% of the gas energy in cases described above, respectively. Notably, the disk outflows with helical magnetic fields, which are driven either by radiation pressure force or magnetic pressure force, are ubiquitous in any accretion modes. Finally, our RMHD simulations first showed that the disk viscosity is proportional to the pressure; this is hitherto the key assumption of the phenomenological standard disk theory.

References

[1] Kato, S., Fukue, J., Mineshige, S.: 2008, Black-Hole Accretion Disks - Towards a New Paradigm (Kyoto University Press).
[2] Balbus, S. A., Hawley, J. F.: 1991, *ApJ*, **376**, 214.
[3] Machida, M., Hayashi, M. R., Matsumoto, R.: 2000, *ApJ*, **532**, L67.
[4] Hawley, J. F., Krolik, J. H.: 2001, *ApJ*, **548**, 348.

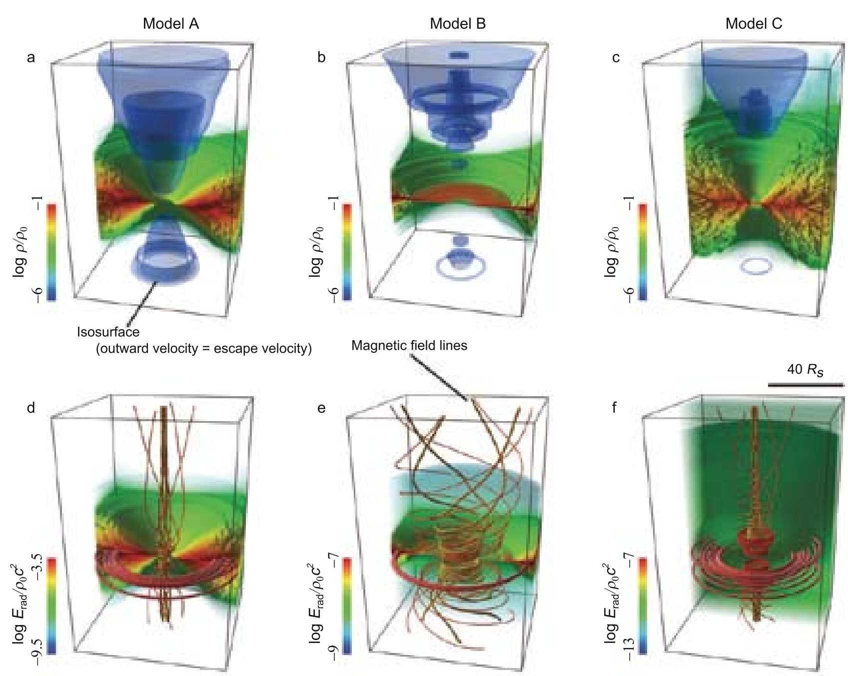


Figure 1: Perspective view of inflow and outflow patterns near the black hole for models A, B, and C, from left to right, respectively. Upper panels: Normalized density distributions (color) are overlaid with isosurfaces, at which the outward velocity equals to the escape velocity. Lower panels: The distributions of the normalized radiation energy density (color) is overlaid with the magnetic field lines.

GreeM: Massively Parallel TreePM Code for Large Cosmological *N*-body Simulations

ISHIYAMA, Tomoaki (NAOJ / University of Tokyo)
FUKUSHIGE, Toshiyuki (K&F Computing Research Co.)
MAKINO, Junichiro (NAOJ)

We developed GreeM, a massively parallel TreePM code for large-scale cosmological *N*-body simulations. GreeM uses a recursive multi-section algorithm for domain decomposition [1]. The size of the domains are adjusted so that the total calculation time of the force becomes the same for all processes. Figure 1 shows the domain decomposition for a simulation of a LCDM universe.

Figure 2 shows the CPU times per step as a function of the number of CPU cores. The loss of performance due to non-optimal load balancing is around 4%, even for more than 10^3 CPU cores whereas those of existing TreePM codes are more than 10% even for less than 256 CPU cores[2, 3] (Figure 3 shows the speed-up factors of GreeM and GADGET-2). GreeM runs efficiently on PC clusters and massively-parallel computers, such as a Cray XT4. The measured calculation speed on Cray XT4 is 7×10^4 particles per second per CPU core, for the case of an opening angle of $\theta = 0.5$, if the number of particles per CPU core is larger than 10^6 [4].

GreeM is extended for simulations on a planet-wide distributed supercomputer [5]. We acheieved to run simulations over a variety of supercomputers in Tokyo (Japan), Amsterdam (Netherlands), Edinburgh (UK), and Espoo (Finland). We are able to achieve ~87 % of the performance compared to an equal number of cores on a single supercomputer.

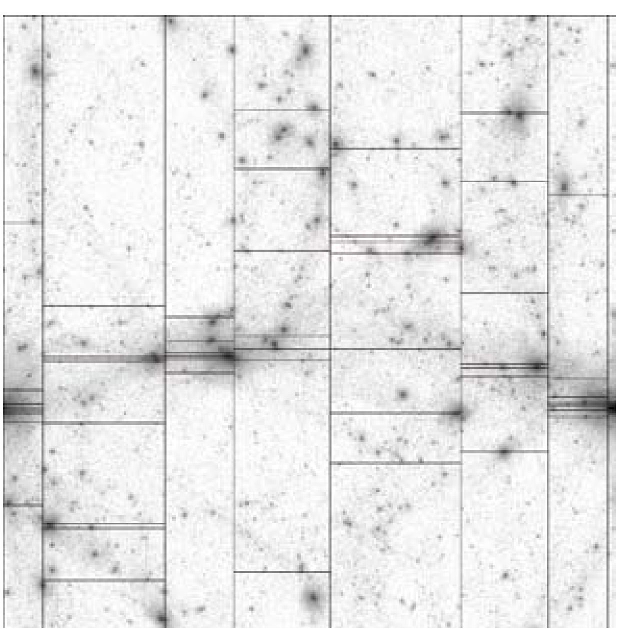


Figure 1: Decomposition in the LCDM universe at $z = 0$. It shows 8 × 8 division in two dimensions.

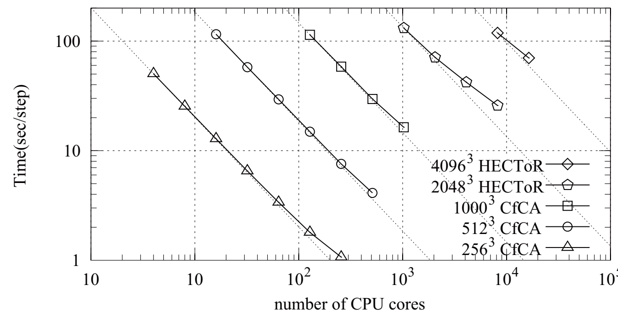


Figure 2: Calculation time per step of our code as a function of the number of CPU cores on Cray-XT4 and HECToR (Edinburgh).

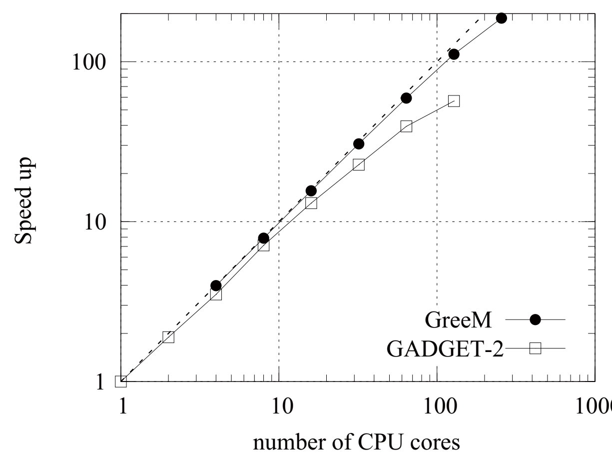


Figure 3: Speed up of our code and GADGET-2 plotted against the number of CPU cores. The filled circles and open squares show the result of GreeM and that of GADGET-2, respectively.

References

[1] Makino, J.: 2004, *PASJ*, **56**, 521.
[2] Dubinski, J., et al.: 2004, *New Astronomy*, **9**, 111.
[3] Springel, V.: 2005, *MNRAS*, **364**, 1105.
[4] Ishiyama, T., et al.: 2009, *PASJ*, **61**, 1319.
[5] Portegies Zwart, S., et al.: 2010, *IEEE Computer Society*, in press.

Magnetic Field Structure of the HH 1–2 Region: Near-Infrared Polarimetry of Point-Like Sources

KWON, Jungmi
(Kyung Hee University / Korea Astronomy and Space Science Institute)

CHOI, Minho
(Korea Astronomy and Space Science Institute)

PAK, Soojong
(Kyung Hee University)

KANDORI, Ryo, TAMURA, Motohide
(NAOJ)

NAGATA, Tetsuya
(Kyoto University)

SATO, Shuji
(Nagoya University)

The HH 1–2 region in the L1641 molecular cloud was observed in the near-infrared (IR) J, H, and K_s bands, and imaging polarimetry was performed. Seventy-six point-like sources were detected in all three bands. The near-IR polarizations of these sources seem to be caused mostly by the dichroic extinction [1]. Using a color-color diagram, reddened sources with little IR excess were selected to trace the magnetic field structure of the molecular cloud. The mean polarization position angle of these sources is about 111°, which is interpreted as the projected direction of the magnetic field in the observed region of the cloud. The distribution of the polarization angle has a dispersion of about 11°, which is smaller than what was measured in previous studies. This small dispersion gives a rough estimate of the strength of the magnetic field to be about 130 μG and suggests that the global magnetic field in this region is quite regular and straight. In contrast, the outflows driven by young stellar objects in this region seem to have no preferred orientation. This discrepancy suggests that the magnetic field in the L1641 molecular cloud does not dictate the orientation of the protostars forming inside[2].

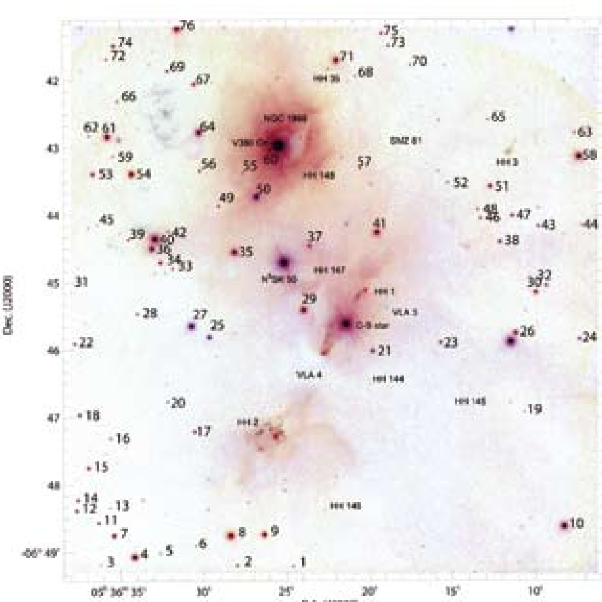


Figure 1: Finding chart of the HH 1–2 field (color-negative image of Color composite Stokes I image in the J(*blue*), H(*green*), and K_s(*red*) bands from the IRSF/SIRPOL observations). Detected point-like sources are labeled. Bright stars and some extended sources are also labeled.

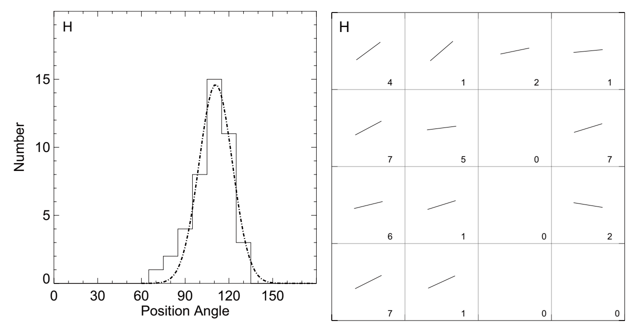


Figure 2: *Left*: Histogram of polarization position angles for the group Ar sources in the H band (either background stars or pre-main-sequence stars with little IR excess and with substantial reddening in the L1641 cloud). The peak angle is 111°, and the dispersion is 11°. Dot-dashed curve: Gaussian fit. *Right*: Average polarization position angle of group Ar sources in 2′ × 2′ subregions of the HH 1–2 field. The number of sources in each subregion is labeled.

References

[1] Tamura, M., et al.: 2007, *PASJ*, **59**, 467.
[2] Kwon, J., et al.: 2010, *ApJ*, **708**, 758.

Stochastic Nature of Gravitational Waves from Supernova Explosions with Standing Accretion Shock Instability

KOTAKE, Kei
(NAOJ)

Traditionally, most of the model calculations of gravitational waves (GWs) have focused on the bounce signals in the context of rotational and magneotrotational corecollapse (see collective references in [1]). However, most of them have been based on the two-dimensional (2D) simulations that assume axisymmetry. Then, the growth of standing accretion shock instability (SASI) [2] and the large-scale convection, both of which are now considered to generically develop in the postbounce phase and to help the neutrino-driven explosions, develop along the symmetry axis preferentially, thus suppressing the anisotropies in explosions.

These situations motivated us to study the properties of GW based on the 3D simulations, which demonstrate the neutrino-driven explosions aided by SASI [3]. Figure 1 shows the 3D hydrodynamical features of SASI from the early phase of the non-linear regime of SASI (top left) until the shock break-out (bottom right) with the gravitational waveform from neutrinos inserted in each panel. After about 100 ms, the deformation of the standing shock becomes remarkable marking the epoch when the SASI enters the non-linear regime (top left of Figure 1). At the same time, the gravitational amplitudes begin to deviate from zero. As seen from the top right through bottom left to right panels of Figure 1, the major axis of the growth of SASI is shown to be not aligned with the symmetric axis (:*Z* axis in the figure) and the flow inside the standing shock wave is not symmetric with respect to this major axis (see the first and third quadrant in Figure 1). This is a generic feature in the computed 3D models, which is in contrast to the axisymmetric case. The GW amplitudes from SASI in 2D showed an increasing trend with time due to the symmetry axis, along which SASI can develop preferentially [2, 4]. Free from such a restriction, a variety of the waveforms is shown to appear (see waveforms inserted in Fig.). Such signals from a Galactic supernova are probably within the detection limits of the LIGO-class detectors, and seem surely visible to the next-generation detectors such as the advanced LIGO and LCGT. This means that the successful detection of the GW signals will supply us a powerful tool to probe the explosion mechanism. Recently the next-generation detectors, by which the GWs studied here could be surely visible for a Galactic source, are planned to be on line soon (2014!). It is an urgent task for theorists to make precise predictions of the GW signals based on more sophisticated 3D supernova modeling.

We have also studied the equilibrium configurations of magnetized neutron stars in the framework of general relativity.

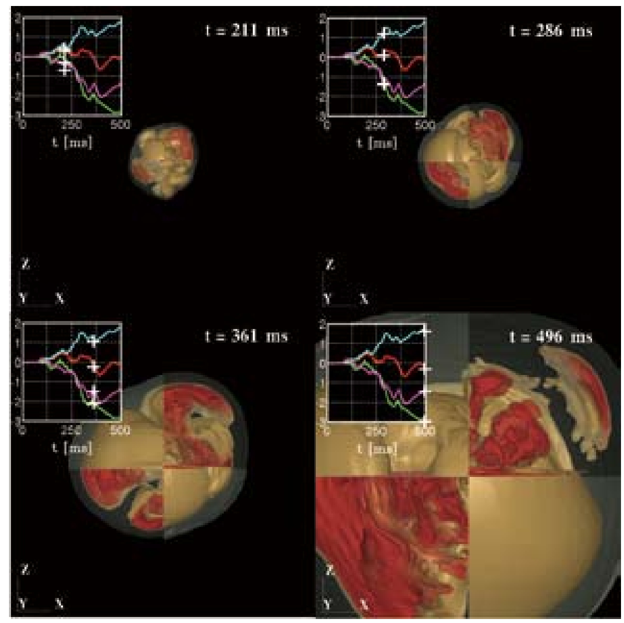


Figure 1: Four snapshots of the entropy distributions of a representative 3D supernova explosion model. The second and fourth quadrant of each panel shows the surface of the standing shock wave. In the first and third quadrant, the profiles of the high entropy bubbles (colored by red) inside the section cut by the *ZX* plane are shown. The side length of each plot is 1000 km. The insets show the gravitational waveforms from anisotropic neutrino emissions, with '+' on each curves representing the time of the snapshot.

References

[1] Kotake, K., Sato, K., Takahashi, K.: 2006, *Reports of Progress in Physics*, **69**, 971.
[2] Kotake, K., Ohnishi, N., Yamada, S.: 2007, *ApJ*, **655**, 406.
[3] Kotake, K., Iwakami, W., Ohnishi, N., Yamada, S.: 2009, *ApJL*, **697**, L133.
[4] Kotake, K., Iwakami, W., Ohnishi, N., Yamada, S.: 2009, *ApJ*, **704**, 951.

Centroid Experiment for 10^{-4} Pixel Order Determination of the Positions of Stars

YANO, Taihei, ARAKI, Hiroshi, HANADA, Hideo, TAZAWA, Seiichi, GOUDA, Naoteru, KOBAYASHI, Yukiyasu
(NAOJ)

YAMADA, Yoshiyuki
(Kyoto University)

NIWA Yoshito
(Kyoto University / NAOJ)

JASMINE Working Group

We have experimented with the determination of the positions of star images on a detector with high precision such as 10 microarcseconds, required by a space astrometry satellite, JASMINE. In order to accomplish such a precision, we take the following two procedures. (1) We determine the positions of star images on the detector with the precision of about 0.01 pixel for one measurement, using an algorithm for estimating them from photon weighted means of the star images. (2) We determine the positions of star images with the precision of about 0.0001–0.00001 pixel, which corresponds to that of 10 microarcseconds, using a large amount of data over 10000 measurements, that is, the error of the positions decreases according to the amount of data. Here, we note that the procedure 2 is not accomplished when the systematic error in our data is not excluded adequately even if we use a large amount of data. We show the results in the laboratory experiment for precision of determining the positions of star images. We obtain that the precision of estimation of positions of star images on the detector is under a variance of 0.01 pixel for one measurement (procedure 1). We also obtain that the precision of the positions of star images becomes a variance of about 0.0001 pixel using about 10000 measurements (procedure 2).

1 Results of Experiment 1

We obtain that the variance of the estimated distances of two stars is less than 0.01 pixel from several image frames using the algorithm shown in [1].

2 Results of Experiment 2

We finally need to determine the positions of star images with the precision of about 0.0001–0.00001 pixel, which corresponds to that of 10 microarcseconds, using a large amount of data over 10000 measurements, that is, the error of the positions decreases according to the amount of data. The above procedure is not necessarily accomplished when the systematic error in our data is not excluded adequately even if we use a large amount of data. In our experiment, we ascertain that the error of the positions of stars decreases according to the amount of data. The result is shown in the figure 1. The abscissa indicates the number of images in deriving the variance. The ordinate indicates the variance of the estimated distance of stars. As shown in the figure 1, the variance decrease according to the slope of random error. Therefore, we obtain that the precision of the positions of star images becomes a variance of about 0.0001 pixel using about 10000 measurements [2].

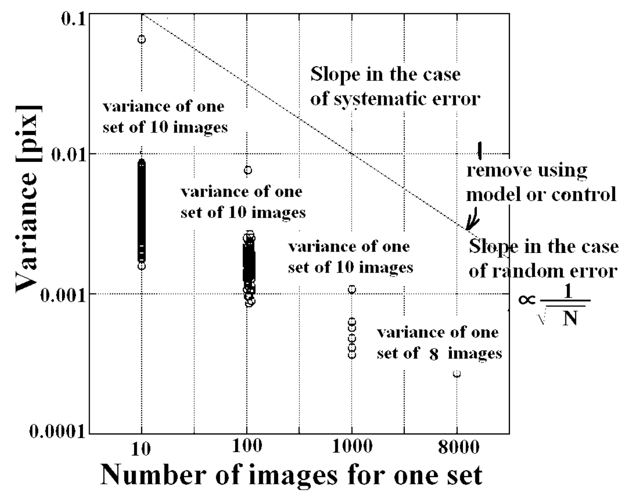


Figure 1: Variance against the number of images.

References

[1] Yano, T., et al.: 2004, *A&A*, **116**, 667.
[2] Yano, T., et al.: Proceedings of the Astronomical Data Analysis Software and Systems(ADASS) XIX, Oct 4-8 2009, Sapporo, Japan.

Achromatic deep nulling with a three-dimensional Sagnac interferometer

YOKOCHI, Kaito, KUROKAWA, Takashi
(Tokyo University of Agriculture and Technology)
TAVROV, Alexander
(Space Research Institute)
NISHIKAWA, Jun, MURAKAMI, Naoshi, TAMURA, Motohide
(NAOJ)
ABE, Lyu
(Universite de Nice-Sophia Antipolis)
TAKEDA, Mitsuo
(The University of Electro-Communications)

Not only for the detection but also the spectroscopic characterization of faint extra-solar planets, bright stellar light should be suppressed over a broad wavelength band to carry out investigations.

A 3-D Sagnac interferometer, which we have already proposed, introduces an achromatic nulling interference with geometrical π phase shift and a stable optical path length because of its common path architecture [1]. So far, to our knowledge the achromaticity of the practical 3-D Sagnac interferometer has never been evaluated theoretically. Here we show the achromaticity of the 3-D Sagnac interferometer based on the Jones matrix and laboratory experiments by using two laser lights ($\lambda = 532$ nm and 633 nm)[2].

Figure 1 shows the schematic of the 3-D Sagnac interferometer. The anticlockwise and clockwise optical paths (1, PBS-BS-M1-M2-M3-M4-M5-M6-BS-PBS and 2, PBS-BS-M6-M5-M4-M3-M2-M1-BS-PBS) in the nulled output rotate the electric field vectors ± 90 deg, respectively.

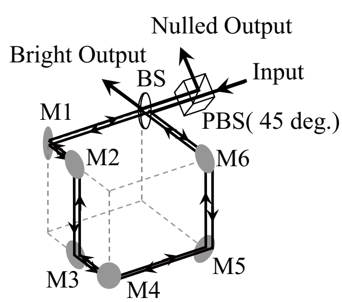


Figure 1: Schematic of the 3-D Sagnac interferometer consisting of a polarized beam splitter (PBS), a beam splitter (BS), and six plane mirrors (M1-M6).

The transformed Jones matrices of the two optical paths can be calculated as

$$\begin{aligned} \mathcal{J}_1 &= C^3 D^3 X \begin{bmatrix} \cos\theta \sin\theta & \sin^2\theta \\ \cos^2\theta & \cos\theta\sin\theta \end{bmatrix}, \\ \mathcal{J}_2 &= -C^3 D^3 Y \begin{bmatrix} \cos\theta \sin\theta & \sin^2\theta \\ \cos^2\theta & \cos\theta\sin\theta \end{bmatrix}, \end{aligned} \tag{1}$$

here

$$\begin{cases} X = AB' \cos^2\theta - BA' \sin^2\theta \\ Y = AB' \sin^2\theta - BA' \cos^2\theta. \end{cases} \tag{2}$$

A nulling condition $\mathcal{J}_1 = -\mathcal{J}_2$ can be obtained only when $X = Y$, which corresponds to the azimuth angle $\theta = \pi/4$. On this condition, the two output electric vectors through the 3-D Sagnac interferometer have the same amplitude and achromatic π-phase difference for arbitrary input electric vector. This optical system can make effective nulling observations for linearly polarized light, so that two Sagnac systems can take all of the unpolarized star light divided into two linear polarizations.

Four pictures shown in Fig. 3 are CCD images in constructive and destructive conditions exposed by the twowavelengths laser light. The pictures are normalized by the peak value of the bright output, and the lower graph is their mean radial intensity profiles. The nulling contrasts of 4.16×10^6 (for 532 nm) and 1.17×10^5 (for 633 nm) at the central position were obtained simultaneously.

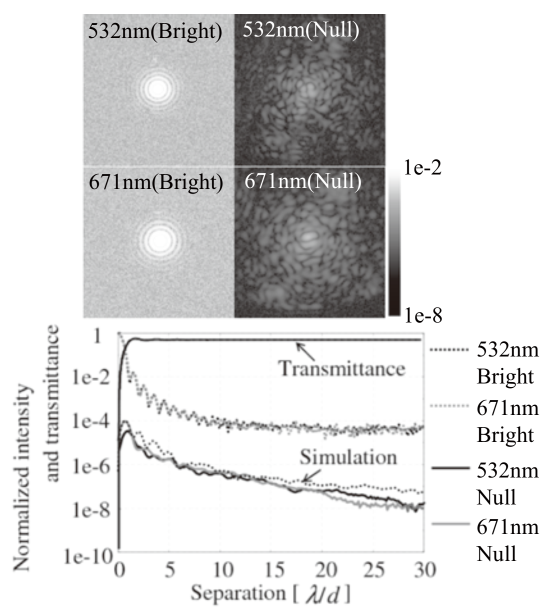


Figure 2: (Upper) Interferometric images and (lower) intensity profiles with the simulated one, assuming wavefront errors of about λ/200 rms. Theoretical transmittance of offaxis light is also plotted.

References

[1] Tavrov, A., et al.: 2005, *Opt. Lett.*, **30**, 2224.
[2] Yokochi, K., et al.: 2009, *Opt. Lett.*, **34**, 1985.

Interstellar Extinction Law toward the Galactic Center: J, H, K_S bands, and 3.6, 4.5, 5.8, 8.0 μm

NISHIYAMA, Shogo, NAGATA, Tetsuya
(Kyoto University)
TAMURA, Motohide
(NAOJ)
HATANO, Hirofumi
(Nagoya University)
KATO, Daisuke, TANABÉ, Toshihiko
(University of Tokyo)
SUGITANI, Koji
(Nagoya City University)

The wavelength dependence of interstellar extinction is not only important information to understand the nature of interstellar dust grains, but an essential ingredient in recovering the intrinsic properties of reddened objects. The absolute value of interstellar extinction to an individual star is difficult to determine, and so is its wavelength dependence. Toward the Galactic center (GC), however, we can directly derive the wavelength dependence of interstellar extinction, assuming only that the center of stellar distribution in the lines of sight is at the same distance from us and that the foreground extinction is patchy. By plotting the apparent magnitude versus the color excess of a group of stars, one obtains a straight line with the slope equal to the total to selective extinction ratio, e.g., A_{K_S}/E_{H-K_S}.

We have determined the interstellar extinction law toward the GC at the wavelength from 1.2 to 8.0 μm, using point sources detected in the IRSF/SIRIUS near-infrared survey and those in the *Spitzer*/IRAC/GLIMPSE II catalog [1]. We made K_S versus $K_S - \lambda$ color-magnitude diagrams where λ = 3.6, 4.5, 5.8, and 8.0 μm. The K_S magnitudes of bulge red clump stars and the $K_S - \lambda$ colors of red giant branches are used as a tracer of the reddening vector in the color-magnitude diagrams. From these magnitudes and colors, we have obtained the ratios of total to selective extinction $A_{K_S}/E_{K_S-\lambda}$ for the four IRAC bands. Combined with A_λ/A_{K_S} for the J and H bands derived by Nishiyama et al. (2006 [2]), we obtain $A_J : A_H : A_{K_S} : A_{[3.6]} : A_{[4.5]} : A_{[5.8]} : A_{[8.0]}$ = 3.02 : 1.73 : 1 : 0.50 : 0.39 : 0.36 : 0.43 for the line of sight toward the GC (Fig. 1). This confirms the flattening of the extinction curve at $\lambda > 3\,\mu$m from a simple extrapolation of the power-law extinction at shorter wavelengths.

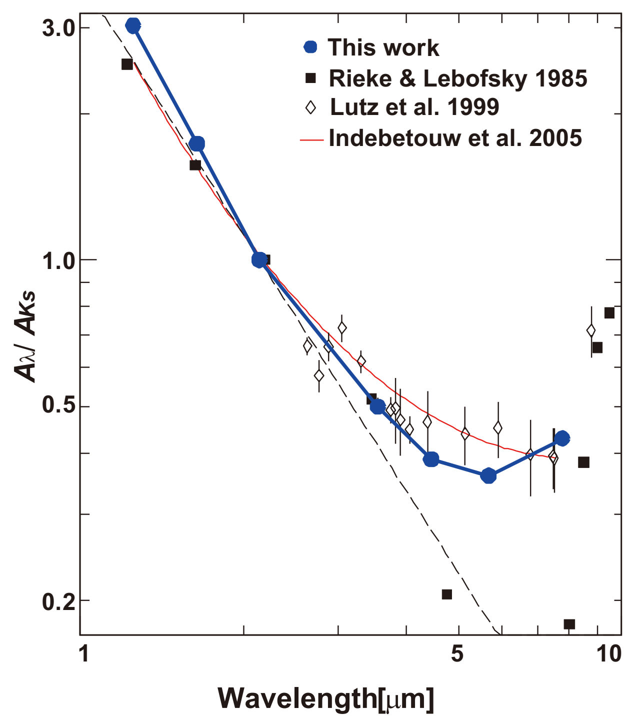


Figure 1: Wavelength dependence of interstellar extinction A_λ/A_{K_S} toward the Galactic center. The ratios derived by this study [1] (*filled blue circles*), Lutz (1999 [3], *open diamonds*), and Rieke & Lebofsky (1985 [4], *filled squares*) are represented. A simple power law, $A_\lambda \propto \lambda^{-1.75}$ is shown by the dashed line. Although it is not toward the Galactic center, the extinction curve for diffuse interstellar medium [5] is shown by *thin red smooth line* for reference.

References

[1] Nishiyama, S., et al.: 2009, *ApJ*, **696**, 1407.
[2] Nishiyama, S., et al.: 2006, *ApJ*, **638**, 839.
[3] Lutz, D.: 1999, in The Universe as Seen by ISO, ed. P. Cox & M. F. Kessler (ESA SP-427; Noordwijk: ESA), 623.
[4] Rieke, G. H., Lebofsky, M. J.: 1985, *ApJ*, **288**, 618.
[5] Indebetouw, R., et al.: 2005, *ApJ*, **619**, 931.

Near-infrared Polarized Flares from Sgr A*

NISHIYAMA, Shogo, NAGATA, Tetsuya
(Kyoto University)
TAMURA, Motohide, KUDO, Tomoyuki, ISHII, Miki
(NAOJ)
HATANO, Hirofumi
(Nagoya University)
SCHÖDEL, Rainer
(Instituto de Astrofisica(IAA)-CSIC))
ECKART, Andreas
(Universit¨at zu Köln)

Although the theory of general relativity has passed experimental tests in a weak gravitational field, it has not been well tested in a strong gravitational field. Testing the theory in the strong field generated by collapsed objects such as a neutron star and a black hole has been proposed as a possible mean for such investigation.

Periodicity of ~20 min claimed in NIR monitoring observations of Sgr A*, a supermassive black hole (SMBH) at the center of our Galaxy, would place the corresponding emission region at roughly three Schwarzschild radii for a BH mass of $4 \times 10^6 M_\odot$ [1]. If this picture is correct, the NIR flares from Sgr A* should be significantly influenced by general relativistic effects, and thus are powerful tools that allows us to probe within a few gravitational radii of the event horizon.

Sgr A* was observed continuously for ~4 hours on 28 May 2008, using the near-infrared camera CIAO and AO36 on the Subaru telescope [2]. We detected three flares (Fig. 1). The rise and decay timescales of ~6.5 min in the third flare are consistent with the light crossing timescale for the inner part of the accretion disk, less than 10 Schwarzschild radii, around $4 \times 10^6 M_\odot$ BH.

Clear variations in the degree and position angle of polarization were also detected. The first and second flares consist of a weakly or non- polarized main flare and a highly polarized sub-flare. The degree of polarization rises slowly up to ~20%, and decays sharply. The rises occur after the bright flare phase, when flux of Sgr A* is decaying. We found swings of the position angle of ~60º–70º in the declining phase of the flares.

The correlation between the flux and the degree of polarization suggests that the flare emission comes from hotspot(s) orbiting Sgr A*. In the hotspot model, observed flares correspond to synchrotron emission from a hot blob orbiting Sgr A* near its innermost stable circular orbit. Recent calculation [3] show that the primary feature of the light curves from the orbiting hotspot with a large orbital inclination angle i (close to the edge-on view) is a narrow and higher peak followed by a broad lower peak/bump. The first peak is formed by a gravitational lensing effect which is strongest when the hotspot is right behind the black hole. Doppler effect and beaming due to the relativistic motion of the hotspot in the approaching regime make the second peak/bump. The time evolutions of the degree of polarization show a doublepeak profile with a higher second peak than the first one, or a slow-rise and sharp-decay profile (with a lower time resolution).

The similarities between the second flare we detected and the calculations [3] suggest that the second flare could be explained with a single orbital motion of a hotspot. In the light curve of the second flare, we can see the "first peak and second peak/bump" profile. It is clearly seen that the degree of polarization increases in the decay phase of the flare, and its profiles is asymmetric, showing slow rise and sharp decay. These comparison with the calculations gives a constraint to the inclination angle i of the orbit of the hotspot around Sgr A*, as $45º \leq i < 90º$ (close to edge-on).

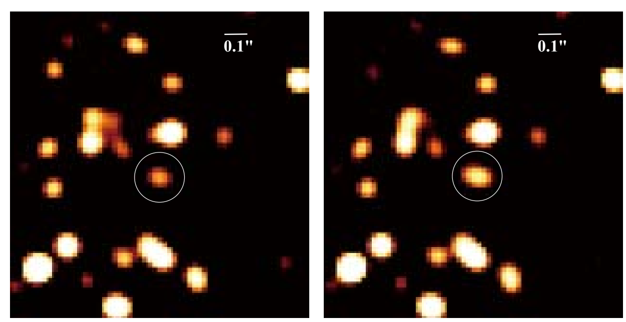


Figure 1: *Ks*-band images of the central 1.3″ × 1.3″ region of our Galaxy. The time from the beginning of the observation is 145.1 (left) and 158.4 min (right). In each image, the location of Sgr A* is marked by a circle.

References

[1] Genzel, R., et al.: 2003, *Nature*, **425**, 934.
[2] Nishiyama, S., et al.: 2009, *ApJL*, **702**, L56.
[3] Broderick, A. E., Loeb, A.: 2006, *MNRAS*, **367**, 905.

A Necessary Condition for Individual Time-steps in SPH Simulations

SAITOH, Takyuki, MAKINO, Junichiro
(NAOJ)

Individual time-step method is widely used in simulation of galaxy formation. This method allows particles to have different time-steps, and integrates these particles with their own time-steps. Almost all implementation of individual time-steps used for particle systems violates Newton's third law. However, as long as physical quantities are integrated with sufficient accuracy, the violation is not so serious in simulations.

It is, however, not always possible to maintain the accuracy. Since time-steps are usually evaluated at the end of previous time-steps, particles can not follow an event during the time-step. Simulations involving supernova explosions are one of such examples. When supernova explosion occurs, a little amount of very hot gas generates in a compact region. The time-steps in the region rapidly shrink about 1/1000 of the previous steps. Therefore, hot gas particles step forward about 1000 steps or more time-steps before neighboring cold gas particle respond to the SN event, resulting in a large integration error. In principle, we can avoid the integration error, for instance, by adopting an implicit method [1], but there are no implementations of such methods for SPH simulations.

Here, we propose a simple limiter for hydrodynamical time-steps in individual time-step method which solves this problem [2]. We denote the time-step of an i-th particle as dt_i and that of a neighbor particle, with index j, as dt_j . The basic idea of our limiter is to enforce the following conditions:

$$dt_i \le f\,dt_j \text{ and } dt_j \le f\,dt_i, \qquad (1)$$

where f is an adjustable parameter. We found $f = 4$ to give good results. By introducing this limiter, particles can follow events which occur during the time-steps.

In order to verify the effect of the limiter, we performed a Sedov problem [3]. We set that there is six orders of magnitude in temperature between the hot gas and cold, ambient gas. We performed three runs: (a) integrated with global time-steps, (b) traditional individual timesteps, and (c) individual time-steps with the limiter.

Figure 1 shows the results of the test. Run (a) shows a clear spherical structure and its density profile traces the analytic solution very well. Run (b), however, displays penetrations of the hot gas particles into the ambient medium and fails to reproduce the analytic solution. This is because the time-steps of the ambient gas particles are quite long compared with those of the initially heated particles. Thus the ambient gas particles can not follow the explosion. Run (c) does not show this problem, and the result of Run (c) is very close to that of Run (a). This is because the short time-steps propagate to surrounding particles quickly enough. As a result, cold gas particles can respond to the pressure of the hot gas particles. Hence we conclude that this limiter (or a similar criterion for time-steps) is necessary for the simulations of SPH with individual time-steps involving strong shocks.

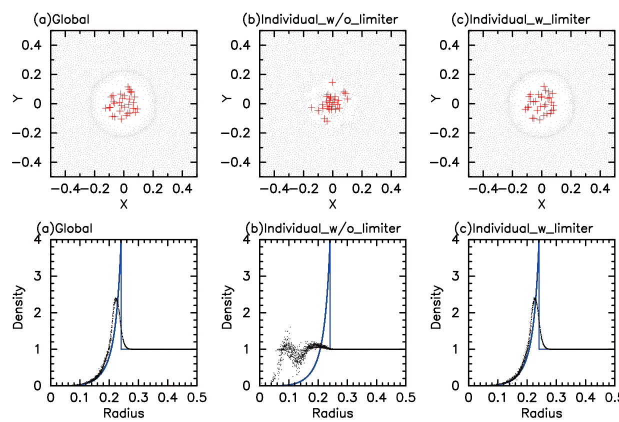


Figure 1: The projected particle distributions in $|z| < 0.01$ (upper row) and the density profiles (bottom row) at $T = 0.02$. Left, middle and right columns show the evolution of particles integrated with (a)global time-steps, (b) traditional individual time-steps, (c) individual time-steps with the limiter. Crosses indicate positions of the initially heated particles. Solid lines are the analytic solution of Sedov problem.

References

[1] Makino, J., Hut, P., Kaplan, M., Saygın, H.: 2006, *New Astronomy*, **12**, 124.
[2] Saitoh, T. R., Makino, J.: 2009, *ApJL*, **697**, L99.
[3] Sedov, L. I.: 1959, Similarity and Dimensional Methods in Mechanics New York: Academic Press.

Chemical composition of extremely metal-poor stars in a dwarf galaxy

AOKI, Wako, ARIMOTO, Nobuo (NAOJ) SADAKANE, Kozo (Osaka Kyoiku University) DART team

Dwarf galaxies in the local group have been investigated from a variety of view points including their roles in the Milky Way formation. Some of them, like the Sagittarius dwarf galaxy, are currently interacting with the Milky Way, indicating that the merging of such galaxies should have played important roles in the Galaxy formation. However, significant differences in the chemical nature are known between Milky Way halo and dwarf galaxies observed at present.

A remarkable difference is found in chemical abundances of individual stars measured for nearby dwarf galaxies based on high resolution spectroscopy. Chemical abundance studies for several dwarf galaxies in the past decade revealed that the abundance ratios between α elements (e.g., Mg, Ca) and Fe are lower, in general, in dwarf galaxy stars than in field stars. This trend is clear particularly in relatively luminous, metal-rich dwarf galaxies. Moreover, the metallicity distribution function of dwarf galaxies, which was estimated from medium resolution spectroscopy, suggests a deficiency of extremely metal-poor stars in dwarf galaxies [1].

We have started chemical abundance measurements of extremely metal-poor stars in dwarf galaxies, which have not been well covered by previous work. Medium resolution spectroscopy suggested that the Sextans dwarf galaxy includes relatively large number of candidates of extremely metal-poor stars. We applied high resolution spectroscopy with the Subaru Telescope High Dispersion Spectrograph (HDS) to six objects in Sextans [2].

We first confirmed the existence of extremely metal-poor stars in this galaxy. Since the calibration for the metallicity estimate from medium resolution spectroscopy (using Ca triplet at ~8500 Å) is still insufficient at very low metallicity ([Fe/H] <-2.5), high resolution spectroscopy for Fe absorption lines is required. Our measurements result in even lower metallicity than the estimates from medium-resolution spectroscopy.

The α elements in such extremely metal-poor stars are expected to be over-abundant as found in the bulk of field halo stars. However, surprisingly, most of the Sextans objects show low α/Fe ratios. Figure 1 depicts the Mg/Fe ratio as an example. The Mg/Fe ratios of most objects are as low as the solar ratio, while only a few shows overabundance of Mg as in the field stars. A similar result is also obtained for Ca abundance ratios. Over-abundances of α elements are expected from the nucleosynthesis of usual core-collapse (type II) supernovae. The Sextans dwarf galaxy includes objects that cannot be explained by the yields of usual type II supernovae alone.

One possible explanation is to include the contributions of type Ia supernovae, as the origins of iron in the Solar-System. However, because of the longer time-scale of type Ia supernovae, large contributions of them are not expected at such low metallicity. Another possibility is to assume that less massive stars, from which only small amount of α elements provided through supernovae, are dominant among the progenitors of type II supernovae in this galaxy.

Rapid progresses are recently found in chemical abundance studies for dwarf galaxies that have similar luminosity and metallicity to Sextans. These studies show significant differences in the chemical abundance ratios between galaxies, indicating that we need to investigate the formation and evolution of individual galaxies. Studies of ultra-faint dwarf galaxies recently discovered might be particularly important as more primitive objects.

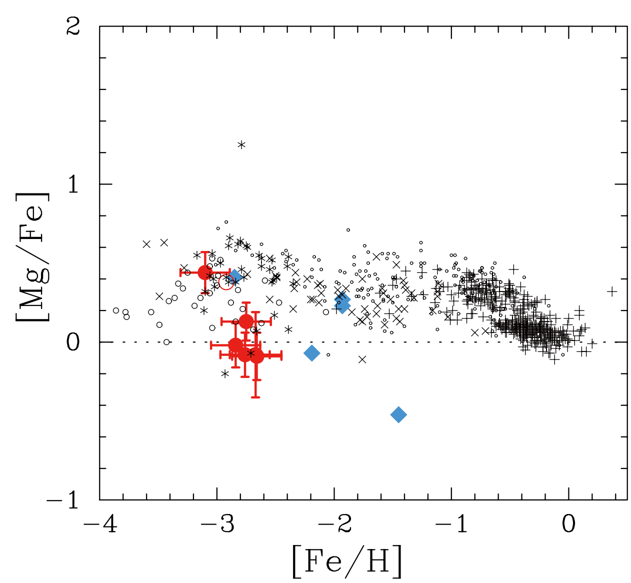


Figure 1: [Mg/Fe] as a function of metallicity for Sextans stars (filled circles: our study; diamonds: previous studies) and field stars (smaller symbols from literature). This galaxy includes extremely metal-poor stars that have quite low α elements.

References

[1] Helmi, A., et al.: 2006, *ApJ*, **651**, L121.
[2] Aoki, W., et al.: 2009, *A&A*, **502**, 569.

Performance Evaluation of Nano-JASMINE

HATSUTORI, Yoichi, KOBAYASHI, Yukiyasu, GOUDA, Naoteru, YANO, Taihei
(NAOJ)

YAMADA, Yoshiyuki (Kyoto University)
NIWA, Yoshito (NAOJ / Kyoto University)
MUROOKA, Jumpei (University of Tokyo)

Nano-JASMINE is mounted a 5 cm effective diameter telescope and aims to measure positions and motions of stars with the accuracy of a few milli-arcseconds in *z–band*($\lambda \sim 0.8\,\mu$m). The satellite weighs about 35 kg and it is developed by National Astronomical Observatory of Japan, Kyoto University and University of Tokyo. Nano-JASMINE will be launched at August 2011 from Alcantara Launch Center at Brazil by Cyclon-4 rocket. JASMINE Project Office contributes to develop a small reflecting telescope and a driver circuit for a CCD detector. In 2009, we developed and evaluated these instruments [1]. This paper reports the results of the performance evaluation.

First, the small reflecting telescope was made of aluminum alloy because of the suppression of effects of strain induced by thermal changes. The reflecting surfaces were polished with a single-crystal diamond cutting tools and deposited with Cr and Au vapor. Developed telescope weighs 1.7 kg and occupies a volume of only 17x12x12 cm. The telscope will be operated below 220 K on orbit. The thermal vacuum test was conducted to evaluate the performance at orbital condition. The telescope was cooled down by LN2 and the wavefront errors of developed telescope were measured by an interferometer. As a result, the RSS wavefront error is $\lambda/14(\lambda = 800\,\text{nm})$. Therefore, it is confirmed that developed telescope can achieve a diffraction-limitted performance. Moreover, numerical analysis was conducted to calculate the relatonship between the thermal change and the deformation of telescope. Fig. 1 shows the result of the numerical analysis.

Second, the radiation test of a CCD detector was conducted to evaluate the performance degradation. Gamma ray and proton were irradiated. As a result, it was confirmed that although noise will be increased and Charge Transfer Efficiency(CTE) will be degraded, these effects can be corrected in analysis.

Finally, the engineering model of Nano-JASMINE was assembled. Fig. 2 shows the outlook of the satellite. Using this engineering model, comprehensive tests were conducted to analyse the total noise of observations. Moreover, the Critical Design Review(CDR) was convened to judge the satellite design. As a result, we obtained the consensus for the flight model of Nano-JASMINE. In 2010, the flight model of Nano-JASMINE is to be developed

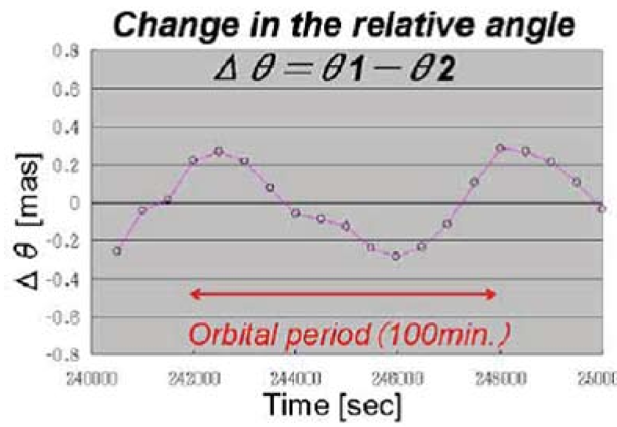


Figure 1: Numerical Result of thermal analysis. The change in the relative angle is required to be below 1mas(p-v). It is confirmed that the result satisfies the requirement.

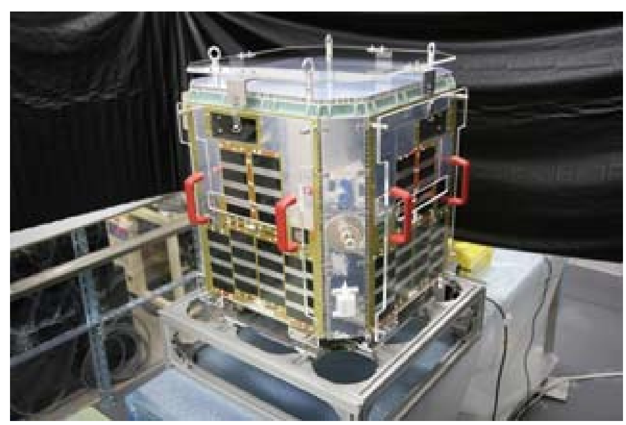


Figure 2: Enginnering Model of Nano-JASMINE. Telescope and CCD are equipped inside the satellite. A series of performance evaluation are conducted.

Reference

[1] Hatsutori, Y., et al.: 2009, *Trans. JSASS Space Tech. Japan*, **7**, Tm19-Tm23.

The Relation between the Magnetic Fields and the Coronal Activities in the Polar Coronal Hole

SHIMOJO, Masumi, TSUNETA, Saku
(NAOJ)

We obtain the spatial relation between the polar magnetic fields and the polar coronal activities/structures with careful co-alignment among the Stokes maps of the lower atmosphere, the X-ray images and the EUV images. These images are taken with *Hinode* and SOHO. We found that the coronal structures and activities appear when the relatively large magnetic concentrations with minority polarity appear near the KG-patches, and we also verified that the increases of the minority signals that associated with the polar X-ray jets in the Na I Stokes-V indicate the emerging flux regions. Since the relation between the coronal structures and the magnetic concentrations with minority polarity can be easily found from other dataset of the polar region, the relation is very rigid. The result suggests that the coronal structures and activities in the polar coronal hole are produced by the interactions of the kG-patches with the emerging minority polarities near the kG-patches [1].

We show that the emerging flux appears even in the polar region. It may not be conceivable that the magnetic flux located in the middle latitude of the convection zone emerges at the polar region. The emerging flux in the polar region may be generated by the local dynamo process due to the granular/super-granular motion.

We discuss the relation between the kG-patches, the Xray jets and the fast solar wind. The kG-patches provide all the open magnetic fields that serves as the channels of the fast solar wind [2]. If the X-ray jets provide the energy for the acceleration of the fast solar wind, the X-ray jets have to occur at around almost all the kG-patches. However, most of the kG-patches are not associated with the X-ray jets. Thus, it is unlikely that the polar X-ray jets provide sufficient energy for the acceleration of the fast solar wind. The energy may be provided

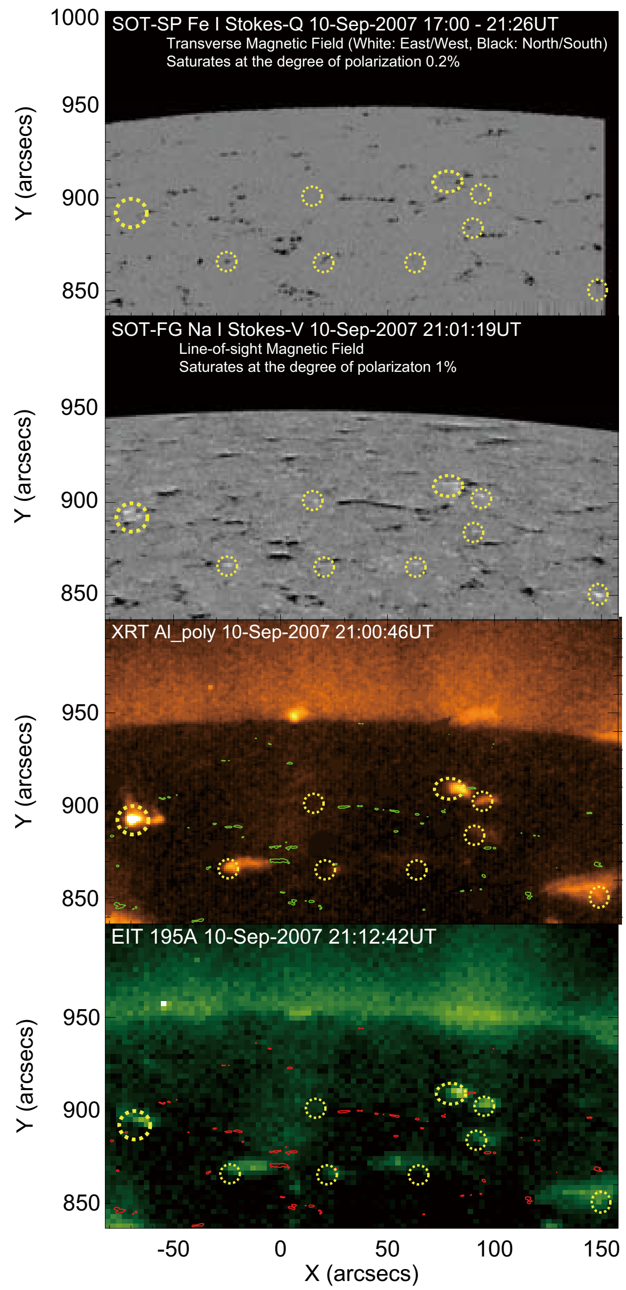


Figure 1: The north pole images around 21:00 UT on September 10, 2007. The yellow dash circles indicate the relatively large minority poles identified in the Na I Stokes-V map. The green and the red lines in the lower panels are the contours of the degree of the polarization (1 %) of the Fe I Stokes-Q map.

References

[1] Shimojo, M., Tsuneta, S.: 2009, *ApJ*, **706**, L145.
[2] Tsuneta, S.: 2008, *ApJ*, **688**, 1374.

Sensitivity improvement of CLIO with cooling the mirrors

TAKAHASHI, Ryutaro, ARAI, Koji, TATSUMI, Daisuke, OHISHI, Naoko
KAWAMURA, Seiji, FUJIMOTO, Masa-Katsu
(NAOJ)

MIYOKI, Shinji, UCHIYAMA, Takashi, MIYAKAWA, Osamu, AGATSUMA, Kazuhiro
SAITIO, Takanori, OHASHI, Masatake, KURODA, Kazuaki, NAKATANI, Ichirou
(Institute of Cosmic Ray Research, University of Tokyo)

TOMARU, Takayuki, SUZUKI, Toshikazu, YAMAMOTO, Akira
(High Energy Accelerator Research Organization)

TELADA, Souichi
(Advanced Industrial Science and Technology)

ASO, Yoichi
(University of Tokyo)

SHINTOMI, Takakazu
(Nihon University)

CLIO (Cryogenic Laser Interferometer Observatory) is the first cryogenic interferometric gravitational wave detector in the world. It has 100 meters baseline length and is located in an underground mine at Kamioka. It is a prototype interferometer for the future LCGT project as well as TAMA300 detector in Mitaka campus. It has the purpose to demonstrate advantages of the cryogenic interferometer and the Kamioka mine as a quiet site.

The detector construction started in 2002. The vacuum and the cryogenic systems were prepared by 2005. After the installation of the interferometer optics and the suspension systems, the interferometer operation with cooling mirrors were demonstrated in 2006. Due to the noise investigations and reductions in room temperature [1], we concluded that the noise level is enough close to the fundamental limit at room temperature and the cooling of the mirrors is necessary for further noise investigations. It was one of the most important milestones in gravitational wave detector developments.

At the beginning of 2009, we made a decision that sensitivity improvement of CLIO by cooling the mirrors is the highest priority issue. In this cooling experiment only two mirrors were cooled among four mirrors of which consist of the main interferometer, because we should get rid of various problems associated with the cooling. In fact, hundreds of hours are spent to address technical issues such as variation of eddy current damping, variation of coil impedance and reduction of scattered lights at the radiation shield.

In March of 2010, we succeed to exceed the fundamental limit at room temperature by cooling the mirrors in a frequency region between 120 and 200 Hz. Figure 1 shows a displacement noise spectrum of CLIO (red) together with the limited sensitivity at room temperature (black). Both purple and aqua dashed lines are mirror thermal noise spectrum without and with two mirrors cooling, respectively. The current noise spectrum is limited by (1) shot noise and RF intensity noise above 500 Hz, (2) seismic originated noises below 40 Hz and (3) thermal noise of the suspension and various under investigating noises such as coil actuator noise. To improve the sensitivity further, we continue to upgrade the detector.

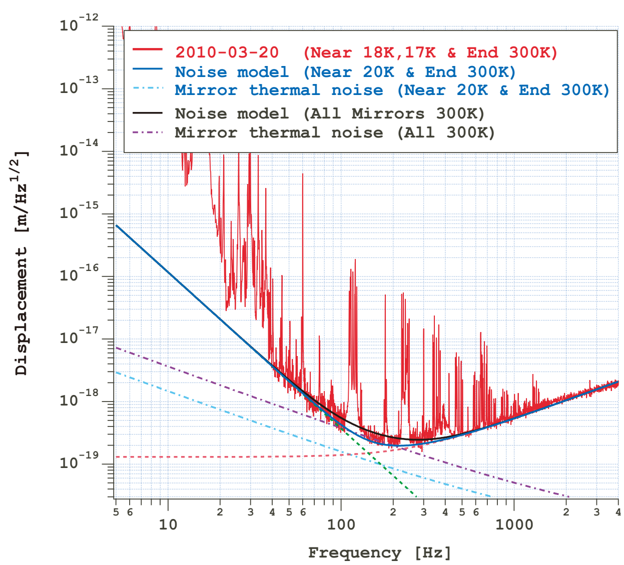


Figure 1: Displacement sensitivity of CLIO (red) and limiting sensitivity at room temperature (black). The current noise spectrum is limited by (1) shot noise and RF intensity noise above 500 Hz, (2) seismic originated noises below 40 Hz and (3) thermal noise of the suspension and various under investigating noises such as coil actuator noise.

References

[1] Agatsuma, K., et al.: 2010, *Phys. Rev. Lett*, **104**, 040602.
[2] Miyoki, S., et al.: 2010, *J. Phys. Conf. Ser*, **203**, 012075.

Prominence formation associated with an emerging helical flux rope

OKAMOTO, Takenori J., TSUNETA, Saku, KATSUKAWA, Yukio
ICHIMOTO, Kiyoshi, SUEMATSU, Yoshinori
(NAOJ)

SHIMIZU, Toshifumi (ISAS / JAXA)
YOKOYAMA, Takaaki (University of Tokyo)
NAGATA, Shin'ichi, SHIBATA, Kazunari (Kyoto University)

KUBO, Masahito, LITES, Bruce W.
(HAO / NCAR)

TARBELL, Theodore D., SHINE, Richard A., BERGER, Thomas E., TITLE, Alan M.
(LMSAL)

Prominences are relatively cool objects embedded in the hotter corona. Although it is known that prominences are supported by coronal magnetic fields against gravity, the structure and formation process of magnetic fields in and around a prominence remains unclear.

A recent study of a series of vector magnetograms obtained by the Spectro-Polarimeter (SP) of the Hinode Solar Optical Telescope (SOT) was interpreted as the emergence of a helical flux rope under a prominence in an active region [1]. This is the first observational study to detail the evolution of the photospheric magnetic field suggesting the emergence of a helical flux rope that may be associated with the formation and maintenance process of an active region prominence. Here, we report the more detailed features of the emerging helical flux rope and the relationship between the flux rope and the prominence. The results are listed below [2].

(1) We can see a similar phenomenon in Ca H-line filtergrams, which is indicated as the emergence of the helical flux rope. However, using only the filtergraph observations, we cannot determine the existence of a flux emergence with confidence. Observations comprising only line-of-sight magnetograms suffer from the same limitation. Observations of vector magnetic fields are necessary to detect a possible flux rope emergence.

(2) We take a closer look at the interaction between the emerging flux rope and granular convection. The horizontal magnetic fields are roughly independent of the granular patterns, but we can find some local modulations caused by granules (see figure). This result is useful for solving 180-degree ambiguity of azimuth of magnetic fields.

(3) We examine the relationship of magnetic fields to photospheric motions. No shear motion or converging flows are detected, but we find diverging flows such as mesogranules along the polarity inversion line under the prominence. The presence of mesogranules may be related to the emergence of the helical flux rope.

(4) The emerging helical flux rope reconnects with magnetic fields of the pre-existing prominence to stabilize the prominence for the next several days. We thus conjecture that prominence coronal magnetic fields emerge in the form of helical flux ropes that contribute to the formation and maintenance of the prominence.

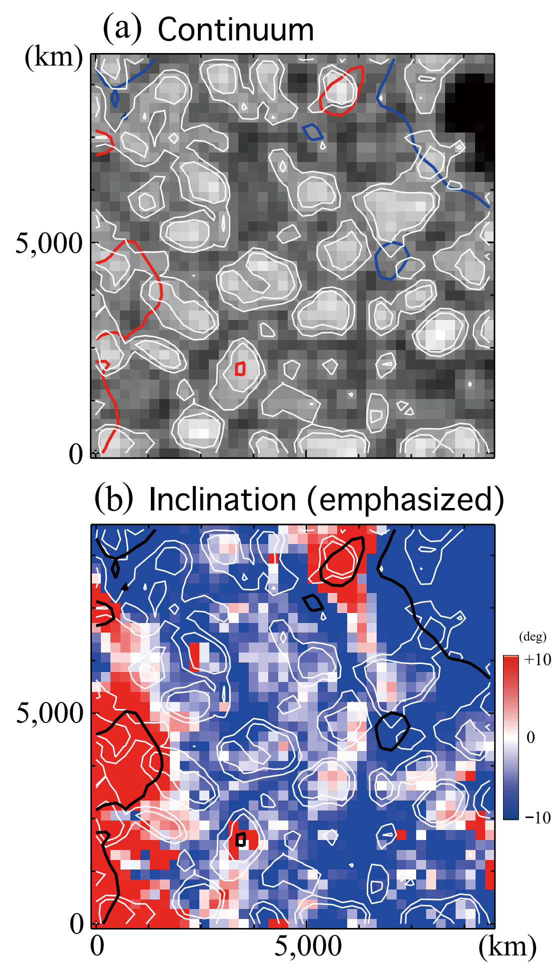


Figure 1: Close-up maps of the helical emerging flux region. (a) Continuum intensity map. White lines indicate bright contours of granules. (b) Inclination map of magnetic fields. Red indicates positive polarity (toward us) and blue indicates negative polarity (away from us) in the local frame. The color table saturates at ±10° with respect to the solar surface.

References

[1] Okamoto, T. J., et al.: 2008, *ApJ*, **673**, L215.
[2] Okamoto, T. J., et al.: 2009, *ApJ*, **697**, 913.

Substellar Objects in Nearby Young Clusters (SONYC): The Bottom of the Initial Mass Function in NGC 1333

SCHOLZ, A.
(University of St. Andrews)

GEERS, V., JAYAWARDHANA, R., FISSEL, L., LEE, L., LAFRENIERE, D.
(University of Torontoa)

TAMURA, Motohide
(NAOJ)

The origin of the stellar initial mass function (IMF) is one of the major issues in astrophysics. The lowest-mass end of the IMF, in particular, has been the subject of numerous studies in star forming regions over the past decade [1, 2].

SONYC - Substellar Objects in Nearby Young Clusters - is a survey program to investigate the frequency and properties of substellar objects with masses down to a few times that of Jupiter in nearby star-forming regions.

We present the first results from SONYC observations of NGC 1333, a ~1 Myr old cluster in the Perseus starforming complex [3]. We have carried out extremely deep optical and near-infrared imaging in four bands (i, z, J, K) using Subaru Prime Focus Camera and Multi-Object InfraRed Camera and Spectrograph (MOIRCS) instruments at the Subaru telescope. The survey covers 0.25 square degrees and reaches completeness limits of 24.7 mag in the i band and 20.8 mag in the J band. We select 196 candidates with colors as expected for young, very low-mass objects. Follow-up multi-object spectroscopy with MOIRCS is presented for 53 objects. We confirm 19 objects as likely brown dwarfs (BDs) in NGC 1333, seven of them previously known. Nine additional objects are classified as possible stellar cluster members, likely with early to mid-M spectral types.

The confirmed objects are strongly clustered around the peak in the gas distribution and the core of the cluster of known stellar members. For 11 of them, we confirm the presence of disks based on Spitzer/Infrared Array Camera photometry.

The effective temperatures for the BD sample range from 2500 K to 3000 K, which translates to masses of ~0.015−0.1 $M_{\odot}$, based on model evolutionary tracks. For comparison, the completeness limit of our survey translates to mass limits of 0.004 $M_{\odot}$ for Av ≤ 5 mag or 0.008 $M_{\odot}$ or Av ≤ 10 mag.

Compared with other star-forming regions, NGC 1333 shows an overabundance of BDs relative to low-mass stars, by a factor of 2-5. On the other hand, NGC 1333 has a deficit of planetary-mass objects: based on the surveys in σ Orionis, the Orion Nebula Cluster and Chamaeleon I, the expected number of planetary-mass objects in NGC 1333 is 8-10, but we find none (see Fig. 1). It is plausible that our survey has detected the minimum mass limit for star formation in this particular cluster, at around 0.012−0.02 $M_{\odot}$. If confirmed, our findings point to significant regional/environmental differences in the number of BDs and the minimum mass of the initial mass function.

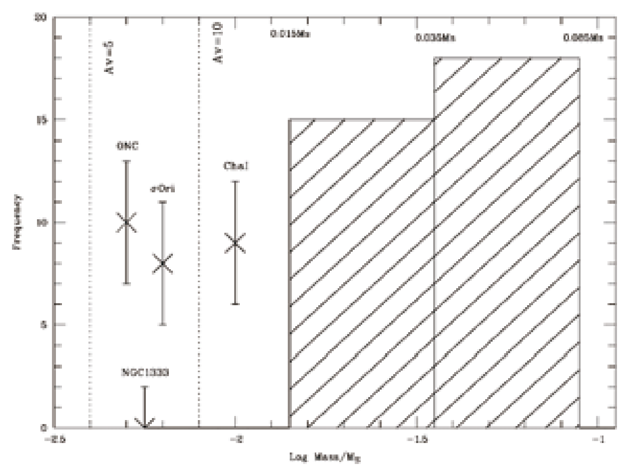


Figure 1: Mass distribution of BDs in NGC 1333 (hatched histogram) and the deficit of planetary-mass objects. The three labeled data points show the predicted number of planemos in NGC 1333 based on the surveys in σ Ori, the ONC, and in ChaI. The non-detection of planetary-mass objects points to a deficit of objects in this mass regime compared with other clusters. The dotted lines refer to our detection limit for Av = 5 and 10 mag.

References

[1] Tamura, M., et al.: 1998, *Science*, **282**, 1095.
[2] Lucas, P. W., Roche, P. F.: 2000, *MNRAS*, **314**, 858.
[3] Scholz, A., et al.: 2009, *ApJ,* **702**, 805.

Constructing a Theoretical Model for High-z Lyman α Emitters

KOBAYASHI, Masakazu A.R. (NAOJ)
TOTANI, Tomonori (Kyoto University)
NAGASHIMA, Masahiro (Nagasaki University)

We have constructed a new theoretical model for high-z Lyα emitters (LAEs) in the framework of hierarchical galaxy formation, which is based on one of the latest semi-analytic model for galaxy formation. It is unique one in the theoretical model for LAEs because the two following physical effects are incorporated in calculating the escape probability of Lyα photons from their host galaxy: extinction by interstellar dust, which is not necessarily the same for that of continuum, and galaxy-scale outflows induced as supernova feedback. Our previous study has confirmed the model reproduces the observational Lyα luminosity functions (LFs) of the LAEs at z ~ 3–6 [1].

We performed a further comparison of the model with the other available observations for the LAEs, i.e., the rest-frame ultraviolet (UV) continuum LFs, the distribution of Lyα equivalent width (EW), and the distribution in UV continuum luminosity vs. EW plane. The model parameters were kept unchanged from our previous study; there is no more free parameters adjustable to fit the observations. We paid careful attention to the selection conditions of the model LAEs (i.e., the threshold Lyα line luminosity and EW: $L^{\rm th}_{\rm Ly\alpha}$ and $\rm EW^{th}_{Ly\alpha}$) and applied the same conditions with those adopted in each observation.

As shown in Figs. 1 and 2, our model nicely reproduced all of the available observations of the LAEs at z ~ 3–6.

It should be emphasized that the number fractions of the LAEs with EW > 240 Å were naturally reproduced, without introducing PopIII stars nor top-heavy IMF. We showed that both the stallar population (young age and low metallicity) and the selective extinction to continuum by clumpy dust geometry are the keys to reproducing large EW LAEs. Our model predicts a positive correlation between EW and extinction. The observed trend that brighter LAEs in UV continuum tend to have smaller mean EW is also reproduced, and the clumpy dust plays an important role again for this trend [2].

Our model would be helpful in planning an LAE survey at even higher redshifts and interpreting such data sets in future studies. The numerical data on these quantities of LAEs are available on request to the authors

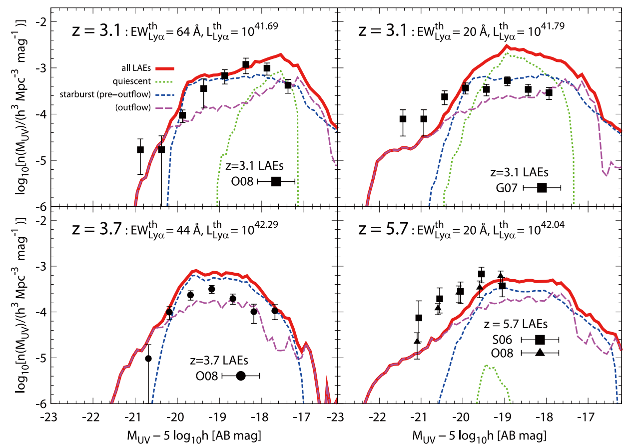


Figure 1: Rest-frame UV continuum LFs for LAEs at z = 3–6. The curves are the model predictions, while the solid symbols with error bars are the observed data of the LAEs at various redshifts. The numerical quantities of $L^{\rm th}_{\rm Ly\alpha}$ (in the unit of ergs/s/h^{-2}) and $\rm EW^{th}_{Ly\alpha}$ are shown in each panel.

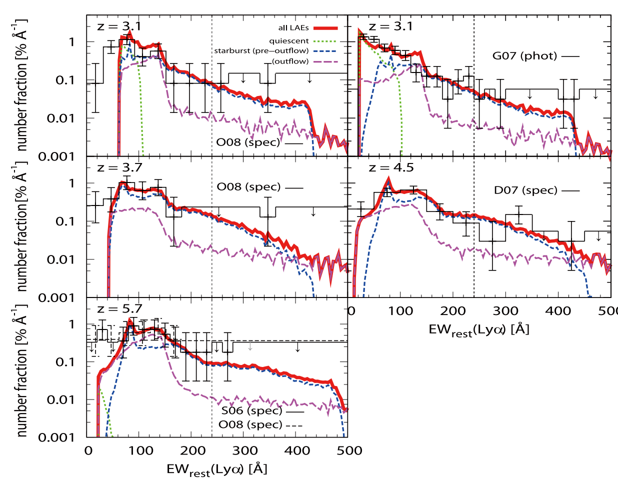


Figure 2: Rest-frame EW distribution for LAEs at z = 3–6. The curves are the model predictions, while the histograms with error bars are the observations. Arrows represent the 1σ upper limits of the Poissonian statistics for small sample number.

References

[1] Kobayashi, M. A. R., Totani, T., Nagashima, M.: 2007, *ApJ*, **670**, 919.

[2] Kobayashi, M. A. R., Totani, T., Nagashima, M.: 2010, *ApJ*, **708**, 1119.

A Cluster of Starburst Galaxies 11.5 Billion Light-years Away

TAMURA, Yoichi , KAWABE, Ryohei, NAKANISHI, Kouichiro, HATSUKADE, Bunyo
(NAOJ)

KOHNO, Kotaro
(University of Tokyo)

the AzTEC/ASTE team

In 2009, the Atacama Submillimeter Telescope Experiment (ASTE) reported a discovery of a dozen of submillimeter-selected galaxies (SMGs) that clusters towards a protocluster at redshift z = 3.1 (11.5 billion light-years away) [1]. In this report, we are highlighting one of the most significant results from our large campaign of SMG survey.

The concordance standard theory of galaxy formation is successfully accounted for introducing the idea in which large galaxies are constructed through merger and accretion of small building blocks of galaxies. The problem is that this idea requires a special condition or environments in which formation of massive galaxies preferentially occurs.

One of the key clue breaking the problem is to take a large submillimeter-wavelength image which covers the sky several 10 Mpc across. One of the reasons is that submm-selected galaxies are now believed to be huge starburst galaxies at high-z and progenitors of presentday massive ellipticals. The other is that large-scale distribution of galaxies (baryons) has a typical spacial scale of ~10 Mpc.

The advantage of AzTEC/ASTE is a survey speed which is 20 times higher than the SCUBA camera, allowing us to investigate the environment in which SMGs are formed. Figure 1 shows the 1.1-mm image taken with ASTE. The target is the SSA22 field, a part of the sky having a proto-cluster of galaxies — Subaru has discovered a hundred of Lyα-emitting galaxies at z = 3.1 in this field, which are thought to be young small galaxies.

Our ASTE observations reveal (1) a spacial correlation between the positions of SMGs and Lyα galaxies (Fig. 2), and (2) that averaged mass of Lyα emitters is much smaller (< 1%) than that of a typical SMG, suggesting that the two populations of galaxies reside in the same volume of the protocluster although they exhibit different properties in their dust content.

These results provide evidence for the preferential formation of SMGs in a high-density environment [1]. The current standard model of galaxy-formation predicts previrialized dark matter halos with $10^{14}M_\odot$ — protoclusters — in the early Universe at $z \geq 2$. In such environments, a lot of small galaxies can merge to form massive galaxies with intense starburst activities. This picture predicts that clustering strength (a degree of nonuniformity of spacial distribution) of the SMG population is higher than coeval normal galaxies, and that SMGs are selectively (preferentially) located in the cosmic largescale structure at high-z. This selective distribution (i.e., clustering) of SMGs are actually observed as the positive signals in the spacial cross-correlation between SMGs and Lyα emitters (Fig. 2)

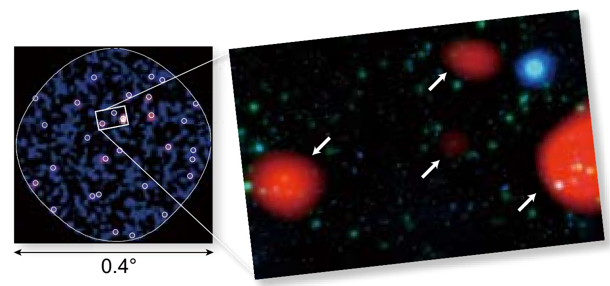


Figure 1: (*left*)The AzTEC/ASTE 1.1-mm image towards the SSA22 protocluster. The field of view is 0.4 degree across, roughly corresponding to the diameter of the full Moon. The open circles indicate the positions of 30 submillimeter galaxies detected with AzTEC/ASTE. (*right*) A false color closeup image near the core of the SSA22 protocluster (red: the AzTEC/ASTE 1.1 mm image, green: *Spitzer*/IRAC 3.6-μm image, blue: *Hubble*/ACS *i*-band image.

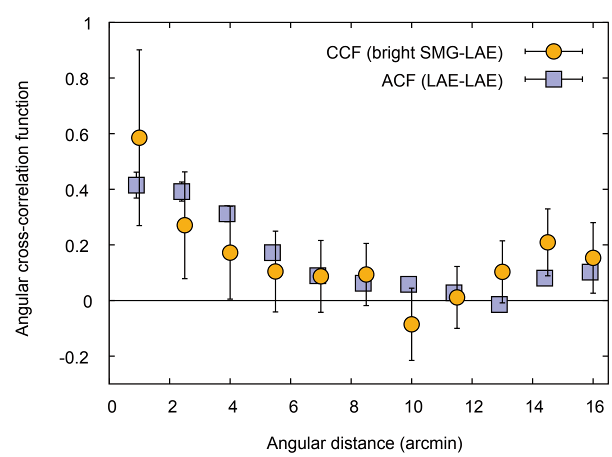


Figure 2: Two point angular cross-correlation function between the positions of AzTEC sources and Lyα emitters (circles) and auto-correlation function of Lyα emitters (squares).

Reference

[1] Tamura, Y., et al.: 2009, *Nature*, **459**, 61–63.

Fiber-link between Okayama 1.88-m reflector and HIDES

KAMBE, Eiji (NAOJ)
YOSHIDA, Michitoshi (Hiroshima University NAOJ)
IZUMIURA, Hideyuki, KOYANO, Hisashi, SHIMIZU, Yasuhiro, NAGAYAMA, Shogo
OKITA, Ki'ichi, SAKAMOTO, Akihiro, OKADA, Norio
(NAOJ)
SATO, Bun'ei (Tokyo Institute of Technology)
YAMAMURO, Tomoyasu (Optcraft)

In December 2009, we successfully had the scientific first-light of our new fiber-link system between OAO 1.88-m reflector and the HIgh Dispersion Echelle Spectrograph (HIDES). Here we report purposes of the project, designs of the fiber-link, and some preliminary results of our commissioning-phase observations.

The HIDES has been the most frequently used openuse instrument at Okayama since its installation in 1999. But recently it became less attractive because of its rather low throughput (typically, 2 % or less) and not-sohigh radial velocity (rv) measurement precision (several ms^{-1}). There is in fact growing need for developing new fiber-fed and more stable spectrographs in near future. Naturally, we started the fiber-link project in 2007 as the first step toward such goals.

The optical design of the fiber-link is as follows; stellar light within 2″.7 FOV is collected into the optical fiber at the Cassegrain focus of the telescope (typical seeing size at OAO is 1″.4); the light is guided to its coude focus through a 11-m length fiber; and then, the output image, sliced into three by an image slicer, is injected into the HIDES (Figure 1). With this design, we expect to improve its throughput by about one magnitude, while maintaining good wavelength resolution (R=52,000). We also pursuit for rv measurement precision with the iodine cell technique. Once completed, the fiber-link will improve the efficiency of various observations, including the on-going planet search projects in which we will be able to monitor several times as many targets as before.

In October 2009, we installed the complete system to the telescope, and checked its basic performance such as the echelle format of sliced image and the wavelength resolution (Figure 2). Then, in December 2009, we had its scientific first-light and confirmed that its throughput was better than that of previous observations.

In Figure 3 we compare the photon count statistics between two observations (blue dash line: slit mode, red solid line: fiber mode), in both of which we monitored the same star over a week. It is clearly seen that the typical throughput is already doubled. We also confirmed that the short-term rv measurement precision is much better than 2 ms^{-1} in this fiber-mode observation.

We currently make further adjustments/improvements of the system toward its open-use in early 2011.

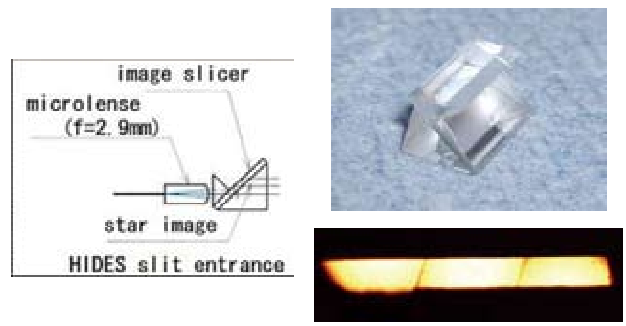


Figure 1: Optical drawings at the output of the fiber (left), image slicer (top-right), and the sliced stellar image (bottom-right).

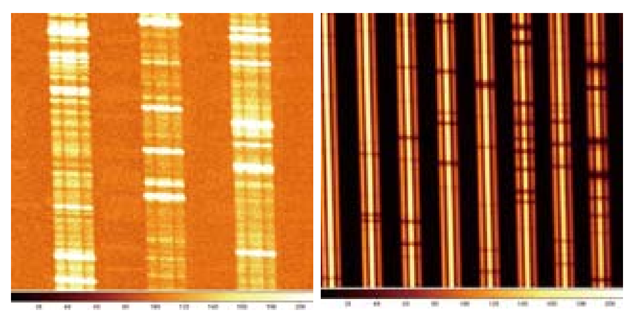


Figure 2: Spectra of Th-Ar (left) and of Procyon (right).

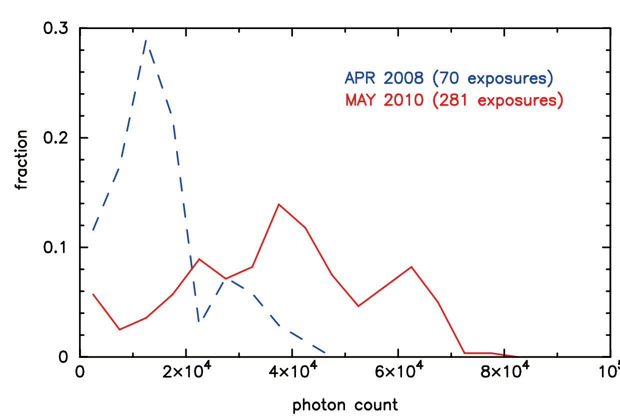


Figure 3: Comparison of the photon count statistics between slit mode and fiber mode observations. See text in detail. (courtesy to Prof. Hiroyasu Ando).

Observations of transient objects using OAO/ISLE

IMADA, Akira, YANAGISAWA, Kenshi, KURODA, Daisuke
(OAO / NAOJ)

YAMANAKA, Masayuki, KAWABATA Koji, YOSHIDA Michitoshi
(Hiroshima University)

KINUGASA, Kenzo (Gunma Observatory)
TANAKA, Masaomi (Tokyo University)
MAEDA, Keiichi, NOMOTO, Ken'ichi (IPMU)

KATO, Taichi (Kyoto University)
OMODATA, Toshihiro (Kagoshima University)
KAWAI, Nobuyuki (Tokyo Institute of Technology)
et al.

Here we report on observations of transient objects using OAO/ISLE [1] in 2009.

First, we succeeded in obtaining multiband light curves of a type Ia supernova SN 2009dc. The supernova was discovered on 2009 April 9 near the outer edge of UGC 10064. On 2009 April 26, the maximum magnitude reached $B = 15.2$. Extensive observations were performed by Hiroshima Univ., Tokyo Univ., OAO/NAOJ, and many other institutes in Japan. As a result, the absolute V magnitude was estimated to be $M_V = -20.19 \pm 0.19$ based on the known distance to the host galaxy. Assuming that the host extinction of $A_V = 0.29$, we estimated the ejected ^{56}Ni mass of $1.6 \pm 0.4\,M_\odot$[2]. These results raise a new question about the maximum mass of white dwarf. Near-infrared observations using ISLE revealed that $M_J = -19.20 \pm 0.16$ mag, $M_H = -19.00 \pm 0.17$ mag, and $M_{Ks} = -19.19 \pm 0.17$ mag. This suggests that SN 2009dc was exceptionally luminous even in near infrared range.

ISLE also detected an afterglow of GRB 090423, which holds the highest record of redshift among GRBs ($z = 8.2$). Detailed discussion is given by YOSHIDA, M.

Dwarf novae are one of the main targets for ISLE. We performed quiescent photometry of SDSS J080434.20+510349.2 and derived $J = 17.29(0.05)$, $H = 16.97(0.05)$, and $K_s = 16.41(0.06)$. This suggests that J0804 has a brown dwarf-like secondary [3]. Quiescent photometry under high S/N was also performed for SU UMa-type dwarf novae, 1RXS J053234+624755 and NSV 4838 [4, 5]. In future, high precision photometry in near infrared range will shed light on understanding the period minimum problem[*1] in dwarf novae.

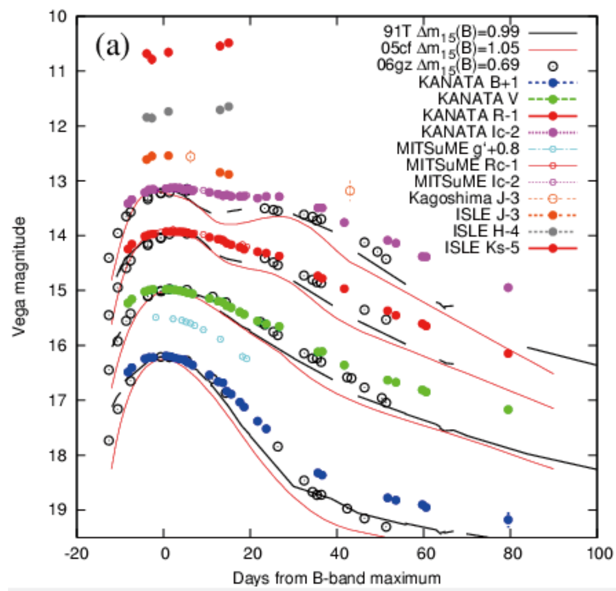


Figure 1: Light curves of SN 2009dc. compared with a super-Chandrasekhar SNe Ia 2006gz and 2003fg, an overluminous SN Ia 1991T, and a normal SN 2005ef. The magnitudes were arbitrarily shifted for display purpose.

References

[1] Yanagisawa, K., et al.: 2006, *SPIE*, **226**, 1421.
[2] Yamanaka, M., et al.: 2009, *ApJ*, **707L**, 118.
[3] Kato, T., et al.: 2009, *PASJ*, **61**, 601.
[4] Imada, A., et al.: 2009, *PASJ*, **61**, 535.
[5] Imada, A., et al.: 2009, *PASJ*, **61L**, 47.

*1 There are big differences between theory and observation with respect to the orbital period minimum (P_{min}) of dwarf novae. Theory suggests $P_{min} = 65$ min, while observation shows $P_{min} = 75$ min. Futher, theory suggests than more than 70 % of dwarf novae should exist around P_{min}. However, observation shows that about 80 % of dwarf novae are *off* the period minimum.

Effect of Long-lived Strongly Interacting Particles on Big Bang Nucleosynthesis

KUSAKABE, Motohiko
(University of Tokyo)
KAJINO, Toshitaka
(NAOJ / University of Tokyo)
YOSHIDA, Takashi
(University of Tokyo)
MATHEWS, Grant J.
(University of Notre Dame)

Some particle models beyond the standard one include long-lived heavy colored particles [1] which are scientific targets of the Large Hadron Collider experiment. If such particle exists in the early universe, it would be confined in exotic hadrons, i.e., X, at $T < 180$ MeV. If the strongly interacting X particle exists in the epoch of Big Bang nucleosynthesis (BBN), it binds to nuclei and makes exotic nuclei. We then study a new BBN scenario including long-lived strongly interacting particles X.

The mass of X is assumed to be much larger than that of nucleon, i.e., O(1 GeV). The strength of interaction between an X and nuclei is supposed to be similar to that between a nucleon and the nuclei. We estimate binding energies between an X and nuclides and thermonuclear reaction rates and β-decay rates of X-bound nuclei (i.e., A_X or X-nuclei) using available cross sections for normal nuclei. We integrated rate equations including terms for radiative captures of X by normal nuclides and nuclear reactions of X-nuclei. Parameters are the life time τ_X and the abundance ratio of X to baryon $Y_X \equiv n_X/n_b$.

Figure 1 shows a result of BBN calculation in which the abundance and the life time of X are $Y_X = 10^{-8}$ and $\tau_X = \infty$. When the temperature decreases to $T_9 \equiv T/(10^9\,\mathrm{K}) \sim 5$, X particles capture nucleons. At $T_9 \sim 1$, the d abundance increases, and consecutive nonradiative d-captures lead to the production of heavy X-nuclei.

Strongly interacting particles have a greater impact on BBN [2] than leptonic particles [3] for the following reasons. 1) Both of binding energies between an X and nuclides, and cross sections of nucleon captures by X are large, so that an early and rapid formation of bound states is possible. 2) ^{5}He and ^{5}Li which are unstable to particle emissions can be stabilized when bound to Xs, so that heavy X-nuclides can form through the states.

Figure 2 shows the contours of calculated abundances in the (τ_X, Y_X) plane. In this scenario ^{9}Be and B can be produced in amounts more than in standard BBN. Future observations of Be [4] and B abundances in metalpoor stars may show primordial plateaus. In addition, the predicted isotopic ratio ^{10}B/^{11}B is very high. A solution to the ^{6,7}Li problems [5, 6] was not found. A constraint on the life time, i.e., $\tau_X < 200$ s is derived using an estimation of relic abundance of X : $Y_X \sim 10^{-8}$ [1].

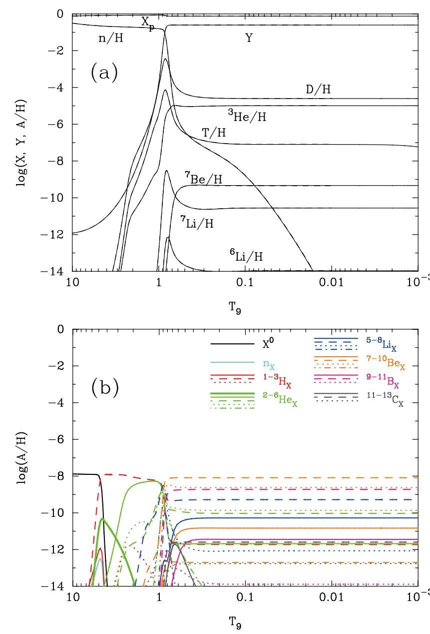


Figure 1: Abundances of normal (a) and X-nuclides (b) as a function of temperature T9. The parameters are set to be YX = 10.8 and τX = ∞. This figure is reprinted from [2].

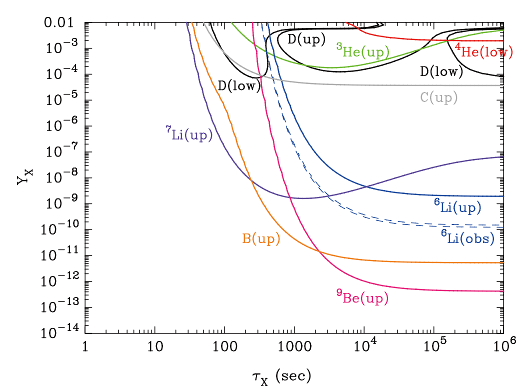


Figure 2: Contours of adopted observational constraints on primordial abundances. Upper right regions surrounded by the contours are excluded. This figure is reprinted from [2].

References

[1] Kang, J., et al.: 2008, *JHEP*, **09**, 086.
[2] Kusakabe, M., et al.: 2009, *PRD*, **80**, 103501.
[3] Kusakabe, M., et al.: 2010, *PRD*, **81**, 083521.
[4] Ito, H., et al.: 2009, *ApJ*, **698**, L37.
[5] Perez, A. E. G., et al.: 2009, *A&A*, **504**, 213.
[6] Aoki, W., et al.: 2009, *ApJ*, **698**, 1803.

Subaru/COMICS Mid-Infrared Observation of the Near-Nucleus Region of Comet 17P/Holmes at the Early Phase of an Outburst

WATANABE, Jun-Ichi (NAOJ)
HONDA, Mitsuhiko (Kanagawa University)
ISHIGURO, Masateru (NAOJ)
OOTSUBO, Takafumi (ISAS/JAXA)
SARUGAKU, Yuki (University of Tokyo)
KADONO, Toshihiko (Osaka University)
SAKON, Itsuki (University of Tokyo)
FUSE, Tetsuharu, TAKATO, Naruhisa, FURUSHO, Reiko (NAOJ)

A Mid-infrared imaging and spectroscopic observations of comet 17P/Holmes in the early phase of its outburst in brightness were performed on 2007 October 25–28 UT using the Cooled Mid-Infrared Camera and Spectrometer (COMICS) on the 8.2-m Subaru Telescope. We detected an isolated dust cloud that moved toward the south-west direction from the nucleus at 8.7 ± 0.3 (″/day) (fig. 1). The 11.2 μm peak of a crystalline silicate feature onto a broad amorphous silicate feature was detected both in the central condensation of the nucleus and the isolated dust cloud. The color temperature of the cloud is estimated to be ~200 K. Our analysis of the motion indicates the isolated cloud moved anti-sunward (fig. 2). We propose several possibilities for the motion of the cloud; fluffy dust particles in the isolated cloud started to depart from the nucleus by radiation pressure almost as soon as the main outburst occurred, or dust particles moved by some other forces such as rocket effect and photophoresis when the surrounding dust coma became optically thin.

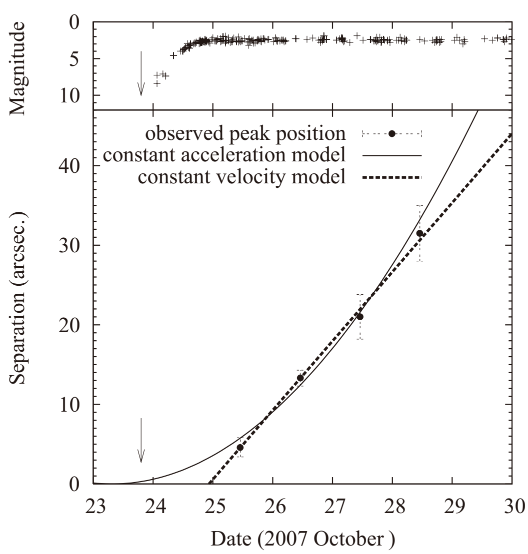


Figure 1: (Top) Light curve of comet 17P/Holmes. (Bottom) Motion of the isolated dust cloud to the central condensation. The dashed and the solid lines denote the first-order (a constant velocity model) and second-order fits (a constant acceleration model), respectively. The estimated onset time of the outburst is indicated by arrows.

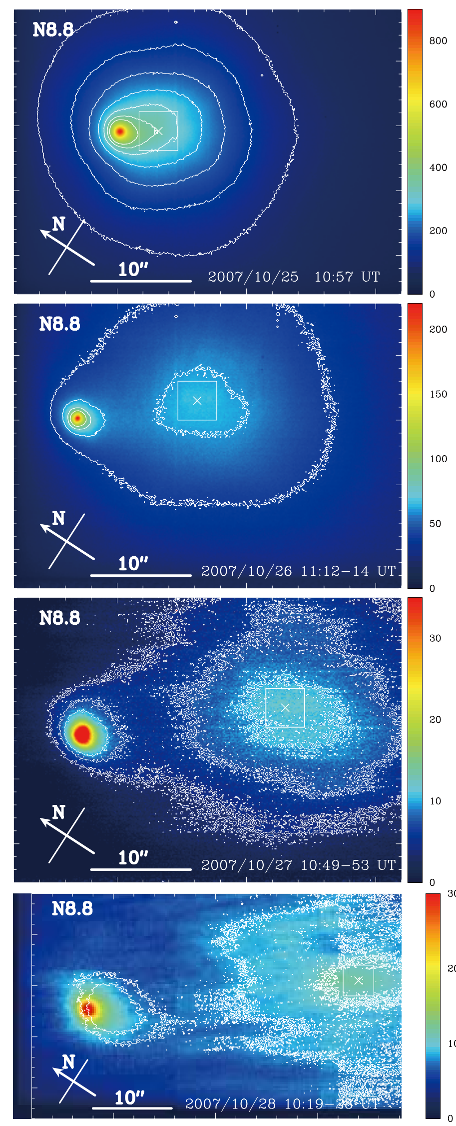


Figure 2: N8.8 images of 17P on Oct. 25, 26, 27, and 28, 2007 UT. The flux unit is in Jy/pixel. The pixel scale is 0.13”. The cross indicates the center of cloud and the rectangular region is the aperture for photometry (31 pix × 31 pix). The isolated cloud was moving toward the anti-sun direction.

Reference

[1] Watanabe, J., et al.: 2009, *PASJ*, **61**, 67.

BD+44º493: A Ninth Magnitude Messenger from the Early Universe; Carbon Enhanced and Beryllium Poor

ITO, Hiroko, AOKI, Wako
(The Graduate University for Advanced Studies / NAOJ)

HONDA, Satoshi
(Gunma Astronomical Observatory)

BEERS, Timothy, C.
(Michigan State University)

The chemical composition of the early universe is essentially recorded in the atmospheres of metal-poor stars. Therefore, chemical abundance studies of metal-poor stars have been playing an important role in our understanding of the nucleosynthesis of the early generations of stars as well as the chemical enrichment in the Galaxy.

We present a one-dimensional LTE chemical abundance analysis of the very bright ($V = 9.1$) carbon-enhanced metal-poor (CEMP) star BD+44º493, based on high-resolution, high signal-to-noise spectra obtained with Subaru/HDS [1]. The star is shown to be a subgiant with an extremely low iron abundance ([Fe/H] = −3.7). Although astronomers have been searching for extremely metal-poor stars for decades, this is the first star found with [Fe/H] < −3.5 and an apparent magnitude $V < 12$ (Fig. 1).

The low metallicity of this object suggests that its chemical composition record the yields of first-generation stars. The most important feature of the star is the large excess of carbon ([C/Fe] = +1.3) and oxygen ([O/Fe] = +1.6), as also found in the most iron-poor ([Fe/H] < −5) stars yet discovered. Based on its low abundances of neutron-capture elements (e.g., [Ba/Fe] = −0.6), BD+44º493 is classified as a "CEMP-no" star. Its abundance pattern implies that a first-generation faint supernova is the most likely origin of its carbon excess, while scenarios related to mass loss from rapidly rotating massive stars or mass transfer from an asymptotic giant branch companion star are not favored.

From a high-quality spectrum in the near-UV region, we set a very low upper limit on this star's beryllium abundance (A(Be) = log (Be/H)+12 < −2.0), which indicates that the decreasing trend of Be abundances with lower [Fe/H] still holds at [Fe/H] < −3.5 (Fig. 2). This is the first attempt to measure a Be abundance for a CEMP star, and demonstrates that high C and O abundances do not necessarily imply high Be abundances. Taking the evolutionary status of the star into account, however, the Be at its surface might have been depleted during the stellar evolution and not means the initial abundance.

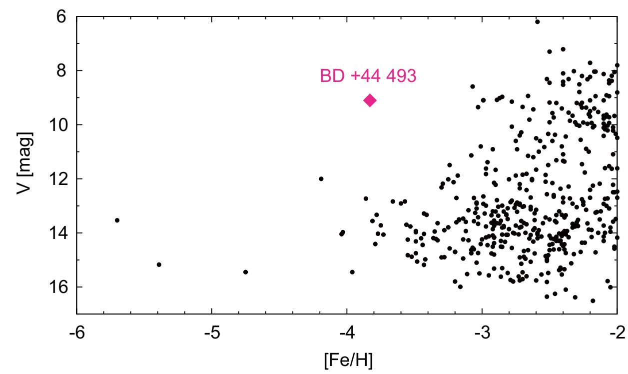


Figure 1: Apparent magnitudes of metal-poor stars in the Milky Way as a function of [Fe/H]. Data are taken from the SAGA database (http://saga.sci.hokudai.ac.jp/).

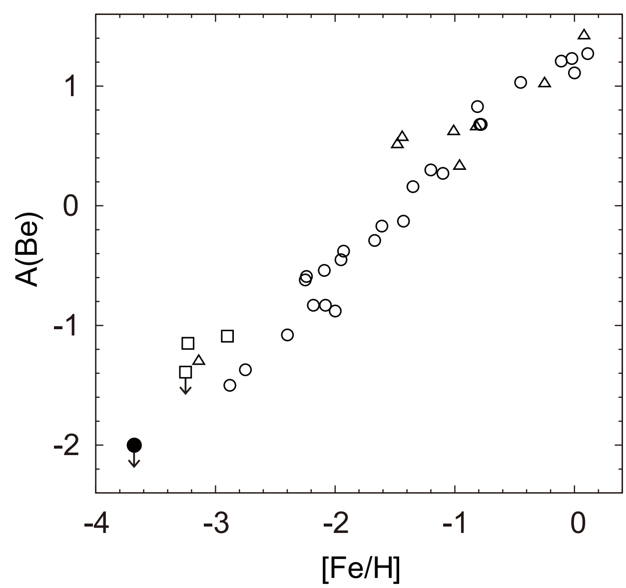


Figure 2: A(Be) vs. [Fe/H]. Our resultant upper limit is the filled circle. The open symbols represent results of previous studies (see [1] for details).

Reference

[1] Ito, H., Aoki, W., Honda, S., Beers, T. C.: 2009, *ApJ*, **698**, L37.

Entire Topography of Lunar Surface: A Movie Created from KAGUYA(SELENE) Data

NAKAYAMA, Hirotaka, KOKUBO, Eiichiro, ARAKI, Hiroshi
(NAOJ)

We make various movies by visualization of scientific observed or simulated data at Four Dimentional Digital Universe Project(4D2U Project). The most recent movie "Entire Topography of Lunar Surface" was made by the lunar topographic data which was observed by Japanese lunar orbiter spacecraft "KAGUYA(SELENE)", and it was accepted to the SIGGRAPH Asia 2009 Computer Animation Festival[1].

There are many visualization software which are shareware or freeware. Naturally, the purpose of these software are scientific visualization, so there is a limit in image quality and camerawork. On the other hand, we created lunar movie by using Autodesk Maya[2] which is high-end 3-D CG software instead of visualization software in this work. Autodesk Maya has no function for scientific visualization. But we can append various functions to Maya by using scripting language or programming language, and we developed special tool for import the data to Maya. Figure 1 shows surface(left) and cube(right) models of lunar topographic data in Maya.

We made this movie at full high-vision size and we prepared stereoscopic vision, too. The low resolution version(640×360) is able to download from the 4D2U website[3]. In the near future, we convert this movie into dome master.

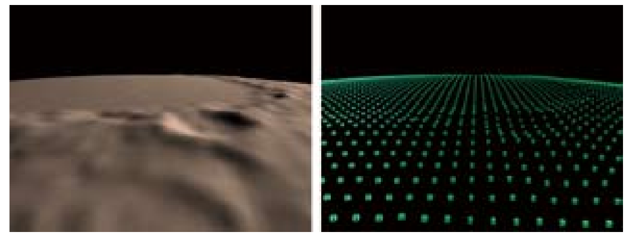
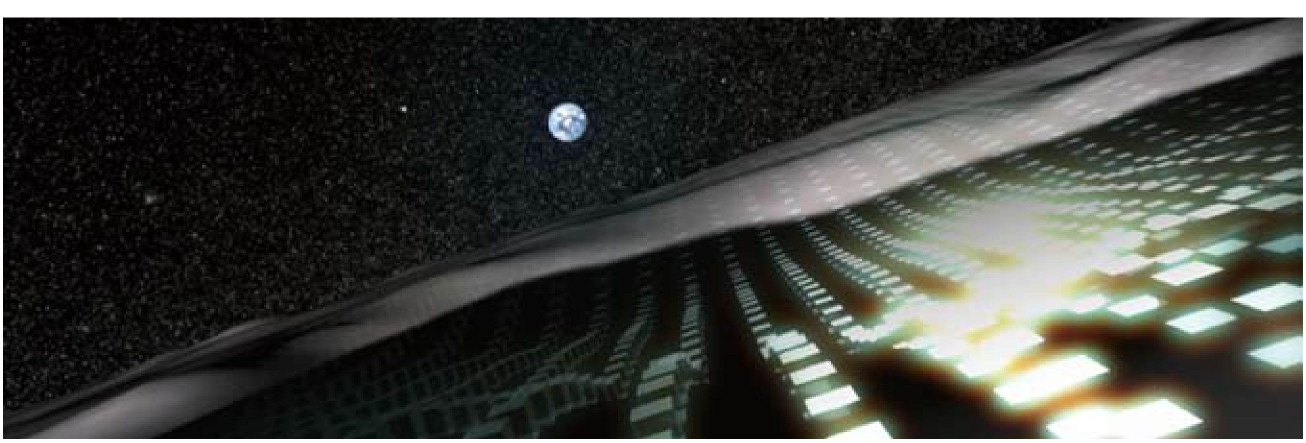


Figure 1: Surface(left) and cube(right) models of lunar topographic data.

References

[1] Nakayama, H., Kokubo, E., Araki, H.: 2009, SIGGRAPH Asia 2009, Animation Theater, 0575.
[2] http://www.autodesk.co.jp
[3] http://4d2u.nao.ac.jp/t/var/download



Orientation of X-Ray Bright Points in the Quiet Sun

UEDA, Kohei (NAOJ / University of Tokyo)
KANO, Ryouhei, TSUNETA, Saku (NAOJ)
SHIBAHASHI, Hiromoto (University of Tokyo)

In the Solar corona, there are many small structures which are bright in soft X-rays and have size of less than 60″ in diameter. They are called "X-ray Bright Points (XBP)". Two processes are considered for formation of XBPs; chance encounters of opposite polarities and emergence of magnetic bipoles

XBPs have been, as the name suggests, observed as point-like features with the previous-generation grazing incidence X-ray telescopes. The soft X-ray telescope (XRT) aboard the Hinode satellite has resolved their complex loop-like structures with its high spatial resolution. This enables us to perform a detailed research about shapes of XBPs. As a first step for understanding the magnetic structures to form XBPs, we measured the orientation angle of many XBPs found in snapshot Xray images[1] and compared its distribution with that of emerging magnetic bipolar regions investigated by Harvey (1993) [2].

We used 26 snapshot XRT images of the quiet Sun near the disk center taken between 2006 December and 2008 November. The field of view is 526″ × 526″. We had 488 valid XBPs in total, and their size ranges between 8″ and 75″. Orientation angles are defined as the angle between the line connecting the two footpoints and the latitudinal east-west line of the Sun.

Figure 1 is the orientation distribution of XBPs identified in this research. The magnitude of orientation angles is defined as 0º for east-west direction, and ± 90º for north-south direction. The shape of this histogram shows that the distribution is not uniform and there is preference toward east-west direction. (The random distribution is rejected with a significance level of 1% by the χ^2-test). This bias of orientation angle is, however, much smaller than that of emerging bipolar regions investigated by Harvey (1993) [2]. The fact that the orientation distribution of XBPs is much more uniform than that of emerging bipolar regions suggests that XBPs come from not only emerging bipoles. However, it is unlikely that the slight preference toward east-west direction appeares through random chance encounters of opposite polarities. This leads us to the concept that both chance encounters and emerging bipoles contribute to the formation of XBPs.

We discuss the origin of XBPs in terms of solar dynamo mechanism. There are two types of dynamo processes; one is the global dynamo system driven by the differential rotation of the Sun, and the other is the local dynamo system with the granular convection flows around the photoshere. Although large-scale magnetic fields made by the global dynamo tend to have east-west direction, transient horizontal magnetic fields, which are thought to come from the local dynamo process, shows uniform orientation distribution [3]. This suggests that the preference toward east-west direction seen in the orientation distribution of XBPs is a hint for the influence of the global dynamo on the formation of emerging bipoles with size of XBPs.

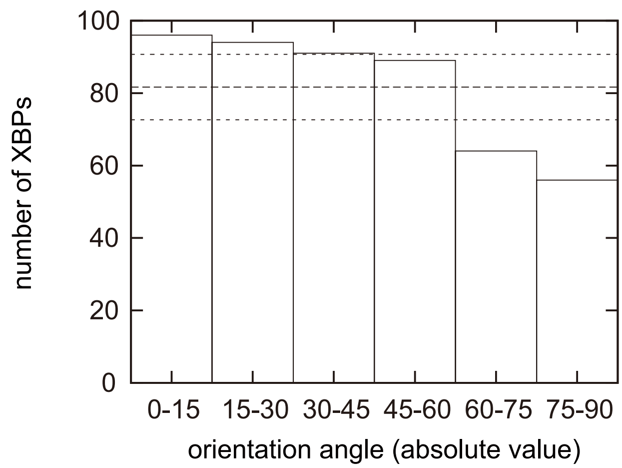


Figure 1: The distribution of the orientation of XBPs. 0º corresponds to the east-west direction, and 90º corresponds to the north-south direction. The dashed line shows the expected distribution in the case of a perfectly uniform distribution, and the dotted lines represent $\pm 1\sigma$ statistical error.

References

[1] Ueda, K., Kano, R., Tsuneta, S., Shibahashi, H.: 2010, *Sol. Phys.*, **261**, 77.
[2] Harvey, K. L.: 1993, Ph.D.thesis, Univ.Utrecht.
[3] Ishikawa, R. Tsuneta, S.: 2009, *A&A*, **495**, 607.

Discovery of the Coldest Imaged Companion of a Sun-like Star

THALMANN, C. (Max Planck Institute for Astronomy)
CARSON, J. (Max Planck Institute for Astronomy / College of Charleston)
JANSON, M. (University of Toronto)
GOTO, M. (Max Planck Institute for Astronomy)
McELWAIN, M. (Princeton University)
EGNER, S. (NAOJ)
FELDT, M. (Max Planck Institute for Astronomy)
HASHIMOTO, J., HAYANO, Y. (NAOJ)
HENNING, T. (Max Planck Institute for Astronomy)
HODAPP, K.W. (University of Hawaii)
KANDORI, R. (NAOJ)
KLAHR, H. (Max Planck Institute for Astronomy)
KUDO, T., KUSAKABE, N. (NAOJ)
MORDASINI, C. (Max Planck Institute for Astronomy)
MORINO, J.-I., SUTO, H., SUZUKI, R., TAMURA, M. (NAOJ)

We present the discovery of a brown dwarf or possible planet to the nearby sun-like star GJ 758 based on direct imaging in the H band using the high contrast imaging instrument HiCIAO on the Subaru telescope[1,2]. The imaged substellar companion, GJ 758 B, was found to have a mass of 10–40$M_{\rm Jup}$, a temperature of 550–640 K, and a projected separations of 1.9″ = 29 AU. This makes GJ 758 B one of the few known T-type companions, and the coldest ever to be imaged around a sun-like star.

GJ 758 is a G9-type star with a mass of 0.97 $M_\odot$, located at a distance of 15.5 pc. We first detected GJ 758 B with HiCIAO in angular differential imaging (ADI) mode on Subaru telescope on May 3, 2009, with a field of view of 20″ In addition to the known nine field objects around the host star, we have detected unknown tenth object in close separation with 5σ confidence. In a follow-up observations on August 6, 2009, the object was rediscovered with 8.5σ confidence. We used a locally optimized combination of images algorithm (LOCI, [3]) in ADI data reduction. The discovery image of GJ 758 B is shown in Fig. 1.

Located only 15.5 pc away from the Sun, GJ 758 B exhibits strong proper motion. On the basis of two epoch data, GJ 758 B is found to share common proper motion with its host star, confirming that they form a gravitationally bound system. Their motion deviates from the proper motion for the background stars by 10σ. thus a chance alignment can be excluded. GJ 758 B is measured to move by (−7.6 ± 9.5, 23.4 ± 9.5) mas along the (RA, Dec) axes relative to GJ 758. This represents the orbital motion of the companion around its host. Future long-term observations are desirable in order to cover the long orbital period of GJ 758 B.

The mass and effective temperature of GJ 758 B are derived based on the COND models[4] and the photometries in the H band. We found 10–40 $M_{\rm Jup}$ for the mass and 549–637 K for the temperature. The large uncertainty in the mass measurements comes from the ambiguity of the estimated system age (0.7 to 8.7 Gyr), because GJ 758 is a nearby field star with no known connection to any co-moving stellar association. If we employ the photometric age (0.7 Gyr), a typically used method for age estimation, we expect the companion to be high-mass (10 $M_{\rm Jup}$) planet with T9 spectral type. This makes GJ 758 B the coolest substellar companion to a sun-like star ever imaged in thermal light.

Though there is large uncertainty in measured orbital motion of GJ 758 B, its orbit can be estimated based on the observations and Monte Carlo simulation. The orbit of GJ 758 B is likely eccentric (e = 0.50–0.87) and of a size comparable to Pluto's orbit (33.9–118.0 AU). The separation occupies intermediate position at which companions are expected to form by core accretion ($\lesssim$ 5 AU) or gravitational collapse (typicaly $\gtrsim$ 100 AU). The search of planets around G-type stars with direct imaging is essentially important to reveal whether the giant planets with large orbit are common or not.

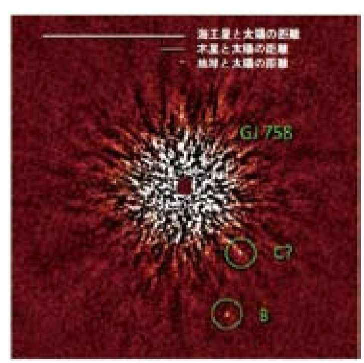


Figure 1: The discovery image of GJ 758 B taken in the observations in August 2009. For the two point sources enclosed by circles, lower source represents GJ 758 B, and upper source is a possible second object detected only in the August image. The host star is located in image center.

References

[1] Thalmann, C., et al.: 2009, *ApJL*, **707**, 123.
[2] Hodapp, K. W., et al.: 2008, *SPIE*, **7014**, 42.
[3] Lafreni`ere, D., et al.: 2007, *ApJ*, **660**, 770.
[4] Baraffe, I., et al.: 2003, *A&A*, **402**, 701.

Development of Cryogenic Integration Circuits with GaAs JFETs for Sub-millimeter Camera

HIBI, Yasunori, MATSUO, Hiroshi
(NAOJ)

NAGATA, Hirohisa, IKEDA, Hirokazu
(JAXA/ISAS)

FUJIWARA, Mikio
(NiCT)

In NAOJ ATC, we have been developing to realize the sub-millimeter/terahertz camera with more than 10 k pixel. As its detectors, we suppose the SIS (Superconductor-Insulator-Superconductor) photon detectors [4]. Since these detectors must be cooled below 1 K for their best performance, a cryogenic readout system is need for precise and effective readout. To realize such many channel cryogenic readout system, it is very important to suppress the system power dissipation. From cooling power of the cryogenic cooler, current power dissipation target is below 1 μW/ch.

We have developed several kinds of integration circuits with n-type GaAs JFETs until 2009 spring. The reason to select the n-type GaAs JFETs is that the cryogenic static characteristics in low power dissipation ($\leq$0.1 μW) are very similar to those in room temperature. From 2007 to 2009, we have done three times trial manufactures and cryogenic demonstrations. These demonstration results are reported in those papers [1-7]. We show some concrete results of cryogenic ICs (integration circuits). We have realized the amplifier which integrate photo current signal and exchange this to voltage at power dissipation 2 ~ 3 μW/ch (Fig. 1a) [2, 6]. We also have realized multiplexers with sample-and-holds (Fig. 1b) [1], the shift registers to control the above-mentioned multiplexers which are able to work faster than 100 kHz at cryogenic temperature (Fig. 1c) [5], and the 32 channels voltage distributer to cancel input offset voltages of the 16 channels AC coupled CTIA (Fig. 1d). We have been planning a cryogenic readout system with these cryogenic circuits. In 2010 spring, we designed and manufactured 32 channel multi-chip modules by using these GaAs ICs to realize the cryogenic readout system. To increase possible number of readout channel by this cryogenic system, power dissipations of each circuit have to be suppressed by redesigning or newly investigations.

These demonstration results are useful not only for our sub-millimeter/terahertz camera but also for every kinds of cryogenic multi-pixel camera which detectors have high impedance.

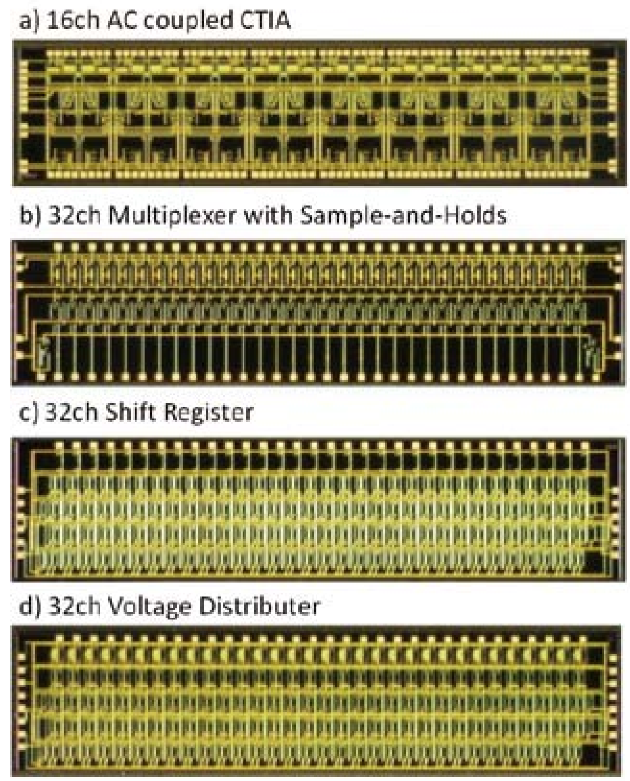


Figure 1: Trial manufactures of ICs with GaAs JFETs in 2008's. The sizes of these ICs are 1.8 mm × 7.6 mm. a): 16 channels AC coupled CTIA (Capacitive Trans-Impedance Amplifier). b): 32 channels multiplexer with sample-and-holds. c): 32 channels shift register. d): 32 channels voltage distributer.

References

[1] Hibi, Y., et al.: 2009, *Cryogenics*, **49**, 672.
[2] Nagata, H., et al.: 2009, *Cryogenics*, **49**, 676.
[3] Fujiwara, M., et al.: 2009, *Cryogenics*, **49**, 626.
[4] Matsuo, H., et al.: 2009, *AIP Conf. Proc.*, **1185**, 393.
[5] Hibi, Y., et al.: 2009, *AIP Conf. Proc.*, **1185**, 290.
[6] Nagata, H., et al.: 2009, *AIP Conf. Proc.*, **1185**, 115.
[7] Fujiwara, M., et al.: 2009, *AIP Conf. Proc.*, **1185**, 267.

Detection of the most distant explosion ever known (Near-infrared observation of GRB 090423@z = 8.2)

YOSHIDA, Michitoshi
(Hiroshima University / NAOJ)

YANAGISAWA, Kenshi, KURODA, Daisuke, SHIMIZU, Yasuhiro, NAGAYAMA, Shogo, TODA, Hiroyuki
(NAOJ)

OHTA, Koji (Kyoto University)
KAWAI, Nobuyuki (Tokyo Institute of Technology)

Gamma ray burst (GRB) is one of the most promising probes currently available for investigating early universe. It has been revealed that significant fraction (~50 %) of GRBs emits optical - infrared afterglow. By observing optical - infrared afterglows, we can obtain various pieces of information about GRB progenitors, circumstance around GRBs, and redshifts, as well as explosion and emission mechanisms of GRBs.

GRB 090423 is a long duration GRB detected by the *Swift* satellite at 07:55:19 UT on April 23 in 2009 [1]. Deep near-infrared (NIR) spectroscopic observations revealed that the redshift of GRB 090423 is ~8.2 [2], indicating that this is the most distant astronomical object ever known.

We performed NIR observations of this burst with a NIR camera, ISLE [3] attached to the 188 cm telescope of Okayama Astrophysical Observatory. We started the observation at 10:32:27 UT, i.e the time delay from the trigger t_d was 9,428 s. We made J, H, and Ks band imaging observations in a $4' \times 4'$ field around the afterglow position reported by other infrared observations. Total exposure times for J, H, and Ks bands were 720 s, 960 s, and 480 s, respectively. Sky was clear and typical seeing is around 1.5″.

We clearly detected the afterglow emission of GRB 090423 in combined J band image (Figure 1) [4]. The J-band AB magnitude of the afterglow was 20.16 ± 0.14 at t_d = 10,694 s. The afterglow was marginally detected (2σ detection) in our H band image, but it was too faint to make reliable photometry. There was no corresponding source in our Ks band image.

Together with other NIR photometric data [2] of GRB 090423, our data revealed that the light curve (LC) of the afterglow is quite shallow ($f \propto t_d^{-0.01}$) in the early epoch and this shallow phase continues to $t_d \sim 3{,}000$ s in the rest frame. Such long, shallow decay of optical afterglow is very rare. The fraction of optical afterglow showing such shallow decay is only 9 %. Similar shallow decay was observed for GRB 050801, but its duration is much shorter than GRB 090423.

The afterglow LC of GRB 090423 shows much rapid decay in later epoch ($t_d > 10{,}000$ s) [2]. In order to estimate the break time of the NIR LC, $t_{b,NIR}$, we tried to fit the late epoch NIR LC by two models of power law decay, a rapid decay model and a shallow decay model. The power-law decay index α ($f \propto t_d^{-\alpha}$) and break time for the both models are (α, $t_{b,NIR}$) ≈ (−1.5, 24,000 s) and ≈ (−0.9, 9,800 s), respectively. Unfortunately, there is no data around $t_d \sim$ 20,000–30,000 s, definite break time cannot be determined. Nevertheless, adding our data to the NIR LC made it clear that $t_{d,NIR}$ is much later than the X-ray break time ($t_{b,X} \approx 4{,}800$ s). The time delay $\Delta t = t_{b,NIR} - t_{b,X}$ is ~ 5,000–17,000 s. The Δt of GRB 090423 is one of the longest ones ever observed in GRB LCs.

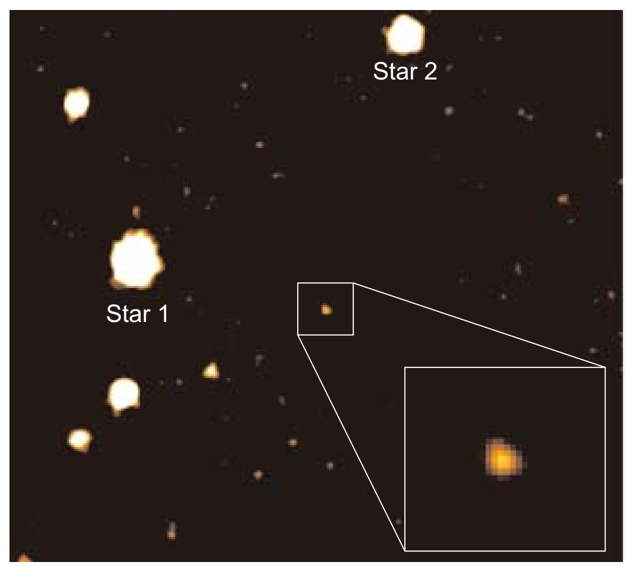


Figure 1: The J band image of the afterglow of GRB 090423. "Star1" and "Star2" are photometric reference stars.

References

[1] Krimm, H. A., et al.: 2009, *GCN Circular*, **9198**, 1.
[2] Tanvir, N. R., et al.: 2009, *Nature*, **461**, 1254.
[3] Yanagisawa, K., et al.: 2006, *SPIE*, **6269**, 118.
[4] Yoshida, M., et al.: 2009, *GCN Circular*, **9218**, 1.

Neutrino-Induced Reactions on ^{56}Ni and Production of ^{55}Mn in Population III Stars

SUZUKI, Toshio (Nihon University / NAOJ)
KAJINO, Toshitaka (NAOJ / University of Tokyo)

We study neutrino nucleus reactions on ^{56}Ni as well as its astrophysical implications [1]. GT transitions in ^{56}Ni are studied by shell model calculations with the use of a new shell model Hamiltonian for the *pf*-shell, GXPF1J [2], which describes well the spin transitions in *fp*-shell nuclei,

The neutral current proton knock out reaction ^{56}Ni (ν, $\nu'p$) ^{55}Co is quite interesting as it leads to production of Mn through electron capture twice; ^{55}Co (e^-, ν_e) ^{55}Fe (e^-, ν_e) ^{55}Mn. The GT transition strengths in ^{56}Ni ($B(GT_0)$) are shown in Fig. 1(a). We find that the strength is fragmented into two peaks for GXPF1J, while it has only one peak for KB3G [3]. This difference in the distribution of the strength leads to different (ν, $\nu'p$) cross sections. Calculated cross sections for ^{56}Ni (ν, ν') ^{56}Ni induced by supernova neutrinos are shown in Fig. 1(b), where contributions from multipoles besides 1^+ are evaluated by the RPA method and the universal quenching, $g_A^{eff}/g_A = 0.74$, is adopted for all multipoles. The present results are close to those of ref. [4] but small compared to those of ref. [5].

Cross sections for particle knock out channels as well as γ emission channels are obtained by using branching ratios calculated by the Hauser-Feshbach theory. We find that the (ν, $\nu'p$) cross section becomes large for GXPF1J compared to the previous calculation using the cross sections of HW92 [6] as shown in Fig. 2. This is due to large branching ratios for the proton knock-out channels for GXPF1J caused by the spreading of the GT distribution.

We now discuss the production yields of elements during supernova explosion for a Population III star with mass 15 $M_\odot$. The production yields of Mn are found to be enhanced for the GXPF1J Hamiltonian. The logarithmic values of the yield ratio over Fe relative to the solar abundances, [Mn/Fe], are −0.19, −0.29 and −0.53 for GXPF1J, HW92 and no ν-processes, respectively. The calculated values are consistent with the abundances observed in extremely metal-poor stars with [Fe/H] ≤ -3 $-0.43 +0.31/-0.17$ [7]. The proton knocked out from ^{56}Ni by the neutrino-induced reaction enhances also the production yield of ^{59}Co (see ref. [1] for details). These enhancement shows the importanct roles of the neutrino processes in nucleosynthesis in stars.

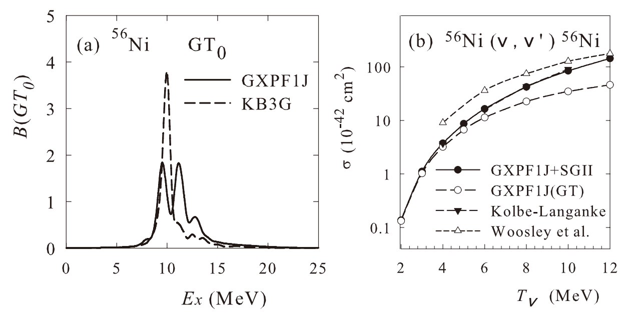


Figure 1: (a) GT strength in ^{56}Ni. (b) Neutral current reaction cross sections for ^{56}Ni at supernova temperatutes T_ν.

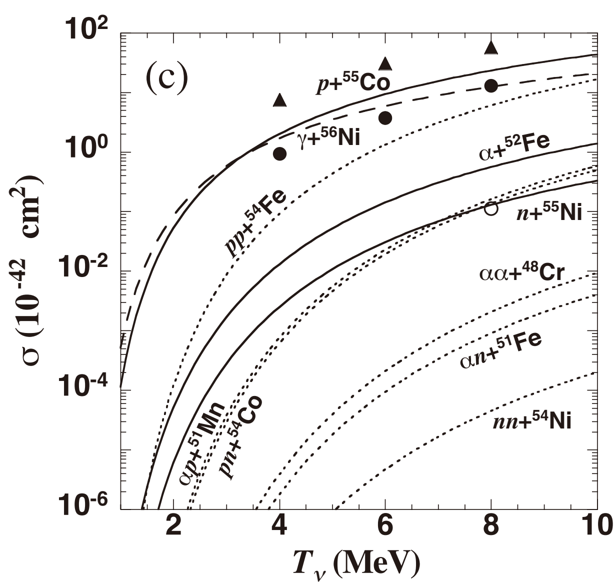


Figure 2: Reaction cross sections on ^{56}Ni for γ and particle emission channbels at supernova temperatures T_ν. Results obtained by using cross sections of HW92 [6] are denoted by triangles, filled circles and hollow circles.

References

[1] Suzuki, T., et al.: 2009, *PRC*, **79**, 061603(R).
[2] Honma, M., et al.: 2002, *PRC*, **65**, 061301; ibid.: 2004, C 69, 034335.
[3] Caurier, E., et al.: 2005, *Rev. Mod. Phys.*, **77**, 427.
[4] Kolbe, E., Langanke, K.: 2001, *PRC*, **63**, 025802.
[5] Woosley, S. E., et al.: 1990, *ApJ*, **356**, 272.
[6] Hoffman, R. D., Woosley, S. E.: 1992, Neutrino Interaction Cross Sections and Branching Ratios.
[7] Cayrel, R., et al.: 2004, *A&A*, **416**, 1117.

Search for Remnant Clouds Associated with the TW Hya Association

TACHIHARA, Kengo
(NAOJ)

NEUHÄUSER, Ralph
(Astrophysikalisches Institut und Universit¨ats-Sternwarte Jena, Germany)

FUKUI, Yasuo
(Nagoya University)

We surveyed for natal molecular clouds that formed the most nearby young cluster TW Hya association in ^{12}CO emission line and estimated their distance from the NaI absorption lines. The TW Hya association (TWA; $d \sim 50$ pc) consist of 20 member stars [1] including a typical classical T Tauri star, TW Hya, and the cluster age is estimated to be ~ 2 Myr. While almost all similarly young associations such as those in Taurus are known to be embedded in or located close to molecular clouds, TWA is isolated from any molecular gas and its natal cloud has not been discovered. Taking advantage of its proximity, proto-planetary disks [2] and young exoplanets have been actively surveyed for the member stars, while due to its large extent, sensitive and extensive survey for molecular cloud has not been well attempted.

We have carried out ^{12}CO (J =1–0) survey for remnant clouds with the NANTEN telescope at Las Companas Observatory, Chile. The survey areas are chosen from cold dust clouds with strong 100 m emission by IRAS where entire TWA member are distributed. As a result, faint CO emission is detected from some of the observed positions (Fig. 1).

In order to investigate the association of those CO clouds with TWA, the distances to the clouds are estimated as follows. Expected background stars with known distances are picked up from the Hipparcos catalog, and their optical spectra are obtained with the FEROS spectrograph on the ESO 2.2 m telescope. The interstellar absorption lines of NaI doublet at 5890 Å are extracted from the spectra (Fig. 2). Because of non- detection from nearby Hipparcos stars, the largest molecular cloud is revealed to be background with a distance of > 200 pc. Distances to the other two small clouds are estimated to be < 100 pc, and thus they are very low-mass possible remnant clouds associated with TWA.

We conclude that despite the extensive survey, the estimated mass of the remnant molecular cloud is ~3 $M_\odot$ at the most. Assuming the star formation efficiency to be 3%, the TWA natal cloud of ~540 $M_\odot$ molecular gas has been dissipated away within only 1 Myr. This implies past disturbance such as nearby supernova explosion.

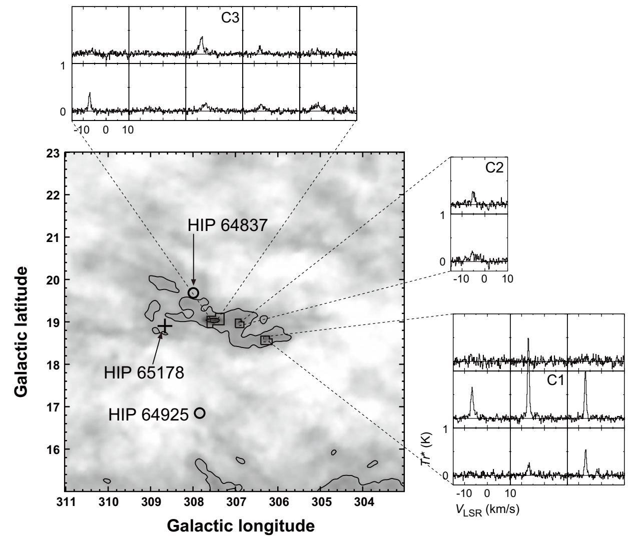


Figure 1: One of the dust cirrus cloud where CO emission is detected. The gray scale represents dust extinction with contours of 0.15 mag. The detected CO emission lines (4 arcmin grid spacing) are illustrated aside. The circles and cross show Hipparcos stars with and without detections of NaI absorption lines, respectively. From the distance to HIP 64837, distance to this cloud is estimated to be < 81 pc.

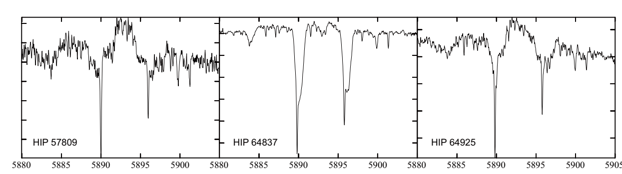


Figure 2: Spectra around the detected Na I doublet lines. The narrower lines than those of the stellar photospheres are by interstellar absorption.

References

[1] Tachihara, K., Neuhäuser, R., Frink, S., Guenther, E.: 2003, *Astronomische Nachrichten*, **324**, 543.
[2] Kastner, J. H., Zuckerman, B., Weintraub, D. A., Forveille, T.: 1997, *Science*, **277**, 67.

Polarimetric mode of stellar interferometer using birefringent retarders

MURAKAMI, Naoshi
(NAOJ / Hokkaido University)

OHISHI, Naoko, NISHIKAWA, Jun
(NAOJ)

YOSHIZAWA, Masanori
(formerly NAOJ)

A stellar interferometer uses two or more telescopes to measure interferometric fringe visibilities, and provides astronomical observations with very high-angular resolution. It is expected that a polarimetric stellar interferometer, which measures fringe visibilities of two orthogonal polarized lights, will be a powerful tool for investigating many astronomical targets, such as magnetism of chemical peculiar stars, mass loss and circumstellar disks of hot stars, extrasolar planets, and so on.

For building a polarimetric stellar interferometer, polarizers or polarizing beam splitters (PBS) are needed to separate the two polarized fringes. When the polarizers are used, one component of polarizations is discarded, which would result in a large time lag between acquisitions of the two polarized fringes. In addition, it is required to rotate the polarizers to measure the two fringes. When the PBSs are used, on the other hand, two detectors or a two-dimensional detector will be needed for acquiring the polarized fringes.

We proposed a novel technique for a polarimetric observational mode, which can be readily installed into existing stellar interferometers [1]. Figure 1 shows a principle of the proposed technique, in which two birefringent retarders R1 and R2 (thickness of l) are inserted into each arm of an interferometer. A birefringent retarder has two different refractive indices (n_e and n_o) along two orthogonal (p- and s-) polarizations. By setting axes of the retarders 0º and 90º, centers of the two polarized fringes shift in opposite directions $\pm\beta l$ ($\beta = n_e - n_o$) along an optical-path deference (OPD). Thus the polarized fringes can be isolated and detected by a single detector for measuring their visibilities separately.

We manufactured quartz retarders of l = 1.124 mm (a picture in Fig. 1). The thickness l corresponds to a fringe isolation of ±10.3 μm in visible. We carried out laboratory demonstration of the proposed technique using a white-light source. Figure 2 shows interferometric fringes acquired (a) without and (b) with the fringe isolation. We can see in the result that the two polarized fringes are clearly isolated.

We also proposed to install this technique into the Mitaka optical Infra-Red Array (MIRA-I.2). Assuming the retarders with l = 0.4 mm, the MIRA-I.2 can detect the two polarized fringes with a time lag of about 18 msec, which is greater than atmospheric coherent time (typically of the order of a few msec). Thus an effect of atmospheric turbulence will not be identical for acquisitions of the two fringes. Nevertheless, precise polarimetric observations will be feasible by averaging a large number of fringe visibilities measured within short time (e.g., 187 fringes/minute for the MIRA-I.2).

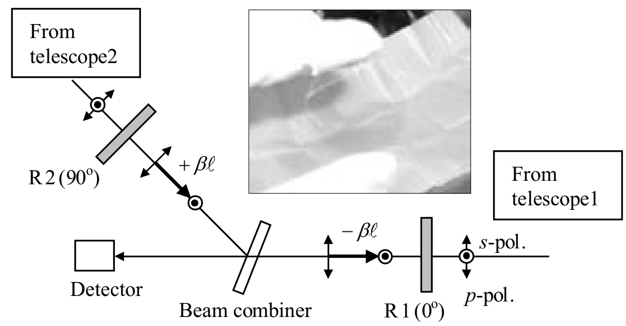


Figure 1: Principle of a novel polarimetric stellar interferometer using birefringent retarders.

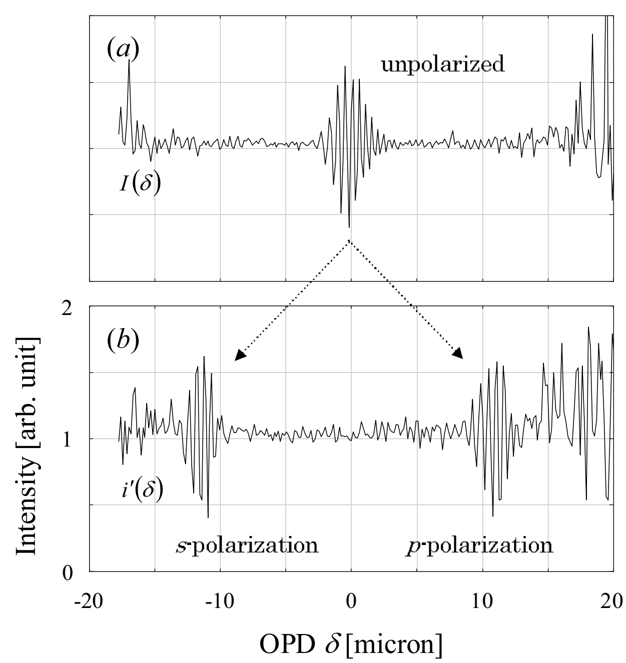


Figure 2: Reslt of laboratory demonstration; interferometric fringes (a) without and (b) with the fringe isolation.

Reference

[1] Murakami, N., Ohishi, N., Nishikawa, J., Yoshizawa, M.: 2009, *Appl. Opt.*, **48**, 5774.

Emission Signature of a Young Protostellar Object: Line Transfer Study of an Embedded Young Molecular Outflow

YAMADA, Masako
(ASIAA)

MACHIDA, Masahiro,TOMISAKA, Kohji
(NAOJ)

INUTSUKA, Shu-ichiro
(Nagoya University)

Pre-main sequence stars exhibit ubiquitously bipolar outflows of molecular gas of the speed about $10\,\mathrm{km\,s^{-1}}$. Recent magneto-hydrodynamic (MHD) simulations have achieved a significant progress in the studies of low-mass star formation and launching mechanisms of the outflows. Formation of stars begins with gravitational collapse of a cold ($\simeq 10$ K) molecular core. We performed non-LTE (non-thermodynamic equilibrium) line transfer simulation with MHD simulation of a young outflow embedded in its parent collapsing core ("envelope"), seeking for characteristic features of the model in the synthesized emission, which will be observed with the ALMA telescope.

In the snapshot data used in the line transfer simulation, the density is as high as $n \gtrsim 10^6\,\mathrm{cm^{-3}}$. The high density thermalizes the population up to $J \simeq 10$ for lines of low critical densities such as ^{12}CO and its isotopologues, and their huge optical thicknesses make them inadequate for probing the central region. Contrarily, the population of higher critical density lines such as SiO ($n_{\mathrm{crit}}(J) \simeq 10^5 \times J^3\,\mathrm{cm^{-3}}$) deflects from LTE for high-J transitions in the sub-mm band. The optical thicknesses of these lines fall below 1% of CO lines, proving their effectiveness in examination of the dynamics of the central launching region of the young outflow.

Figure 1 shows the density structure of the snapshot data of MHD simulation, and the integrated intensity map of SiO(7–6) line for the inclination angle of the outflow axis 30º. In this model, the interplay of the core rotation and magnetic field drives the outflow. The magneto-centrifugal force (MCF) moves away the matter close to the first core (Figure 1(a), $R \sim 50$ AU). The distribution of red- and blue-shifted intensity components in Figure 1(b) reflects the rotation.

One of the most characteristic features of the MCFdriven flow is the rotation of the formed outflow in the same direction of the launching region. It appears most clearly in the line-of-sight velocity (v_r) related diagrams such as velocity channel maps (see [1] for details). In Figure 2, we plot the distribution of line profiles of the SiO(7–6) line for 30. inclination (Figure 1(b)). Figure 2 exhibits a double-horn profile skewed to the blue-ward in most of the region. This is known as a signature of the collapse of the cloud [2]. Our line transfer simulation caputures the global feature of the object embedded in the contracting envelope. Local profiles reflect the rotation and birth of the outflow. In the early stage examined in this article, different kinds of velocities take the similar speed ($v_{\mathrm{infall}} \simeq v_{\mathrm{outflow}} \simeq v_{\mathrm{rot}}$). It complicates the emission distributions compared to the more evolved objects ($v_{\mathrm{outflow}} \gg v_{\mathrm{infall}}$) observed with current instruments.

Our simulation demonstrated how the characteristics of a specific MHD model appear in the line emission. The relation between the emission feature and the physical processes generating them is quite complicated, and should be pursued more with further line transfer experiments in the future.

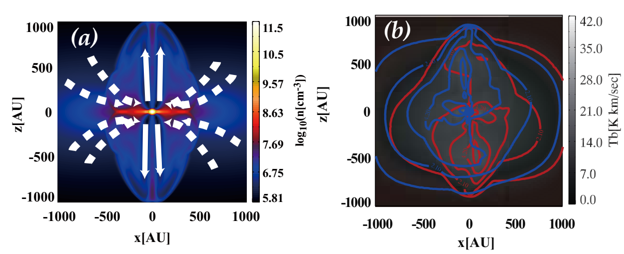


Figure 1: Panel(a) shows the density structure (in color), and white arrows describe the flows directions. Panel(b) exhibits the integrated intensity map of SiO(7–6) line for an inclination angle 30º. Red and blue contours indicate redand blue-shifted components integrated separately.

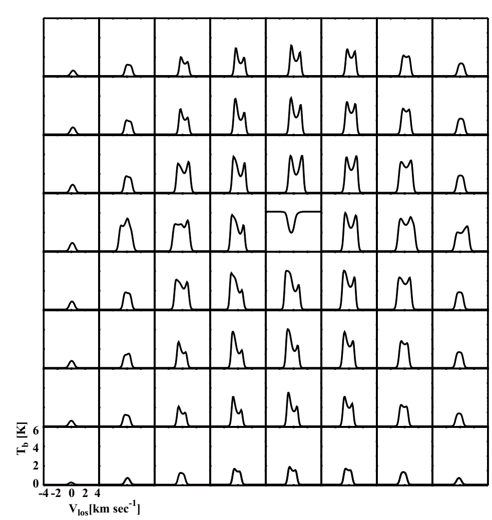


Figure 2: SiO(7–6) line profile distribution of Figure 1(b).

References

[1] Yamada, M., et al.: 2009, *ApJ*, **703**, 1141.
[2] Evans, N.: 1999, *Annual Review of A&A*, **37**, 311.

An improved lunar gravity field model from SELENE and historical tracking data

MATSUMOTO, Koji, GOOSSENS, Sander, ISHIHARA, Yoshiaki
KIKUCHI, Fuyuhiko, NODA, Hirotomo, HANADA, Hideo
(NAOJ)

LIU, Quinghui, KAWANO, Nobuyuki (SHAO)
IWATA, Takahiro (JAXA)

NAMIKI, Noriyuki (Chiba Inst. of Tech.)
LEMOINE, Frank, ROWLANDS, David (NASA GSFC)

The direct satellite tracking data over the lunar farside were for the first time collected by SELENE (Kaguya) mission using a relay sub-satellite. The first 5 months of 4-way Doppler data so obtained by the relay subsatellite greatly improved our knowledge of the farside gravity field [1, 2]. A new spherical harmonic solution of the lunar gravity field to degree and order 100, called SGM100h, has been developed using historical tracking data and longer span (14.2 months) of SELENE tracking data including all usable 4-way Doppler data [3]. Figure 1 shows free-air gravity anomaly maps which are calculated from SGM100h model.

The new model successfully reveals farside features in free-air gravity anomalies which are characterized by ring-shaped structures for large impact basins and negative spots for large craters. SGM100h produces a correlation with SELENE-derived topography as high as about 0.9, through degree 70. Comparison between SGM100h and LP100K (one of the pre-SELENE models) shows that the large gravity errors which existed in LP100K are drastically reduced and the asymmetric error distribution between the nearside and the farside almost disappears. The gravity anomaly errors predicted from the error covariance, through degree and order 100, are 26 mGal and 35 mGal for the nearside and the farside, respectively. Owing to the 4-way Doppler measurements the gravity coefficients below degree and order 70 are now determined by real observations with contribution factors larger than 80 percent. With the SELENE farside data coverage, it is possible to estimate the gravity field to degree and order 70 without applying any a priori constraint or regularization. SGM100h can be used for global geophysical interpretation through degree and order 70.

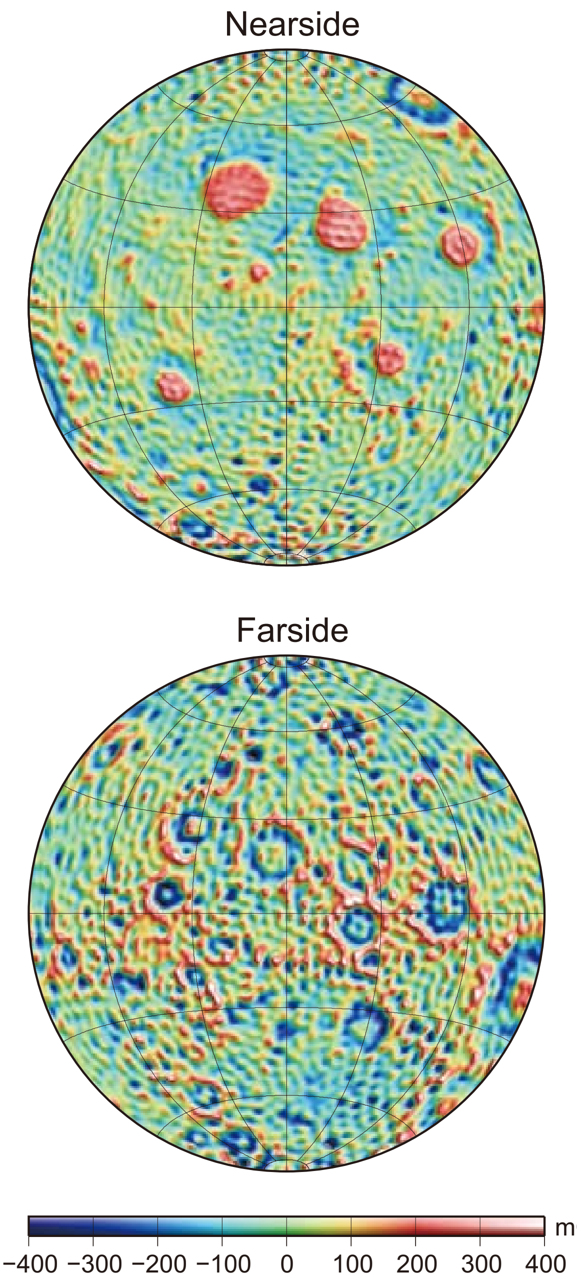


Figure 1: Free-air gravity anomalies from SGM100h model for lunar nearside (top) and farside (bottom).

References

[1] Namiki, N., et al.: 2009, *Science*, **323**, 900.
[2] Matsumoto, K., et al.: 2009, *J. Geod. Soc. Jpn*., **55**, 269.
[3] Matsumoto, K., et al.: 2010, *JGR*, **115**, E06007.

Development of the Lunar Crustal Thickness Model by SELENE (Kaguya) Selenodetic Data

ISHIHARA, Yoshiaki, GOOSSENS, Sander, MATSUMOTO, Koji
NODA, Hirotomo, ARAKI, Hiroshi, HANADA, Hideo, TAZAWA, Seiichi, SASAKI, Sho
(NAOJ)

NAMIKI, Noriyuki (Chiba Inst. of Tech.)
IWATA, Takahiro (ISAS / JAXA)

The SELENE (Kaguya) were launched on September 14, 2007. The main orbiter of the SELENE was directly tracked, even when that was over the lunar farside using relay subsatelite (4-WAY Doppler measurements). SELENE gravity models [1], those constructed using SELENE and previous tracking data, drastically improve the farside gravity anomaly. Accurate and high resolution lunar shape models were also developed using laser altimeter data of the SELENE [2]. These SELENE selenodetic data enable us to conduct various kinds of selenodetic analysis not only for the nearside but also for the farside.

Free-air gravity anomaly indicate effect of both topography and subsurface density anomalies. Bouguer gravity anomaly, that express internal density anomalies, can compute by subtracting topography contribution from free-air gravity anomaly using lunar shape model. For the lunar case, a main cause of Bouguer gravity anomaly is undulation of the Moho (crust / mantle interface). The Moho relief can compute by assuming the value of density difference of interface, and at least one reference depth of interface. In this model, we have used crustal density of 2800 kg/m^3, mantle density of 3360 kg/m^3, and we assume that the mantle materials are not exposed anywhere. Mare basalts are higher density than that of crustal materials. Therefore moho relief modeling are affected by thick basalt fills. So we extract effects of some thick mare basalt fills by assuming mare basalt density of 3200 kg/m^3.

Figure 1 shows total crustal thickness (thickness of crustal materials plus mare basalt) variations over the whole Moon [3]. Crustal thickness ranges from the minimum of nearly zero beneath the Moscoviense basin to a maximum of 110 km on the southern rim of the Dirichlet- Jackson basin, and mean thickness is about 53 km. Nearside crust is thinner than that of farside. At inside area of impact basins have thinner crust than that of surrounding area. Our result agrees well with previous analyses of general features of crustal thickness. On the other hand, locations of the minimum and maximum crustal thickness are quite different from those of previous analyses. The shift of the thinnest crust is due to the low resolution and inaccuracy of previous gravity models over the farside. Shifting of the thickest crust position is mainly due to the inaccuracy of previous topographic models.

For farside baisins, we classified the lunar impact basins into two types (type I, and type II) by spatial pattern and ratio of free-air and Bouguer gravity anomalies. The crustal thickness map indicates that the differences between type I and type II basins are probably controlled by the ratio between pre-impact crustal thickness and impact scale.

This research was supported by a Grant-in-Aid for Scientific Research (A) (20244073, PI: S. Sasaki).

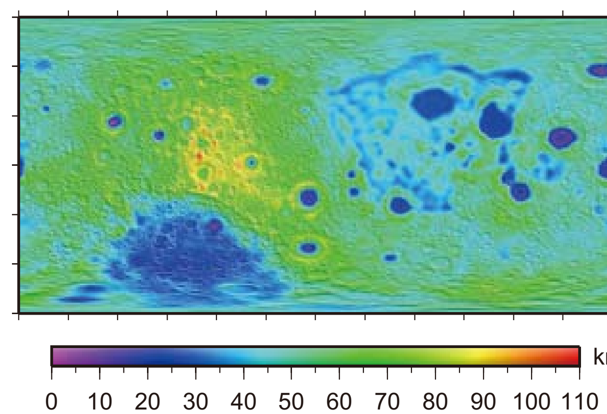


Figure 1: Total lunar crustal thickness (crustal materials and mare basalt fills) map for a simple one-layer crust model. This map is centered on 180ºE longitude.

References

[1] Namiki, N., et al.: 2009, *Science*, **323**, 900.
[2] Araki, H., et al.: 2009, *Science*, **323**, 897.
[3] Ishihara,Y., et al.: 2009, *Geophys. Res. Lett.*, **36**, L19202.

The new detections of $^{7}Li/^{6}Li$ isotopic ratio in the interstellar media

KAWANOMOTO, Satoshi, KAJINO, Toshitaka, AOKI, Wako, ANDO, Hiroyasu
NOGUCHI, Kunio, IZUMIURA, Hideyuki, KAMBE, Eiji, OKITA, Kiichi, TAJITSU, Akito
TANAKA, Wataru, WATANABE, Etsuji, YOSHIDA, Michitoshi
(NAOJ)

BESSELL,M. (Mount Stromlo Observatory)
SUZUKI, Ken, Takeru (University of Tokyo)
HONDA, Satoshi (Gunma Astronomical Observatory)
SADAKANE, Kozo (Osaka-Kyoiku University)
SATO, Bun'ei (Tokyo Institute of Technology)
TAKADA-HIDAI, Masahide (Tokai University)

The elemental abundance of lithium preserves rich information from the early Big-Bang Universe to the present Milky Way Galaxy. Lithium has two stable isotopes, ^{6}Li and ^{7}Li. Within the framework of a well established theory of standard BBN, significant amounts of the light elements, ^{2}H (D), ^{3}He, ^{4}He and ^{7}Li, were synthesized during the first three minutes of the hot Big- Bang Universe. At later times, ^{7}Li is continuously produced by stellar nucleosynthesis, as well as by spallation and $\alpha+\alpha$ fusion reactions of Galactic Cosmic Rays interacting with the interstellar medium, while ^{6}Li is almost purely synthesized by the GCR-ISM interactions.

We have determined the isotopic abundance ratio of $^{7}Li/^{6}Li$ in the interstellar media (ISMs) along lines of sight to HD169454 and HD250290 using the High Dispersion Spectrograph on the Subaru Telescope. We also observed ζ Oph for comparison with previous data.

The observed abundance ratios were $^{7}Li/^{6}Li = 8.1^{+3.6}_{-1.7}$ and $6.3^{+3.0}_{-1.8}$ for HD169454 and HD250290, respectively. These values are in reasonable agreement with those observed previously in the solar neighborhood ISMs within $\pm 2\sigma$ error bars and are also consistent with our measurement of $^{7}Li/^{6}Li = 7.1^{+2.9}_{-1.6}$ for a cloud along the line of sight to ζ Oph. This is good evidence for homogeneous mixing and instantaneous recycling of the gas component in the Galactic disk. We also discuss several source compositions of ^{7}Li, Galactic cosmic-ray interactions, stellar nucleosynthesis, and Big-Bang nucleosynthesis [1].

Although we cannot find a clear R_G-dependence of $^{7}Li/^{6}Li$, we expect that more precise determination of the lithium isotopic ratio $(^{7}Li/^{6}Li)_{obs}$ over the wider range of R_G than the present study may exhibit the gradient as suggested theoretically. This would serve to infer a more reliable value of the primordial ^{7}Li abundance independently of stellar depletion effects that confront the identification of the primordial value from the Spite plateau in population II stars. A primordial ^{7}Li abundance that is totally free from the stellar depletion process should directly test the cosmological models for the Big-Bang nucleosynthesis and the particle theory of weak interactions and dark matter.

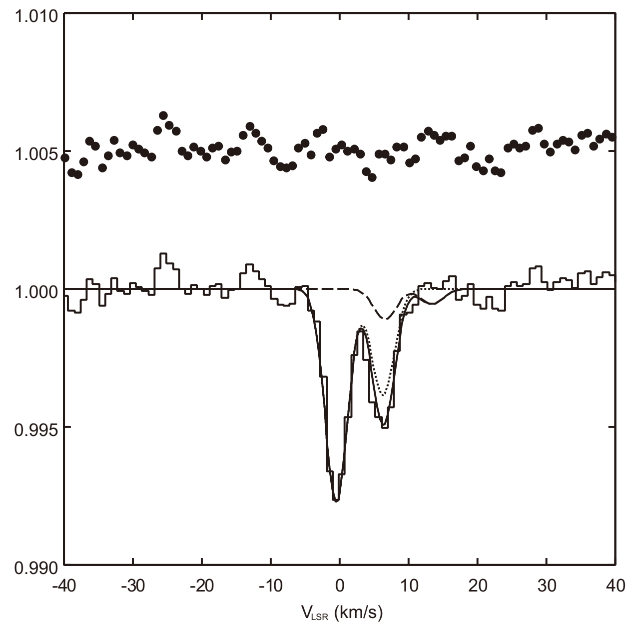


Figure 1: An example of observation of neutral lithium absorption. Histogram : Observational data toward ζ Oph. Solid line : The model fitting of absorption line of ^{7}Li. Dashed line: The model fitting of absorption line of ^{6}Li. Dots: Residuals.

Reference

[1] Kawanomoto, S.: 2009, *ApJ*, **701**, 1506.

The interstellar rubidium isotope ratio toward HD169454

KAWANOMOTO, Satoshi, AOKI, Wako, KAJINO, Toshitaka
(NAOJ)

MATHEWS, Grant J.
(University of Notre Dame)

We report here on a new determination of the interstellar ^{85}Rb/^{87}Rb isotopic ratio for diffuse gas along the line of sight toward HD169454 [1]. We have detected no contribution of ^{87}Rb in the Rb I absorption line at 7800 Å in this cloud. We deduce a lower limit of ^{85}Rb/^{87}Rb > 2.4(95%C.L.).

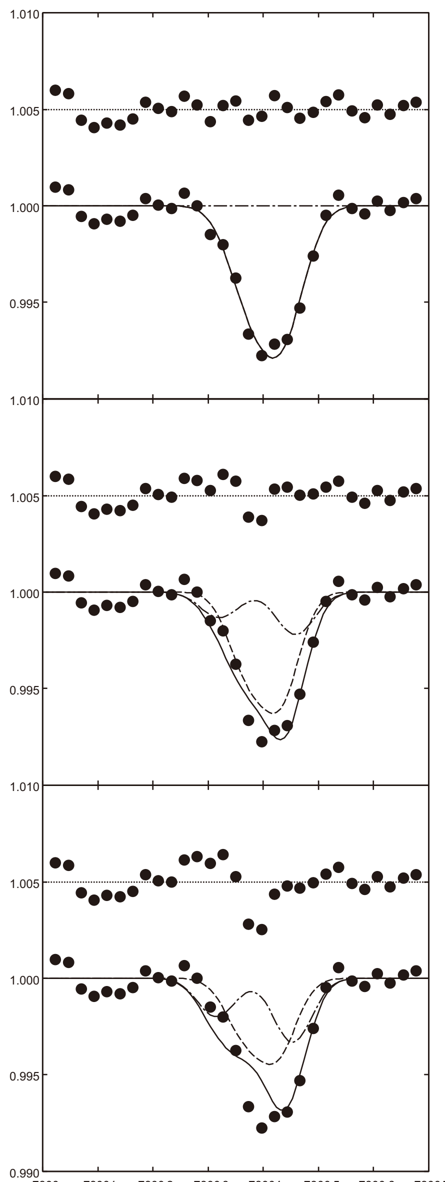


Figure 1: The absorption line of neutral rubidium toward HD169454. Three panels show the best fit to the absorption feature in which ^{85}Rb/^{87}Rb = ∞, 2.59, 1.21, respectively.

This new value differs significantly from the only other reported local interstellar value of 1.21 ± 0.30(1σ) along a different line of sight [2], and is marginally consistent with the Solar value of 2.43. We discuss the implications of this new isotopic ratio in the context of the various relevant models for the nucleosynthesis of heavy elements. We suggest that material in this cloud may be depleted in the main s-process component.

A pure r-process, a pure main s-process, and a pure weak s-process produce Rb isotopes in the ratio of 5.9, 2.0, and 1.1, respectively. The difference between our results and that of Federman et al.[2] suggests that variations in neutron-capture nucleosynthesis may have indeed occurred in the local Solar neighborhood.

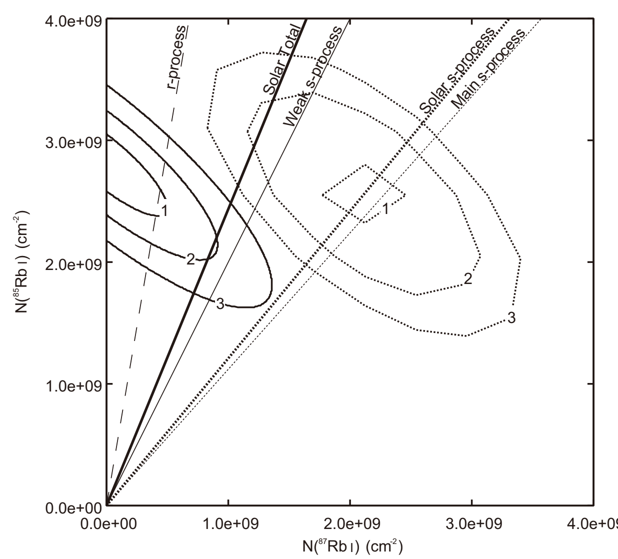


Figure 1: Contours of constant χ^2 confidence levels in the ^{85}Rb I vs. ^{87}Rb I plane. Contours are drawn for the 1, 2, and 3σ confidence levels as labeled. Our data for HD169454 are shown in solid lines. For illustration, the dotted lines are extracted from Federman et al.[2].

References

[1] Kawanomoto, S., et al.: 2009, *ApJ*, **698**, 509.
[2] Federman, S. R., et al.: 2004, *ApJL*, **603**, L105.

s-Process contribution to Sn-115 [1]

HAYAKAWA, Takehito, SHIZUMA, Toshiyuki, CHIBA, Satoshi, HATSUKAWA, Yuichi
IWAMOTO, Nobuyuki, SHINOHARA, Nobuo, HARADA, Hideo
(JAEA)

KAJINO, Toshitaka
(NAOJ / University of Tokyo)

The astrophysical origin of rare isotopes ^{115}Sn has been a long-standing puzzle [2]. It was suggested that β unstable isomers in stable isotopes may have important role for nucleosynthesis of this neutron-deficient isotope as shown in Fig. 1 [3]. The isotope ^{115}Sn may be produced by a weak branch of the s-process through an isomer in ^{113}Cd. However, a neutron capture cross-section for the ^{112}Cd(n, γ)^{113}Cd^{m} reaction has not beem emassured yet. We have measured this cross section by using the cadmium-difference method with neutrons provided from a nuclear reactor, and discuss the s-process contribution to the solar abundance of ^{115}Sn.

The isomer in ^{113}Cd β-decays dominantly to the ground state of the daughter nucleus ^{113}In with a branching ratio of 99.86 % (see Fig. 2). This isomer also decays to its ground state through an internal 263.59-keV γ- transition with a branching ratio of 0.14 %. Thus, we obtain the neutron capture cross-section by measuring of the internal 263.59-keV γ-ray. Two sets of a ^{112}Cd foil enriched to 98.27 % and an Al-Co wire were irradiated with neutrons provided from a nuclear reactor JRR-3 at the Japan Atomic Energy Agency (JAEA). One set of the samples was irradiated with a cover of natural cadmium of 1-mm thickness, the other was irradiated without Cd covers. After the neutron irradiation of a period of two hours, the samples were cooled in a water pool in order to reduce background γ-rays emitted from short-lived radioactivities. The γ-rays from the activated samples were measured by a HPGe detector with a low-background environment 8 and 14 months after the neutron irradiation.

We obtain the thermal neutron capture cross-section of 0.028 ± 0.009 [b] and the resonance integral of 1.1 ± 0.3 [b] using a cadmium difference method. The cross-section ratio of the isomer to the ground state has been calculated as a function of the incident neutron energy, E, by using a statistical model. The calculated ratios are almost constant over a wide range of E < 100 keV. We have evaluated the *s*-process contribution to the solar abundance of ^{115}Sn using the classical steady-flow model with various astrophysical parameters. This calculated results have shown that the production through ^{113}Cd^{m} may give minor contribution to the solar abundance of ^{115}Sn.

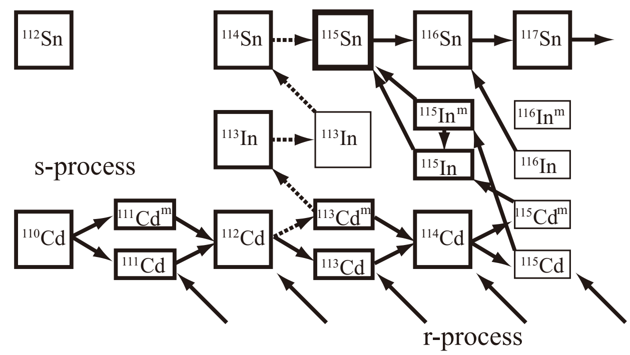


Figure 1: Schematic view of nucleosynthesis of ^{115}Sn.

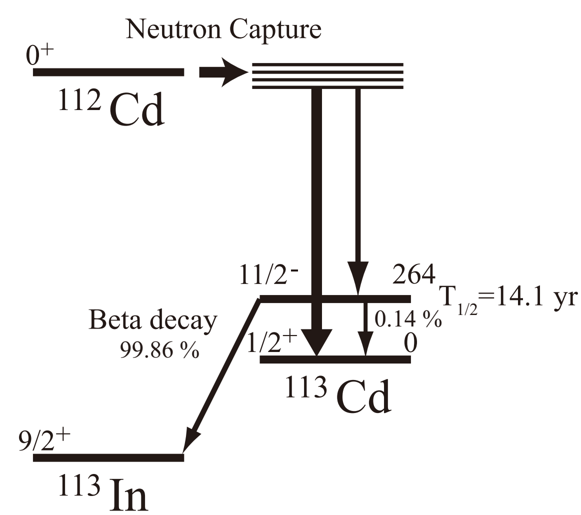


Figure 2: Partical decay scheme of ^{113}Cd.

References

[1] Hayakawa, et al.: 2009, *ApJ*, **707**, 859.
[2] N´emeth, Zs., et al.: 1994, *ApJ*, **426**, 357.
[3] Ward, R.A., et al.: 1976, *ApJ*, **31**, 33.

Neutrino-nucleus reactions via neutral and charged currents by the Quasi-particle Random Phase Approximation(QRPA)

CHEOUN, Myung-Ki (NAOJ / Soongsil University)
HA, Eunja, LEE, Su Youn (Soongsil University)
KAJINO, Toshitaka (NAOJ / University of Tokyo)
KIM, Kyungsik (Korea Aerospace University)
SO, W.Y (Kangwon University)

We applied the QRPA to $\nu(\bar{\nu})-A$ reactions by including multipole transitions up to $J^\pi = 4^\pm$ state with finite momentum transfers and evaluated cross sections of ν- reactions on ^{12}C, ^{56}Ni and ^{56}Fe target nucleus. Our results for $\nu(\bar{\nu})-A$ reactions show quite consistent results with available experimental data and other theoretical calculations [1].

Remarkable points from our results are summarized as follows. Firstly, not only GT, IAS and spin dipole transitions but also other multipole transitions could play roles for $\nu(\bar{\nu})-A$ reactions via CC. However, NC reactions are dominated by the GT transition.

Secondly, np pairing as well as nn and pp pairing correlations, which act as important ingredients for describing the BCS ground state and the QRPA excited states, may contribute to large extent to cross sections of $\nu(\bar{\nu})-A$ reactions. In particular, we showed that it affects results for medium heavy nuclei such as ^{56}Ni and ^{56}Fe, which was already expected from our previous results for $2\nu2\beta$ and $0\nu2\beta$ decays.

Finally, for more exact evaluations within a few % for the flux averaged cross section expected from the would-be experiment, more deliberate calculations of the Coulomb correction are of importance [2]. In particular, experimental data via NC reactions are highly desirable to pin down the ambiguities on the Coulomb correction, because they are not subject to the Coulomb distortion.

For the application to the SN explosions, in Fig. 1, we summarize the cross sections averaged by the SN neutrino spectrum.

$$f(E_\nu) = \frac{1}{F(\alpha)T^3}\frac{E_\nu^2}{exp[(E_\nu/T)-\alpha]-1}\,, \qquad (1)$$

where F(α) is a nomalization factor. T and α can be chosen for neutrino types. Cross sections via CC are much larger, about 3 times, than those by NC, irrespective of nuclear species. Applications to the ν-process for relevant nuclear abundances are in progress.

The QRPA is a very efficient method to consider multiparticle and multi-hole interactions and their configuration mixing. It successfully described nuclear reactions sensitive on the nuclear structure, such as the nuclear $\beta^\pm$, $2\nu2\beta$ and $0\nu2\beta$ decays. Therefore the uncertainties due to the nuclear structure in $\nu(\bar{\nu})-A$ reactions can be pinned down to some extent by reproducing the data related to the β and $\beta\beta$ decays.

Since the present discussions are based on the nondeformed spherical QRPA, one needs to exploit the deformed QRPA [3, 4] for the nucleosynthesis of deformed nuclei, which are expected to be synthesized frequently in core collapsing SN explosions. Such extension of the QRPA calculation for $\nu-A$ reactions is in progress. It also enables us to perform various nuclear weak reactions for unstable exotic nuclei.

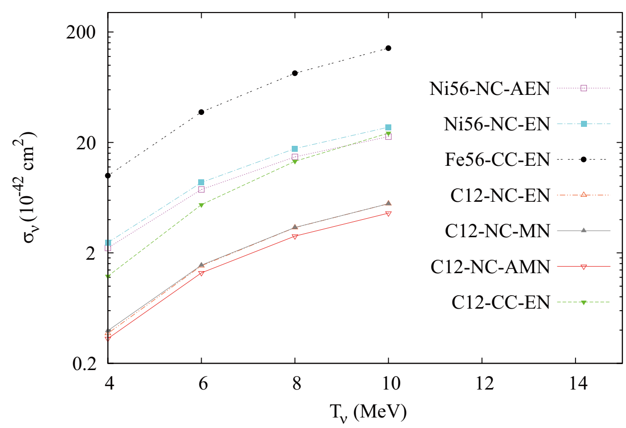


Figure 1: Temperature dependence of the energy weighted cross section for $\nu-^{12}C$, -^{56}Ni and -^{56}Fe reactions, where neutrino spectrum for the SN, Eq.(1), is exploited.

References

[1] Cheoun, M.-K., et al.: 2010, *J. of Phys. G*, **37**, 055101.
[2] Cheoun, M.-K., et al.: 2010, *PRC*, **81**, 028501.
[3] Simkovic, F., et al.: 2003, *PRC*, **68**, 054319.
[4] Simkovic, F., et al.: 2004, *Nuc. Phys. A*, **733**, 321.

Imaging Spectroscopy on Preflare Coronal Nonthermal Sources Associated with the 2002 July 23 Flare

ASAI, Ayumi, NAKAJIMA, Hiroshi, SHIMOJO, Masumi
(NAOJ)

YOKOYAMA, Takaaki
(University of Tokyo)

MASUDA, Satoshi
(Nagoya University)

KRUCKER, Säm
(University of California)

Nonthermal emissions from accelerated particles are often observed in hard X-rays (HXRs), γ-rays, and microwaves at the beginning of a solar flare. Although these nonthermal emissions are undoubtedly associated with intense energy release processes, the mechanisms to accelerate particles are still unclear. The HXR nonthermal emission is explained with the bremsstrahlung emission, which is emitted by the nonthermal electrons with energies $E > 20$ keV. In the microwave range, on the other hand, the gyrosynchrotron emission is the most promising for nonthermal emission. The microwave-emitting electrons have relatively higher energies (~1 MeV). Although HXR and microwave emissions have shown a lot of similarities, it has been also reported that an electron spectral index derived from HXR emissions is often larger (softer) than that derived from microwave emissions, and the temporal behaviors of the spectral indices are totally different between HXR and microwave.

In order to study such similarities/dissimilarities on the nonthermal emissions, we examined in detail the coronal nonthermal emissions during the preflare phase of the X4.8 flare that occurred on 2002 July 23, spatially, temporally and spectroscopically [1]. In the previous paper [2], we reported that nontheral emission sources are clearly seen in microwaves and in HXRs during the preflare phase (Fig. 1). By using the microwave data obtained by Nobeyama Radioheliograph (NoRH), we derived a spectral index for the microwave emission source. By following the gyrosynchrotron emission model, we further derived the spectral index of the accelerated electron. Although the gyrosynchrotron emission strongly depends on the magnetic field strength in the corona, which is very difficult to measure, we can roughly assume that $B_0 = 150$ gauss from other observational results. Finally, we got the spectral index of about 4.7, and the number density of nonthermal electrons as $N_{20\mathrm{keV}} \sim 4.8 \times 10^8$ electrons cm^{-3} with the low energy cut-off of 20 keV.

Then, we investigate the spectral index of the HXR emission source by using the *Reuven Ramaty High Energy Solar Spectroscopic Imager* (*RHESSI*) data. The intensity of the core region clearly shows the power-law distribution. We could adopt the thin-target bremsstrahlung model to derive an electron power-law index, since the HXR source is located on the loop-top, where is almost the same location as the nonthermal emission source seen in microwaves. Assuming the thin-target model for the HXR emission, the spectral index of the accelerated electrons is derived as 4.7, which is almost the same as that from the NoRH microwave data. This implies that the distribution of the accelerated electrons follows a single power-law. We can further estimate the number density of the HXR-emitting electron in the core region to be $N_{20\mathrm{keV}} = 5.1 \times 10^6$ electrons cm^{-3} with the lower energy cut-off of 20 keV. These results on the accelerated electrons are, however, about two orders of magnitude less than those from the microwave emission.

The gap of the number density is reduced if we assume low ambient plasma density for the HXR-emitting region. If we adopt the thick-target model for the HXR emission source, however, the electron spectral index (~6.7) is much different, while the gap of the number density of the accelerated electrons is somewhat reduced.

References

[1] Asai, A., et al.: 2009, *ApJ*, **695**, 1623.
[2] Asai, A., et al.: 2006, *PASJ*, **58**, L1.

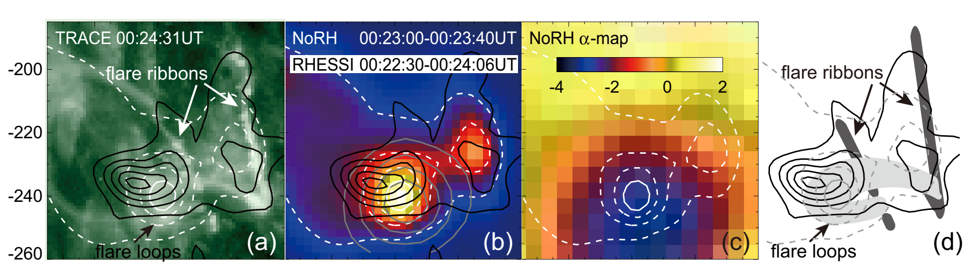


Figure 1: Images for the preflare phase of the flare. (a) the EUV image taken with *TRACE* 195 Å at 00:24:31 UT. (b) (c) show the microwave image of NoRH 34 GHz and the map of NoRH α index. (d) shows the positions of the flare ribbons (*dark gray regions*) and the flare loops (*light gray*). We overlaid the contour images of NoRH 34 GHz and of the *RHESSI* 30–40 keV with the *white* dashed and with *black* solid lines, respectively.

Multiple Plasmoid Ejections and Associated Hard X-ray Bursts in the 2000 November 24 Flare

NISHIZUKA, Naoto, TAKASAKI, Hiroyuki, SHIBATA, Kazunari (Kyoto University)
ASAI, Ayumi (NAOJ)

We present an examination of the GOES X2.3 class flare that occurred at 14:51 UT on 2000 November 24 [1].

The Soft X-ray Telescope (SXT) on board *Yohkoh* revealed that the a soft X-ray emitting plasma ejection, or plasmoid ejection, is sometimes observed in solar flares. It was also found that the plasmoids show blob-like or loop-like shapes and that the strong acceleration of the plasmoid ejection occurs during the peak time of the hard X-ray emission. Their ejection velocities are typically several hundred km s^{-1} and the ejected plasma is heated to more than 10 MK before the onset of the ejection.

The standard CSHKP flare model, which includes a filament/ plasmoid ejection, was extended, to unify reconnection and plasmoid ejection. The model stresses the importance of the plasmoid ejection in a reconnection process, and is called the "plasmoid-induced reconnection" model. The plasmoid, in that model, inhibits reconnection and stores magnetic energy in a current sheet. However, once it is ejected, inflow is induced because of the mass conservation, resulting in the enhancement of reconnection rate and the acceleration of the plasmoid due to the faster reconnection outflow. Reconnection theories, furthermore, predict several plasmoids of various scales are generated. The dynamics of plasmoid formation in the solar flare and their subsequent plasmoid ejection affect the reconnection rate in the nonlinear evolution. Therefore, plasmoid ejections are observational evidence of magnetic reconnection of solar flares.

In the SXT images we found "multiple" plasmoid ejections with velocities in the range of 250–1500 km/s (Fig. 1). Furthermore, we also found that each plasmoid ejection is associated with an impulsive burst of hard X-ray emission (Fig. 2). Although some correlation between plasmoid ejection and hard X-ray emission has been discussed previously, our observation shows similar behavior for multiple plasmoid ejection such that each plasmoid ejection occurs during the strong energy release of the solar flare. As a result of temperature- emission measure analysis of such plasmoids, it was revealed that the apparent velocities and kinetic energies of the plasmoid ejections show a correlation with the peak intensities in the hard X-ray emissions.

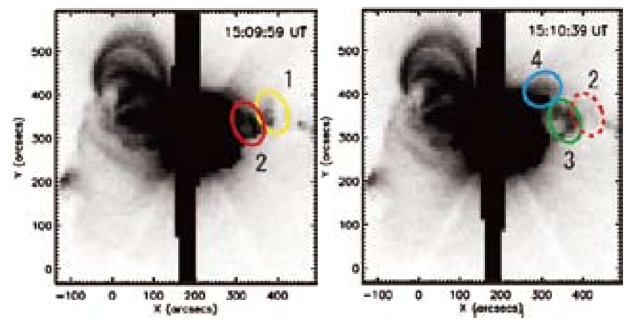


Figure 1: The snapshot images of multiple plasmoid ejections asociated with a flare on 2000 November 24 taken with *Yohkoh*/SXT. Each plasmoid ejection is marked with a colored circle.

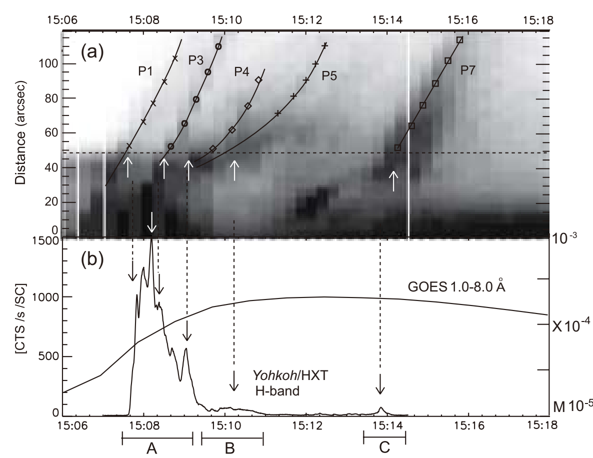


Figure 2: (a) Apparent height of the ejected plasmoids. Time slice image is obtained with *Yohkoh*/SXT. The signs are plotted over the time slice image in figure. (b) Counting rates of hard X-ray emission observed with the H-band (52.7–92.8 keV channel) of *Yohkoh*/HXT and the corresponding GOES soft X-ray light curve.

Reference

[1] Nishizuka, N., Takasaki, H., Asai, A., Shibata, K.: 2010, *ApJ*, **711**, 1062.

II Publications, Presentations

1. Refereed Publications

Abazajian, K. N., et al. including **Ichikawa, S.**: 2009, The Seventh Data Release of the Sloan Digital Sky Survey, *ApJS*, **182**, 543-558.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2009, An upper limit on the stochastic gravitational-wave background of cosmological origin, *Nature*, **460**, 990-994.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2009, Einstein@Home search for periodic gravitational waves in early S5 LIGO data, *Phys. Rev. D*, **80**, 42003.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2009, First LIGO search for gravitational wave bursts from cosmic(super) strings, *Phys. Rev. D*, **80**, 62002.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2009, LIGO: the Laser Interferometer Gravitational-Wave Observatory, *Rep. Prog. Phys.*, **72**, 76901.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2009, Observation of a kilogram-scale oscillator near its quantum ground state, *New J. Phys.*, **11**, 73032.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2009, Search for gravitational wave ringdowns from perturbed black holes in LIGO S4 data, *Phys. Rev. D*, **80**, 62001.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2009, Search for gravitational waves from low mass binary coalescences in the first year of LIGO's S5 data, *Phys. Rev. D*, **79**, 122001.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2009, Search for gravitational waves from low mass compact binary coalescence in 186 days of LIGO's fifth science run, *Phys. Rev. D*, **80**, 47101.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2009, Search for gravitational-wave bursts in the first year of the fifth LIGO science run, *Phys. Rev. D*, **80**, 102001.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2009, Search for high frequency gravitational-wave bursts in the first calendar year of LIGO's fifth science run, *Phys. Rev. D*, **80**, 102002.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2009, Stacked Search for Gravitational Waves from the 2006 SGR 1900+14 Storm, *ApJ*, **701**, L68-L74.

Abbott, B. P., et al. including **Ballmer, S.**, **Kawamura, S.**, **Majorana, E.**, **Nishizawa, A.**, **Sakata, S.**: 2010, Searches for Gravitational Waves from Known Pulsars with Science Run 5 Ligo Data, *ApJ*, **713**, 671-685.

Abdo, A. A., et al. including **Kino, M.**, **Nagai, H.**: 2009, Multi-wavelength Monitoring of the Enigmatic Narrow-Line Seyfert 1 PMN J0948+0022 in 2009 March-July, *ApJ*, **707**, 727-737.

Abdo, A. A., et al. including **Yamashita, T.**: 2010, PKS 1502+106: A New and Distant Gamma-ray Blazar in Outburst Discovered by the Fermi Large Area Telescope, *ApJ*, **710**, 810.

Agatsuma, K., Uchiyama, T., Yamamoto, K., Ohashi, M., **Kawamura, S.**, Miyoki, S., Miyakawa, O., Telada, S., Kuroda, K.: 2010, Direct measurement of thermal fluctuation of high-Q pendulum, *Phys. Rev. Lett.*, **104**, 40602.

Akitaya, H., Ikeda, Y., Kawabata, K. S., Matsuda, K., Okazaki, A., Seki, M.: 2009, Linear polarization in forbidden lines of the T Tauri star RY Tauri, *A&A*, **499**, 163.

Amaro-Seoane, P., Sesana, A., Hoffman, L., Benacquista, M., Eichhorn, C., **Makino, J.**, Spurzem, R.: 2010, Triplets of supermassive black holes: astrophysics, gravitational waves and detection, *MNRAS*, **402**, 2308-2320.

Ando, M., et al. including **Kawamura, S.**, **Fujimoto, M.**, **Fukushima, M.**, **Ishizaki, H.**, **Kotake, K.**, **Nakamura, K.**, **Nishizawa, A.**, **Obuchi, Y.**, **Okada, N.**, **Takahashi, R.**, **Torii, Y.**, **Ueda, A.**, **Yamazaki, T.**: 2009, DECIGO pathfinder, *Class. Quantum Grav.*, **26**, 94019.

Aoki, W., **Arimoto, N.**, Sadakane, K., Tolstoy, E., Battaglia, G., Jablonka, P., Shetrone, M., Letarte, B., Irwin, M., Hill, V., Francois, P., Venn, K., Primas, F., Helmi, A., Kaufer, A., Tafelmeyer, M., Szeifert, T., Babusiaux, C.: 2009, Chemical composition of extremely metal-poor stars in the Sextans dwarf spheroidal galaxy, *A&A*, **502**, 569.

Aoki, W., Barklem, P. S., Beers, T. C., Christlieb, N., Inoue, S., García Pérez, A. E., Norris, J. E., Carollo, D.: 2009, Lithium Abundances of Extremely Metal-Poor Turnoff Stars, *ApJ*, **698**, 1803.

Arai, A., et al. including **Okita, K.**, **Yoshida, M.**, **Yanagisawa, K.**: 2009, Anti-Correlation of Near-Infrared and X-Ray Variations of the Microquasar GRS 1915+105 in the Soft State, *PASJ*, **61**, L1-L5.

Arai, K., et al. including **Takahashi, R.**, **Tatsumi, D.**, **Izumi, K.**, **Wakabayashi, Y.**, **Ishizaki, H.**, **Fukushima, M.**, **Yamazaki, T.**, **Fujimoto, M.-K.**: 2009, Status of Japanese gravitational wave detectors, *Class. Quantum Grav.*, **26**, 204020.

Araki, H., **Tazawa, S.**, **Noda, H.**, Migita, E., Kamiya, I., Kawano, N., **Sasaki, S.**: 2009, Preliminary Results of the Lunar Topography by KAGUYA-LALT Mission, Transaction of Japan Society for Aeronautical and Space Sciences, *Aerospace Technology Japan*, **7**, Tk_23-Tk_25.

Ariyoshi, S., Taino, T., Dobroiu, A., Sato, H., **Matsuo, H.**, Otani, C.: 2009, Terahertz detector based on a superconducting tunnel junction coupled to a thin superconductor film, *Appl. Phys. Lett.*, **95**, 193504.

Asai, A., **Nakajima, H.**, **Shimojo, M.**, Yokoyama, T., Masuda, S., Krucker, Säm: 2009, Imaging Spectroscopy on Preflare Coronal

Nonthermal Sources Associated with the 2002 July 23 Flare, *ApJ*, **695**, 1623-1630.
Asayama, S., Kamikura, M.: 2009, Development of Double-Ridged Wavegide Orthomode Transducer for the 2 MM Band, *Int. J. Infrared Millimeter Waves*, **30**, 573-579.
Baba, J., Asaki, Y., **Makino, J.**, **Miyoshi, M.**, **Saitoh, T. R.**, **Wada, K.**: 2009, The origin of large peculiar motions of star-forming regions and spiral, *ApJ*, **706**, 471-481.
Barker, M. K., Ferguson, A. M. N., Irwin, M., **Arimoto, N.**, Jablonka, P.: 2009, Resolving the Stellar Outskirts of M81: Evidence for a Faint, Extended Sgtructural Components, *AJ*, **138**, 1469-1484.
Bedding, T. R., et al. including **Kambe, E.**, **Ando, H.**, **Izumiura, H.**: 2010, A Multi-Site Campaign to Measure Solar-Like Oscillations in Procyon. II. Mode Frequencies, *ApJ*, **713**, 935-949.
Bisterzo, S., Gallino, R., Straniero, O., **Aoki, W.**: 2009, Interpretation of CEMP(s) and CEMP(s + r) Stars with AGB Models, *PASA*, **26**, 314.
Bouy, H., Huélamo, N., Barrado Y Navascués, D., Martín, E. L., Petr-Gotzens, M. G., Kolb, J., Marchetti, E., Morales-Calderón, M., Bayo, A., Artigau, E., Hartung, M., Marchis, F., **Tamura, M.**, Sterzik, M., Köhler, R., Ivanov, V. D., Nürnberger, D.: 2009, A deep look into the core of young clusters. II. λ-Orionis, *A&A*, **504**, 199-209.
Brooks, D. H., Warren, H. P., Williams, D. R., **Watanabe, T.**: 2009, Hinode/Extreme-Ultraviolet Imaging Spectrometer Observations of the Temperature Structure of the Quiet Corona, *ApJ*, **705**, 1522-1532.
Burningham, B., et al. including **Tamura, M.**: 2009, The discovery of an M4+T8.5 binary system, *MNRAS*, **395**, 1237-1248.
Campisi, M. A., Vignali, C., Brusa, M., Daddi, E., Comastri, A., Possetti, L., Alexandre, D. M., Renzini, A., **Arimoto, N.**, Kong, X.: 2009, On the nature of red galaxies: the Chandra perspective, *A&A*, **501**, 485-494.
Chassefiere, E., et al. including **Sasaki, S.**: 2010, PHEBUS: A double ultraviolet spectrometer to observe Mercury's exosphere, *Planet. Space Sci.*, **58**, 201-223.
Cheoun, M. K., Ha, E., Kim, K. M., **Kajino, T.**: 2010, Neutrino reactions via neutral and charged current by quasi-particle random phase approximation (QRPA), *J. Phys. G*, **37**, 55101.
Cheoun, M. K., Ha, E., Lee, S. Y., Kim, K. M., So, W. Y., **Kajino, T.**: 2010, Neutrino reactions on C^{12} by the quasiparticle random-phase approximation, *Phys. Rev. C*, **81**, 28501.
Codella, C., Cesaroni, R., López-Sepulcre, A., Beltrán, M. T., **Furuya, R.**, Testi, L.: 2010, Looking for high-mass young stellar objects: H_2O and OH masers in ammonia cores, *A&A*, **510**, A86.
Dawson, K. S., et al. including **Hattori, T.**, **Kashikawa, N.**, **Morokuma, T.**, **Takanashi, N.**: 2009, An Intensive Hubble Space Telescope Survey for z>1 Type Ia Supernovae by Targeting Galaxy Clusters, *AJ*, **138**, 1271.
Desmet, M., Briquet, M., Thoul, A., Zima, M., De Cat, P., Handler, G., Ilyin, I., **Kambe, E.**, Krzesinski, J., Lehmann, H., Masuda, S., Mathias, P., Mkrtichian, D. E., Telting, J., Uytterhoeven, K., Yang, S. L. S., Aerts, C.: 2009, An asteroseismic study of the beta Cephei star 12 Lacertae: multisite spectroscopic observations, mode identification and seismic modelling, *MNRAS*, **396**, 1460.
Doherty, M., et al. including **Kodama, T.**: 2009, Optical and near-IR spectroscopy of candidate red galaxies in two z~2.5 protoclusters, *A&A*, **509**, 83.
Doi, A., et al. including **Kawaguchi, N.**, **Kono, Y.**, **Oyama, T.**, **Yamauchi, A.**: 2009, VLBI Detections of Parsec-Scale Nonthermal Jets in Radio-Loud Broad Absorption Line Quasars, *PASJ*, **61**, 1389-1398.
Endo, A., **Noguchi, T.**, Kroug, M., Shitov, S. V., Shan, W., Tamura, T., Kojima, T., Uzawa, Y., Sakai, T., Inoue, H., Kohno, K.: 2009, A THz SIS Mixer with a NbTiN-Ground Plane and SIS Microtrilayers Directly Grown on a Quartz Substrate, *IEEE Trans. Appl. Supercond.*, **19**, 400-404.
Enomoto, R., et al. including **Mizumoto, Y.**: 2009, CANGAROO-III Observation of TeV Gamma Rays from the Vicinity of PSR B1706-44, *ApJ*, **703**, 1725-1733.
Espada, D., Matsushita, S., Peck, A., Henkel, C., **Iono, D.**, Israel, F. P., Muller, S., Petitpas, G., Pihlstroem, Y., Taylor, G. B., Dinh-V-Trug: 2009, Disentangling the Circumnuclear Environs of Centaurus A: I. High Resolution Molecular Gas Imaging, *ApJ*, **695**, 116-134.
Förster, S., et al. including **Arimoto, N.**: 2009, The SINS Survey: SINFONI Integral Field Spectroscopy of z~2 Star-forming Galaxies, *ApJ*, **706**, 1364-1428.
Freyhammer, L. M., Kurtz, D. W., Elkin, V. G., Mathys, G., Savanov, I., Zima, W., Shibahashi, H., **Sekiguchi, K.**: 2009, A 3D study of the photosphere of HD99563 - I. Pulsation analysis, *MNRAS*, **396**, 325-342.
Friesen, R. K., Di Franesco, J., **Shimajiri, Y.**, Takakuwa, S.: 2010, The Initial Conditions of Clusteres Star Formation II: N_2H^+ Observations of the Ophiuchus B Core, *ApJ*, **708**, 1002-1024.
Fujii, M., **Iwasawa, M.**, Funato, Y., **Makino, J.**: 2009, Trojan Stars in the Galactic Center, *ApJ*, **695**, 1421-1429.
Fujimura, D., **Tsuneta, S.**: 2009, Properties of Magneto-hydrodynamic Waves in the Solar Photosphere Obtained with Hinode, *ApJ*, **702**, 1443-1457.
Fujishita, M., Torii, K., Kudo, N., Kawase, T., Yamamoto, H., Kawamura, A., **Mizuno, N.**, Onishi, T., Mizuno, A., Machida, M., Takahashi, K., Nozawa, S., Matsumoto, R., Fukui, Y.: 2009, Discovery of Molecular Loop 3 in the Galactic Center: Evidence for a Positive-Velocity Magnetically Floated Loop towards L = 355°–359°, *PASJ*, **61**, 1039-1053.
Fujiwara, H., **Yamashita, T.**, Ishihara, D., Onaka, T., Kataza, H., Ootsubo, T., Fukagawa, M., Marshall, J. P., Murakami, H., Nakagawa, T., Hirao, T., Enya, K., White, G. J.: 2009, Hot Debris Dust Around HD 106797, *ApJ*, **695**, L88.
Fujiwara, M., Sasaki, M., Nagata, H., **Matsuo, H.**: 2009, Optical control of low frequency noise behavior in cryogenic GaAs junction field effect transistor, *Cryogenics*, **49**, 626-629.
Fukagawa, M., Itoh, Y., **Tamura, M.**, Oasa, Y., **Hayashi, S. S.**, Fujita, Y., Shibai, H., **Hayashi, M.**: 2009, H-Band Image of a Planetary Companion Around HR 8799 in 2002, *ApJ*, **696**, L1-L5.
Fukui, Y., Furukawa, N., Dame, T. M., Dawson, Joanne R., Yamamoto, H., Rowell, G. P., Aharonian, F., Hofmann, W., de

Oña Wilhelmi, E., Minamidani, T., Kawamura, A., **Mizuno, N.**, Onishi, T., Mizuno, A., Nagataki, S.: 2009, A Peculiar Jet and Arc of Molecular Gas toward the Rich and Young Stellar Cluster Westerlund 2 and a TeV Gamma Ray Source, *PASJ*, **61**, L23-L27.

Fukui, Y., Kawamura, A., Wong, T., Murai, M., Iritani, H., **Mizuno, N.**, Mizuno, Y., Onishi, T., Hughes, A., Ott, J., Muller, E., Staveley-Smith, L., Kim, S.: 2009, Molecular and Atomic Gas in the Large Magellanic Cloud. II. Three-dimensional Correlation Between CO and HI, *ApJ*, **705**, 144-155.

Fukushima, T.: 2009, Efficient Solution of Initial-Value Problem of Torque-Free Rotation, *AJ*, **138**, 210-218.

Fukushima, T.: 2009, Fast Computation of Jacobian Elliptic Functions and Incomplete Elliptic Integrals for Constant Values of Elliptic Parameter and Elliptic Characteristic, *Celest. Mech. Dyn. Astron.*, **105**, 245-260.

Fukushima, T.: 2009, Fast Computation of Complete Elliptic Integrlals and Jacobian Elliptic Functions, *Celest. Mech. Dyn. Astron.*, **105**, 305-328.

Furukawa, N., Dawson, J. R., Ohama, A., Kawamura, A., **Mizuno, N.**, Onishi, T., Fukui, Y.: 2009, Molecular Clouds Toward RCW49 and Westerlund 2: Evidence for Cluster Formation Triggered by Cloud-Cloud Collision, *ApJ*, **696**, L115-L119.

Furuya, R. S., Shinnaga, H.: 2009, High-velocity Molecular Outflow in CO $J = 7–6$ Emission from the Orion Hot Core, *ApJ*, **703**, 1198.

García Pérez, A. E., **Aoki, W.**, Inoue, S., Ryan, S. G., Suzuki, T. K., Chiba, M.: 2009, ^{6}Li/^{7}Li estimates for metal-poor stars, *A&A*, **504**, 213.

Goossens, S., **Matsumoto, K.**, **Ishihara, Y.**, **Liu, Q.**, **Kikuchi, F.**, **Noda, H.**: 2009, Results for Orbit Determination of the Three Satellites of Kaguya, *J. Geodetic Soc. Jpn.*, **55**, 255-268.

Goto, T., **Utsumi, Y.**, **Furusawa, H.**, **Miyazaki, S.**, **Komiyama, Y.**: 2009, A QSO host galaxy and its Lyα emission at $z = 6.43$, *MNRAS*, **400**, 843.

Guyon, O., Pluzhnik, E., Martinache, F., Totems, J., Tanaka, S., **Matsuo, T.**, Blain, C., Belikov, R.: 2010, High-Contrast Imaging and Wavefront Control with a PIAA Coronagraph: Laboratory System Validation, *PASP*, **122**, 71-84.

Hachisuka, K., Brunthaler, A., Menten, K. M., Reid, M. J., **Hagiwara, Y.**, Mochizuki, N.: 2009, The Distance to a Star-Forming Region in the Outer Arm of the Galaxy, *AJ*, **696**, 1981-1986.

Hamana, T., **Miyazaki, S.**, **Kashikawa, N.**, Ellis, R. S., Massey, R. J., Refregier, A., Taylor, J. E.: 2009, Subaru Weak-Lensing Survey II: Multi-Object Spectroscopy and Cluster Masses, *PASJ*, **61**, 833.

Hanada, H., Iwata, T., Namiki, N., **Kawano, N.**, **Sasaki, S.**, **Matsumoto, K.**, **Noda, H.**, **Tsuruta, S.**, **Asari, K.**, **Ishikawa, T.**, **Kikuchi, F.**, **Liu, Q.**, **Goossens, S.**, **Ishihara, Y.**, Petrova, N., **Harada, Y.**, Shibata, K., Iwadate, K., Kameya, O., Tamura, Y., Hong, X., Ping, J., Aili, Y., Ellingsen, S., Schlueter, W.: 2009, Exploration of Lunar Gravity by VLBI Observations of SELENE (KAGUYA), Transaction of Japan Society for Aeronautical and Space Sciences, *Aerospace Technology Japan*, **7**, Tk_1-Tk_5.

Hanawa, T., Ochi, Y., Ando, K.: 2010, Gas Accretion from a Circumbinary Disk, *ApJ*, **708**, 485-497.

Hara, H.: 2009, Differential Rotation Rate of X-ray Bright Points and Source Region of Their Magnetic Fields, *ApJ*, **697**, 980-984.

Harikae, S., **Takiwaki, T.**, **Kotake, K.**: 2009, Long-Term Evolution of Slowly Rotating Collapsar in Special Relativistic Magnetohydrodynamics, *ApJ*, **704**, 354-371.

Hasegawa, K., Umemura, M., **Susa, H.**: 2009, Radiative Regulation of Population III Star Formation, *MNRAS*, **395**, 1280-1286.

Hashimoto, S., Ogata, K., **Chiba, S.**, Yahiro, M.: 2009, New Approach for Evaluating Incomplete and Complete Fusion Cross Sections with Continuum-Discretized Coupled-Channels Method, *Prog. Theo. Phys.*, **122**, 1291-1300.

Hashimoto, T., et al. including **Kajino, T.**: 2009, A new measurement of the astrophysical Li^{8}(d,t)Li^{7} reaction, *Phys. Lett. B*, **674**, 276-280.

Hatsukade, B., et al. including **Iono, D.**, **Ezawa, H.**, **Kawabe, R.**, **Nakanishi, K.**: 2010, Unveiling the Nature of Submillimeter Galaxy SXDF 850.6, *ApJ*, **711**, 974-979.

Hatsukade, B., **Iono, D.**, Motohara, K., **Nakanishi, K.**, **Hayashi, M.**, Shimasaku, K., Nagao, T., **Tamura, Y.**, Malkan, M., Ly, C., Kohno, K.: 2009, A Search for Molecular Gas toward a BzK-Selected Star-Forming Galaxy at $z = 2.044$, *PASJ*, **61**, 487-491.

Hatsutori, Y., Shinichi, N.: 2009, A Study on Vibration Isolator for Reaction Wheel Assembly, Transactions of the Japan Society for Aeronautical and Space Sciences, *Space Technology Japan*, **7**, Pd_69-Pd_73.

Hatsutori, Y., Suganuma, M., **Kobayashi, Y.**, **Gouda, N.**, **Yano, T.**, Yamada, Y., Yamauchi, M.: 2009, A Very Small Astrometry Satellite, Nano-JASMINE: Its Telescope and Mission Goals, Transactions of the Japan Society for Aeronautical and Space Sciences, *Space Technology Japan*, **7**, Tm_19-Tm_23.

Hayakawa, T., Shizuma, T., **Chiba, S.**, **Kajino, T.**, Hatsukawa, Y., Iwamoto, N., Shinohara, N., Harada, H.: 2009, Neutron capture cross-section to Cd^{113} isomer and s-process contribution to rare p-nuclide Sn^{115}, *ApJ*, **707**, 859-865.

Hayakawa, T., Shizuma, T., **Kajino, T.**, Ogawa, K., Nakada, N.: 2009, Reply to Comment on La^{138}-Ce^{138}-Ce^{136} nuclear cosmochronometer of supernova neutrino process, *Phys. Rev. C*, **79**, 59802.

Hayashi, M., **Kodama, T.**, Koyama, Y., Tanaka, I., Shimasaku, K., Okamura, S.: 2010, High star formation activity in the central region of a distant cluster at z=1.46, *MNRAS*, **402**, 1980-1990.

Hayashi, Sei., et al. including **Mizumoto, Y.**: 2009, Search for VHE gamma rays from SS433/W50 with the CANGAROO-II telescope, *Astropart. Phys.*, **32**, 112-119.

Hibi, Y., **Matsuo, H.**, Arai, H., Nagata, H., Ikeda, H., Fujiwara, M.: 2009, The cryogenic multiplexer and shift register for submillimeter-wave digital camera, *Cryogenics*, **49**, 672-675.

Higuchi, A. E., **Kurono, Y.**, **Saito, M.**, **Kawabe, R.**: 2009, A Mapping Survey of Dense Clumps Associated with Embedded Clusters: Evolutionary Stages of Cluster-Forming Clumps, *ApJ*, **705**, 468-482.

Hioki, T., Itoh, Y., Oasa, Y., Fukagawa, M., **Kudo, T.**, Mayama, S., **Pyo, T.-S.**, **Hayashi, M.**, **Hayashi, S. S.**, **Ishii, M.**, **Tamura,**

M.: 2009, High-Resolution Near-Infrared Images of the T Tauri Binary System XZ Tauri, *PASJ*, **61**, 1271-1279.

Hirashita, H., **Omukai, K.**: 2009, Dust coagulation in star formation with different metallicities, *MNRAS*, **399**, 1795-1801.

Hirota, A., **Kuno, N.**, Sato, N., Nakanishi, H., Tosaki, T., Matsui, H., Habe, A., Sorai, K.: 2009, Determination of the Pattern Speed of Barred Spiral Galaxies, *PASJ*, **61**, 441-450.

Hirota, T., **Ohishi, M.**, Yamamoto, S.: 2009, A Search for Carbon-Chain-rich Cores in Dark Clouds, *ApJ*, **699**, 585-602.

Hosokawa, T., **Omukai, K.**: 2009, Low-Metallicity Protostars and the Maximum Stellar Mass Resulting from Radiative Feedback: Spherically Symmetric Calculations, *ApJ*, **703**, 1810-1818.

Huang, G., **Nakajima, H.**: 2009, Statistical Analysis of Flaring Loops Observed by Nobeyama Radioheliograph. I. Comparison of Looptop and Footpoints, *ApJ*, **696**, 136-142.

Huang, G., **Nakajima, H.**: 2009, Statistics of Flaring Loops Observed by Nobeyama Radioheliograph. II. Spectral Evolution, *ApJ*, **702**, 19-26.

Hwang, N., Lee, M. G.: 2010, Vestige of the Star Cluster Burst in M51, *ApJ*, **709**, 411-423.

Ichihashi, Y., Masuda, N., Tsuge, M., **Nakayama, H.**, Shiraki, A., Shimobaba, T., Ito, T.: 2009, One-unit system to reconstruct a 3-D movie at a video-rate via electroholography, *Opt. Express*, **17(22)**, 13895-13903.

Ichihashi, Y., **Nakayama, H.**, Ito, T., Masuda, N., Shimobaba, T., Shiraki, A., Sugie, T.: 2009, HORN-6 special-purpose clustered computing system for electroholography, *Opt. Express*, **17(16)**, 13895-13903.

Iliev, I. T., et al. including **Susa, H.**: 2009, Cosmological radiative transfer comparison project - II. The radiation-hydrodynamic tests, *MNRAS*, **400**, 1283-1316.

Imada, A., Henden, A., Kato, T., Moritani, Y., Sumiyoshi, M., Tanada, S., Omodaka, T., Ishioka, R., Uemura, M., **Yanagisawa, K.**, Nogami, D.: 2009, Superhump Development during the 2005 Superoutburst of 1RXS J053234+624755, *PASJ*, **61**, L17-L21.

Imada, A., Yasuda, T., Omodaka, T., Oizumi, S., Yamamoto, H., Tanada, S., Arao, Y., Kodama, K., Suzuki, M., Matsuo, T., Maehara, H., Kato, T., Sugiyasu, K., Moritani, Y., Sumiyoshi, M., Nakajima, K., Pietz, J., **Yanagisawa, K.**, Nogami, D.: 2009, CCD Photometry of a Newly Confirmed SU UMa-Type Dwarf Nova, NSV 4838, *PASJ*, **61**, 535-541.

Imada, S., **Hara, H.**, **Watanabe, T.**: 2009, Ion Temperature and Non-Thermal Velocity in a Solar Active Region: Using Emission Lines of Different Atomic Species, *ApJ*, **705**, L208-L212.

Imai, H., He, J.-H., Nakashima, J., **Ukita, N.**, **Deguchi, S.**, Koning, N.: 2009, CO J=3–2 Emission from the "Water Fountain" Sources IRAS 16342-3814 and IRAS 18286-0959, *PASJ*, **61**, 1365-1372.

Imanishi, M., Maiolino, R., Nakagawa, T.: 2010, Spitzer Infrared Low-Resolution Spectroscopic Study of Buried Active Galactic Nuclei in a Complete Sample of Nearby Ultraluminous Infrared Galaxies, *ApJ*, **709**, 801-815.

Imaishi, M., **Nakanishi, K.**, Yamada, M., **Tamura, Y.**, Kohno, K.: 2010, ASTE Simultaneous HCN(4–3) and HCO^+(4–3) Observations of the Two Luminous Infrared Galaxies NGC 4418 and Arp 220, *PASJ*, **62**, 201-209.

Imanishi, M.: 2009, Luminous Buried Active Galactic Nuclei as a Function of Galaxy Infrared Luminosity Revealed through Spitzer Low-resolution Infrared Spectroscopy, *ApJ*, **694**, 751-764.

Imanishi, Y., **Tamura, Y.**, Ikeda, H., Okubo, S.: 2009, Permanent gravity changes recorded on superconducting gravimeters from earthquakes in central Japan–The Noto Hantou and Niigataken Chuetsu-oki events in 2007, *J. Geodyn.*, **48**, 260-268.

Inoue, T., Inutsuka, S.-I.: 2009, Two-fluid MHD Simulations of Converging HI Flows in the Interstellar Medium. II: Are Molecular Clouds Generated Directly From Warm Neutral Medium?, *ApJ*, **704**, 161-169.

Iono, D., Wilson, C. D., Yun, M. S., Baker, A. J., Petitpas, G. R., Peck, A. B., Krips, M., Cox, T. J., Matsushita, S., Mihos, J. C., Pihistrom, Y.: 2009, Luminous Infrared Galaxies with the Submillimeter Array: II. Comparing the CO(3–2) Size and Luminosities of Local and High-Redshift Luminous Infrared Galaxies, *ApJ*, **695**, 1537-1549.

Ishigaki, M., Chiba, M., **Aoki, W.**: 2010, Chemical Abundances of Outer Halo Stars in the Milky Way, *PASJ*, **62**, 143.

Ishiguro, M., Usui, F., Sarugaku, Y., Ueno, M.: 2009, 2006 Fragmentation of Comet 73P/Schwassmann-Wachmann 3B Observed with Subaru/Suprime-Cam, *Icarus*, **203**, 560.

Ishihara, Y., **Goossens, S.**, **Matsumoto, K.**, **Noda, H.**, **Araki, H.**, Namiki, N., **Hanada, H.**, Iwata, T., **Tazawa, S.**, **Sasaki, S.**: 2009, Crustal thickness of the Moon: Implications for farside basin structures, *Geophys. Res. Lett.*, **36**, L19202.

Ishii, S., Seta, M., Nakai, N., Nagai, S., Miyagawa, N., **Yamauchi, A.**, Motoyama, H., Taguchi, M.: 2010, Site testing at Dome Fuji for submillimeter and terahertz astronomy: 220 GHz atomospheric-transparency, *Polar Sci.*, **3**, 213-221.

Ishiyama, T., Fukushige, T., **Makino, J.**: 2009, GreeM: Massively Parallel TreePM Code for Large Cosmological *N*-body Simulations, *PASJ*, **61**, 1319-1330.

Ishiyama, T., Fukushige, T., **Makino, J.**: 2009, Variation of the Subhalo Abundance in Dark Matter Halos, *ApJ*, **696**, 2115-2125.

Isobe, N., Tashiro, M. S., Gandhi, P., Hayato, A., **Nagai, H.**, **Hada, K.**, Seta, H., Matsuta, K.: 2009, Suzaku Observation of the Giant Radio Galaxy 3C 326, *ApJ*, **706**, 454-463.

Ito, H., **Aoki, W.**, Honda, S., Beers. T. C.: 2009, BD+44°493: A Ninth Magnitude Messenger from the Early Universe; Carbon Enhanced and Beryllium Poor, *ApJ*, **698**, L37-L41.

Ito, M., **Hayano, Y.**, **Saito, Y.**, **Takami, H.**, Saito, N., Akagawa, K., Takazawa, A., Ito, M., Wada, S., **Iye, M.**: 2009, High-Power Laser Beam Transfer through Optical Relay Fibers for a Laser Guide Adaptive Optics System, *PASJ*, **61**, 763-768.

Ito, T.: 2009, Asymmetric impacts of near-Earth asteroids on the Moon, *Adv. Geosci.*, **15**, 107-118.

Iwakami, W., **Kotake, K.**, Ohnishi, N., Yamada, S., Sawada, K.: 2009, Spiral mode of standing accretion shock instability in core-collapse supernovae, *ApJ*, **700**, 232-242.

Iwakami, W., Ohnishi, N., **Kotake, K.**, Yamada, S., Sawada, K.: 2009, Spiral mode of standing accretion shock instability in core-collapse supernovae, *Astrophys. Space Sci.*, **322**, 43-47.

Iwata, T., Namiki, N., **Hanada, H.**, **Noda, H.**, **Kawano, N.**, **Matsumoto, K.**, **Tsuruta, S.**, **Liu, Q.**, **Kikuchi, F.**, Minamino, H., Sasaki, T.: 2009, Properties of SELENE Small Satellites for Selenodetic Measurements: Rstar(OKINA) and Vstar(OUNA), Transaction of Japan Society for Aeronautical and Space Sciences, *Aerospace Technology Japan*, **7**, Tk_33-Tk_37.

Jike, T., **Manabe, S.**, **Tamura, Y.**: 2009, Result of VERA Internal Geodetic VLBI with 1Giga-bps Recording in the First Three Years, *J. Geodetic Soc. Jpn.*, **55**, 369-384.

Kadono, T., Sugita, S., Ootsubo, T., Sako, S., Miyata, T., **Furusho, R.**, Honda, M., Kawakita, H., **Watanabe, J.**: 2010, Interpretation on Deep Impact results: Radial Distribution of Ejecta and the Size Distribution of Large-sized Grains, *Earth, Planets and Space*, **62**, 13-16.

Kajino, H., Ohta, K. **Iwata, I.**, Yabe, K., Yuma, S., Akiyama, M., Tamura, N., Aoki, K., Sawicki, M.: 2009, Lyman Break Galaxies at $z \sim 5$: Rest-Frame UV Spectra. III, *ApJ*, **704**, 117.

Kajino, T., Kojima, K., Yamazaki, D, Ichiki, K., Mathews, G. J.: 2010, An alternative to inflation? Critical role of neutrino anisotropic stress in CMB, *Prog. Part. Nucl. Phys.*, **64**, 378-380.

Kajisawa, M., Ichikawa, T., **Tanaka, I.**, Konishi, M., Yamada, T., Akiyama, M., **Suzuki, R.**, Tokoku, C., Uchimoto, Y. K., Yoshikawa, T., Ouchi, M., **Iwata, I.**, **Hamana, T.**, Onodera, M.: 2009, MOIRCS Deep Survey. IV. Evolution of Galaxy Stellar Mass Function Back to $z \sim 3$, *ApJ*, **702**, 1393.

Kamikura, M., **Naruse, M.**, **Asayama, S.**, **Satou, N.**, **Shan, W.**, **Sekimoto, Y.**: 2010, Development of a 385–500 GHz Orthomode Transducer(OMT), *J. Infrared, Millimeter, and Terahertz Waves*, **31**, 697-707.

Kamio, S., **Hara, H.**, **Watanabe, T.**, Curdt, W.: 2009, Distribution of jets and magnetic fields in a coronal hole, *A&A*, **502**, 345-353.

Kamohara, R., Bujarrabal, V., **Honma, M.**, Nakagawa, A., **Matsumoto, N.**, **Oyama, T.**, **Hirota, T.**, Imai, H., **Shibata, K. M.**, **Kobayashi, H.**, **Sato, K.**, **Ueno, Y.**: 2010, VERA observations of SiO maser emission from R Aquarii, *A&A*, **510**, A69.

Kaneda, H., Fouks, B., Yasuda, A., Murakami, N., Okada, Y., Coulais, A., Doi, Y., Fujiwara, M., Kawada, M., **Matsuo, H.**, Takahashi, H.: 2009, Application of Photoconductor Physical Transient Model to Fourier Transform Spectrometer Data of AKARI/Far-Infrared Surveyor(FIS), *PASP*, **121**, 549-557.

Karr, J. L., Ohashi, N., **Kudo, T.**, **Tamura, M.**: 2010, Candidate Coronagraphic Detections of Protoplanetary Disks Around Four Young Stars, *AJ*, **139**, 1015-1027.

Kato, T., Pavlenko, E. P., Maehara, H., Nakajima, K., Andreev, M., Shugarov, S. Y., de Ponthiere, P., Brady, S., Klingenberg, G., Shears, J., **Imada, A.**, **Yanagisawa, K.**: 2009, SDSS J080434.20+510349.2: Eclipsing WZ Sge-Type Dwarf Nova with Multiple Rebrightenings, *PASJ*, **61**, 601-613.

Kato, Y., **Miyoshi, M.**, Takahashi, R., Negoro, H., Matsumoto, R.: 2010, Measuring spin of a supermassive black hole at the Galactic centre, *MNRAS*, **403**, L74-L78.

Kato, Y., Umemura, M., **Ohsuga, K.**: 2009, Three-dimensional Radiative Properties of Hot Accretion Flows onto the Galactic Centre Black Hole, *MNRAS*, **400**, 1742-1748.

Kawabata, K. S., Tanaka, M., Maeda, K., **Hattori, T.**, Nomoto, K., Tominaga, N., Yamanaka, M.: 2009, Extremely Luminous Supernova 2006gy at Late Phase: Detection of Optical Emission from Supernova, *ApJ*, **697**, 747.

Kawagoe, S., **Takiwaki, T.**, **Kotake, K.**: 2009, Neutrino oscillations in magnetically driven supernova explosions, *J. Cosmol. Astropart. Phys.*, **9**, 33.

Kawakatu, N., **Kino, M.**, **Nagai, H.**: 2009, On the Origin of Fanaroff-Riley Classification of Radio Galaxies: Deceleration of Supersonic Radio Lobes, *ApJ*, **679**, L173-L176.

Kawakatu, N., **Wada, K.**: 2009, Formation of High-redshift (z>6) Quasars Driven by Nuclear Starbursts, *ApJ*, **706**, 676-686.

Kawamura, A., Mizuno, Y., Minamidani, T., Filipović, M. D., Staveley-Smith, L., Kim, S., **Mizuno, N.**, Onishi, T., Mizuno, A., Fukui, Y.: 2009, The Second Survey of the Molecular Clouds in the Large Magellanic Cloud by NANTEN. II. Star Formation, *ApJS*, **184**, 1-17.

Kawanomoto, S., **Aoki, W.**, **Kajino, T.**, Mathews, G. J.: 2009, The interstellar rubidium isotope ratio toward HD169454, *ApJ*, **698**, 509-513.

Kawanomoto, S., **Kajino, T.**, **Aoki, W.**, Bessell, M., Suzuki, T. K., **Ando, H.**, **Noguchi, K.**, Honda, S., **Izumiura, H.**, **Kambe, E.**, **Okita, K.**, Sadakane, K., Sato, B., **Tajitsu, A.**, Takada-Hidai, M., Tanaka, W., Watanabe, E., **Yoshida, M.**: 2009, The New Detections of ^{7}Li/^{6}Li Isotopic Ratio in the Interstellar Media, *ApJ*, **701**, 1506-1518.

Kawashima, T., **Ohsuga, K.**, Mineshige, S., Heinzeller, D., Takabe, H., Matsumoto, R.: 2009, New Spectral State of Supercritical Accretion Flow with Comptonizing Outflow, *PASJ*, **61**, 769-776.

Kida, S., et al. including **Niinuma, K.**: 2010, Radio Variability of a Fermi Large Area Telescope Bright Source 0FGL J1847.8+3223, *ApJ*, **711**, L36-L40.

Kim, M., Kim, E., **Hwang, N.**, Lee, M. G., Im, M., **Karoji, H.**, **Noumaru, J.**, **Tanaka, I.**: 2009, Reddening and Distance of the Local Group Starburst Galaxy IC 10, *ApJ*, **703**, 816-828.

Kimura, H., Fukagawa, M., **Tamura, M.**, Kobayashi, H., Yamamoto, T., **Ishii, M.**, **Suto, H.**: 2010, Planets in orbit around β Pictoris formed the orbital architecture of planetesimal belts?, *Earth, Planets and Space*, **62**, 111-116.

Kino, M., Ito, H., **Kawakatu, N.**, **Nagai, H.**: 2009, New prediction of extragalactic GeV γ-ray emission from radio lobes of young AGN jets, *MNRAS*, **395**, L43-L47.

Kitamura, M., **Sekiguchi, K.**, Yumoto, K., Haubold, H. J.: 2009, Third UN/ESA/NASA Workshop on the International Heliophysical Year 2007 and Basic Space Science, *Earth Moon and Planets*, **104**, 141-159.

Kiuchi, K., **Sekiguchi, Y.**, Shibata, M., Taniguchi, K.: 2009, Long-term general relativistic simulation of binary neutron stars collapsing to a black hole, *Phys. Rev. D*, **80**, 064037.

Kiuchi, K., **Kotake, K.**, Yoshida, S.: 2009, Equilibrium Configurations of Relativistic Stars with Purely Toroidal Magnetic Fields: Effects of Realistic Equations of State, *ApJ*, **698**, 541-557.

Kiuchi, R., et al. including **Mizumoto, Y.**: 2009, CANGAROO-III Search for TeV Gamma Rays from Two Clusters of Galaxies, *ApJ*, **704**, 240-246.

Ko, J., Im, M., Lee, H. M. Lee, M. G., Hopwood, R. H., Serjeant, S., Smail, I., Hwang, H. S., **Hwang, N.**, Shim, H., Kim, S. J., Lee, J. C., Lim, S., Seo, H., Goto, T., Hanami, H., Matsuhara, H., Takagi, T., Wada, T.: 2009, The Mid-infrared View of Red Sequence

Galaxies in Abell 2218 with AKARI, *ApJ*, **695**, L198-L202.

Kobayashi, M. A. R., Totani, T., **Nagashima, M.**: 2010, Lyman Alpha Emitters in Hierarchical Galaxy Formation II. UV Continuum Luminosity Function and Equivalent Width Distribution, *ApJ*, **708**, 1119-1134.

Koda, J., et al. including **Sawada, T.**: 2009, Dynamically Driven Evolution of the Interstellar Medium in M51, *ApJ*, **700**, L132-L136.

Koike, C., Imai, Y., Chihara, H., **Suto, H.**, Murata, K., Tsuchiyama, A., Tachibana, S., Ohara, S.: 2010, Effects of Forsterite Grain Shape on Infrared Spectra, *ApJ*, **709**, 983-992.

Kojima, K., **Kajino, T.**, Mathews, G. J.: 2010, Growth of Cosmological Perturbation by Extra Anisotropic Stress, *J. Cosmol. Astropart. Phys.*, **2**, 18.

Kojima, T., **Kroug, M.**, **Takeda, M.**, Shan, W., **Fujii, Y.**, **Uzawa, Y.**, Wang, Z., Shi, S.: 2009, Performance of Terahertz Waveguide SIS Mixers Employing Epitaxial NbN Films and Nb Junctions, *IEEE Tran. Appl. Supercond.*, **19**, 405.

Kojima, T., **Kroug, M.**, **Takeda, M.**, **Uzawa, Y.**, Shan, W., **Fujii, Y.**, Wang, Z., Ogawa, H.: 2009, Three Quanta Sensitivity Superconductor-Insulator-Superconductor Mixer for the 0.78-0.95 THz Band, *Appl. Phys. Express*, **2**, 10220.

Kokeyama, K., Sato, S., **Nishizawa, A.**, **Kawamura, S.**: 2009, Development of displacement- and frequency-noise-free interferometer in 3-D configuration for gravitational wave detection, *Phys. Rev. Lett.*, **103**, 171101.

Komiya, Y., Habe, A., Suda, T., Fujimoto, M.: 2009, Hierarchical Formation of the Galactic Halo and the Origin of Hyper Metal-Poor Stars, *ApJ*, **696**, L79.

Komiya, Y., Suda, T., Fujimoto, M.: 2009, Early-Age Evolution of the Milky Way Related by Extremely Metal-Poor Stars, *ApJ*, **694**, 1577.

Kong, X., Fang, G., **Arimoto, N.**, Wang, M.: 2009, Classification of Extremely Red Objetcs in the Cosmos Field, *ApJ*, **702**, 1458-1471.

Korn, A. J., Richard, O., Mashonkina, L., Bessell, M. S., Frebel, A., **Aoki, W.**: 2009, HE 1327–2326, An Unevolved Star with [Fe/H] < −5.0. III. Does its Atmosphere Reflect its Natal Composition?, *A&A*, **698**, 410.

Koshida, S., Yoshii, Y., **Kobayashi, Y.**, Minezaki, T., Sakata, Y., Sugawara, S., Enya, K., Suganuma, M., Tomita, H., Aoki, T., Peterson, B. A.: 2009, Variation of Inner Radius of Dust Torus in NGC4151, *ApJ*, **700**, L109-L113.

Kotake, K., Iwakami, W., Ohnishi, N., Yamada, S.: 2009, Ray-Tracing Analysis of Anisotropic Neutrino Radiation for Estimating Gravitational Waves in Core-Collapse Supernova, *ApJ*, **704**, 951-963.

Kotake, K., Iwakami, W., Ohnishi, N., Yamada, S.: 2009, Stochastic Nature of Gravitational Waves from Supernova Explosions with Standing Accretion Shock Instability, *ApJ*, **697**, L133-L136.

Kroug, M., **Endo, A.**, **Tamura, T.**, **Noguchi, T.**, **Kojima, T.**, **Uzawa, Y.**, **Takeda, M.**, Wang, Z., Shan, W.: 2009, SIS Mixer Fabrication for ALMA Band10, *IEEE Tran. Appl. Supercond.*, **19**, 171.

Kuinieda, S., **Chiba, S.**, Shibata, K., Ichihara, A., Iwamoto, O., Iwamoto, N., Fukahori, T., Soukhovitski, E. Sh.: 2009, An Extensive Study of the Soft-rotator Model Hamiltonian Parameters for Medium and Heavy Even-even Nuclei, *J. Nucl. Sci. Technol.*, **46**, 914-924.

Kurono, Y., **Morita, K.-I.**, **Kamazaki, T.**: 2009, A Study of Combining Technique of Single-Dish and Interferometer Data: Imaging Simulations and Analysis, *PASJ*, **61**, 873-894.

Kusakabe, M., **Kajino, T.**, Yoshida, T., Mathews, G. J.: 2009, Effect of Long-lived Strongly Interacting Relic Particles on Big-Bang Nucleosynthesis, *Phys. Rev. D*, **80**, 103501.

Kusakabe, M., **Kajino, T.**, Yoshida, T., Shima, T., Nagai, Y., Kii, T.: 2009, New Constraints on Radiative Decay of Long-Lived X Particles in Big Bang Nucleosynthesis with New Rates of Photodisintegration Reactions of He^4, *Phys. Rev. C*, **79**, 23513.

Kwon, J., Choi, M., Pak, S., **Kandori, R.**, **Tamura, M.**, Nagata, T., Sato, S.: 2010, Magnetic Field Structure of the HH 1-2 Region: Near-Infrared Polarimetry of Point-Like Sources, *ApJ*, **708**, 758-769.

Landi, E., Miralles, M. P., Curdt, W., **Hara, H.**: 2009, Physical Properties of Cooling Plasma in Quiescent Active Region Loops, *ApJ*, **695**, 221-237.

Landi, E., Raymond, J. C., Miralles, M. P., **Hara, H.**: 2010, Physical Conditions in a Coronal Mass Ejection from Hinode, Stereo, and SOHO Observations, *ApJ*, **711**, 75-98.

Lee, J.-Y., Hahn, I., Kim, Y., Hong, S.-W., **Chiba, S.**, Soukhovitskii, E. Sh.: 2009, Optical potentials for nuclear level structures and nucleon interactions data of tin isotopes based on the soft-rotator model, *Phys. Rev. C*, **79**, 064612.

Lee, M. G., Park, H. S., Hwang, H. S., **Arimoto, N.**, **Tamura, N.**, Onodera, M.: 2010, The Globular Cluster System of the Virgo Giant Elliptical Galaxy NGC 4636. II. Kinematics of the Globular Cluster System, *ApJ*, **709**, 1083.

Leggett, S. K., Burningham, B., Saumon, D., Marley, M. S., Warren, S. J., Smart, R. L., Jones, H. R. A., Lucas, P. W., Pinfield, D. J., **Tamura, M.**: 2010, Mid-Infrared Photometry of Cold Brown Dwarfs: Diversity in Age, Mass, and Metallicity, *ApJ*, **710**, 1627-1640.

Leggett, S. K., et al. including **Tamura, M.**: 2009, The Physical Properties of Four ~600 K T Dwarfs, *ApJ*, **695**, 1517-1526.

Li, J., Shen, Z. Q., **Miyazaki, A.**, Huang, L., Sault, R. J., **Miyoshi, M.**, Tsuboi, M., Tsutsumi, T.: 2009, The Variability of Sagittarius A* at 3 Millimeter, *ApJ*, **700**, 417-425.

Liszt, H. S., Pety, J., **Tachihara, K.**: 2009, Imaging galactic diffuse clouds: CO emission, reddening and turbulent flow in the gas around ζ Ophiuchi, *A&A*, **499**, 503.

Liu, G., Calzetti, D., Yun, M. S., Wilson, G. W., Draine, B. T., Scott, K., Austerman, J., Perera, T., Hughes, D., Aretxaga, I., Kohno, K., **Kawabe, R.**, **Ezawa, H.**: 2010, An Investigation of the Dust Content in the Galaxy Pair NGC 1512/1510 from Near-Infrared to Millimeter Wavelengths, *AJ*, **139**, 1190-1198.

Liu, Q., **Kikuchi, F.**, **Goossens, S.**, **Matsumoto, K.**, **Hanada, H.**, Ping, J., Shi, X., Tamura, Y., **Harada, Y.**, **Asari, K.**, **Tsuruta, S.**, **Ishikawa, T.**, Kawano, N., **Ishihara, Y.**, **Noda, H.**, **Sasaki, S.**, **Iwata, T.**, Namiki, N.: 2009, S-band Same-Beam VLBI Observations in SELENE (kaguya) and Correction of Atmospheric and Ionospheric Delay, *J. Geodetic Soc. Jpn.*, **55**, 243-254.

Liu, Q., et al. including **Kikuchi, F.**, **Matsumoto, K.**, **Goossens, S.**, **Hanada, H.**, **Harada, Y.**, **Ishikawa, T.**, **Tsuruta, S.**, **Asari,**

K., **Ishihara, Y.**, **Iwata, T.**, **Noda, H.**, **Sasaki,S.**, **Shibata, K.**, **Tamura, Y.**, **Jike, T.**, **Iwadate, K.**, **Kameya, O.**: 2010, Same-beam VLBI Observations of SELENE for Improving Lunar Gravity Field Model, *Radio Sci.*, **45**, RS2004.

Liu, Q., Shi, X., **Kikuchi, F.**, Huang, Q., Kamata, S., **Matsumoto, K.**, **Hanada, H.**, Hong, X., Yu, A., Ping, J., Fan, Q., Xia, B., An, T., Qian, Z., Yang, W., Zhang, H., Wang, Z., Wang, N.: 2009, High-accuracy same-beam VLBI observations using Shanghai and Urumqi telescopes, *Sci. China, Ser. G*, **52**, 1858-1866.

Lundock, R., Ichikawa, T., Okita, H., Kurita, K., Kawabata, K. S., Uemura, M., **Yamashita, T.**, Ohsugi, T., Sato, S., **Kino, M.**: 2009, Tohoku-Hiroshima-Nagoya planetary spectra library: a method for characterizing planets in the visible to near infrared, *A&A*, **507**, 1649.

Ly, C., Malkan, M. A., Treu, T., Woo, J.-H., Currie, T., Hayashi, M., **Kashikawa, N.**, Motohara, K., Shimasaku, K., Yoshida, M.: 2009, Lyman Break Galaxies at $z \approx 1.8$–2.8: GALEX/NUV Imaging of the Subaru Deep Field, *ApJ*, **697**, 1410.

Machida, M. N., Inutsuka, S., Matsumoto, T.: 2009, First Direct Simulation of Brown Dwarf Formation in a Compact Cloud Core, *ApJ*, **699**, 157-160.

Machida, M. N., Inutsuka, S., Matsumoto, T.: 2009, The Circumbinary Outflow: A Protostellar Outflow Driven by a Circumbinary Disk, *ApJ*, **704**, 10-14.

Machida, M. N., **Omukai, K.**, Matsumoto, T., Inutsuka, S.-i.: 2009, Binary formation with different metallicities: dependence on initial conditions, *MNRAS*, **399**, 1255-1263.

Machida, M. N., **Omukai, K.**, Matsumoto, T.: 2009, Star Formation in Relic H II Regions of the First Stars: Binarity and Outflow Driving, *ApJ*, **705**, 64-67.

Machida, M., Matsumoto, R., Nozawa, S., Takahashi, K., Fukui, Y., Kudo, N., **Tomisaka, K.**: 2009, Formation of Galactic Center Magnetic Loops, *PASJ*, **61**, 411-420.

Magakian, T. Y., Nikogossian, E. H., Aspin, C., **Pyo, T.-S.**, Khanzadyan, T., Movessian, T., Smith, M. D., Mitchison, S., Davis, C. J., Beck, T. L., Moriarty-Schieven, G. H.: 2010, A Wide-Field Narrowband Optical Survey of the Braid Nebula Star Formation Region in Cygnus OB7, *AJ*, **139**, 969-983.

Magara, T.: 2009, Characteristic Development of Magnetic Shear in a Flare-producing Sunspot Obtained from Vector Magnetic Field Measurements by Hinode, *ApJ*, **702**, 386-391.

Mamyoda, K., Nakai, N., **Yamauchi, A.**, Diamond, P., Huré, J. M.: 2009, Detection of a Sub-Keplerian Water Maser Disk at the Active Galactic Nucleus of the Galaxy IC 1481, *PASJ*, **61**, 1143-1151.

Martínez-Pillet, P. V., **Katsukawa, Y.**, Puschmann, K. G., Ruiz-Cobo, B.: 2009, Supersonic Continuation of the Evershed Flow Outside a Sunspot as Observed with Hinode, *ApJ*, **701**, L79-L82.

Matsubayashi, K., Sugai, H., Hattori, T., Kawai, A., **Ozaki, S.**, **Kosugi, G.**, Ishigaki, T., Shimono, A.: 2009, Galactic Wind in the Nearby Starburst Galaxy NGC 253 Observed with the Kyoto3DII Fabry-Perot Mode, *ApJ*, **701**, 1636.

Matsuda, Y., Richard, J., Smail, Ian, **Kashikawa, N.**, Shimasaku, K., Frye, B. L., Yamada, T., Nakamura, Y., Hayashino, T., Fujii, T.: 2010, A search for galaxies in and around an H I overdense region at $z = 5$, *MNRAS*, **403**, L54.

Matsui, H., Habe, A.: 2009, Effects of Minor Mergers on the Coalescence of a Supermassive Black Hole Binary, *PASJ*, **61**, 421-428.

Matsui, R., Uemura, M., Arai, A., Sasada, A., Ohsugi, T., Yamashita, T., Kawabata, K., Fukazawa, Y., Mizuno, T., Katagiri, H., Takahashi, H., Sato, S., **Kino, M.**, **Yoshida, M.**, **Shimizu, Y.**, **Nagayama, S.**, **Yanagisawa, K.**, **Toda, H.**, **Okita, K.**, Kawai, N.: 2009, Optical and Near-Infrared Photometric Observation during the Superoutburst of the WZ Sge-Type Dwarf Nova, V455 Andromedae, *PASJ*, **61**, 1081-1092.

Matsumura, N., **Niinuma, K.**, Kuniyoshi, M., Takefuji, K., Asuma, K., Daishido, T., Kida, S., Tanaka, T., Aoki, T., Ishikawa, S., Hirano, K., Nakagawa, S.: 2009, The Closely Positioned Three Radio Transients in the Nasu 1.4 GHz Wide-Field Survey, *AJ*, **138**, 787-795.

Matsunaga, N., Kawadu, T., Nishiyama, S., Nagayama, T., Hatano, H., **Tamura, M.**, Glass, I. S., Nagata, T.: 2009, A near-infrared survey of Miras and the distance to the Galactic Centre, *MNRAS*, **399**, 1709-1729.

Mayama, S., **Tamura, M.**, Hanawa, T., Matsumoto, T., **Ishii, M.**, **Pyo, T.-S.**, **Suto, H.**, **Naoi, T.**, **Kudo, T.**, **Hashimoto, J.**, Nishiyama, S., Kuzuhara, M., **Hayashi, M.**: 2010, Direct Imaging of Bridged Twin Protoplanetary Disks in a Young Multiple Star, *Science*, **327**, 306-308.

Michikoshi, S., **Kokubo, E.**, Inutsuka, S.: 2009, *N*-Body Simulation of Planetesimal Formation through Gravitational Instability and Coagulation. II. Accretion Model, *ApJ*, **703**, 1363-1373.

Miki, S., **Takeda, M.**, Fujiwara, M., Sasaki, M., Wang, Z.: 2009, Compactly packaged superconducting nanowire single-photon detector with an optical cavity for multichannel system, *Opt. Express*, **17**, 23557.

Minato, F., **Chiba, S.**, Hagino, K.: 2009, Fission of heavy Λhyper-nuclei with the Skyrme-Hartree-Fock approach, *Nucl. Phys. A*, **831**, 150-162.

Minezaki, T., Chiba, M., **Kashikawa, N.**, Inoue, K. T., Kataza, H.: 2009, Subaru Mid-Infrared Imaging of the Quadruple Lenses. II. Unveiling Lens Structure of MG0414+0534 and Q2237+030, *ApJ*, **697**, 610.

Miura, N., Noto, Y., Kato, S., Yokoyama, F., Kuwamura, S., Baba, N., **Hanaoka, Y.**, Nagata, S., Ueno, S., Kitai, R., Ichimoto, K., **Takami, H.**: 2009, Solar Adaptive Optics System Using an Electromagnetic Deformable Mirror, *Opt. Rev.*, **16**, 558-561.

Mizuno, Y., et al. including **Mizuno, N.**, **Ezawa, H.**, **Yamaguchi, N.**, **Hasegawa, T.**, **Tatematsu, K.**: 2010, Warm and dense Molecular Gas in the N^{159} Region: ^{12}CO J=4–3 and ^{13}CO J=3–2 Observations with NANTEN2 and ASTE, *PASJ*, **62**, 51-67.

Mizuta, A., **Kino, M.**, Nagakura, H.: 2010, Hysteresis of Backflow Imprinted in Collimated Jets, *ApJ*, **709**, L83-L87.

Momose, M., Ohashi, N., **Kudo, T.**, **Tamura, M.**, Kitamura, Y.: 2010, High-resolution Observations of Dust Continuum Emission at 340 GHz from the Low-Mass T Tauri Star FN Tauri, *ApJ*, **712**, 397-404.

Moon, D.-S., Koo, B.-C., Lee, H.-G., Matthews, K., Lee, J.-J., **Pyo, T.-S.**, Seok, Ji Yeon, **Hayashi, M.**: 2009, Dense Iron Ejecta and Core-Collapse Supernova Explosion in the Young Supernova Remnant G11.2-0.3, *ApJ*, **703**, L81-L85.

Morokuma, T., et al. including **Hattori, T.**, **Furusawa, H.**, **Kashikawa, N.**, **Takanashi, N.**: 2010, Subaru FOCAS Spectroscopic Observations of High-Redshift Supernovae, *PASJ*, **62**, 19.

Morota, T., Haruyama, J., Honda, C., Ohtake, M., Yokota, Y., Kumura, J., Matsunaga, T., Ogawa, Y., Hirata, N., Demura, H., Iwasaki, A., Miyamoto, H., Nakamura, R., Takeda, H., **Ishihara, Y.**, **Sasaki, S.**: 2009, Mare volcanism in the lunar farside Moscoviense region: Implication for lateral variation in magma production of the Moon, *Geophys. Res. Lett.*, **36**, L21202.

Muller, E., Ott, J., Hughes, A., Pineda, J. L., Wong, T., **Mizuno, N.**, Kawamura, A., Mizuno, Y., Fukui, Y., Onishi, T., Rubio, M.: 2010, Characterizing the Low-Mass Molecular Component in the Northern Small Magellanic Cloud, *ApJ*, **712**, 1248-1258.

Murakami, N., **Ohishi, N.**, **Nishikawa, J.**, Yoshizawa, M.: 2009, Polarimetric stellar interferometry by use of birefringent retarders, *Appl. Opt.*, **48**, 5774-5781.

Muraoka, K., Kohno, K., Tosaki, T., **Kuno, N.**, **Nakanishi, K.**, Sorai, K., **Ishizuki, S.**, Handa, T., **Okuda, T.**: 2009, Nobeyama Millimeter Array Observations of the Nuclear Starburst of M83: A GMA Scale Correlation between Dense Gas Fraction and Star Formation Efficiency, *PASJ*, **61**, 163-176.

Muraoka, K., Kohno, K., **Tosaki, T.**, **Kuno, N.**, **Nakanishi, K.**, Sorai, K., Sawada, T., Tanaka, K., Handa, T., **Fukuhara, M.**, **Ezawa, H.**, **Kawabe, R.**: 2009, ASTE CO(3–2) Mapping toward the Whole Optical Disk of M 83: Properties of Inter-arm Giant Molecular-Cloud Associations, *ApJ*, **706**, 1213-1225.

Nagakura, T., **Hosokawa, T.**, **Omukai, K.**: 2009, Star formation triggered by supernova explosions in young galaxies, *MNRAS*, **399**, 2183-2194.

Nagashima, K., **Sekii, T.**, Kosovichev, A. G., Zhao, J., Tarbell, T. D.: 2009, Helioseismic Signature of Chromospheric Downflows in Acoustic Travel-Time Measurements From Hinode, *ApJ*, **694**, L115-L119.

Nagata, H., **Matsuo, H.**, **Hibi, Y.**, Kobayashi, J., Nakahashi, M., Ikeda, H., Fujiwara, M.: 2009, GaAs cryogenic readout electronics for high impedance detector arrays for far-infrared and submillimeter wavelength region, *Cryogenics*, **49**, 676-680.

Nagayama, T., Omodaka, T., Handa, T., Toujima, H., Sofue, Y., **Sawada, T.**, **Kobayashi, H.**, Koyama, Y.: 2009, NH_3 in the Galactic Center is Formed under Cool Conditio, *PASJ*, **61**, 1023-1037.

Nakagawa, H., Kasaba, Y., Maezawa, H., Hashimoto, A., Sagawa, H., Murata, I., Okano, S., Aoki, S., Moribe, N., **Mizuno, A.**, Momose, M., Ohnishi, T., Mizuno, N., Nagahama, T.: 2009, Search of SO_2 in the Martian atmosphere by ground-based submillimeter observation, *Planet. Space Sci.*, **57**, 2123-2127.

Nakajima, T., Sakai, T., **Kuno, N.**, **Ogawa, H.**: 2010, Development of the Measurement System of Image Rejection Ratio for the Sideband-Separating Receiver, *J. Infrared, Millimeter, and Terahertz Waves*, **31**, 143-150.

Nakamura, K.: 2009, Consistency of Equations in the Second-order Gauge-invariant Cosmological Perturbation Theory, *Prog. Theor. Phys.*, **121**, 1321.

Nakamura, K.: 2009, Perturbations of Matter Fields in the Second-order Gauge-invariant Cosmological Perturbation Theory, *Phys. Rev. D*, **80**, 124021.

Nakariakov, V. M., **Melnikov, V. F.**: 2009, Quasi-Periodic Pulsations in Solar Flares, *Space Sci. Rev.*, **149**, 119-151.

Narita, N., Hirano, T., Sato, B., Winn, J. N., Suto, Y., Turner, E. L., **Aoki, W.**, **Tamura, M.**, Yamada, T.: 2009, Improved Measurement of the Rossiter-McLaughlin Effect in the Exoplanetary System HD 17156, *PASJ*, **61**, 991-997.

Narita, N., Sato, B., Hirano, T., **Tamura, M.**: 2009, First Evidence of a Retrograde Orbit of a Transiting Exoplanet HAT-P-7b, *PASJ*, **61**, L35-L40.

Naruse, M., **Ito, T.**, **Sekimoto, Y.**, Toba, H., **Satou, N.**, **Sugimoto, M.**, Shan, W., **Iizuka, Y.**, Kamba, T., **Kamikura, M.**, **Serizawa, Y.**: 2009, Near-Field Beam Pattern Measurement of Qualification Model of ALMA Band 8(385–500 GHz) Cartridge Receiver, *Exp. Astron.*, **24**, 89-107.

Niino, Y., Totani, T., **Kobayashi, M.**: 2009, Probing the Long Gamma-Ray Burst Progenitor by Lyα Emission of Host Galaxies, *ApJ*, **707**, 1634.

Niinuma, K., Daishido, T., Matsumura, N., Takefuji, K., Kuniyoshi, M., Asuma, K., Kida, S., Tanaka, T., Aoki, T., Ishikawa, S., Hirano, K., Uehara, H., Nakagawa, S.: 2009, Discovery of Two Radio Transients at a High Galactic Latitude in A 1.4 GHz Drift-Scan Survey, *ApJ*, **704**, 652-660.

Nishimura, T., Aikawa, M., Suda, T., Fujimoto, M.: 2009, Oxygen and Light-Element Synthesis by Neutron-Capture Reactions in Metal-Free and Extremely Metal-Poor AGB Stars, *PASJ*, **61**, 909-929.

Ning, Z., Cao, W., **Okamoto, T. J.**, Ichimoto, K., Qu, Z.: 2009, Small-scale oscillations in a quiescent prominence observed by HINODE/SOT - Prominence oscillations, *A&A*, **499**, 595-600.

Nishiyama, S., **Tamura, M.**, Hatano, H., Kato, D., Tanabé, T., Sugitani, K., Nagata, T.: 2009, Interstellar Extinction Law Toward the Galactic Center III: J, H, K_S Bands in the 2MASS and the MKO Systems, and 3.6, 4.5, 5.8, 8.0 μm in the Spitzer/IRAC System, *ApJ*, **696**, 1407-1417.

Nishiyama, S., **Tamura, M.**, Hatano, H., Nagata, T., **Kudo, T.**, **Ishii, M.**, Schödel, R., Eckart, A.: 2009, Near-Infrared Polarimetry of Flares from Sgr A* with Subaru/CIAO, *ApJ*, **702**, L56-L60.

Nishizawa, A., Taruya, A., Hayama, K., Kawamura, S., Sakagami, M.: 2009, Probing nontensorial polarizations of stochastic gravitational-wave backgrounds with ground-based laser interferometers, *Phys. Rev. D*, **79**, 82002.

Nishizuka, N., Takasaki, H., **Asai, A.**, Shibata, K.: 2010, Multiple Plasmoid Ejections and Associated Hard X-ray Bursts in the 2000 November 24 Flare, *ApJ*, **711**, 1062-1072.

Niwa, T., **Tachihara, K.**, Itoh, Y., Oasa, Y., **Sunada, K.**, Sugitani, K., Mukai, T.: 2009, Millimeter-wave survey of molecular clouds around the W5-East triggered star-forming region, *A&A*, **500**, 1119-1129.

Niwa, Y., Arai, K., **Ueda, A.**, Sakagami, M., **Gouda, N.**, **Kobayashi, Y.**, Yamada, Y., **Yano, T.**: 2009, Long-term stabilization of a heterodyne metrology interferometer down to a noise level of 20 pm over an hour, *Appl. Opt.*, **48**, 6105-6110.

Nogami, K., Fujii, M., Ohashi, H., Miyachi, T., **Sasaki, S.**, Hasegawa, S., Yano, H., Shibata, H., Iwai, T., Minami, S., Takechi, S., Gruen, E., Srama, R.: 2010, Development of the Mercury dust monitor(MDM) onboard the BepiColombo mission, *Planet.*

Space Sci., **58**, 108-115.

Noguchi, T., **Suzuki, T.**, **Endo A.**, Tamura, T.: 2009, Contribution of the Imaginary Part of the Superconducting Gap Energy on the SIS Tunneling Current, *Physica C*, **469**, 1585-1588.

Noguchi, T., Tsuchiyama, A., Hirata, N., Demura, H., Nakamura, R., Miyamoto, H., Yano, H., Nakamura, T., Saito, J., **Sasaki, S.**, Hashimoto, T., Kubota, T., Ishiguro, M., Zolensky, M. E.: 2010, Surface morphological features of boulders on Asteroid 25143 Itokawa, *Icarus*, **206**, 319-326.

Oh, C. S., **Kobayashi, H.**, **Honma, M.**, **Hirota, T.**, **Sato, K.**, **Ueno, Y.**: 2010, VERA Observations of H_2O Maser Sources in Three Massive Star-Forming Regions and Galactic Rotation Measurements, *PASJ*, **62**, 101-114.

Ohama, A., Dawson, J. R., Furukawa, N., Kawamura, A., Moribe, N., Yamamoto, H., Okuda, T., **Mizuno, N.**, Onishi, T., Maezawa, H., Minamidani, T., Mizuno, A., Fukui, Y.: 2010, Temperature and Density Distribution in the Molecular Gas Toward Westerlund 2: Further Evidence for Physical Association, *ApJ*, **709**, 975-982.

Ohishi M.: 2009, JVO and NaReGi(Japanese Grid middleware initiative), *Memorie della Societa Astronomica Italiana*, **80**, 554-558.

Ohishi, M.: 2010, Astronomical Virtual Observatories through International Collaboration, *Data Sci. J.*, **8**, S128-S134.

Ohsuga, K., Mineshige, S., Mori, M., Kato, Y.: 2009, Global Radiation-Magnetohydrodynamic Simulations of Black Hole Accretion Flow and Outflow: Unified Model of Three States, *PASJ Lett.*, **61**, 7-11.

Ohtake, M., et al. including **Sasaki, S.**: 2009, The global distribution of pure anorthosite on the Moon, *Nature*, **461**, 236-240.

Ohtsuka, K., Nakato, A., Nakamura, T., Kinoshita, D., **Ito, T.**, Yoshikawa, M., Hasegawa, S.: 2009, Solar radiation heating effects on 3200 Phaethon, *Publ. Soc. Astron. Japan*, **61**, 1375-1387.

Okabe, N., **Okura, Y.**, Futamase, T.: 2009, Weak-lensing Mass Measurements of Substructures in Coma Cluster with Subaru/Suprime-cam, *ApJ*, **713**, 291-303.

Okamoto, T. J., **Tsuneta, S.**, Lites, B. W., Kubo, M., Yokoyama, T., Berger, T. E., Ichimoto, K., **Katsukawa, Y.**, Nagata, S., Shibata, K., Shimizu, T., Shine, R. A., **Suematsu, Y.**, Tarbell, T. D., Title, A. M.: 2009, Prominence Formation Associated with an Emerging Helical Flux Rope, *ApJ*, **697**, 913-922.

Okamoto, Y. K., Kataza, H., Honda, M., Fujiwara, H., Momose, M., Ohashi, N., **Fujiyoshi, T.**, Sakon, I., Sako, S., **Yamashita, T.**, Miyata, T., Onaka, T.: 2009, Direct Detection of a Flared Disk Around a Young Massive Star HD200775 and its 10 to 1000 AU Scale Properties, *ApJ*, **706**, 665.

Okoshi, K., Nagashima, M., **Gouda, N.**, Minowa, Y.: 2010, H I-Selected Galaxies as a Probe of Quasar Absorption Systems, *ApJ*, **710**, 1295-1309.

Okura, Y., Futamase, T.: 2009, A New Method for Measuring Weak Gravitational Lensing Shear using Higher, *ApJ*, **699**, 143-149.

Omiya, M., **Izumiura, H.**, Han, I., Lee, B.-C., Sato, B., **Kambe, E.**, Kim, K.-M., Yoon, T. S., **Yoshida, M.**, Masuda, S., Toyota, E., Urakawa, S., Takada-Hidai, M.: 2009, A Massive Substellar Companion to the Massive Giant HD 119445, *PASJ*, **61**, 825-831.

Ono, M., Hashimoto, M., Fujimoto, S., **Kotake, K.**, Yamada, S.: 2009, Explosive Nucleosynthesis in Magnetohydrodynamical Jets from Collapsars, *Prog. Theor. Phys.*, **122**, 755-777.

Onodera, M., **Arimoto, N.**, Daddi, E., Renzini, A., Kong, X., Cimatti, A., Broadhurst, T., Alexander, D. M.: 2010, A Wide Area Survey or High-redshift Massive Galaxies. II. Near-Infrared Spectroscopy of BzK-selected Massive Star-forming Galaxies, *ApJ*, **715**, 385.

Oshima, T., Yoshitake, H.: 2009, Optimization Method for TES Microcalorimeters with Absorbers, *IEEE Trans. Appl. Supercond.*, **19**, 465-468.

Otsubo, T., Kunimori, H., **Noda, H.**, **Hanada, H.**: 2010, Simulation of optical response of retroreflectors for future lunar laser ranging, *Adv. Space Res.*, **45**, 733-740.

Otsuka, M., Hyung, S., Lee, S.-J., **Izumiura, H.**, **Tajitsu, A.**: 2009, High-dispersion Spectrum of the Halo Planetary Nebula DdDm 1, *ApJ*, **705**, 509-528.

Ouchi, M., Mobasher, B., Shimasaku, K., Ferguson, H. C., Fall, S. M., Ono, Y., **Kashikawa, N.**, **Morokuma, T.**, Nakajima, K., Okamura, S., Dickinson, M., Giavalisco, M., Ohta, K.: 2009, Large Area Survey for z = 7 Galaxies in SDF and GOODS-N: Implications for Galaxy Formation and Cosmic Reionization, *ApJ*, **706**, 1136.

Ouchi, M., et al. including **Oguri, M.**, **Kashikawa, N.**, **Furusawa, H.**, **Hayashi, M.**, **Iye, M.**, **Kodama, T.**, **Yoshida, M.**: 2009, Discovery of a Giant Lya Emitter Near the Reionization Epoch, *ApJ*, **696**, 1164-1175.

Ozaki, S.: 2009, Kinematic and Excitation Structure of the NGC 1068 Narrow-Line Region, *PASJ*, **61**, 259.

Park, H. S., Lee, M. G., Hwang, H. S., **Arimoto, N.**, **Tamura, N.**, Onodera, M.: 2010, The Globular Cluster System of the Virgo Giant Elliptical Galaxy NGC 4636. I. Subaru/Faint Objects Camera and Spetrograph Specgtroscopy and Database, *ApJ*, **709**, 377-385.

Reach, W. T., **Vaubaillon, J.**, Kelley, M. S., Lisse, C. M., Sykes, M. V.: 2009, Distribution and Properties of Fragments and Debris from the Split Comet 73P/Schwassmann-Wachmann 3 as Revealed by Spitzer Space Telescope, *Icarus*, **203**, 571.

Reid, M. J., Menten, K. M., Zheng, X. W., Brunthaler, A., Moscadelli, L., Xu, Y., Zhang, B., **Sato, M.**, **Honma, M.**, **Hirota, T.**, Hachisuka, K., Choi, Y. K., Moellenbrock, G. A., Bartkiewicz, A.: 2009, Trigonometric Parallaxes of Massive Star-Forming Regions. VI. Galactic Structure, Fundamental Parameters, and Noncircular Motions, *ApJ*, **700**, 137-148.

Reznikova, V. E., **Melnikov, V. F.**, **Shibasaki, K.**, Gorbikov, S. P., Pyatakov, N. P., Myagkova, I. N., Ji, H.: 2009, 2002 August 24 Limb Flare Loop: Dynamics of Microwave Brightness Distribution, *ApJ*, **697**, 735-746.

Risaliti, G., **Imanishi, M.**, Sani, E.: 2010, A quantitative determination of the AGN content in local ULIRGs through L-band spectroscopy, *MNRAS*, **401**, 197-203.

Rusu, C. E.: 2009, Simple considerations on the deflection angle of light in General Relativity, *Creative Math. Inf.*, **18**, 200-207.

Saito, Y.-J., Takada-Hidai, M., Honda, S., **Takeda, Y.**: 2009, Chemical Evolution of Zinc in the Galaxy, *PASJ*, **61**, 549-561.

Saitoh, T. R., **Makino, J.**: 2009, A Necessary Condition for Individual Time Steps in SPH Simulations, *ApJ*, **697**, L99-L102.

Saitoh, T. R., Daisaka, H., **Kokubo, E.**, **Makino, J.**, Okamoto, T., **Tomisaka, K.**, **Wada, K.**, Yoshida, N.: 2009, Toward First-Principle Simulations of Galaxy Formation: II. Shock-Induced Starburst at a Collision Interface during the First Encounter of Interacting Galaxies, *PASJ*, **61**, 481-486.

Sajina, A., Spoon, H., Yan, L., **Imanishi, M.**, Fadda, D., Elitzur, M.: 2009, Detections of Water Ice, Hydrocarbons, and 3.3 μm PAH in $z \sim 2$ ULIRGs, *ApJ*, **703**, 270-284.

Sakai, N., Sakai, T., **Hirota, T.**, Burton, M., Yamamoto, S.: 2009, Discovery of the Second Warm Carbon-Chain-Chemistry Source, IRAS15398 - 3359 in Lupus, *ApJ*, **697**, 769-786.

Sakai, N., Sakai, T., **Hirota, T.**, Yamamoto, S.: 2009, Deuterated Molecules in Warm Carbon Chain Chemistry: The L1527 Case, *ApJ*, **702**, 1025-1035.

Sakamoto, Y., **Tsuneta, S.**, Vekstein, G.: 2009, A Nanoflare Heating Model and Comparison with Observations, *ApJ*, **703**, 2118-2130.

Sakata, S., Miyakawa, O., **Nishizawa, A.**, **Ishizaki, H.**, **Kawamura, S.**: 2010, Measurement of angular anti-spring effect in optical cavity by radiation pressure, *Phys. Rev. D*, **81**, 64023.

Sakata, Y., Minezaki, T., Yoshii, Y., **Kobayashi, Y.**, Koshida, S., Aoki, T., Enya, K., Tomita, H., Suganuma, M., Katsuno, U. Y., Sugawara, S.: 2010, Long-Term Optical Continuum Color Variability of Nearby Active Galactic Nuclei, *ApJ*, **711**, 461-483.

Sakuma, M., **Susa, H.**: 2009, Feedback Effects of First Supernovae on the Neighboring Dark Matter Halos, *ApJ*, **698**, 155-162.

Sasaki, S., Ohashi, H., Hirai, T., Iwai, T., Shibata, H., Nogami, K., Fujii, M.: 2010, Development of Plane-parallel Impact-ionization Dust Detectors with Large Aperture: A Candidate for Kibo Exposed Facility Payload, Transaction of Japan Society for Aeronautical and Space Sciences, *Aerospace Technology Japan*, **7**, Tr_2_71-Tr_2_74.

Schneider, R., **Omukai, K.**: 2010, Metals, dust and the cosmic microwave background: fragmentation of high-redshift star-forming clouds, *MNRAS*, **403**, 429-435.

Scholz, A., Geers, V., Jayawardhana, R., Fissel, L., Lee, E., Lafreniere, D., **Tamura, M.**: 2009, Substellar Objects in Nearby Young Clusters(SONYC): The Bottom of the Initial Mass Function in NGC 1333, *ApJ*, **702**, 805-822.

Seta, H., et al. including **Fukuhara, M.**, **Nakanishi, K.**, **Shimajiri, Y.**: 2009, Suzaku and Multi-Wavelength Observations of OJ287 During the Periodic Optical Outburst in 2007, *PASJ*, **61**, 1011-1022.

Shan, W., **Takeda, M.**, **Kojima, T.**, **Uzawa, Y.**, Shi, S.-C., **Noguchi, T.**, Wang, Z.: 2009, Low-Noise Waveguide-Type NbN/AlN/NbN SIS Mixers Approaching Terahertz Frequencies, *IEEE Trans. Microwave Theory Tech.*, **58**, 841-848.

Shiino, T., Shiba, S., Sakai, N., Yamakura, T., Jiang, L., **Uzawa, Y.**, Maezawa, H., Yamamoto, S.: 2010, Improvement of the critical temperature of superconducting NbTiN and NbN thin films using the AlN buffer layer, *Supercond. Sci. Technol.*, **23**, 45004.

Shimajiri, Y., Takahashi, S., Takakuwa, S., **Saito, M.**, **Kawabe, R.**: 2009, Millimeter- and Submillimeter-Wave Observations of the OMC-2/3 Region. IV Interaction between the Outflow and the Dense Gas in the Cluster Forming Region of OMC-2 FIR 6, *PASJ*, **61**, 1055-1063.

Shimizu, T., **Katsukawa, Y.**, **Kubo, M.**, Lites, B. W., Ichimoto, K., **Suematsu, Y.**, **Tsuneta, S.**, Nagata, S., Shine, R. A., Tarbell, T. D.: 2009, *Hinode* Observation of the Magnetic Fields in a Sunspot Light Bridge Accompanied by Long-Lasting Chromospheric Plasma Ejections, *ApJ*, **696**, L66-L69.

Shimojo, M., **Tsuneta, S.**: 2009, The Relation Between Magnetic Fields and Coronal Activities in the Polar Coronal Hole, *ApJ*, **706**, L145-L149.

Shimono, A., Sugai, H., Kawai, A., Matsubayashi, K., Ohtani, H., Ozaki, S., **Hattori, T.**, **Kosugi, G.**: 2010, A study of three-dimensional kinematics of the narrow-line region of the Seyfert galaxy NGC 4151 based on integral field spectroscopy, *PASJ*, **62**, 225.

Shinnaga, H., Phillips, T. G., **Furuya, R. S.**, Kitamura, Y.: 2009, Warm Extended Dense Gas at the Heart of a Cold Collapsing Dense Core, *ApJ*, **706**, 226.

Shirasaki, Y., **Ohishi, M.**, **Mizumoto, Y.**, **Kawanomoto, S.**, **Yasuda, N.**, Honda, S.: 2010, Astronomical Research Using Virtual Observatories, *Data Sci. J.*, **8**, S113-S121.

Shirasaki, Y., Tanaka, M., **Ohishi, M.**, **Mizumoto, Y.**, **Kawanomoto, S.**, Honda, S., **Yasuda, N.**, **Masunaga, Y.**: 2010, Application of Information Technologies on Astronomy: Japanese Virtual Observatory(JVO) Portal, *Data Sci. J.*, **8**, S122-S127.

Sobue, S., et al. including **Sasaki, S.**, **Iwata, T.**, **Araki., H.**, **Hanada, H.**: 2009, The Result of SELENE (KAGUYA) Development and Operation, *Recent Patents on Space Technology*, **1**, 12-23.

Stalin, C. S., Kawabata, K. S., Uemura, M., **Yoshida, M.**, Kawai, N., **Yanagisawa, K.**, **Shimizu, Y.**, **Kuroda, D.**, **Nagayama, S.**, **Toda, H.**: 2009, Simultaneous MITSuME g'RCIC monitoring of S5 0716+714, *MNRAS*, **399**, 1357-1366.

Su, J., **Sakurai, T.**, **Suematsu, Y.**, **Hagino, M.**, Liu, Y.: 2009, Local Twist and Current Helicity Distributions of Active Region NOAA 10930, *ApJ*, **697**, L103-L107.

Sugai, H., **Hattori, T.**, Kawai, A., **Ozaki, S.**, Hayashi, T., Ishigaki, T., Ishii, M., Ohtani, H., Shimono, A., Okita, Y., Matsubayashi, K., **Kosugi, G.**, Sasaki, M., Takeyama, N.: 2010, The Kyoto Tridimensional Spectrograph II on Subaru and the University of Hawaii 88 in Telescopes, *PASP*, **122**, 103.

Sugimoto, M., Carter, M., **Inatani, J.**, **Sekimoto, Y.**, **Iguchi, S.**: 2009, Design of Corrective Beam Waveguide System for the ALMA/ACA 7-m Antenna, *PASJ*, **61**, 1065-1080.

Sugimoto, M., **Iguchi, S.**, **Inatani, J.**, **Sekimoto, Y.**, **Asayama, S.**: 2010, Sensitivity Analysis of Optical Systems in Radio Telescopes, *PASJ*, **62**, 39-50.

Sugimoto, M., **Kosugi, G.**, **Iguchi, S.**, **Iwashita, H.**, **Saito, M.**, **Inatani, J.**, **Tasaki, M.**, **Takahashi, T.**, **Nakanishi, K.**, McMullin, J. P., Puga, J. P., Hoff, B., Notambuena, J., **Kamazaki, T.**, Vila-Volaro, B., **Ikenoue, B.**, **Morita, K.-I.**, **Asayama, S.**, **Yamada, M.**, **Kiuchi, H.**: 2009, Beam Pattern Measurements and Observational Evaluations of the ALMA/ACA 12-m Antenna, *PASJ*, **61**, 451-459.

Susa, H., Hasegawa, K., Umemura, M.: 2009, Formation Criteria and the Mass of Secondary Population III Stars, *ApJ*, **702**, 480-488.

Suzuki, T., Honma, H., Higashiyama, K., Yoshida, T., **Kajino, T.**, Otsuka, T., Umeda, H., Nomoto, K.: 2009, Neutrino-Induced Reactions on Fe^{56} and Ni^{56} and Production of Mn^{55} in Population III Stars, *Phys. Rev. C*, **79**, 061603®.

Swinyard, B., et al. including **Arimoto, N.**, **Furusho, R.**, **Hayashi, M.**, **Imanishi, M.**, **Izumiura, H.**, **Kodama, T.**, **Kokubo, E.**, **Omukai, K.**, **Tamura, M.**, **Watanabe, J.**: 2009, The Space Infrared Telescope for Cosmology and Astrophysics: SPICA A Joint Mission between JAXA and ESA, *Exp. Astron.*, **23**, 193-219.

Tachihara, K., Neuhäuser, R., Fukui, Y.: 2009, Search for Remnant Clouds Associated with the TW Hya Association, *PASJ*, **61**, 585.

Takahashi, R. H., Hanawa, T., Matsumoto, R.: 2009, Extension of the Sweet-Parker Magnetic Reconection to the Relativistic Plasma, *Journal of Plasma and Fusion Research Series*, **8**, 246.

Takahashi, R., Saito, Y.: 2010, Vacuum-system design for the large-scale cryogenic gravitational wave telescope, *Vacuum*, **84**, 709-712.

Takahashi, S., Ho, P. T. P., Tang, Y.-W., **Kawabe, R.**, **Saito, M.**: 2009, Evolutionary Status of Brightest and Youngest Sources in the Orion Molecular Cloud -3 Region, *ApJ*, **704**, 1459-1470.

Takahashi, S., **Yoshida, F.**, Shinokawa, K., Mukai, T., Kawabata, K. S.: 2009, Simultaneous Photometric and Polarimetric Observations of Asteroid 3 Juno, *AJ*, **138**, 951-955.

Takami, H., Goto, M., Gaessler, W., **Hayano, Y.**, **Iye, M.**, **Kamata, Y.**, **Kanzawa, T.**, Kobayashi, N., **Minowa, Y.**, **Oya, S.**, **Pyo, T.-S.**, Saint-Jacques, D., **Takato, N.**, **Teradea, H.**, Tokunaga, A. T., Tsuji, T.: 2009, Direct Observation of the Extended Molecular Atmosphere of Ceti by Differential Spectral Imaging with an Adaptive Optics System, *PASJ*, **61**, 623-627.

Takeda, M., Shan, W., **Kojima, T.**, Saito, S., **Kroug, M.**, **Uzawa, Y.**, Wang, Z.: 2009, Low-noise waveguide SIS mixer with NbN/AlN/NbN tunnel junctions tuned by an NbN/MgO/NbTiN microstrip circuit, *Supercond. Sci. Technol.*, **22**, 75015.

Takeda, M., Shan, W., **Kojima, T.**, **Uzawa, Y.**, **Kroug, M.**, Li, J., Shi, S., Wang, Z.: 2009, Mixing Properties of NbN-Based SIS Mixers With NbTiN, *IEEE Tran. Appl. Supercond.*, **19**, 436.

Takeda, Y., **Kaneko, H.**, Matsumoto, N., Oshino, S., Ito, H., Shibuya, T.: 2009, Potassium Abundances in Red Giants of Mildly to Very Metal-Poor Globular Clusters, *PASJ*, **61**, 563-576.

Takeda, Y., Kang, D.-I., Han, I., Lee, B.-C., Kim, K.-M.: 2009, Can Sodium Abundances of A-Type Stars Be Reliably Determined from Na I 5890/5896 Lines?, *PASJ*, **61**, 1165-1178.

Takeda, Y., **Tajitsu, A.**: 2009, High-Dispersion Spectroscopic Study of Solar Twins: HIP 56948, HIP 79672, and HIP 100963, *PASJ*, **61**, 471-480.

Takeuchi, S., Mineshige, S., **Ohsuga, K.**: 2009, Modified Slim-Disk Model Based on Radiation-Hydrodynamic Simulation Data: The Conflict Between Outflow and Photon Trapping, *PASJ*, **61**, 783-790.

Tamura, Y., Kohno, K., **Nakanishi, K.**, Hatsukade, B., **Iono, D.**, Wilson, G. W., Yun, M. S., Takada, T., Matsuda, Y., Tosaki, T., **Ezawa, H.**, Perera, T. A., Acott, K. S., Austermann, J. E., Hughes, D. H., Aretxaga, I., Chung, A., **Oshima, T.**, **Yamaguchi, N.**, **Tanaka, K.**, **Kawabe, R.**: 2009, Spatial Correlation between Submillimeter and Lyman-Alpha Galaxies in the SSA 22 Protocluster, *Nature*, **459**, 61-63.

Tanabe, N., Ichihashi,Y., **Nakayama, H.**, Masuda, N., Ito, T.: 2009, Speed-up of hologram generation using ClearSpeed Accelerator board, *Comput. Phys. Commun.*, **180**, 1870-1873.

Tanaka, M., Chiba, M., **Komiyama, Y.**, Guhathakurta, P., Kalirai, J. S., **Iye, M.**: 2010, Structure and Population of the Andromeda Stellar Halo from a Subaru/Suprime-Cam Survey, *ApJ*, **708**, 1168-1203.

Tanaka, M., Finoguenov, A., **Kodama, T.**, Koyama, Y., Maughan, B., **Nakata, F.**: 2009, The spectroscopically confirmed huge cosmic structure at z=0.55, *A&A*, **505**, L9-L12.

Tanaka, M., Kawabata, K. S., Maeda, K., **Iye, M.**, **Hattori, T.**, Pian, E., Nomoto, K., Mazzali, P., Tominaga, N.: 2009, Spectropolarimetry of the Unique Type Ib Supernova 2005bf: Larger Asymmetry Revealed by Later-Phase Data, *ApJ*, **699**, 1119-1125.

Tanaka, M., Yamanaka, M., Maeda, K., Kawabata, K. S., **Hattori, T.**, Minezaki, T., Valenti, S., Della Valle, M., Sahu, D. K., Anupama, G. C., Tominaga, N., Nomoto, K., Mazzali, P. A., Pian, E.: 2009, Nebular Phase Observations of the Type Ib Supernova 2008D/X-ray Transient 080109: Side-viewed Bipolar Explosion, *ApJ*, **700**, 1680.

Tanigawa, T., Abe, S., **Ishiguro, M.**, Mukai, T.: 2010, Models for the Origin of the Quadrantids, *Earth, Moon, and Planets*, **106**, 55.

Thalmann, C., Carson, J., Janson, M., Goto, M., McElwain, M., Egner, S., Feldt, M., **Hashimoto, J.**, **Hayano, Y.**, Henning, T., Hodapp, K. W., **Kandori, R.**, Klahr, H., **Kudo, T.**, **Kusakabe, N.**, Mordasini, C., **Morino, J.-I.**, **Suto, H.**, **Suzuki, R.**, **Tamura, M.**: 2009, Discovery of the Coldest Imaged Companion of a Sun-like Star, *ApJ*, **707**, L123-L127.

Tomida, K., **Tomisaka, K.**, Matsumoto, T., **Ohsuga, K.**, **Masahiro, M. N.**, **Saigo, K.**: 2010, Radiation Magnetohydrodynamics Simulation of Proto-stellar Collapse: Two-component Molecular Outflow, *ApJ*, **714**, L58-L63.

Tsai, A. L., Matsushita, S., **Nakanishi, K.**, Kohno, K., **Kawabe, R.**, Inui, T., Matsumoto, H., Tsuru, T. G., Peck, A. B., Tarchi, A.: 2009, Molecular Superbubbles and Outflows from the Starburst Galaxy NGC 2146, *PASJ*, **61**, 237-250.

Tsuboi, M., **Miyazaki, A.**, **Okumura, S. K.**: 2009, A Galactic Center 50-km s^{-1} Molecular Cloud with an Expanding Shell, *PASJ*, **61**, 29-37.

Tsujimoto, T., Bekki, K.: 2009, Chemical Signature of a Major Merger in the Early Formation of the Small Magellanic Cloud, *ApJ*, **700**, L69-L72.

Tsujimoto, T., Bland-Hawthorn, J., Freeman, K. C.: 2010, Evidence of Early Enrichment of the Galactic Disk by Large-Scale Winds, *PASJ,* **62**, 447-456.

Ueda, K., **Kano, R.**, **Tsuneta, S.**, Shibahashi, H.: 2010, Orientation of X-Ray Bright Points in the Quiet Sun, *Sol. Phys.*, **261**, 77-85.

Uehara, T., Sato, A., Maehara, S., Nimonji, T., Sato, T., Ohkawa, M., Maruyama, T., **Kawamura, S.**: 2009, Comparison of three semiconductor laser systems for gravitational wave detection, *Opt. Eng.*, **48**, 34302.

Uemura, M., et al. including **Yamashita, T.**: 2010, Dwarf Novae in the Shortest Orbital Period Regime. I A New Short Superhump Period Dwarf Nova, OT J055717+683226, *PASJ*, **62**, 187.

Uzawa, Y., **Kroug, M.**, **Kojima, T.**, **Takeda, M.**, Candotti, M., **Fujii, Y.**, **Kaneko, K.**, Shan, W., **Noguchi, T.**, Wang, Z.: 2009, A sensitive ALMA Band 10 SIS receiver engineering model, *Supercond. Sci. Technol.*, **22**, 114002.

Wada, K., Papadopoulos, P. P., Spaans, M.: 2009, Molecular Gas Disk Structures Around Active Galactic Nuclei, *ApJ*, **702**, 63-74.

Wang, Y., Yamada, T., **Tanaka, I.**, **Iye, M.**: 2009, A Massive Disk Galaxy at $z > 3$ along the Line of Sight of QSO 1508+5714, *PASJ*, **61**, 1179-1184.

Watabe, Y., **Kawakatu, N.**, **Imanishi, M.**, Takeuchi, T. T.: 2009, Supermassive Black Hole Mass Regulated by Host Galaxy Morphology, *MNRAS*, **400**, 1803-1807.

Watanabe, H., Kitai, R., Ichimoto, K., **Katsukawa, Y.**: 2009, Magnetic Structure of Umbral Dots Observed with the *Hinode* Solar Optical Telescope, *PASJ*, **61**, 193-200.

Watanabe, J., Honda, M., **Ishiguro, M.**, Ootsubo, Y., Sarugaku, Y., Kadono, T., Sakon, I., **Fuse, T.**, **Takato, N.**, **Furusho, R.**: 2009, Subaru/COMICS Mid-Infrared Observation of the Near-Nucleus Region of Comet 17P/Holmes at the Early Phase of an Outburst, *PASJ*, **61**, 679-685.

Whitelock, P. A., Menzies, J. W., Feast, M. W., Matsunaga, N., Tanabé, T., **Ita, Y.**: 2009, Asymptotic giant branch stars in the Fornax dwarf spheroidal galaxy, *MNRAS*, **394**, 795-809.

Wiegert, P., **Vaubaillon, J.**, Campbell-Brown, M.: 2009, A Dynamical Model of the Sporadic Meteoroid Complex, *Icarus*, **201**, 295.

Winnberg, A., **Deguchi, S.**, Reid, M. J., Nakashima, J., Olofsson, H., Habing, H. J.: 2009, CO in OH/IR Stars to the Galactic Centre, *A&A*, **497**, 177-181.

Wong, T., Hughes, A., Fukui, Y., Kawamura, A., **Mizuno, N.**, Ott, J., Muller, E., Pineda, J. L., Welty, D. E., Kim, S., Mizuno, Y., Murai, M., Onishi, T.: 2009, Molecular and Atomic Gas in the Large Magellanic Cloud. I. Conditions for CO Detection, *ApJ*, **696**, 370-384.

Yaji, Y., Tashiro, M. S., Isobe, N., **Kino, M.**, Asada, K., **Nagai, H.**, **Koyama, S.**, Kusunose, M.: 2009, Evidence of Non-thermal X-ray Emission from Radio Lobes of Cygnus A, *ApJ*, **714**, 37-44.

Yamada, M., **Machida, M. N.**, Inutsuka, S., **Tomisaka, K.**: 2009, Emission from a Young Protostellar Object. I. Signatures of Young Embedded Outflows, *ApJ*, **703**, 1141-1158.

Yamada, T., Kajisawa, M., Akiyama, M., Ichikawa, T., Konishi, M., **Nishimura, T.**, **Omata, K.**, **Suzuki, R.**, **Tanaka, I.**, Tokoku, C., Uchimoto, Y. K., Yoshikawa, T.: 2009, Moircs Deep Survey. III. Active Galactic Nuclei in Massive Galaxies at $z = 2–4$, *ApJ*, **699**, 1354-1364.

Yamada, Y., Yamauchi, M., **Gouda, N.**, **Kobayashi, Y.**, **Tsujimoto, T.**, **Yano, T.**, Suganuma, M., Nakasuka, S., Sako, N., Inamori, T.: 2009, A Star Image Extractor for Small Satellites, Transactions of the Japan Society for Aeronautical and Space Sciences, *Space Technology Japan*, **7**, Tm_25-Tm_29.

Yamamoto, S., Wada, K., Kobayashi, H., Kimura, H., **Ishiguro, M.**, Matsui, T.: 2010, Collisional Process on Comet 9/P Tempel 1: Mass Loss of its Dust and Ice by Impacts of Asteroidal Objects and its Collisional History, *Earth, Planets and Space*, **62**, 5.

Yamamoto, T. T., **Sakurai, T.**: 2009, Forecasting Maximum Solar Flare Magnitudes from Photospheric Magnetograms, *Space Weather*, **7**, 04007.

Yamamoto, T. T., **Sakurai, T.**: 2009, Time Variation and Statistical Studies of Magnetic Helicity Injection in Solar Magnetic Regions, *ApJ*, **698**, 928-937.

Yamanaka, M., et al. including **Imada, A.**, **Kuroda, D.**, **Miyazaki, S.**, **Nakaya, H.**, **Yamashita, T.**, **Yanagisawa, K.**, **Yoshida, M.**: 2009, Early Phase Observations of Extremely Luminous Type Ia Supernova 2009dc, *ApJ*, **707**, L118.

Yamanaka, M., Naito, H., Kinugasa, K., **Takanashi, N.**, Tanaka, M., Kawabata, K. S., **Ozaki, S.**, Narusawa, S., Sadakane, K.: 2009, Early Spectral Evolution of the Rapidly Expanding Type Ia Supernova 2006X, *PASJ*, **61**, 713.

Yamazaki, D. G., Ichiki, K., **Kajino, T.**, Mathews, G. J.: 2010, New constraint on the Primordial Magnetic Field, *Phys. Rev. D*, **81**, 23008.

Yasui, C., Kobayashi, N., Tokunaga, A. T., **Saito, M.**, Tokoku, C.: 2009, The Lifetime of Protoplanetary Disks in a Low-metallicity Environment, *ApJ*, **705**, 54.

Yasutake, N., Maruyama, T., Tatsumi, T.: 2009, Hot hadron-quark mixed Phase transition including hyperons, *Phys. Rev. D*, **80**, 123009.

Yasutake, N., Kiuchi, K., **Kotake, K.**: 2010, Relativistic hybrid stars with super-strong toroidal magnetic fields: an evolutionary track with QCD phase transition, *MNRAS*, **401**, 2101-2112.

Yokochi, K., Tavrov, V., A., **Nishikawa, J.**, **Murakami, N.**, Abe, L., **Tamura, M.**, Takeda, M., Kurokawa, T.: 2009, Achromatic deep nulling with a three-dimensional Sagnac interferometer, *Opt. Lett.*, **34**, 1985-1987.

Yoshida, F., **Ito, T.**, **Takahashi, S.**, Ibrahimov, M. A., Marchalkina, A. L.: 2009, Photometric observations of young asteroid families at Maidanak observatory, *Adv. Geosci.*, **15**, 119-132.

Yoshida, T., Takamura, A., Kimura, K., Yokomakura, H., **Kawagoe, S.**, **Kajino, T.**: 2009, Resonant spin-flavor conversion of supernova neutrinos: Dependence on electron mole fraction, *Phys. Rev. D*, **80**, 12.

Yoshikoshi, T., Mori, M., Edwards, P. G., Gunji, S., Hara, S., Hara, T., Kawachi, A., **Mizumoto, Y.**, Naito, T., Nishijima, K., Tanimori, T., Thornton, G. J., Yoshida, T.: 2009, Reanalysis of Data Taken by the Cangaroo 3.8 Meter Imaging Atmospheric Cherenkov Telescope: PSR B1706-44, SN 1006, and Vela, *ApJ*, **702**, 631-648.

Yusef-Zadeh, F., et al. including **Miyazaki, A.**: 2009, Simultaneous Multi-Wavelength Observations of Sgr A* During 2007 April 1-11, *ApJ*, **706**, 348-375.

Zhang, H., **Sakurai, T.**, Pevtsov, A., Gao, Y., Xu, H., Sokoloff, D. D., Kuzanyan, K.: 2010, A New Dynamo Pattern Revealed by Solar Helical Magnetic Fields, *MNRAS*, **402**, L30-L33.

Zhang, L., Ishigaki, M., **Aoki, W.**, Zhao, G., Chiba, M.: 2009, Chemical Compositions of Kinematically Selected Outer Halo Stars, *ApJ*, **706**, 1095.

Zhao, J., Kosovichev, A. G., **Sekii, T.**: 2010, High-Resolution Helioseismic Imaging of Subsurface Structures and Flows of a Solar Active Region Observed by *Hinode*, *ApJ*, **708**, 304-313.

Zhu, M., Papadopoulos, P. P., Xilouris, E. M., **Kuno, N.**, Lisenfeld, U.: 2009, Tracing Molecular Gas Mass in Extreme Extragalactic Environments: An Observational Study, *ApJ*, **706**, 941-959.

2. Publications of the National Astronomical Observatory of Japan

Miyashita, A., Tanaka, K., Watanabe, H., Tanabe, H., **Sato, M.**, **Watanabe. J.**: 2009, Fireball Monitoring Observation at the Kiso Observatory, *Publ. Nat. Astron. Obs. Japan*, **12**, 11-80.

Miyoshi, M.: 2009, Re-analysis of the First Fringe with 2-Beam in the VERA System from Archive Data, *Publ. Nat. Astron. Obs. Japan*, **12**, 1-10.

3. Report of the National Astronomical Observatory of Japan (in Japanese)

Sôma, M.: 2009, Problems in Using the Revised "Calendar and Ephemeris", *Rep. Nat. Astron. Obs. Japan*, **12**, 1-11.

Ishizaki, H., **Fukuda, T.**, **Nishino, T.**, **Arai, K.**: 2009, Development and Experiments of a Pendulum with Suppressed Rotational Motion, *Rep. Nat. Astron. Obs. Japan*, *Rep. Nat. Astron. Obs. Japan*, **12**, 13-22.

Tonooka, H., Gan, H., **Shimojo, M.**, PAONET Working Group for Public Use of Hinode Data: 2009, Making of the DVD "The Sun Captured by Hinode" for Public Outreach, *Rep. Nat. Astron. Obs. Japan*, **12**, 23-37.

Shimoikura, T., Nakamichi, A., **Tonooka, H.**: 2009, Surveys on the Program Hinode DVD for Public Outreach, *Rep. Nat. Astron. Obs. Japan*, **12**, 39-51.

Yamada, Y., Ozawa, T., **Nishizawa, A.**, **Furusho, R.**, Nishimura, T., Enoki, M., Yoshino, A., **Furusawa, J.**, **Takata, T.**, **Ichikawa, S.-I.**: 2009, Development of Public Science Archive System of Subaru Telescope 5, *Rep. Nat. Astron. Obs. Japan*, **12**, 53-78.

Tamura, T., **Noguchi, T.**, **Endo, A.**, **Krong, M.**, Shan, W., **Ito, T.**, **Niizeki, Y.**, **Iizuka, Y.**: 2009, The Establishment of SIS Mixer Device Fabrication System and the Development of SIS Mixer Device for the ALMA Band 8 Cartridge Receivers, *Rep. Nat. Astron. Obs. Japan*, **12**, 79-91.

Onoma, F., Itoh, A., Harada, Y., **Fukushima, H.**, Kosai, H.: 2009, A Proposal of Photometric Technique for Evaluating the Night-Sky Brightness Using Commercially Available Digital Single Lens Reflex Camera, *Rep. Nat. Astron. Obs. Japan*, **12**, 93.

4. Conference Proceedings

Abramov-Maximov, V. E., Gelfreikh, G. B., Kobanov, N. I., **Shibasaki, K.**: 2009, A Possible Scenario of Energy Transport in the 17th May 2002 Flare, Central European Astrophysical Bulletin 33, 207-215.

Akamatsu, H., Ishisaki, Y., Hoshino, A., Ezoe, Y., Ohashi, T., Takei, Y., Yamasaki, N. Y., Mitsuda, K., **Oshima, T.**, Tanaka, K.: 2009, Impedance Measurement of a Gamma-Ray TES Calorimeter with a Bulk Sn Absorber, AIP Conf. Proc. 1185, 191-194.

Aoki, K., Totani, T., **Hattori, T.**, Ohta, K., Kawabata, K. S., Kobayashi, N., **Iye, M.**, Nomoto, K., Kawai, N.: 2009, No Evidence for Variability of Intervening Absorption Lines toward GRB 060206: Implications for the Mg II Incidence Problem, AIP Conf. Proc. 1133, 467-472.

Aoki, W.: 2010, Carbon-Enhanced Metal-Poor (CEMP) stars, IAU Symp. 265, Eds. K. Cunha, M. Spite, B. Barbuy, 111-116.

Aoki, W., Honda, S.: 2010, Enrichment of Thorium (Th) and Lead (Pb) in the early Galaxy, IAU Symp. 265, Eds. K. Cunha, M. Spite, B. Barbuy, 61-62.

Ariyoshi, S., Taino, T., Dobroiu, A., Sato, H., **Matsuo, H.**, Otani, C.: 2009, Design of Terahertz Detector based on a Superconducting Tunnel Junction Coupled to a Thin Superconductor Film, Proc. 34th Int. Conf. on Infrared, Millimeter, and Terahertz Waves, T5E06.0372.

Asada, K., Doi, A., **Kino, M.**, **Nagai, H.**, Nakamura, M., Kameno, S., VSOP-2 Science Working Group: 2009, VSOP-2 Observations of M 87: A Proposal for a VSOP-2 Key Science Program, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 262.

Asaki, Y., **Miyoshi, M.**: 2009, A Future Submillimeter-Wave Space VLBI, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 431.

Barker, M., Ferguson, A., Irwin, M., **Arimoto, N.**, Jablonka, P.: 2009, Hunting the Halos of M81 and NGC2403 with Subaru, Bulletin of AAS 41, 689.

Buehler, S., Ferguson, A., Irwin, M., **Arimoto, N.**, Jablonka, P., Macjkey, D.: 2009, The stellar outskirts of the disk galaxy NGC 4244, IAU Symp. 254, Eds. J. Andersen et al., 12.

Choi, Y. K., **Hirota, T.**, **Honma, M.**, **Kobayashi, H.**: 2009, Astrometry of the Red Supergiant Star VY Canis Majoris with VERA, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 363.

De Cat, P., Wright, D. J., Pollard, K. R., Maisonneuve, F., Kilmartin, P. M., Lehmann, H., Yang, S., **Kambe, E.**, Saesen, S., Carrier, F., Mkrtichian, D., Mantegazza, L., Rainer, M., Poretti, E., Laney, D., Fu, J. N.: 2009, Towards asteroseismology of main-sequence g-mode pulsators: spectroscopic multi-site campaigns for slowly pulsating B stars and γ Doradus stars, AIP Conf. Proc. 1170, Eds. J. A. Guzik, P. A. Bradley, 480.

de Wijn, A. G., Stenflo, J. O., Solanki, S. K., **Tsuneta, S.**: 2009, Small-Scale Solar Magnetic Fields, Space Science series of ISSI 32, Eds. M. J. Thompson, A. Balogh, J. L. Culhane, Å. Nordlund, S. K. Solanki, J.-P. Zahn, 275-315.

Deguchi, S., **Koike, K.**, Balasubramanyam, R.: 2009, Nature of Meterwave Luminous Objects and Search for Electron-Cyclotron Maser Emission, ASP Conf. Ser. 407, Eds. D. J. Saikia, D. A. Green, Y. Gupta, T. Venturi, 260-263.

Deguchi, S., Matsunaga, N., **Takahashi, S.**, **Kuno, N.**, Nakashima, J.: 2010, Dying SiO Maser in the V407 Cyg System, The Astronomer's Telegram, #2519.

Doeleman, S., et al. including **Honma, M.**: 2009, Imaging an Event Horizon: submm-VLBI of a Super Massive Black Hole, Astro2010: The Astronomy and Astrophysics Decadal Survey, Science White Papers, 68.

Enya, K., et al. including **Yamashita, T.**, **Narita, N.**, **Tamura, M.**, **Nishikawa, J.**, **Hayano, H.**, **Oya, S.**, **Murakami, N.**, **Matsuo, T.**, **Guyon, O.**, Spica Coronagraph Team: 2009, SPICA Coronagraph Instrument (SCI) for the Direct Imaging and Spectroscopy of Exo-Planets, SPICA joint European/Japanese Workshop, Eds. A. M. Heras, B. M. Swinyard, K. G. Isaak, J. R. Goicoechea, 01004.

Fomalont, E. B., Kopeikin, S., Titov, O., **Honma, M.**: 2009, VLBA/VERA Test of General Relativity, IAU Symp. 261, Bulletin of the AAS, 41, 890.

Fomalont, E., Kopeikin, S., Jones, D., **Honma, M.**, Titov, O.: 2010, Recent VLBA/VERA/IVS tests of general relativity, IAU

Symp. 261, Bulletin of the AAS, 41, 291-295.

Friesen, R., Di, F., Shirley, Y., Myers, P. C., **Shimajiri, Y.**, Takakuwa, S., Belloche, A., Andre, P., Bourke, T.: 2010, Probing the Initial Conditions of Star Formation: Dense Gas in the Ophiuchus Molecular Cloud, AAS Meeting #215, Bulletin of AAS 41, 257.

Fujimoto, M.-K.: 2009, Searching for Gravitational Waves with Laser Interferometers, Proc. of the 28th Symp. on Materials Science and Engineering, Ed. K. Kuriyama, 1.

Fujiwara, M., Nagata, H., **Hibi, Y.**, **Matsuo, H.**, Sasaki, M.: 2009, Cryogenic Low Noise Amplifier with GaAs JFETs, AIP Conf. Proc. 1185, 267-270.

Geise, K. M., Ueta, T., Speck, A. K., **Izumiura, H.**, Stencel, R. E.: 2010, Spitzer Reveals New Insights into Mass Loss History of Evolved Stars, Bulletin of AAS 41, 41.

Gopalswamy, N., Yashiro, S., Makela, P. A., **Shibasaki, K.**: 2009, The subdued solar cycle 23/24 minimum revealed by microwave butterfly diagram, AGU Fall Meeting 2009, SH13C-02.

Guhathakurta, P., et al. including **Iye, M.**: 2010, The SPLASH Survey: Spectroscopy of Newly Discovered Tidal Streams in the Outer Halo of the Andromeda Galaxy, AAS Meeting #215, Bulletin of AAS 42, 537.

Hagino, M., Nakatani, Y., Ishii, T. T., **Hanaoka, Y.**, **Sakurai, T.**, Hiei, E., Suzuki, D.: 2009, Comparison of the Vector Magnetograms taken with the SFT/MTK and the SST/KSW, ASP. Conf. Ser. 405, Eds. S. V. Berdyugina, K. N. Nagendra, R. Ramelli, 393-396.

Hagiwara, Y., VSOP-2 Science Working Group: 2009, Extragalactic Water Maser Observations with VSOP-2, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 266.

Hanaoka, Y.: 2009, Expanding Applications of the Polarimeters with Ferroelectric Liquid Crystals and their Calibration, ASP. Conf. Ser. 405, Eds. S. V. Berdyugina, K. N. Nagendra, R. Ramelli, 401-405.

Hara, H., **Watanabe, T.**, Bone, L. A., Culhane, J. L., van Driel-Gesztelyi, L., Young, P. R.: 2009, Characteristics of the Nonthermal Velocity Signature Observed in the Impulsive Phase of the 2007 May 19 Flare, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 459-462.

Hara, H.: 2009, Coronal Plasma Motions in Active Region Loops Observed with Hinode EIS, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 252-255.

Harada, Y., **Iwata, T.**, **Kikuchi, F.**, **Araki, H.**, **Ishihara, Y.**, **Sasaki, S.**, **Noda, H.**, **Hanada, H.**, **Goossens, S.**, **Matsumoto, K.**: 2010, What do we know from Mars' rotation?, Proc. of the 42th ISAS Lunar and Planetary Symp., 22-25.

Harikae, S., **Takiwaki, T.**, **Kotake, K.**: 2009, Long-Term Evolution of Collapsar: Mechanism of Outflow Production, eConf Proc. C091122, 2009 Fermi Symp., November 2-5.

Hashimoto, J., **Tamura, M.**, **Kandori, R.**, **Nakajima, Y.**, **Kusakabe, N.**, **Sato, Y.**: 2009, Polarimetry for the Disks around Young Brown Dwarfs, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 111-114.

Hibi, Y., **Matsuo, H.**, **Nagata, H.**, Ikeda, H., Fujiwara, M.: 2009, The Cryogenic Digital Readout Module with GaAs JFET Ics, AIP Conf. Proc.,1185, 290-293.

Hirota, T., **Bushimata, T.**, Choi, Y. K., **Honma, M.**, **Imai, H.**, **Iwadate, K.**, **Jike, T.**, Kameno, S., **Kameya, O.**, Kamohara, R., **Kan-Ya, Y.**, **Kawaguchi, N.**, **Kijima, M.**, **Kim, M. K.**, **Kobayashi, H.**, **Kuji, S.**, Kurayama, T., **Manabe, S.**, Maruyama, K., Matsui, M., **Matsumoto, N.**, **Miyaji, T.**, Nagayama, T., Nakagawa, A., Nakamura, K., Oh, C. S., Omodaka, T., **Oyama, T.**, Sakai, S., Sasao, T., **Sato, K.**, **Sato, M.**, **Shibata, K. M.**, Shintani, M., **Tamura, Y.**, Tsushima, M., **Yamashita, K.**: 2009, Astrometry of H_2O Maser Sources in Nearby Molecular Clouds with VERA, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 456.

Honma, M., **Bushimata, T.**, Choi, Y. K., **Hirota, T.**, **Imai, H.**, **Iwadate, K.**, **Jike, T.**, Kameno, S., **Kameya, O.**, Kamohara, R., **Kawaguchi, N.**, **Kijima, M.**, **Kim, M.**, **Kobayashi, H.**, **Kuji, S.**, Kurayama, T., **Manabe, S.**, Matsui, M., **Matsumoto, N.**, **Miyaji, T.**, Nagayama, T., Nakagawa, A., Nakamura, K., Oh, C. S., Omodaka, T., **Oyama, T.**, Sakai, S., **Sato, K.**, **Sato, M.**, Sasao, T., **Shibata, K. M.**, **Tamura, Y.**, Yamashita, K.: 2009, Maser Astrometry with VERA and VSOP-2, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 460.

Hwang, N., Lee, M. G.: 2010, Tracing star cluster formation in the interacting galaxy M51, IAU Symp. 266, Eds. R. de Grijs, J. R. D. Lépine, 423-426.

Ichimoto, K., **Suematsu, Y.**, **Katsukawa, Y.**, **Tsuneta, S.**, **Shimojo, M.**, Shimizu, T., Shine, R. A., Tarbell, T. D., Berger, T., Title, A. M., Lites, B. W., **Kubo, M.**, Yokoyama, T., Nagata, S.: 2009, A New View of Fine Scale Dynamics and Magnetism of Sunspots Revealed by Hinode/SOT, ASP. Conf. Ser. 405, Eds. S. V. Berdyugina, K. N. Nagendra, R. Ramelli, 167.

Imamura, T., **Iwata, T.**, Yamamoto, Z., Mochizuki, N., **Kono, Y.**, **Matsumoto, K.**, **Liu, Q.**, **Noda, H.**, **Hanada, H.**, Oyama, K., Nabatov, A., Futaana, Y., Saito, A., Ando, H.: 2010, Studying the Lunar Ionosphere with SELENE Radio Science Experiment, Proc. of the 42th ISAS Lunar and Planetary Symp., 80-83.

Imanishi, M.: 2009, Luminous Buried AGNs in Nearby ULIRGs, ASP Conf. Ser. 408, Eds. W. Wang, Z. Yang, Z. Luo, Z. Chen, 41-45.

Imanishi, M.: 2009, Luminous Buried AGNs in Ultraluminous Infrared Galaxies and the Origin of Galaxy Downsizing, SPICA joint European/Japanese Workshop, Eds. A. M. Heras, B. M. Swinyard, K. G. Isaak, J. R. Goicoechea, 04011-04014.

Ishihara, D., et al. including **Ita, Y.**: 2009, AKARI Mid-Infrared All-sky Survey, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 127-128.

Ishihara, Y., Morota, T., **Iwata, T.**, Namiki, N., **Goossens, S.**, **Matsumoto, K.**, **Noda, H.**, **Araki, H.**, **Hanada, H.**, **Tazawa, S.**, **Sasaki, S.**: 2010, Lunar Crustal Thickness and Impact Basin Structures Based on Kaguya Gravity and Topography Data, Proc. of the 42th ISAS Lunar and Planetary Symp., 59-62.

Ishikawa, R., **Tsuneta, S.**: 2009, Propeties of Transient Horizontal Magnetic Fields, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 132-139.

Ishiyama, H., et al. including **Kajino, T.**: 2009, A Systematic Study of Astrophysical Reaction Rates through Li^8, AIP Conf. Proc. 1120, Eds. S. C. Jeong, Y. Utsuno, T. Motobayashi, A. Bracco, 177-182.

Ita, Y., IRSF Variable Star Survey Team, SIRIUS Variable Star Survey Team: 2009, IRSF/SIRIUS JHKs Near-Infrared Variable Star Survey in the Magellanic Clouds, AIP Conf. Proc. 1170, Eds. J. A. Guzik, P. A. Bradley, 321-323.

Ito, H., **Aoki, W.**, Honda, S., Beers, T. C., Tominaga, N.: 2010, The 9th Magnitude CEMP star BD+44°493: Origin of its Carbon Excess and Beryllium Abundance, IAU Symp. 265, Eds. K. Cunha, M. Spite, B. Barbuy, 124-125.

Ito, T.: 2009, NIR lightcurve of (832) Karin and its rotation, Proc. of the *N*-body Dynamics Symposium, March 13-14, 2009, National Astronomical Observatory, Mitaka, Tokyo, Japan, Ed. M. Sekiguchi, 14-23.

Iye, M.: 2009, National Astronomical Observatory, AAPPS Bulletin, 19(3), 5-10.

Jenniskens, P., Genovese, L., Barentsen, G., **Vaubaillon, J.**, Watson, W., Godley, W., Lunsford, R., Kozich, P., Stone, W.: 2009, Perseid Meteors 2009, Central Bureau Electronic Telegrams 2009, Ed. D. W. E. Green, 1921, 1.

Jenniskens, P., **Sato, M.**, **Watanabe, J.**: 2009, Orionid Meteors 2009, Central Bureau Electronic Telegrams 2009, Ed. D. W. E. Green, 1976, 1.

Kameya, O., Vera Team: 2009, Water Vapor Masers in the NGC7538 Region, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 369.

Kandori, R., **Tamura, M.**, **Morino, J.**, **Ishii, M.**, **Suzuki, R.**, **Hashimoto, J.**, **Kusakabe, N.**, **Narita, N.**, Sato, B., Yamada, T., Enya, K., Goto, M., Carson, J., Thalmann, C., McElwain, M., Moro-Martin, A., Knapp, J., Turner, E. L.: 2009, Selection of Nearby Star Targets for the Subaru Strategic Exploration of Exoplanets and Disks, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 251-252.

Kandori, R., **Tamura, M.**, **Tatematsu, K.**, **Kusakabe, N.**, **Nakajima, Y.**: 2009, Distortion of magnetic fields in the pre-stellar core Barnard 68, IAU Symp. 259, Eds. K. G. Strassmeier, A. G. Kosovichev, J. E. Beckman, 107-108.

Kanoh, T., Shibai, H., Fukagawa, M., **Matsuo, T.**, Kato, E., Itoh, Y., Kawada, M., Watabe, T., Kohyama, T., Matsumoto, Y., Morishita, H., Yamamoto, K., Kanoh, R., Nakashima, A., Tanabe, M., Narita, M.: 2009, Development of the Far-Infrared Interferometric Telescope Experiment, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 389-390.

Kato, Y., **Magara, T.**, Shimizu, T.: 2009, Radiation Transfer Analysis on Heating Mechanism of Magnetohydrodynamic Emerging Magnetic Flux Tube, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 272-274.

Katsukawa, Y., Jurcak, J.: 2009, Donwflow Patches in a Penumbra Observed with the Hinode Spectropolarimeter, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 117-120.

Kawagoe, S., **Takiwaki, T.**, **Kotake, K.**: 2010, Neutrino oscillations in MHD supernova explosions, J. Phys.: Conf. Ser., 203, Eds. E. Coccia, L. Pandola, N. Fornengo, R. Aloisio, 12128.

Kawaguchi, N.: 2009, HALCA Data Recording and ASTRO-G, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 18.

Kawakami, A., **Takeda, M.**, **Uzawa, Y.**, Wang, Z.: 2009, Design and Fabrication of Epitaxial NbN/MgO/NbN SIS Mixers, Int. Superconductive Electronics Conf. 2009 (ISEC2009), MD-P18.

Kawakatu, N., **Nagai, H.**, **Kino, M.**: 2009, A New Evolution Scenario of Compact Symmetric Objects, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 299.

Kawakatu, N., **Wada, K.**: 2009, Co-Evolution Model of AGNs and Nuclear Starbursts, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 148153.

Kikuchi, F., **Matsumoto, K.**, **Goossens, S.**, **Ishihara, Y.**, **Liu, Q.**, **Iwata, T.**, Namiki, N., **Noda, H.**, **Hanada, H.**, **Sasaki, S.**, RSAT/VRAD mission team: 2010, On the latest lunar gravity field model from SELENE and historical tracking data, Proc. of the 42th ISAS Lunar and Planetary Symp., 76-79.

Kim, M. K., **Hirota, T.**, **Honma, M.**, **Kobayashi, H.**: 2009, SiO Maser Observations toward Orion-KL with VERA, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 469.

Kino, M., Asada, K., **Hagiwara, Y.**, Edwards, P. G., VSOP-2 Science Working Group: 2009, Direct Observations of the Dynamics and Variability at High Energy Emission Regions in TeV Blazars, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 270.

Kino, M., Takahara, F.: 2009, Invisible Plasma Content in Blazars?—: The Case of Markarian 421, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 303.

Kitamura, M., Yamada, T., **Tamura, M.**, **Kudo, T.**: 2009, Direct Imaging of the Pre-outburst FU Ori Candidate V1331 Cyg, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 135-136.

Kiuchi, H., Kawanishi, T.: 2009, Photonic millimeter-wave generation and transmission system applicable to the high-frequency Radio Interferometers, EFTF-IFCS 2009, 880-885.

Kiuchi, H., Kawanishi, T.: 2009, Photonic millimeter-wave generation and transmission techniques for the high-frequency Radio Interferometers, LEOS 2009, 591-592.

Kojima, K., **Kajino, T.**, Mathews, G. J.: 2009, Neutrino mass effects on the CMB polarization with PMF, AIP Conf. Proc. 1120, Eds. S. C. Jeong, Y. Utsuno, T. Motobayashi, A. Bracco, 303-307.

Kojima, T., **Kroug, M.**, **Takeda, M.**, **Shitov, S.**, **Uzawa, Y.**, Shan, W., **Fujii, Y.**, Wang, Z.: 2009, A low noise NbTiN-based SIS mixer for terahertz band, Int. Superconductive Electronics Conf. 2009 (ISEC2009), MD-P32.

Kokubo, E.: 2009, Formation of Terrestrial Planets from Proto-planets, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 235-238.

Kudo, Y., Kawai, N., Shimokawabe, T., Vasquez, N., Mori, Y. A., **Yoshida, M.**, **Yanagisawa, K.**, **Nagayama, S.**, **Toda, H.**, **Shimizu, Y.**, **Kuroda, D.**, **Watanabe, J.**, **Fukushima, H.**, Mori, M.: 2009, The State of Development and Observation of MITSuME Telescope, Proc. of the RIKEN Symp., held 10-12 June, 2008.

Kudoh, T., Basu, S.: 2009, Molecular cloud fragmentation driven by gravity, ambipolar diffusion and nonlinear flows: three-dimensional simulations, Revista Mexicana de Astronomía Astrofísica, 36, Eds. A. Esquivel, et al., CD278.

Kudoh, T., Basu, S.: 2009, Three-dimensional MHD simulations of molecular cloud fragmentation regulated by gravity, ambipolar diffusion, and turbulence, IAU Symp. 259, Eds. K. G.

Strassmeier, A. G. Kosovichev, J. E. Beckman, 115.

Kuroda, D., **Hanayama, H.**, **Miyaji, T.**, **Watanabe, J.**, Yanagisawa, K., **Yoshida, M.**, Ohta, K., Kawai, N.: 2010, GRB100305A: Optical upper limits at IAO, GRB Coordinates Network, Circular Service, 10482, Ed. B. Scott, 1.

Kuroda, D., **Yanagisawa, K.**, **Shimizu, Y.**, **Nagayama, S.**, **Toda, H.**, **Yoshida, M.**, Kawai, N.: 2010, GRB100206: MITSuME optical upper limits, GRB Coordinates Network, Circular Service, 10388, Ed. B. Scott, 1.

Kuroda, D., **Yanagisawa, K.**, **Shimizu, Y.**, **Toda, H.**, Nakajima, H., Yatsu, Y., Mori, Y. A., Endo, A., Shimokawabe, T., Kawai, N., **Nagayama, S.**, **Yoshida, M.**, Ohta, K.: 2010, GRB 100219A Akeno and Okayama MITSuME Optical Observation, GRB Coordinates Network, Circular Service, 10430, Ed. B. Scott, 1.

Kuroda, D., **Yoshida, M.**, Isogai, M., **Yanagisawa, K.**, **Shimizu, Y.**, **Nagayama, S.**, **Toda, H.**, Kawai, N.: 2009, GRB 090418: optical observations with Mitsume Okayama and Ishigaki 1m telescope, GRB Coordinates Network, Circular Service, 9168, Ed. B. Scott, 1.

Kuroda, D., **Yoshida, M.**, **Yanagisawa, K.**, **Shimizu, Y.**, **Nagayama, S.**, **Toda, H.**, Kawai, N.: 2009, GRB 090401B: upper limits of Mitsume optical observation, GRB Coordinates Network, Circular Service, 9080, Ed. B. Scott, 1.

Kuroda, D., **Yoshida, M.**, **Yanagisawa, K.**, **Shimizu, Y.**, **Nagayama, S.**, **Toda, H.**, Kawai, N.: 2009, GRB 090417B: Mitsume Okayama optical upper limits, GRB Coordinates Network, Circular Service, 9143, Ed. B. Scott, 1.

Kusakabe, N., **Tamura, M.**, **Kandori, R.**: 2009, Magnetic fields in massive star forming regions: wide-field NIR polarimetry of M42 and Mon R2, IAU Symp. 259, Eds. K. G. Strassmeier, A. G. Kosovichev, J. E. Beckman, 97-98.

Kuznetsov, S. A., **Melnikov V. F.**: 2009, Roles of the self-absorption and Razin effect on formation of the frequency spectrum of microwave emission of solar flares, Proc. of All-Russian Conf., The Year of Astronomy: Solar and Solar-Terrestrial Physics - 2009, 261-264.

Kuzuhara, M., **Tamura, M.**, **Kudo, T.**, **Kandori, R.**, **Ishii, M.**, Nishiyama, S.: 2009, A Substellar Companion with a Very Wide Separation from a Binary T Tauri Star, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 253-254.

Lagg, A., **Ishikawa, R.**, Merenda, L., Wiegelmann, T., **Tsuneta, S.**, Solanki, S. K.: 2009, Internetwork Horizontal Magnetic Fields in the Quiet Sun Chromosphere: Results from a Joint Hinode/VTT Study, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 327-331.

Li, J., Cao, X., Takeda, M., **Matsuo, H.**, Wang, Z., Shi, S.: 2009, Shot-Noise Characteristics of NbN Superconducting Tunnel Junctions, Proc. of the 20th Int. Symp. on Space Terahertz Technology, Eds. E. Bryerton, A. Kerr, A. Lichtenberger, 262.

Li, X.-X., Paine, S., Yao, Q.-J., Shi, S.-C., **Matsuo, H.**, Yang, J., Zhang, Q.-Z.: 2009, A Fourier transform spectrometer for site testing at Dome A, Proc. SPIE 7385, Eds. X.-C. Zhang, J. M. Ryan,C.-L. Zhang, C.-X. Tang, 73851D-73851D-10.

Lim, S., **Hwang, N.**, Lee, M. G.: 2010, Star clusters in the starburst galaxy M82, IAU Symp. 266, Eds. R. de Grijs, J. R. D. Lépine, 454-457.

Lites, B. W., Kubo, M., Socas-Navarro, H., Berger, T., Frank, Z., Shine, R., Tarbell, T., Title, A. M., Ichimoto, K., **Katsukawa, Y.**, **Tsuneta, S.**, **Suematsu, Y.**, Shimizu, T., Nagata, S.: 2009, Has *Hinode* Revealed the Missing Turbulent Flux of the Quiet Sun?, ASP. Conf. Ser. 405, Eds. S. V. Berdyugina, K. N. Nagendra, R. Ramelli, 173-181.

Liu, G., Calzetti, D., Yun, M. S., Wilson, G. W., Draine, B. T., Scott, K., Austermann, J., Perera, T., Hughes, D., Aretxaga, I., Kohno, K., **Kawabe, R.**, **Ezawa, H.**: 2010, From Near-Infrared to Millimeter: An Investigation of the Content in the NGC 1512/1510 Pair, AAS Meeting #215, Bulletin of AAS 41, 369.

Liu, Q., **Goossens, S.**, **Hanada, H.**, **Kikuchi, F.**, **Matsumoto, K.**, **Iwata, T.**: 2010, Same-beam VLBI technique and its applications, Proc. of the 31st Solar System Science Symp.

Machida, M. N., Inutsuka, S., Matsumoto, T.: 2009, Protostellar Jet and Outflow in the Collapsing Cloud Core, Protostellar Jets in Context, Eds. K. Tsinganos, T. Ray, M. Stute, 405-410.

Machida, M. N., **Omukai, K.**, Matsumoto, T., Inutsuka, S.: 2009, Influence of the Magnetic Field on the Formation of Population III Stars, Magnetic Fields in the Universe II: From Laboratory and Stars to the Primordial Universe, Eds. A. Esquivel, J. Franco, G. García-Segura, E. M. de Gouveia Dal Pino, A. Lazarian, S. Lizano, A. Raga, 272-277.

Magara, T.: 2009, Saturation of Magnetic Helicity as an Indicator of the Possible Occurrence of a Solar Flare, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 439-442.

Matsuo, H., **Hibi, Y.**, Nagata, H., Ikeda, H., Fujiwara, M.: 2009, Cryogenic Integrated Circuits for Superconducting Terahertz Camera, Proc. of The 9th Japan-Taiwan Microelectronics Int. Symp., 4-1.

Matsuo, H., **Hibi, Y.**, Nagata, H., Ikeda, H., Fujiwara, M.: 2009, GaAs-JFET Cryogenic Readout Electronics for the Superconducting Terahertz Digital Camera, Proc. 34th Int. Conf. on Infrared, Millimeter, and Terahertz Waves, R5E35.0434.

Matsuo, H., **Hibi, Y.**, **Suzuki, T.**, **Naruse, M.**, **Noguchi, T.**, **Sekimoto, Y.**, **Uzawa, Y.**, Nagata, H., Ikeda, H., Ariyoshi, S., Otani, C., Nitta, T., Yao, Q.-J., Fujiwara, M.: 2009, Superconducting THz Camera with GaAs-JFET Cryogenic Readout Electronics, AIP Conf. Proc. 1185, 393-396.

Melnikov, V. F., Pyatakov, N. P., Gorbikov, S. P.: 2009, Microwave diagnostics of the position of an acceleration site and pitch-angle anisotropy of accelerated electrons in flaring loops, Proc. of All-Russian Conf., The Year of Astronomy: Solar and Solar-Terrestrial Physics - 2009, 293-298.

Miki, S., **Takeda, M.**, Fujiwara, M., Sasaki, M., Otomo, A., Wang, Z.: 2009, Compact Packaging of Superconducting Nanowire Single Photon Detectors with Optical Cavity, Int. Superconductive Electronics Conf. 2009 (ISEC2009), MD-P23.

Miki, S., **Takeda, M.**, Fujiwara, M., Sasaki, M., Otomo, A., Wang, Z.: 2009, Superconducting Nanowire Single Photon Detectors with NbTiN Thin Films, Int. Superconductive Electronics Conf. 2009 (ISEC2009), MD-P06.

Miura, N., Noto, Y., Kato, S., Kuwamura, S., Baba, N., **Hanaoka, Y.**, Nagata, S., Ueno, S., Kitai, R., **Takami, H.**: 2009, Solar Adaptive Optic system at the Hida Observatory, Proc. SPIE 7015, Eds. N.

Hubin, C. E. Max, P. L. Wizinowich, 70156U-1-U-8.

Miyazaki, A., Shen, Z.-Q., Li, J., **Miyoshi, M.**, Tsuboi, M., Tsutsumi, T.: 2009, Flux variability of Sagittarius A* at short mm-wavelengths, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 379.

Miyoshi, M., Kameno, S., Ishitsuka, J.: 2009, An Approach to Detect the Event Horizon in SgrA* Using Ground, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 380.

Mochizuki, N., Hachisuka, K., **Umemoto, T.**: 2009, Survey of Outer Galaxy Molecular Lines Associated with Water Masers, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 384.

Momose, M., Hiramatsu, M., Tsukagoshi, T., **Shimajiri, Y.**, Ikeda, N., Kitamura, Y., Kamegai, K., **Ezawa, H.**, **Kawabe, R.**, **Saito, M.**: 2009, Wide-field Imaging Survey of Dust Continuum Emissions at $\lambda = 1.1$ mm toward the Chamaeleon and Lupus Regions with AzTEC on ASTE, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 141-142.

Moon, Dae-Sik, Koo, B., Lee, H., Matthews, K., Lee, J., **Pyo, T.-S.**, Seok, J., **Hayashi, M.**: 2009, Dense Iron-predominant Ejecta and Core-collapse Supernova Explosion in the Young Supernova Remnant G11.2-0.3, AAS Meeting #214, Bulletin of AAS 41, 762.

Mori, Y. A., Kawai, N., Arimoto, M., **Yoshida, M.**, Ohta, K.: 2009, MITSuME Telescope Observation of GRB080506, AIP Conf. Proc. 1133, 232.

Moritani, Y., Nogami, D., Okazaki, A. T., **Imada, A.**, **Kambe, E.**, Honda, A. S., Ishino, Y., Suzuki, Y.: 2009, High-Dispersion Spectroscopy of a Be/X-Ray Binary A0535+26/V725 Tau, ASP Conf. Ser. 404, Eds. B. Soonthornthum, S. Komonjinda, K. S. Cheng, K. C. Leung, 154.

Murakami, N., **Yokochi, K.**, **Nishikawa, J.**, **Tamura, M.**, Baba, N., Uemura, R., Hashimoto, N., Abe, L., Tavrov, A. V., Kurokawa, T., Takeda, M.: 2009, Development of Fourth-order Nulling Coronagraphs for Partially Resolved Stars, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 397-398.

Nagai, H., Asada, K., Doi, A., Kameno, S., Inoue, M.: 2009, Constraining the Synchrotron Age of 3C 84, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 106.

Nagai, H., Asada, K., Doi, A., **Kino, M.**, Kameno, S., VSOP-2 Science Working Group: 2009, Disk-Jet Connection in the Nearby Low Luminosity AGN M 81: A Proposal for VSOP-2 Key Science Program, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 110.

Nagashima, K., **Sekii, T.**, Kosovichev, A. G., Zhao, J., Tarbell, T. D.: 2009, Travel-Time Analyses of an Emerging-Flux Region, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 417-420.

Nagata, H., **Matsuo, H.**, **Hibi, Y.**, Ikeda, H., Fujiwara, M.: 2009, Development of cryogenic analog amplifiers based on GaAs-JFET technology for high impedance array sensors, AIP Conf. Proc. 1185, 115-118.

Nakamura, K.: 2009, Consistency of Equations for the Single Scalar Field Case in Secondorder Gauge-invariant Cosmological Perturbation Theory, Proc. of the 19th Workshop on General Relativity and Gravitation in Japan, Eds. M. Harada, et al.

Namiki, N., **Ishihara, Y.**, **Sasaki, S.**, Sugita, S., **Iwata, T.**, Kamata, S., Mori, A., Sato, M.: 2010, Comparative Study of Compensation Mechanism of Lunar Impact Basins, Proc. of the 42th ISAS Lunar and Planetary Symp., 71-75.

Naruse, M., **Sekimoto, Y.**, **Suzuki, T.**, **Hibi, Y.**, **Matsuo, H.**, **Uzawa, Y.**, **Noguchi, T.**: 2009, Design of SIS Imaging Array for Terahertz Astronomy, Proc. 34th Int. Conf. on Infrared, Millimeter, and Terahertz Waves, M1B04.0318.

Niino, Y., Totani, T., **Kobayashi, M.**: 2009, Lyα Emission of Long GRB Host Galaxies at High Redshift and the Metallicity Dependence of Long GRB Production, AIP Conf. Proc. 1133, 273.

Nishikawa, J., **Yokochi, K.**, **Murakami, N.**, Abe, L., Kotani, T., **Tamura, M.**, Kurokawa, T., Tavrov, A. V., Takeda, M.: 2009, Coronagraph Methods on Precise Wavefront Compensation (UNI-PAC) and Deep Achromatic Nulling, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 365-368.

Nishiyama, S., Hatano, H., **Tamura, M.**, Nagata, T.: 2010, Near-infrared Polarimetry toward the Galactic Center - Magnetic Field Configuration in the Central One Degree Region -, Proc. Article for the Galactic Center Workshop 2009.

Nishizawa, A., Taruya, A., Hayama, K., Kawamura, S., Sakagami, M.: 2009, Searching for nontensorial polarizations of stochastic gravitational waves with laser interferometers, Proc. of the 19th Workshop on General Relativity and Gravitation in Japan (JGRG19), 271-274.

Noguchi, T., **Suzuki, T.**, Endo, A., **Naruse, M.**, **Hibi, Y.**, **Matsuo, H.**, **Sekimoto, Y.**: 2009, Effect of lifetime broadening of superconducting energy gap on quasiparticle tunneling current, Proc. of the 20th Int. Symp. on Space Terahertz Technology, Eds. E. Bryerton, A. Kerr, A. Lichtenberger, 74-79.

Okoshi, K., **Nagashima, M.**, **Gouda, N.**, **Minowa, Y.**: 2010, H I-Selected Galaxies as a Probe of Galactic Disks, IAU Symp. 262, 402-403.

Orozco-Suarez, D.: 2009, Simulation and Analysis of Hinode Spectropolarimteric Observations, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 57-62.

Otsuka, M., **Tajitsu, A.**, **Izumiura, H.**, Hyung, S.: 2010, A search for s-process elements in extremely metal-poor halo planetary nebulae, IAU Symp. 265, Eds. K. Cunha, M. Spite, B. Barbuy, 77-78.

Pyo, T.-S., **Kudo, T.**, **Hashimoto, J.**, **Tamura, M.**: 2009, Transition Disks-Key to Disk Evolution and Planet Formation, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 151-152.

Qiu, W., Wang, Z., **Takeda, M.**, Miki, S., Terai, H., Shimakage, H., Kawakami, A.: 2009, Fabrication and Characterization of High Quality Low Critical Current Density NbN/AlN/NbN tunnel junctions, Int. Superconductive Electronics Conf. 2009 (ISEC2009), TD-P11.

Readon, K. P., Rimmele, T., Tritschler, A., Cauzzi, G., Woeger, F., Uitenboroek, H., **Tsuneta, S.**, Berger, T.: 2009, Service-Mode Obsevations for Ground-Based Solar Physics, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 332-336.

Reznikova, V. E., **Melnikov, V. F.**, Ji, H.: 2009, Spatial dynamics of flaring loop footpoints, Proc. of All-Russian Conf., The Year of Astronomy: Solar and Solar-Terrestrial Physics - 2009, 377-378.

Ross, N., Ly, C., Ota, K., Malkan, M., **Sekiguchi, K.**, SXDS Team: 2010, Tracing Star Formation Using Narrowband-Emitters in the SXDS, Bulletin of AAS 42, 259.

Rottler, L., Rau, A., Koda, J., Kirkpatrick, D., **Deguchi, S.**, Kaminski, T.: 2010, CARMA Observations of the Mysterious Galactic Transient V838 Monocerotis, AAS Meeting #215, Bulletin of AAS 41, 269.

Saito, S., **Takeda, M.,** Shimakage, H., **Uzawa, Y.**, Wang, A., Sekine, N., Hosako, I., Sakai, K.: 2009, Observation of phase transition in niobium nitride with THz time-domain spectroscopy, Proc. 34th Int. Conf. on Infrared, Millimeter, and Terahertz Waves, 234.

Sasaki, S., **Ishihara, Y.**, **Araki, H.**, **Noda, H.**, **Hanada, H.**, **Matsumoto, K.**, **Goossens, S.**, Namiki, N., **Iwata, T.**, Sugita, S.: 2010, Shape and Structure of the Lunar South Pole-Aitken Basin from KAGUYA (SELENE) Gravity/Topography, Proc. of the 42th ISAS Lunar and Planetary Symp., 63-66.

Sato, M., **Hirota, T.**, **Honma, M.**, **Kobayashi, H.**, Vera Project Team: 2009, Superbubble Motion Away from the Galactic Plane: Astrometry of Water Masers in NGC 281 with VERA, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 476.

Sato, S., et al. including **Kawamura, S.**, **Fujimoto, M.**, **Fukushima, M.**, **Hayama, K.**, **Ishizaki, H.**, **Kotake, K.**, **Nakamura, K.**, **Nishida, E.**, **Nishizawa, A.**, **Obuchi, Y.**, **Okada, N.**, **Takahashi, R.**, **Torii, Y.**, **Ueda, A.**, **Yamazaki, T.**: 2009, DECIGO: The Japanese space gravitational wave antenna, J. Phys.: Conf. Ser., 154, 12040.

Sawada-Satoh, S., Kameno, S., Nakamura, K., Namikawa, D., **Shibata, K. M.**, Inoue, M.: 2009, Positional Coincidence of H_2O Maser and a Plasma Obscuring Torus in the Radio Galaxy NGC 1052, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 127.

Sekido, M., **Kawaguchi, N.**, Koyama, Y., Kimura, M., Kondo, T., Takiguchi, H., Hobiger, T., Takefuji, K., Ikeda, T., Shimojo, S., **Oyama, T.**, Harai, H., **Hara, T.**, **Kono, Y.**, Kurihara, S., Kokado, K., Tanimoto, D., Nozawa, K., Takeuchi, H., Uose, H., Fujisawa, K., Takaba, H.: 2009, e-VLBI Activities in Japan, Proc. of the 8th Int. e-VLBI Workshop. 22-26 June 2009. Madrid, Spain , 24.

Sekiguchi, Y.: 2009, Towards clarlying the central engine of long gamma-ray bursts, Proc. of the 18th Workshop on General Relativity and Gravitation in Japan (JGRG18), Ed. Y. Kojima.

Sekii, T.: 2009, Hinode/SOT Helioseismic Observations, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 405-410.

Shibasaki, K.: 2009, Nonlinear and Diamagnetic Nature of Plasma and Activities in the Solar Atmosphere, Bulletin of AAS 41, 864.

Shih, Y. H., Chen, W. P., Hsiao, W. S., **Tamura, M.**: 2009, Near Infrared Polarimetric Imaging of the Giant H II region NGC 3576, ASP Conf. Ser. 404, Eds. B. Soonthornthum, S. Komonjinda, K. S. Cheng, K. C. Leung, 27.

Shiino, T., Todoroki, K., Minh, N., Jiang, L., Shiba, S., **Uzawa, Y.**, Maezawa, H., Sakai, N., Yamamoto, S.: 2009, Improvement of critical temperature of superconducting NbN and NbTiN thin films using an AlN buffer layer, Int. Superconductive Electronics Conf. 2009 (ISEC2009), MD-P04.

Shimokawabe, T., Kawai, N., Mori, Y. A., Kudo, Y., Nakajima, H., **Yoshida, M.**, **Yanagisawa, K.**, **Nagayama, S.**, **Toda, H.**, **Shimizu, Y.**, **Kuroda, D.**, **Watanabe, J.**, **Fukushima, H.**, Mori, M.: 2009, MITSuME-multicolor optical/NIR telescopes for GRB afterglows, AIP Conf. Proc. 1133, Eds. M. Charles, K. Chryssa, G. Neil, 79-81.

Shimonishi, T., Onaka, T., Kat, D., Sakon, I., **Ita, Y.**, Kawamura, A., Kaneda, H.: 2009, Near-infrared Spectroscopic Observation of Ices around Extragalactic Young Stellar Objects, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 155-156.

Shirasaki, Y., et al. including **Ohishi, M.**, **Mizumoto, Y.**, **Kawanomoto, S.**, **Yasuda, N.**, **Masunaga, Y.**: 2009, Design and Implementation of the Japanese Virtual Observatory (JVO) system, Proc. of the 10th Asian-Pacific Regional IAU Meeting (APRIM 2008).

Shirasaki, Y., Tanaka, M., **Ohishi, M.**, **Mizumoto, Y.**, **Kawanomoto, S.**, Honda, S., **Yasuda, N.**, **Masunaga, Y.**, Ishihara, Y., Machida, Y., Nakamoto, H., Sakamoto, M.: 2009, The Japanese Virtual Observatory in Action, ASP Conf. Ser. 411, Eds. D. A. Bohlender, D. Durand, P. Dowler, 396.

Suda, T., Yamada, S., Katsuta, Y., Ishizuka, C., Komiya, Y., Nishimura, T., **Aoki, W.**, Fujimoto, M. Y.: 2010, An overall picture of EMP stars using the stellar abundances for galactic archaeology(SAGA) database, IAU Symp. 265, Eds. K. Cunha, M. Spite, B. Barbuy, 90-93.

Sugiyama, K., Fujisawa, K., Wajima, K., Sawada-Satoh, S., Isono, Y., **Honma, M.**, Murata, Y., Mochizuki, N., Doi, A.: 2009, The Kinematics of the Methanol Maser at 6.7 GHz in Cepheus A, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 392.

Suzuki, R., **Tamura, M.**, **Suto, H.**, **Morino, J.**, **Hashimoto, J.**, **Kudo, T.**, **Kandori, R.**, **Murakami, N.**, **Nishikawa, J.**, **Ukita, N.**, **Takami, H.**, **Guyon, O.**, **Nishimura, T.**, **Hayashi, M.**, **Izumiura, H.**, Abe, L., Tavrov, A., Jacobson, S., Stahlberger, V., Yamada, H., Shelton, R., Hodapp, K.: 2009, HiCIAO: A High-contrast Instrument for the Next Generation Subaru Adaptive Optics, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 293-298.

Suzuki, T., **Noguchi, T.**, **Matsuo, H.**: 2009, Origin of subgap current in an SIS junction, AIP Conf. Proc. 1185, 405-408.

Takeda, M., Nakayama, S., Saito, A., Shimakage, H., **Uzawa, Y.**, Ohshima, S., Wang, Z.: 2009, Measurements of Microwave Surface Resistances of NbN and NbTiN Thin Films, Int. Superconductive Electronics Conf. 2009 (ISEC2009), HF-P25.

Tamura, M., Takami, M., Enya, K., Ootsubo, T., Fukagawa, M., Honda, M., Okamoto, Y. K., Sako, S., **Yamashita, T.**, Hasegawa, S., Kataza, H., Doi, Y., Matsuhara, H., Nakagawa, T.: 2009, Key Sciences of SPICA Mission: Planetary Formation, Exoplanets, and our Solar System, SPICA joint European/Japanese Workshop, Eds. A. M. Heras, B. M. Swinyard, K. G. Isaak, J. R. Goicoechea, 02001.

Tamura, M.: 2009, Subaru Strategic Exploration of Exoplanets and Disks with HiCIAO/AO188 (SEEDS), AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 11-16.

Tamura, N., Sharples, R. M., **Arimoto, N.**, Onodera, M., Ohta, K., Yamada, Y.: 2009, A Subaru/Suprime-Cam Wide-Field Survey of Globular Cluster Populations around M87, ESO Astrophysics Symposia "Globular Clusters - Guide to the Galaxy", 287-291.

Tanaka, M., Maeda, K., Nomoto, K., Mazzali, P. A., Tominaga, N., Kawabata, K. S., **Hattori, T.**: 2009, Optical Emission from

Aspherical Core-Collapse Supernovae, AIP Conf. Proc. 1111, Eds. G. Giobbi, et al., 413.

Thalmann, C., Goto, M., Carson, J., Feldt, M., Henning, T., Itoh, Y., Janson, M., **Kandori, R.**, Knapp, G. R., Mayama, S., McElwain, M., Moro-Martín, A., **Suzuki, R.**, **Tamura, M.**, Turner, E. L., **Usuda, T.**, Wisniewski, J.: 2009, SPOTS: Search for Planets Of Two Stars-A Direct Imaging Survey for Exoplanets in Binary Systems, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 271-272.

Tsang, E.: 2010, Digitizing newspaper clippings on the Mauna Kea Astronomy Community, ASP Conf. Ser. 433, 232.

Tsuboi, M., **Miyazaki, A.**, **Nakanishi, K.**, Kamegai, K., Kotani, T.: 2009, A mm-wave Flare from Cyg X-3, The Astronomer's Telegram, #2053.

Tsujimoto, T., Bekki, K.: 2010, Metal-rich infall onto the inner disk through the interaction between bulge winds and gaseous halos, IAU Symp. 265, Eds. K. Cunha, M. Spite, B. Barbuy, 384-385.

Tsujimoto, T., Bland-Hawthorn J., Freeman, K. C.: 2009, Chemical evolution of the Galaxy disk in connection with large-scale winds, IAU Symp. 254, Eds. J. Andersen et al., 393-398.

Tsuneta, S., Harra, L. K., Masuda, S.: 2009, *Hinode* "A New Solar Observatory in Space", Climate and Weather of the Sun-Earth System(CAWSES): Selected Papers from the 2007 Kyoto Symp., Eds. T. Tsuda, R. Fujii, K. Shibata, M. Geller, 63-75.

Uemura, M., Arai, A., Matsui, R., Sasada, M., Ohsugi, T., **Yamashita, T.**, Kawabata, K. S., Sato, S., **Kino, M.**, **Yoshida, M.**, **Kawai, N.**: 2009, New Aspects of WZ Sge-Type Dwarf Novae through Simultaneous Optical-Infrared Observations during Superoutbursts, ASP Conf. Ser. 404, Eds. B. Soonthornthum, S. Komonjinda, K. S. Cheng, K. C. Leung, 64.

Ujihara, H., **Bushimata, T.**: 2009, Measurement of the Antenna Mesh: Characteeristics for VSOP-2/ASTRO-G, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 66.

Umemoto, T., **Saito, M.**, **Nakanishi, K.**, **Kuno, N.**, Tsuboi, M.: 2009, Detection of a Radio Flare at Millimeter-Wavelengths from the X-ray T Tauri Star V773 Tau, ASP Conf. Ser. 402, Eds. Y. Hagiwara, E. Fomalont, M. Tsuboi, Y. Murata, 400.

Uzawa, Y., **Kojima, T.**, **Kroug, M.**, **Takeda, M.**, **Candotti, M.**, **Fujii, Y.**, **Kaneko, K.**, **Shan, W.**, **Noguchi, T.**, Wang, Z.: 2009, Development of the 787-950 GHz ALMA Band 10 Cartridge, Int. Superconductive Electronics Conf. 2009 (ISEC2009), MD-O1.

Vaubaillon, J., Atreya, P., **Watanabe, J.**, **Sato, M.**, Maslov, M., Moser, D., Cooke, B., Lyytinen, E., Nissinen, M., Asher, D., Jenniskens, P.: 2009, Leonid Meteors 2009, Central Bureau Electronic Telegrams 2009, Ed. D. W. E. Green, 2019, 2.

Watanabe, H., Kitai, R., Ichimoto, K., **Katsukawa, Y.**: 2009, Magnetic Structure of Umbral Dots with SOT SP, ASP Conf. Ser. 415, Eds. B. Lites, M. Cheung, T. Magara, J. Mariska, K. Reeves, 378-382.

Wright, D. J., De Cat, P., Pollard, K. R., Maisonneuve, F., Kilmartin, P. M., Telting, J. H., **Kambe, E.**, Poretti, E., Lehmann, H., Yang, S., Mkrtichian, D., Laney, D., Fu, J. N.: 2009, Results from Classification Observations and a Multi-site Campaign on γ Doradus and SPB Type Stars, AIP Conf. Proc. 1170, Eds. J. A. Guzik, P. A. Bradley, 467.

Yamada, Y., Shimokawa, T., Shinomoto, S., **Yano, T.**, **Gouda, N.**: 2009, JASMINE – Japan Astrometry Satellite Mission for INfrared Exploration: Data Analysis and Accuracy Assessment with a Kalman Filter, ASP Conf. Ser. 411, Eds. D. A. Bohlender, D. Durand, P. Dowler, 39.

Yamamoto, K., Matsuo, T., McElwain, M., **Tamura, M.**, Morishita, H., Nakashima, A., Shibai, H., Fukagawa, M., Kato, E., Kanoh, T., Itoh, Y., Kaneko, Y., Shimoura, M., Itoh, Y., Funayama, H., Hashiguchi, T.: 2009, SEEDS: Target Selection for Open Clusters and Moving Groups, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 273-274.

Yasui, C., Kobayashi, N., Tokunaga, A. T., **Saito, M.**, Tokoku, C.: 2009, Disk Fraction in a Low-Metallicity Environment, AIP Conf. Proc. 1158, Eds. T. Usuda, M. Tamura, M. Ishii, 171.

Yasutake, N., Maruyama, T., Tatsumi, T.: 2009, General Relativistic Compact Stars with Exotic Matter: Effects of rotation and strong magnetic field, The 6th Japan-Italy symp. on Heavy-Ion Physics, Eds. S.-C. Jeong, H. Miyatake, Y. Utsuno, H. Ikezono, T. Motobayashi, A. Bracco, 146-150.

Yoshida, F., **Yagi, M.**, **Komiyama, Y.**, **Nakata, F.**, **Furusawa, H.**, Ohno, T., Okamura, S., Nakamura, T.: 2010, Slitless Spectroscopy of Small Solar System Bodies on a Dark Cloud Curtain, LPI Contribution No. 1533 (41st Lunar and Planetary Science Conf., held March 1-5, 2010 in The Woodlands, Texas), 1290.

Yoshida, F., **Ito, T.**: 2009, Asteroids: are they dangerous?, Science & Life of Uzbekistan, 73.

Yoshida, F.: 2009, 從特洛依群小行星　探討　太陽系行星形成史, 台北市立天文教育科学館季刊誌「台北星空」, 46, 6.

Yoshida, M., **Kuroda, D.**, **Yanagisawa, K.**, **Shimizu, Y.**, **Nagayama, S.**, **Toda, H.**, Kawai, N.: 2009, GRB 090410: Mitsume optical upper limits, GRB Coordinates Network, Circular Service, 9126, Ed. B. Scott, 1.

Yoshida, M., **Kuroda, D.**, **Yanagisawa, K.**, **Shimizu, Y.**, **Nagayama, S.**, **Toda, H.**, Kawai, N.: 2009, GRB 090426: Okayama Mitsume optical observation, GRB Coordinates Network, Circular Service, 9266, Ed. B. Scott, 1.

Yoshida, M., **Kuroda, D.**, **Yanagisawa, K.**, **Shimizu, Y.**, **Nagayama, S.**, **Toda, H.**, Kawai, N.: 2009, GRB 090529: Mitsume optical observation, GRB Coordinates Network, Circular Service, 9467, Ed. B. Scott, 1.

Yoshida, M., **Kuroda, D.**, **Yanagisawa, K.**, **Shimizu, Y.**, **Nagayama, S.**, **Toda, H.**, Kawai, N.: 2009, GRB 090807: Mitsume optical upper limit, GRB Coordinates Network, Circular Service, 9752, Ed. B. Scott, 1.

Yoshida, M., **Kuroda, D.**, **Yanagisawa, K.**, **Shimizu, Y.**, **Nagayama, S.**, **Toda, H.**, Kawai, N.: 2009, GRB 090831B: Mitsume optical upper limits, GRB Coordinates Network, Circular Service, 9858, Ed. B. Scott, 1.

Yoshida, M., **Kuroda, D.**, **Yanagisawa, K.**, **Shimizu, Y.**, **Nagayama, S.**, **Toda, H.**, Kawai, N.: 2009, GRB 091208B: MITSuME Okayama Optical Observation, GRB Coordinates Network, Circular Service, 10258, Ed. B. Scott, 1.

Yoshida, M., **Yanagisawa, K.**, **Kuroda, D.**, **Shimizu, Y.**, **Nagayama, S.**, **Toda, H.**, Kawai, N.: 2009, GRB 090423: near infrared observation at Okayama observatory, GRB Coordinates Network, Circular Service, 9218, Ed. B. Scott, 1.

Yoshida, T., Suzuki, T., Chiba, S., **Kajino, T.**, Yokomakura, H., Kimura, K., Takamura, A., Hartmann, D. H.: 2009, Neutrino Nucleosynthesis in Supernovae, AIP Conf. Proc. 1120, Eds. S. C. Jeong, Y. Utsuno, T. Motobayashi, A. Bracco, 165-170.

Yoshida, T., Takamura, A., Kimura, K., Yokomakura, H., **Kawagoe, S.**, **Kajino, T.**: 2009, Effects of Spin-Flavor Conversion in Supernova Neutrino Signal, AIP Conf. Proc. 1120, Eds. S. C. Jeong, Y. Utsuno, T. Motobayashi, A. Bracco, 298.

Younger, J. D., Fazio, G. G., Wilner, D. J., Ashby, M. L. N., Blundell, R., Gurwell, M. A., Huang, J.-S., **Iono, D.**, Peck, A. B., Scott, K. S., Wilson, G. W., Yun, M. S.: 2009, Are the Most Luminous Submillimeter Galaxies Eddington Limited Starburst?, ASP Conf. Ser. 408, Eds. W. Wang, Z. Yang, Z. Luo, Z. Chen, 405-409.

Zhu, M., Papadopoulos, P. P., Xilouris, M., **Kuno, N.**, Lisenfeld, U.: 2009, Is the Gas and Dust Mass Over-Estimated in the Starburst Galaxy NGC 3310?, ASP Conf. Ser. 408, Eds. W. Wang, Z. Yang, Z. Luo, Z. Chen, 76-79.

5. Publications in English

Hagiwara, Y., Fomalont, E., Tsuboi, M., Yasuhiro, M.: 2009, Approaching Micro-Arcsecond Resolution with VSOP-2: Astrophysics and Technologies, ASP.

Nakata, F., **Yagi, M.**, **Yoshida, F.**, Marsden, B. G.: 2009, 2009 KK30, 2009 KL30, 2009 KM30, 2009 KN30, 2009 KO30, Minor Planet Electronic Circ., 2009-P22.

Usuda, T., **Ishii, M.**, **Tamura, M.**: 2010, Proceedings of the International Conference "Exoplanets and Disks: Their Formation and Diviersity", AIP, New York.

6. Conference Presentations

Agata, H.: 2009, “You are also Galileo” Project - Produced by the IYA Japan, Global Hands-On Universe Workshop 2009, (Porto Alegre, Brazil, Jul. 23-27, 2009).

Agata, H.: 2009, The You are also Galileo! Telescopes, IAU XXVII General Assembly, (Rio De Janeiro, Brazil, Aug. 03-14, 2009).

Agata, H.: 2010, Evaluation of You are also Galileo! Project, Communicating Astronomy with the Public 2010, (Cape Town, South Africa, Mar. 15-19, 2010).

Ando, H., Tsuboi, Y., **Kambe, E.**, Sato, B.: 2009, Characteristics of Oscillations in G-type Giants, The 4th Workshop on Extra-Solar Planet Search with Accurate Radial Velocity Measurements, (Sapporo, Japan, Oct. 7-9, 2009).

Aoki, W.: 2009, Alpha-elements in dwarf spheroidal galaxies and the Galactic halo, Workshop on using the [alpha/Fe] as a tracer of formation and evolution of the Galaxy, (Beijing, China, Sep. 28-30, 2009).

Aoki, W.: 2009, Carbon-Enhanced Metal-Poor (CEMP) stars, IAU symp. 265 "Chemical Abundances in the Universe: Connecting First Stars to Planets", (Rio de Janeiro, Brazil, Aug. 10-14, 2009).

Aoki, W.: 2009, Enrichment of the heaviest elements Th and Pb in the Galaxy, Third Joint Meeting of the Nuclear Physics Divisions of the APS and JPS, (Hawaii, Oct. 13-17, 2009).

Aoki, W.: 2010, Extremely metal-poor stars in dwarf galaxies around the Milky Way, Origin of Matter and Evolution of Galaxies, (Osaka, Japan, Mar. 8-10, 2010).

Araki, H., et al.: 2009, Results from the One Year Topographic Observation by the Laser Altimeter (LALT) aboard KAGUYA (SELENE), Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Araki, H., **Tazawa, S.**, **Noda, H.**, **Ishihara, Y.**, **Goossens, S.**, **Sasaki, S.**, Kawano, N., Kamiya, I., Ohtake, H., Obserst, J., Shum, C. K.: 2009, Lunar global topographic map by the Kaguya laser altimeter (LALT), The Moon, moons & Planets, (Kazan, Russia, Aug. 24-26, 2009).

Araki, H., **Tazawa, S.**, **Noda, H.**, **Ishihara, Y.**, **Goossens, S.**, Sasaki, S., Oberst, J., Shum, C. K.: 2010, Operation summary and accuracy of the lunar topography by KAGUYA–LALT, 4th KAGUYA (SELENE) Science Working Team Meeting, (Tokyo, Japan, Jan. 31-Feb. 2, 2010).

Ariyoshi, S., Otani, C., Dobroiu, A., Sato, H., Taino, T., **Matsuo, H.**, Shimizu, H. M.: 2009, Two-dimensional Superconducting Detector Array for Terahertz Imaging Applications, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Ariyoshi, S., Taino, T., Dobroiu, A., Sato, H., **Matsuo, H.**, Otani, C.: 2009, Design of Terahertz Detector based on a Superconducting Tunnel Junction Coupled to a Thin Superconductor Film, The 34th Int. Conf. on Infrared, Millimeter, and Terahertz Waves, (Busan, Korea, Sep. 21-25, 2009).

Asai, A., **Hara, H.**, **Watanabe, T.**, Imada, S.: 2009, Flare onset observed with Hinode in the 2006 December 13 flare, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Asai, A.: 2009, Flare Dynamics and Geoeffectiveness: Observations of Solar Active Regions that Generate Geoeffective Flares/CMEs, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Asai, A.: 2009, Flare onset observed with Hinode in the 2006 December 13 flare, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Bando, T.: 2010, UV telescope Contamination Control, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Barinov, A. V., **Melnikov, V. F.**, Ji, H.: 2009, A comparative analysis of the microwave spectral evolution from the flaring loop top and foot points, The Pulkovo conf. "The Year of Astronomy: Solar and Solar-Terrestrial Physics – 2009", (Saint-Peterbug, GAO RAS, Russia, Jul. 5-11, 2009).

Bussey, D. B. J., McGovern, J. A., Spudis, P. D., Neish, C., Sorensen, S., **Noda, H.**, **Ishihara, Y.**: 2010, Lunar Polar Illumination Conditions Derived Using Kaguya Laser Data, 41st Lunar and Planetary Science Conf. (LPSC 2010), (Woodlands, Texas, USA, Mar. 1-5, 2010).

Candotti, M., **Uzawa, Y.**, **Fujii, Y.**, **Kojima, T.**: 2009, Design study for the local oscillator injection scheme for the ALMA band 10 receiver, Int. Symp. on Space THz Technology 2009, (Virginia, USA, Apr. 20-22, 2009).

Fujii, M., **Iwasawa, M.**, Funato, Y., **Makino, J.**: 2009, Star Cluster Migration near the Galactic Center, IAU Symp. 267 "Evolution of Galaxies and Central Black Holes: Feeding and Feedback", (Rio de Janeiro, Brazil, Aug. 10-14, 2009).

Fujii, M.: 2009, Self-consistent *N*-body simulation of star clusters within their parent galaxies, Star Formation and Star Clusters, (Seoul, Korea, Apr. 9, 2009).

Fujiwara, M., Nagata, H., **Hibi, Y.**, **Matsuo, H.**, Sasaki, M.: 2009, Cryogenic Low Noise Amplifier with GaAs JFETs, 13th Int. Workshop on Low Temperature Detectors LTD-13, (Stanford, USA, Jul. 20-24, 2009).

Goossens, S., et al.: 2009, Updated Lunar Gravity Results From Kaguya (SELENE) and Historical Tracking Data, AGU Fall Meeting, (San Francisco, USA, Dec. 14-18, 2009).

Goossens, S., **Matsumoto, K.**, **Liu, Q.**, **Kikuchi, F.**, **Ishihara, Y.**, **Noda, H.**, **Hanada, H.**, Kawano, N., **Iwata, T.**, Namiki, N., Lemoine, F. G., Rowlands, D. D.: 2010, Lunar gravity field modelling with VLBI data and orbit determination using altimetry crossovers, 4th KAGUYA (SELENE) Science Working Team Meeting, (Tokyo, Japan, Jan. 31-Feb. 2, 2010).

Goossens, S., **Matsumoto, K.**, **Liu, Q.**, **Kikuchi, F.**, **Noda, H.**, Namiki, N., **Iwata, T.**, **Hanada, H.**, **Ishihara, Y.**: 2009, Lunar Gravity Results from Kaguya (SELENE) and Historical Tracking Data, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Goossens, S.: 2009, Lunar Orbit Determination with Kaguya: Models and Data, NASA/GSFC Seminar, (GSFC, NASA, USA, Sep. 16, 2009).

Gouda, N., JASMINE working group: 2009, JASMINE projects: Series of Infrared Space Astrometry Missions, The Milky Way and the Local Group - Now and in the Gaia Era, (The University of Heidelberg, Germany, Aug. 31-Sep. 4. 2009).

Gouda, N., JASMINE working group: 2009, JASMINE: Infrared Space Astrometry Mission, 27th Int. Symp. on Space Technology and Science, (Tsukuba, Japan, Jul. 5-12, 2009).

Gouda, N., JASMINE working group: 2009, Series of JASMINE projects -Exploration of the Galactic bulge-, Commission 8 Science meeting at IAU Gneral Assembly 27, (Rio de Janeiro, Brazil, Aug. 10, 2009).

Gusev, A., **Noda, H.**: 2010, Prospects for Lunar Laser Ranging in Japan and in Russia, First Workshop: Theory and Model for the New Generation of the Lunar Laser Ransing Data, (ISSI, Bern, Switzerland, Feb. 16-19, 2010).

Hada, K.: 2010, Strong gradient of the spectral index in the compact jet of the low-luminosity active galactic nucleus M 81, Galactic Center Workshop 2009, (Shanghai, China, Oct. 19-23, 2009).

Hamana, T.: 2009, Prospects and issues of HSC weak lensing survey, Science Opportunities with Wide-Field Imaging and Spectroscopy of the Distant Universe, (Princeton, New Jersey, USA, Nov. 9-11, 2009).

Hanada, H., Gusev, A., Petrova, N.: 2010, Physical Librations and Interior of the multi-layered Moon in Japanese and Russian space programs of 2010-2014 yrs, Int. Astron. Forum "ASTROKAZAN – 2010", (Kazan, Russia, Feb. 9-10, 2010).

Hanada, H., **Iwata, T.**, **Liu, Q.**, **Kikuchi, F.**, **Matsumoto, K.**, **Goossens, S.**, **Harada, Y.**, **Asari, K.**, **Ishikawa, T.**, **Ishihara, Y.**, **Noda, H.**, **Tsuruta, S.**, Petrova, N., Kawano, N., **Sasaki, S.**, Sato, K., Namiki, N., **Kono, Y.**, **Iwadate, K.**, **Kameya, O.**, **Shibata, K.**, **Tamura, Y.**, Kamata, S., Yahagi, Y., Masui, W., Tanaka, K., Maejima, H., Hong, X., Ping, J., Shi, X., Huang, Q., Aili, Y., Ellingsen, S., Schlüter, W.: 2010, Overview of differential VLBI observations in SELENE (Kaguya) for precise orbit determination and lunar gravity field study, 4th KAGUYA (SELENE) Science Working Team Meeting, (Tokyo, Japan, Jan. 31-Feb. 2, 2010).

Hanada, H., **Noda, H.**, **Kikuchi, F.**, **Tazawa, S.**, Kunimori, H., **Matsumoto, K.**, **Araki, H.**, **Iwata, T.**, Funazaki, K., **Sasaki, S.**: 2009, Different kinds of Observation of Lunar Rotation and Gravity for SELENE-2, The Moon, moons & Planets, (Kazan, Russia, Aug. 24-26, 2009).

Hanada, H., **Sasaki, S.**, **Kikuchi, F.**, **Noda, H.**, **Iwata, T.**, Funazaki, K., Kawano, N., Kunimori, H., RISE Project Team: 2009, Observation of Lunar Rotation by Future Landing Missions, European Geosciences Union General Assembly 2009, (Vienna, Austria, Apr. 19-24, 2009).

Hanada, H., **Sasaki, S.**, **Kikuchi, F.**, **Noda, H.**, **Matsumoto, K.**, **Araki, H.**, **Iwata, T.**, Funazaki, K., Kunimori, H., RISE Project Team: 2009, Lunar Rotation and Gravity by SELENE-2, The 2nd Annual NLSI Lunar Science Forum, (Moffett Field, California, USA, Jul. 21-23, 2009).

Hanada, H., **Sasaki, S.**, **Kikuchi, F.**, **Noda, H.**, **Matsumoto, K.**, **Araki, H.**, **Iwata, T.**, Funazaki, K., Kunimori, H., RISE Project Team: 2009, Observation of lunar rotation in SELENE-2, JPL Seminar, (JPL, NASA, USA, Jul. 16, 2009).

Hanaoka, Y.: 2009, Professional-Amateur Collaborative Network of Japan for White-light Imaging Observations of the July 2009 Eclipse, The Dynamic Solar Corona, (Suzhou, China, Jul. 23-26, 2009).

Hanawa, T.: 2009, A New Scheme to Solve Gas Disks around Stars, 4th Int. Conf. on Numerical Modeling of Space Plasma Flows, (Chamonix, France, Jun. 30, 2009)

Hara, H., JAXA SOLAR-C WG: 2009, JAXA SOLAR-C Mission, SPD 2009 meeting in American Astronomical Society, (Boulder, CO, USA, Jun. 14-18, 2009).

Hara, H., JAXA SOLAR-C WG: 2009, The SOLAR-C Plan-A, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Hara, H.: 2009, Coronal Heating Mechanisms Resticted from Coronal Plasma Motions in Active region Loops, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Hara, H.: 2009, Plasma motions and heating by magnetic reconnection in 2007 May 19 flare, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Hara, H.: 2009, SOLAR-C out-of-ecliptic mission orbit and spacecraft systems, 3rd Solar Orbiter Workshop, (Sorrent, Italy, May 25-29, 2009).

Hara, H.: 2009, The SOLAR-C Mission, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Hara, H.: 2009, The SOLAR-C Plan-A, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Hara, H.: 2010, Instrumentation & Data rates, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Hara, H.: 2010, Plan A Mission description, The 2nd SOLAR-C

Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Harada, Y.: 2009, Long-Term Polar Motion on a Quasi-Fluid Planet with an Elastic Lithosphere: Semi-Analytic Solutions of the Time-Dependent Equation, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Harada, Y.: 2009, Long-Term Polar Motion on a Quasi-Fluid Planet with an Elastic Lithosphere: Semi-Analytic Solutions of the Time-Dependent Equation, AGU Fall Meeting, (San Francisco, USA, Dec. 14-18, 2009).

Harada, Y.: 2009, True Polar Wander Due to Surface Mass Loading on Mars: Implication to Evolution of the Tharsis Province, European Geosciences Union General Assembly 2009, (Vienna, Austria, Apr. 19-24, 2009).

Hatsutori, Y., **Gouda, N.**, **Kobayashi, Y.**, **Yano, T.**, Yamada, Y., Nano-JASMINE Project Team: 2009, A very small satellite for space astrometry: Nano-JASMINE, Commission 8 Science meeting at IAU Gneral Assembly 27, (Rio de Janeiro, Brazil, Aug. 10, 2009).

Hatsutori, Y., Kobayashi, Y., **Gouda, N.**, **Yano, T.**, Yamada, Y., Niwa, Y.: 2009, Development of 5cm Reflecting Telescope for Nano-JASMINE, 27th Int. Symp. on Space Technology and Science, (Tsukuba, Japan, Jul. 5-12, 2009).

Hayano, Y., **Takami, H.**, **Oya, S.**, **Hattori, M.**, **Saito, Y.**, **Watanabe, M.**, **Minowa, Y.**, **Egner, S.**, **Guyon, O.**, **Ito, M.**, **Garrel, V.**, **Colley, S.**, Dinkins, M., **Golota, T.**, **Kurakami, T.**, **Nabeshima, Y.**, Saito, N., Wada, S., **Shibuya, T.**, **Iye, M.**: 2009, A Laser Guide Star Adaptive Optics System of Subaru Telescope, OSA topical meeting on Nonlinear Optics, (Honolulu, HI, USA, Jul. 12-17, 2009).

Hayashi, M., **Takeda, T.**, **Nakayama, H.**: 2009, 4D2U demonstration, Astronomical Data Analysis Software and Systems XIX, (Sapporo, Japan, Oct. 4-8, 2009).

Hibi, Y., **Matsuo, H.**, Nagata, H., Ikeda, H., Fujiwara, M.: 2009, The Cryogenic Digital Readout Module with GaAs JFET Ics, 13th Int. Workshop on Low Temperature Detectors LTD-13, (Stanford, USA, Jul. 20-24, 2009).

Hibi, Y.: 2009, Cyogenic digital readout system with GaAs JFETs, 10th Workshop on Submillimeter-Wave Receiver Technologies in Eastern Asia, (Wuxi, China, Nov. 15-18, 2009).

Hibi,Y., **Matsuo, H.**, Nagata, H., Ikeda, H., Fujiwara, M.: 2009, The cryogenic digital readout system with GaAs JFETs, The Int. Workshop on Terahertz Technology 2009, (Osaka, Japan, Nov. 30-Dec. 3, 2010).

Hirota, T.: 2010, Detailed studies on newly found chemically young cores in the Aquila region, The Third Tokyo-NRO Workshop Submillimeter and THz Astrochemistry, (Tokyo, Japan, Mar. 17-18, 2010).

Hong, P. K., Sugita, S., Okamura, N., Sekine, Y., **Terada, H.**, **Takato, N.**, **Hayano, Y.**, **Fuse, T.**, Kawakita, H., Wooden, D. H., Young, E. F., Lucey, P. G., **Furusho, R.**, **Watanabe, J.**, Haruyama, J., Nakamura, R., Kurosawa, K., Hamura, T., Kadono, T.: 2010, Hot Bands Observation of Water in Ejecta Plume of LCROSS Impact Using the Subaru Telescope, 41st Lunar and Planetary Science Conf. (LPSC 2010), (Woodlands, Texas, USA, Mar. 1-5, 2010).

Honma, M.: 2009, Galactic Structure Seen with VLBI Astrometry, New Science Enabled by Microarcsecond Astronmetry, (Socorro, NM, USA, Jul. 21-23, 2009).

Hosokawa, T.: 2010, Evolution of Massive Protostars and Formation of Massive Stars, Multi-Phase Interstellar Medium and Dynamics of Star Formation, (Nagoya, Japan, Feb. 28-Mar. 2, 2010).

Hwang, N.: Nov-09, Extended Star Clusters and Galaxy Evolution, The 2nd Japan-Korea Joint Workshop: Galaxy Build-Up Across Cosmic Ages and Environments, (Hiraizumi, Japan, Nov. 25-28, 2009).

Ikeda, H., Ogawa, M., Hirota, M., Mori, S., Aoshima, C., Ohnishi, T., Ishibashi, S., **Noda, H.**, **Ishihara, Y.**, **Iwata, T.**, Namiki, N.: 2009, Lunar Gravity Field Estimation Results of SELENE (KAGUYA), Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Imanishi, M.: 2009, Buried AGNs in luminous infrared galaxies and the origin of galaxy down-sizing, Huntinh for the Dark: The Hidden Side of Galaxy Formation, (Malta, Oct, 19-23, 2009).

Imanishi, M.: 2009, Luminous buried AGNs in the local universe, Joint Subaru/Gemini Science Conf., (Kyoto, Japan, May 18-21, 2009).

Imanishi, M.: 2009, Luminous buried AGNs in the local universe and the origin of galaxy downsizing, TIARA Workshop on AGN and Star Formation, (Taipei, Taiwan, Nov. 16-20, 2009).

Imanishi, M.: 2009, Nobeyama millimeter interferometric observations of high density molecular gas in luminous infrared galaxies, Millimeter and Submillimeter Astronomy at High Angular Resolution, (Taipei, Taiwan, Jun. 8-12, 2009).

Imanishi, M.: 2009, The AGN-starburst connections and origin of galaxy downsizing in the distant universe, SPICA Joint European - Japanese Workshop, (Oxford, UK, Jul. 6-8, 2009).

Inoue, H., **Noguchi, T.**, Kohno, K.: 2009, SIS junction using as a microwave noise source, 9th European Conf. on Applied Superconductivity, (Dresden, Germany, Sep. 15, 2009).

Inoue., T.: 2009, Turbulence and Magnetic Field Amplification in SNRs, Shock Waves, Turbulence, and Particle Acceleration, (Pohang, Korea, Nov. 18-21, 2009).

Inoue., T.: 2010, Nonlinear Evolution of Thermal Instability Behind Shock Wave and Formation of Molecular Cloud, Multi-Phase Interstellar Medium and Dynamics of Star Formation, (Nagoya, Japan, Feb. 28-Mar. 2, 2010).

Ishihara, Y., Morota, T., **Iwata, T.**, **Matsumoto, K.**, **Goossens, S.**, **Sasaki, S.**: 2010, Lunar large impact basin structures and implications for thermal history, 41st Lunar and Planetary Science Conf. (LPSC 2010), (Woodlands, Texas, USA, Mar. 1-5, 2010).

Ishihara, Y., Namiki, N., Sugita, S., **Matsumoto, K.**, **Goossens, S.**, **Araki, H.**, **Noda, H.**, **Sasaki, S.**, **Iwata, T.**, **Hanada, H.**: 2009, Localized gravity/topography correlation and admittance spectra on the Moon, European Geosciences Union General Assembly 2009, (Vienna, Austria, Apr. 19-24, 2009).

Ishihara, Y., Yamamoto, M.-Y., Kanao, M.: 2009, Current Status of Infrasound Pilot Observation at Japanese Islands and SYOWA Antarctica, and Development of New Infrasound Sensor using Optical Sensing Method, AGU Fall Meeting, (San Francisco, USA, Dec. 14-18, 2009).

Ishihara, Y.: 2009, results by RSAT/VRAD and LALT: new insight on the crustal thickness, SELENE-2 LBBS (Seismology) Team int. meeting on lunar interior, (Tokyo, Japan, Nov. 24, 2009).

Ishikawa, R.: 2009, 3D view of transient horizontal magnetic fields in the convection zone with Hinode, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Ito, H., **Aoki, W.**, Honda, S., Beers, T. C., Tominaga, N.: 2009, A very low upper limit for a Beryllium abundance of a carbon-enhanced metal-poor star BD+44°493, IAU Symp. 268 "Light Elements in the Universe", (Geneva, Switzerland, Nov. 9-13, 2009).

Ito, H., **Aoki, W.**, Honda, S., Beers, T. C., Tominaga, N.: 2009, The 9th Magnitude CEMP Star BD+44°493: Origin of its Carbon Excess and Beryllium Abundance, IAU symp. 265 "Chemical Abundances in the Universe: Connecting First Stars to Planets", (Rio de Janeiro, Brazil, Aug. 10-14, 2009).

Ito, H., **Aoki, W.**, Honda, S., Beers, T. C.: 2009, The Exceptionally Bright Carbon-Enhanced Metal-Poor Star BD+44°493, Joint Subaru/Gemini Science Conf., (Kyoto, Japan, May 18-21, 2009).

Ito, H., **Kino, M.**, **Kawakatu, N.**, Yamada, S.: 2009, Non-Thermal emissions from shocked shells driven by powerful AGN jets, HEPRO II conf., (Buenos Aires, Argentina, Oct. 26, 2009).

Ito, T., Higuchi, A.: 2009, Impact probability of the Oort cloud comets on planets, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Ito, T., **Yoshida, F.**, Ibrahimov, M.: 2009, Photometric observations of young asteroid families at Maidanak Observatory, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Ito, T.: 2010, JSPS Asia-Africa science platform program, 2010 Asian asteroid observation network workshop, (Lijiang, China, Mar. 11-13, 2010).

Iwata, I.: 2009, Detections of ionizing radiation from high-z galaxies, Reionization with Multi-frequency Datasets, (Stockholm, Sweden, Jul. 17-21, 2009).

Iwata, I.: 2009, Observations of Forming Galaxies at z>4 and Cosmic Reionization, Joint Subaru/Gemini Science Conf., (Kyoto, Japan, May 18-21, 2009).

Iwata, I.: 2009, Observing the Dark Universe with Euclid, WISH - Wide-field Imaging Surveyor for High-redshift, (Noordwijk, Nederlanden, Nov. 17-18, 2009).

Iwata, T., **Hanada, H.**, **Noda, H.**, **Kikuchi, F.**, **Tazawa, S.**, Kunimori, H., **Matsumoto, K.**, Imai, K., **Ishihara, Y.**, **Harada, Y.**, **Sasaki, S.**: 2010, Lunar, Martian, and Jovian Geodesy and Science Mission using VLBI and Astrometrical Technology, IVS GM2010, (Hobart, Australia, Feb. 7-14, 2010).

Iwata, T., Namiki, N., **Hanada, H.**, **Matsumoto, K.**, **Noda, H.**, **Ishihara, Y.**, **Goossens, S.**, **Liu, Q.**, **Kikuchi, F.**, Ogawa, M., **Asari, K.**, **Tsuruta, S.**, **Ishikawa, T.**, **Harada, Y.**, Kawano, N., **Sasaki, S.**, Takano, T.: 2010, Results of the Global Mapping of Lunar Gravity Field by KAGUYA, OKINA, and OUNA, Int. Symp. on Lunar Science, (Macau, China, Mar. 25-26, 2010).

Iwata,T., **Noda, H.**, Misawa, H., Imai, K., Kondo, T., Takeuchi, H., Tsuchiya, F., Kumamoto, A., Nakajo, T., Nariyuki, Y., Inoue, M., Kawano, N.: 2009, A study on the Observation System for LLFAST: the Lunar Low Frequency Astronomical Telescope, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Iye, M.: 2009, Adaptive Optics in Astronomy, OSA topical meeting on Nonlinear Optics, (Honolulu, HI, USA, Jul. 12-17, 2009).

Kajino, T.: 2009, An Alternative to Inflation?: Critical Role of Neutrino Anisotropic Stress in CMB, Erice Int. School of Nuclear Physics 31st Course on Neutrinos in Cosmology, in Astro-, Particle- and Nuclear-Physics, (Erice, Sicily, Italy, Sep. 16-20, 2009).

Kajino, T.: 2009, Neutrinos in Nuclear Physics and Astrophysics and US-Japan Collaboration, Third Joint Meeting of the Nuclear Physics Divisions of the APS and JPS, (Hawaii, USA, Oct. 13-17, 2009).

Kajino, T.: 2009, Nuclear Astrophysics in Japan: Understanding the Universe with the Origin and Evolution of Elements, Elizabeth and Frederick White Conference on Nuclear Astrophysics in Australia, (Canberra, Australia, Aug. 24-26, 2009).

Kajino, T.: 2009, Nucleosynthetic Signature of Supernovae and Collapsars (Gamma Ray Bursts), JUSTIPEN-EFES Workshop on Unstable Nuclei, (Wako, Japan, Dec. 7-9, 2009).

Kajino, T.: 2009, R-process in Supernovae and Gamma-Ray Bursts, 7th Japan-China Joint Nuclear Physics Symp., (Tsukuba, Japan, Nov. 9-13, 2009).

Kajino, T.: 2009, The Big-Bang Cosmology and Nucleosynthesis, 5th European Summer School on Nuclear Astrophysics, (Santa Tecla, Sicily, Italy, Sep. 21-27, 2009).

Kajino, T.: 2010, Effects of primordial magnetic field and neutrino on CMB, The First APCosPA (Asia Pacific Center for Cosmology and Particle Astrophysics) Winter School on Cosmology and Particle Astrophysics, (Taipei, Taiwan, Jan. 18-19, 2010).

Kajino, T.: 2010, Observational constraints on brane world cosmology, The First APCosPA (Asia Pacific Center for Cosmology and Particle Astrophysics) Winter School on Cosmology and Particle Astrophysics, (Taipei, Taiwan, Jan. 18-19, 2010).

Kajino, T.: 2010, Supernova nucleosynthesis and neutrino oscillation, The First APCosPA (Asia Pacific Center for Cosmology and Particle Astrophysics) Winter School on Cosmology and Particle Astrophysics, (Taipei, Taiwan, Jan. 18-19, 2010).

Kajino, T.: 2010, SUSY-particle catalized Big-Bang Nucleosynthesis and DM, The First APCosPA (Asia Pacific Center for Cosmology and Particle Astrophysics) Winter School on Cosmology and Particle Astrophysics, (Taipei, Taiwan, Jan. 18-19, 2010).

Kamata, S., Sugita, S., Abe, Y., **Ishihara, Y.**, **Harada, Y.**, Namiki, N., **Iwata, T.**, **Hanada, H.**, **Araki, H.**: 2010, The thermal evolution of the lunar farside inferred from viscoelastic deformation of impact basins, 4th KAGUYA (SELENE) Science Working Team Meeting, (Tokyo, Japan, Jan. 31-Feb. 2, 2010).

Kamata, S., Sugita, S., Abe, Y., **Ishihara, Y.**, **Harada, Y.**, Namiki, N., **Iwata, T.**, **Hanada, H.**, **Araki, H.**: 2010, Viscoelastic deformation of lunar basins : implications for lunar farside thermal history based on selenodetic data of Kaguya, 41st Lunar and Planetary Science Conf. (LPSC 2010), (Woodlands, Texas, USA, Mar. 1-5, 2010).

Kambe, E.: 2009, Progress in Developing the Fiber-Link of 188-cm Telescope and HIDES, The 4th Workshop on Extra-Solar Planet Search with Accurate Radial Velocity Measurements, (Sapporo, Japan, Oct. 7-9, 2009).

Kameya, O.: 2009, Water Vapor Masers in the NGC 7538 Region, New Science Enabled by Microarcsecond Astronmetry, (Socorro, NM, USA, Jul. 21-23, 2009).

Kandori, R., **Tamura, M.**, **Kusakabe, N.**, Nakajima, Y.: 2009, Wide-field NIR Imaging Polarimetry of Brown Dwarfs in NGC 2024, New Technologies for Probing the Diversity of Brown Dwarfs and Exoplanets, (Shanghai, China, Jul. 19-24, 2009).

Kano, R.: 2009, Connectivities between Corona and Photosphere viewed from Microflares, 2009 XRT Team Meeting, (Boston, USA, Jun. 22-24, 2009).

Kano, R.: 2009, Multi-thermal structures above a polar region observed with XRT and EIS, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Kano, R.: 2010, Coronal heating, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Kashikawa, N.: 2009, High-z Galaxies at the epoch of reionization, Reionization with Multi-frequency Datasets, (Stockholm, Sweden, Jul. 17-21, 2009).

Kashikawa, N.: 2009, High-z Galaxies at the epoch of reionization, Focus week of the Epoch of the reionization, (IPMU, Japan, Nov. 30-Dec. 2, 2009).

Kato, Y., Takahashi, R., **Miyoshi, M.**: 2009, 3-D Radiative Properties of Hot Accretion Flows onto the Galactic Center Black Hole, Galactic Center Workshop 2009, (Shanghai, China, Oct. 19-23, 2009).

Katsukawa, Y., Jurcak, J.: 2009, Photosphere-Chromosphere Coupling as Observed with HINODE, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Katsukawa, Y.: 2009, Persistent circulating motion of umbral dots observed with HINODE SOT, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Katsukawa, Y.: 2009, Photospheric Dynamics around Sunspots Observed from HINODE, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Katsukawa, Y.: 2010, Basic requirements to the instrument including priority of chromospheric lines, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Katsukawa, Y.: 2010, Hinode – Space Mission to Investigate the Sun, The First Asia-Europe Physics Summit, (Tsukuba, Japan, Mar. 24-26, 2010).

Katsukawa, Y.: 2010, Plan B Mission description, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Kawabe, R.: 2009, Recent Activity at NRO: Observational Results and Upgrading of NRO 45m and ASTE Telescopes, 10th Workshop on Submillimeter-Wave Receiver Technologies in Eastern Asia, (Wuxi, China, Nov. 15-18, 2009).

Kawagoe, S., **Takiwaki, T.**, **Kotake, K.**: 2009, Neutrino oscillations in MHD supernova explosions, Int. Conf. on Topics in Astroparticle and Underground Physics 2009 (TAUP2009), (Rome, Italy, Jul. 1-5, 2009).

Kawakami, A., **Takeda, M.**, **Uzawa, Y.**, Wang, Z.: 2009, Design and Fabrication of Epitaxial NbN/MgO/NbN SIS Mixers, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Kawakatu, N., **Wada, K.**: 2009, Formation of High-redshift (z>6) Quasars Driven by Nuclear Starbursts, Max Planck Institute for Extraterrestrial Physics (MPE) seminar, (Munich, Germany, Nov. 13, 2009).

Kawamura, S.: 2009, Ground-based Interferometers and their Science Reach, 8th Edoardo Amaldi Conf. on Gravitational Waves, (New York, USA, Jun. 21-26, 2009).

Kawamura, S.: 2009, Japanese Gravitational Wave Detectors: LCGT and DECIGO, Frontiers in Optics 2009/Laser Science XXV, (San Jose, USA, Oct. 11-15, 2009).

Kikuchi, F., et al.: 2010, Lunar gravimetry by inverse VLBI method/ iVLBI mission of SELENE‐2, 4th KAGUYA (SELENE) Science Working Team Meeting, (Tokyo, Japan, Jan. 31-Feb. 2, 2010).

Kikuchi, F., **Iwata, T.**, Kawano, N., **Sasaki, S.**, **Liu, Q.**: 2009, Application of VLBI technique for lunar and planetary exploration, European Geosciences Union General Assembly 2009, (Vienna, Austria, Apr. 19-24, 2009).

Kim, M. K.: 2009, The Outflows Traced by Water Masers in Orion-KL, New Science Enabled by Microarcsecond Astronmetry, (Socorro, NM, USA, Jul. 21-23, 2009).

Kino, M.: 2010, Blazars: Progress, Problems, Prospects, Variability of blazars on diverse timescales, (Hiroshima, Japan, Mar. 4-5, 2010).

Kitazato, K., Abe, M., **Kuroda, D.**, Yoshikawa, M.: Photometric observations of Hayabusa follow-on mission targets, European Planetary Science Congress 2009, (Potsdam, Germany, Sep. 13-18, 2009).

Kiuchi, H.: 2010, Photonic Millimeter-wave generation and transmission techniques for the ALMA high-frequency Radio Interferometer, Symp. on Innovative Lightwave, Millimeter-Wave and THz Technologies for Future Sustainable Network, (San Diego, CA, USA, Mar. 26, 2010).

Kobayashi, H.: 2009, Status and Future Plan of VERA Project, New Science Enabled by Microarcsecond Astronmetry, (Socorro, NM, USA, Jul. 21-23, 2009).

Kobayashi, H.: 2010, VLBI activities in Eastern Asia and Pacific, Siam Physics Conf. 2010, (Kanchanaburi, Thailand, Mar. 25-27, 2010).

Kobayashi, M.: 2009, A Theoretical Model for LAE in Hierarchical Galaxy Formation: Comparison with the LAEs at z=4.86 in the COSMOS 2-sq. degree Field, 2009 COSMOS Team Meeting, (Ehime, Japan, Jun. 15-18, 2009).

Kobayashi, M.: 2009, Semi-Analytic Model for high-z LAEs, 25th IAP Annual Colloq. "The Lyman Alpha Universe", (Paris, France, Jul. 6-10, 2009).

Kobayashi, N., Araya, A., Shiraishi, H., Kakuma, H., Satoh, T., Okada, T., Tanaka, S., Kurita, K., Takeuchi, N., Okamoto, T., **Ishihara, Y.**, **Sasaki, S.**, Miyamoto, H.: 2009, Seismology in MELOS, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Kodama, T.: 2009, Inside-out propagation of star forming activity in clusters, Galaxies Evolution and Environment, (Kuala Lumpur, Malaysia, Apr. 3, 2009).

Kodama, T.: 2009, Panoramic Views of Cluster Evolution since z=3 with Subaru, Galaxy Clusters in the Early Universe, (Pucón, Chile, Nov. 12, 2009).

Kodama, T.: 2009, Panoramic Views of Cluster Formation and Evolution, The 2nd Japan-Korea Joint Workshop: Galaxy Build-Up Across Cosmic Ages and Environments, (Hiraizumi, Japan, Nov. 25-28, 2009).

Kojima, T., **Kroug, M.**, **Takeda, M.**, Shan, W., **Fujii, Y.**, **Uzawa, Y.**, Wang, Z.: 2009, Terahertz waveguide SIS mixers with epitaxial NbTiN films and Nb junctions, 9th European Conf. on Applied Superconductivity, (Dresden, Germany, Sep. 15, 2009).

Kojima, T., **Kroug, M.**, **Takeda, M.**, **Shitov, S.**, **Uzawa, Y.**, Shan, W., **Fujii, Y.**, Wang, Z.: 2009, A low noise NbTiN-based SIS mixer for terahertz band, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Kokubo, E.: 2009, Formation of Terrestrial Planets: The Basic Dynamical Model, The Dynamics of Discs and Planets, (Cambridge, UK, Aug. 17-21, 2009).

Kokubo, E.: 2009, Planetesimal Dynamics, Winter Workshop on Planetary Astrophysics, (Beijing, China, Dec. 12-19, 2009).

Komiya, Y.: 2009, Near field cosmology with binary, high mass IMF, and hierarchical galaxy formation, Tours 2009: Tours Symp. on Nuclear Physics and Astrophysics VII, (Kobe, Japan, Nov. 16-20, 2009).

Komiya, Y.: 2010, Extremely metal-poor stars and hierarchical models of the Galactic chemical evolution, Origin of Matter and Evolution of Galaxies, (Osaka, Japan, Mar. 8-10, 2010).

Kotake, K.: 2009, Magnetically-driven explosion of massive stars: a possible route to collapsar and beyond, Shocking universe, (Venice, Itary, Sep. 14-18, 2009).

Kotake, K.: 2009, Neutrino-driven explosion of massive stars, New frontiers in QCD, (Kyoto, Japan, Feb. 2, 2010).

Kotake, K.: 2009, Probing supernova mechanisms through gravitational waves, Spanish relativity meeting, (Valencia, Spain, Sep. 5-11, 2009).

Kotake, K.: 2009, Probing the central engine of core-collapse supernovae through gravitational-wave and neutrino emissions, Gravitational Wave + High-Energy Neutrino Workshop, (Paris, France, May 18-21, 2009).

Kotake, K.: 2010, 2D and 3D modeling of core-collapse supenova explosion, 15th workshop on nuclear astrophysics, (Tegernsee, Germany, Mar. 22-27, 2010).

Kroug, M., **Kojima, T.**, **Takeda, M.**, **Fujii, Y.**, **Miyachi, A.**, **Noguchi, T.**, **Uzawa, Y.**, Wang, Z.: 2009, Low noise SIS mixer for the 790-950 GHz band, 10th Workshop on Submillimeter-Wave Receiver Technologies in Eastern Asia, (Wuxi, China, Nov. 15-18, 2009).

Kuno, N., Tosaki, T., **Onodera, S.**, **Muraoka, K.**, **Kaneko, H.**, **Sawada, T.**, **Nakanishi, K.**, Komugi, S., **Tamura, Y.**, Kohno, K., **Kawabe, R.**, **Arimoto, N.**, Okamoto, S.: 2009, NRO Legacy Project: Survey of Giant Molecular Clouds in M33, FIR2009: the ISM of Galaxies in the Far-Infrared and Sub-Millimetre-Joint Discussion at the 2009 XXVII IAU General Assembly (IAU-JD 14), (Reo de Janero, Brasil, Aug. 12-14, 2009).

Kusakabe, M., **Kajino, T.**, Yoshida, T., Mathews, G. J.: 2009, Big Bang nucleosynthesis with long-lived strongly interacting relic particles, IAU Symp. 268 "Light Elements in the Universe", (Geneva, Switzerland, Nov. 9-13, 2009).

Kusakabe, M., **Kajino, T.**, Yoshida, T., Mathews, G. J.: 2009, Effect of Long-lived Strongly Interacting Relic Particles on Big Bang Nucleosynthesis, Third Joint Meeting of the Nuclear Physics Divisions of the APS and JPS, (Hawaii, USA, Oct. 13-17, 2009).

Kusakabe, N.: 2009, Wide-Field NIR Imaging Polarimetry of Brown Dwarfs in M42, New Technologies for Probing the Diversity of Brown Dwarfs and Exoplanets, (Shanghai, China, Jul. 19-24, 2009).

Kuznetsov, S. A., **Melnikov, V. F.**: 2009, The role of the self-absorption and Razin effect in formation of the frequency spectrum of solar flare microwave emission, The Pulkovo conf. "The Year of Astronomy: Solar and Solar-Terrestrial Physics – 2009", (Saint-Peterbug, GAO RAS, Russia, Jul. 5-11, 2009).

Li, J., Cao, X., Takeda, M., **Matsuo, H.**, Wang, Z., Shi, S.: 2009, Shot-Noise Characteristics of NbN Superconducting Tunnel Junctions, 20th Int. Symp. on Space Terahertz Technology, (Charlottesville, VA, USA, Apr. 22-24, 2009).

Liu, Q., **Goossens, S.**, **Hanada, H.**, **Kikuchi, F.**, **Matsumoto, K.**, Chen, M., Ping, J., **Iwata, T.**: 2010, Same-beam VLBI technique and its applications, 4th KAGUYA (SELENE) Science Working Team Meeting, (Tokyo, Japan, Jan. 31-Feb. 2, 2010).

Liu, Q., **Kikuchi, F.**, **Matsumoto, K.**, **Goossens, S.**, **Hanada, H.**, **Iwata, T.**, Namiki, N., **Noda., H.**, **Ishihara, Y.**, Ping, J., **Asari, K.**, **Ishikawa, T.**, **Tsuruta, S.**, **Harada, Y.**, **Sasaki, S.**: 2009, Studies on same-beam VLBI and 4-way Doppler techniques of SELENE for improving lunar gravity field model, Lunar/Planetary Meeting & Forum, (Beijing/Wuhan, China, Jun. 15-27, 2009).

Machida, M. N.: 2009, Circumplanetary disk formation around proto-gas giant planets and implication of the satellite formation, Icy Moons and Origin of Jupiter and other Giant Planets, (Sapporo, Japan, Nov. 9-10, 2009).

Machida, M. N.: 2009, Gas Giant Planet Formation in Magnetized Disks, Magneto-Rotational Instability in Protoplanetary Disks, (Kobe, Japan, Jun. 2-3, 2009).

Magara, T.: 2009, Characteristic Development of Magnetic Shear in a Flare-producing Sunspot obtained from Vector Magnetic-field Measurements by Hinode, 2009 UN BSS and IHY Workshop, (Daejeon, Korea, Sep. 24, 2009).

Magara, T.: 2009, Characteristic Development of Magnetic Shear in a Flare-productive Sunspot obtained by Hinode, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Magara, T.: 2009, Dynamics of Coronal Mass Ejections, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Makino, J.: 2010, GRAPE-DR and Next-Generation GRAPE, Accelerated Computing, (Tokyo, Jan. 28, 2010).

Makino, J.: 2009, Cosmogrid Project, GLIF 2009, (Daejeon, Korea, Oct. 27, 2009).

Makino, J.: 2009, Gamma-rays from Earth-Size dark-matter halos, Seminar at Ebisuzaki Lab, RIKEN, (Wako, Japan, Nov. 20, 2009).

Makino, J.: 2009, GRAPE-DR and Next-Generation GRAPE, Accelerator-based Computing and Manycore Manycore and Accelerator-based Computing for Physics and Astronomy Applications, (Menlo Park, CA, USA, Dec. 2, 2009).

Makino, J.: 2009, Stellar Dynamics of Massive Blackhole Binaries, Workshop on Massive Black Hole Binaries and Their Coalescence in Galactic Nuclei, (Beijing, China, Jul. 21, 2009).

Maruyama, T., **Yasutake, N.**, **Kajino, T.**, **Cheoun, M.-K.**, Ryu, C.-Y.: 2010, Asymmetric Neutrino Reaaction from Magnetized

Proto-Neutron Stars in fully Relativisitc Framework including Hyperons, Origin of Matter and Evolution of Galaxies, (Osaka, Japan, Mar. 8-10, 2010).

Masada, Y.: 2009, A possible roles of Magneto-Rotational Instability in the solar, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Masada, Y.: 2010, Pointing stability of Hinode and requirements for Solar-C, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Matsumoto, K., et al.: 2009, Gravity field of the Moon derived from SELENE (Kaguya), JPL Seminar, (JPL, NASA, USA, Jul. 16, 2009).

Matsumoto, K., **Goossens, S.**, **Ishihara, Y.**, **Liu, Q.**, **Kikuchi, F.**, **Iwata, T.**, Namiki, N., **Hanada, H.**, **Noda, H.**, Kawano, N., Lemoine, F. G., Rowlands, D. D.: 2010, Lunar gravity field modeling with 4-way Doppler data obtained during whole RSAT mission period, 4th KAGUYA (SELENE) Science Working Team Meeting, (Tokyo, Japan, Jan. 31-Feb. 2, 2010).

Matsumoto, K., **Goossens, S.**, **Ishihara, Y.**, **Liu, Q.**, **Kikuchi, F.**, **Iwata, T.**, Namiki, N., **Noda, H.**, **Hanada, H.**, Kawano, N., RSAT/VRAD Mission Team: 2010, An Improved Lunar Gravity Field Model from SELENE and Historical Tracking Data, IVS GM2010, (Hobart, Australia, Feb. 7-14, 2010).

Matsumoto, K., **Goossens, S.**, Namiki, N., **Ishihara, Y.**, **Liu, Q.**, **Kikuchi, F.**, **Iwata, T.**, **Noda, H.**, **Hanada, H.**, RSAT/VRAD: 2009, A new lunar garvity field model from SELENE and historical tracking data, European Geosciences Union General Assembly 2009, (Vienna, Austria, Apr. 19-24, 2009).

Matsumoto, K.: 2009, An Improved Lunar Gravity Field Model from SELENE and Historical Tracking Data, NASA/GSFC Seminar, (GSFC, NASA, USA, Sep. 16, 2009).

Matsumoto, N.: 2009, Astrometric Observations of Methanol Masers toward W3(OH) with JVN, New Science Enabled by Microarcsecond Astronmetry, (Socorro, NM, USA, Jul. 21-23, 2009).

Matsuo, H., Arai, T., Nitta, T., Kosaka, A.: 2009, Far-infrared spectroscopic imaging of interstellar material around eta-Carinae, IAU XXVII General Assembly, (Rio De Janeiro, Brazil, Aug. 03-14, 2009).

Matsuo, H., **Hibi, Y.**, Nagata, H., Ikeda, H., Fujiwara, M.: 2009, Cryogenics Integrated Circuits for Superconducting Terahertz Camera, The 9th Japan-Taiwan Microelectronics Int. Symp., (Tokyo, Japan, Oct. 28-29, 2009).

Matsuo, H., **Hibi, Y.**, Nagata, H., Ikeda, H., Fujiwara, M.: 2009, GaAs-JFET Cryogenic Readout Electronics for the Superconducting Terahertz Digital Camera, The 34th Int. Conf. on Infrared, Millimeter, and Terahertz Waves, (Busan, Korea, Sep. 21-25, 2009).

Matsuo, H., **Hibi, Y.**, **Suzuki, T.**, **Naruse, M.**, **Noguchi, T.**, **Sekimoto, Y.**, **Uzawa, Y.**, Nagata, H., Ikeda, H., Ariyoshi, S., Otani, C., Nitta, T., Yao, Q.-J., Fujiwara, M.: 2009, Superconducting THz Camera with GaAs-JFET Cryogenic Readout Electronics, 13th Int. Workshop on Low Temperature Detectors LTD-13, (Stanford, USA, Jul. 20-24, 2009).

Matsuo, H.: 2009, Far-Infrared Interferometry from Antarctica, 10th Workshop on Submillimeter-Wave Receiver Technologies in Eastern Asia, (Wuxi, China, Nov. 15-18, 2009).

Matsuo, H.: 2010, AKARI FIR spectroscopic imaging of interstellar material around Eta Carinae, Global-COE Workshop on Eta Carinae and its Surrounding Media, (Nagoya, Japan, Jan. 10, 2010).

Matsuo, H.: 2010, Far-Infrared Interferometry from Antarctica, 21th Int. Symp. on Space Terahertz Technology, (Oxford, UK, Mar. 23-25, 2010).

Melnikov, V. F.: 2009, Microwave diagnostics of the position of acceleration site and pitch-angle anisotropy of energetic electrons in flaring loops, The Pulkovo conf. "The Year of Astronomy: Solar and Solar-Terrestrial Physics – 2009", (Saint-Peterbug, GAO RAS, Russia, Jul. 5-11, 2009).

Melnikov, V. F., Reznikova, V. E., **Shibasaki, K.**, Pyatakov, N. P., Myagkova, I., Ji, H.: 2009, Microwave diagnostic of the position of an acceleration site and pitch-angle anisotropy of energetic electrons, The 9th RHESSI general Workshop, (Genova, Italy, Sep. 1-5, 2009).

Melnikov, V. F.: 2009, Possibilities for constraining acceleration models from microwave observations, The 9th RHESSI general Workshop, (Genova, Italy, Sep. 1-5, 2009).

Michikoshi, S.: 2009, *N*-body simulation of planetesimal formation through gravitational instability, Magneto-Rotational Instability in Protoplanetary Disks, (Kobe, Japan, Jun. 2-3, 2009).

Michikoshi, S.: 2009, *N*-body simulation of planetesimal formation through gravitational instability, The Dynamics of Discs and Planets, (Cambridge, UK, Sep. 17-21, 2009).

Miki, S., **Takeda, M.**, Fujiwara, M., Sasaki, M., Otomo, A., Wang, Z.: 2009, Compact Packaging of Superconducting Nanowire Single Photon Detectors with Optical Cavity, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Miki, S., **Takeda, M.**, Fujiwara, M., Sasaki, M., Otomo, A., Wang, Z.: 2009, Superconducting Nanowire Single Photon Detectors with NbTiN Thin Films, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Miki, S., **Takeda, M.**, Fujiwara, M., Sasaki, M., Wang, Z.: 2009, Compact packaging of optical cavity structured SNSPDs with high optical coupling efficiency, 9th European Conf. on Applied Superconductivity, (Dresden, Germany, Sep. 15, 2009).

Miyazaki, A.: 2009, First Phase of the East Asia VLBI Network, New Science Enabled by Microarcsecond Astronmetry, (Socorro, NM, USA, Jul. 21-23, 2009).

Miyazaki, A.: 2009, NMA monitoring observations of Sagittarius A* at short mm-wavelengths, Galactic Center Workshop 2009, (Shanghai, China, Oct. 19-23, 2009).

Miyazaki, A.: 2009, Wide-field mapping observations of multi-ammonia emission lines in the Galactic center region, Galactic Center Workshop 2009, (Shanghai, China, Oct. 19-23, 2009).

Miyazaki, A.: 2010, Present status of the first phase East Asia VLBI Network, ミニワークショップ「KVN－山口アレイで狙うサイエンス」, (Yamaguchi, Japan, Mar. 16, 2010).

Miyoshi, M., **Furuya, R.**, **Kawaguchi, N.**, Nakajima, J., Irimajiri, Y., Koyama, Y., Sekido, M., **Ujihara, H.**, Ishitsuka, K. J. I., Asaki, Y., Kato, Y., Takeuchi, H., Tsuboi, M., Kasuga, T., Tomimatsu, A., Takahashi, M., Eriguchi, Y., Yoshida, S., Koide, S., Takahashi, R., Oka, T.: 2009, An Earliest Black Hole Imager at Andes, The

19th Workshop on General Relativity and Gravitation in Japan (JGRG19), (Tokyo, Japan, Nov. 30-Dec. 4, 2009).

Miyoshi, M., **Furuya, R.-S.**, **Kawaguchi, N.**, Nakajima, J., Irimajiri, Y., Koyama, Y., Sekido, M., **Ujihara, H.**, Ishitsuka, K. J. I., Asaki, Y., Kato, Y., Takeuchi, H., Tsuboi, M., Kasuga, T., Tomimatsu, A., Takahashi, M., Eriguchi, Y., Yoshida, S., Koide, S., Takahashi, R., Oka, T.: 2009, A First Black Hole Imager, Caravan-sub at Andes, Galactic Center Workshop 2009, (Shanghai, China, Oct. 19-23, 2009).

Miyoshi, M., **Furuya, R.-S.**, **Kawaguchi, N.**, Nakajima, J., Irimajiri, Y., Koyama, Y., Sekido, M., **Ujihara, H.**, Ishitsuka, K., J., I., Asaki, Y., Kato, Y., Takeuchi, H., Tsuboi, M., Kasuga, T., Tomimatsu, A., Takahashi, M., Eriguchi, Y., Yoshida, Si., Koide, S., Takahashi, R., Oka, T.: 2010, An Earliest Black Hole Imager at Andes, Probing Strong Gravity near Black Holes, (Prague, Cheko, Feb. 15-18, 2010).

Miyoshi, M., **Oyama, T.**, Shen, Z.-Q.: 2009, VLBA Synthesis Imagings of SgrA* at 43 GHz, Galactic Center Workshop 2009, (Shanghai, China, Oct. 19-23, 2009).

Miyoshi, M., Shen, Z.-Q., **Oyama, T.**, Takahashi, R., Kato Y.: 2009, Oscillation phenomena in Sagittarius A*, Galactic Center Workshop 2009, (Shanghai, China, Oct. 19-23, 2009).

Miyoshi, M.: 2009, Slit-Modulation Imaging Method for Detecting Periodic Structural Change in SgrA*, Galactic Center Workshop 2009, (Shanghai, China, Oct. 19-23, 2009).

Morota, T., Haruyama, J., Ohtake, M., Matsunaga, T., Yokota, Y., Honda, C., Sugihara, T., Kimura, J., **Ishihara, Y.**, Kawamura, T., Iwasaki, A., Saiki, K., Takeda, H.: 2010, Mare Volcanism on the Farside and in the Orientale Region of the Moon, 41st Lunar and Planetary Science Conf. (LPSC 2010), (Woodlands, Texas, USA, Mar. 1-5, 2010).

Motoyama, K., Shang, H., **Hasegawa, T.**, **Umemoto, T.**: 2010, Test of radiation-driven implosion model by comparison between hydrodynamic simulation and molecular line observations, Multi-Phase Interstellar Medium and Dynamics of Star Formation, (Nagoya, Japan, Feb. 28-Mar. 2, 2010).

Murakami, N., Baba, N., **Nishikawa, J.**, **Yokochi, K.**, **Tamura, M.**, Hashimoto, N., Abe, L.: 2009, Eight-Octant Phase-Mask Coronagraph by Using Liquid Crystal and Photonic Crystal Devices, OIE '09 The Eighth Japan-Finland Joint Symp. on Optics in Engineering, (Tokyo, Japan, Sep. 3-4, 2009).

Murakami, N., **Nishikawa, J.**, **Yokochi, K.**, **Tamura, M.**, Baba, N., Hashimoto, N., Abe, L.: 2009, Eight-octant phase-mask coronagraph for detecting Earth-like exoplanets around partially resolved stars, Pathways towards habitable planets, (Barcelona, Spain, Sep. 14-18, 2009).

Murakami, N., Inabe, T., Komatsu, T., **Nishikawa, J.**, Hashimoto, N., Kurihara, M., Baba, N., **Tamura, M.**: 2010, Laboratory demonstrations of liquid-crystal eight-octant phase-mask coronagraph, The 6th Exoplanet Conf., (Mitaka, Japan, Jan. 18-20, 2010).

Muraoka, K., Tosaki, T., **Kuno, N.**, Kohno, K., **Nakanishi, K.**, Sorai, K.: 2009, ASTE CO(3–2) Mapping of the Spiral Galaxy M 83: GMA Properties in the Whole Optical Disk, Millimeter and Submillimeter Astronomy at High Angular Resolution, (Taipei, Taiwan, Jun. 8-12, 2009).

Muraoka, K., Tosaki, T., **Kuno, N.**, Kohno, K., **Nakanishi, K.**, Sorai, K.: 2009, ASTE CO(3–2) Mapping of the Spiral Galaxy M 83: GMA Properties in the Whole Optical Disk, FIR2009: the ISM of Galaxies in the Far-Infrared and Sub-Millimetre-Joint Discussion at the 2009 XXVII IAU General Assembly (IAU-JD 14), (Reo de Janero, Brasil, Aug. 12-14, 2009).

Nagashima, K.: 2009, Local helioseismology of the polar region dynamics by Hinode/SOT, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Nagata, H., **Matsuo, H.**, **Hibi, Y.**, Ikeda, H., Fujiwara, M.: 2009, Development of cryogenic analog amplifiers based on GaAs-JFET technology for high impedance array sensors, 13th Int. Workshop on Low Temperature Detectors LTD-13, (Stanford, USA, Jul. 20-24, 2009).

Nakajima, T., **Miyazawa, C.**, **Iwashita, H.**, **Kuno, N.**, **Kawabe, R.**, Sakai, T., Kohno, K., Nishimura, A., Kimura, K., **Ogawa, H.**, **Asayama, S.**, **Noguchi, T.**: 2009, Development of the 100-GHz Band 2SB SIS Receiver Systems for the NRO 45-m Telescope, 10th Workshop on Submillimeter-Wave Receiver Technologies in Eastern Asia, (Wuxi, China, Nov. 15-18, 2009).

Nakamura, K., Yoshida, T., Shigeyama, T., **Kajino, T.**: 2009, Lithium, beryllium, and boron production in core-collapse supernovae, IAU Symp. 268 "Light Elements in the Universe", (Geneva, Switzerland, Nov. 9-13, 2009).

Nakamura, K., Yoshida, T., Shigeyama, T., **Kajino, T.**: 2010, Light elements from core-collapse supernovae: the neutrino-process and spallation reactions, Origin of Matter and Evolution of Galaxies, (Osaka, Japan, Mar. 8-10, 2010).

Nakamura, K.: 2009, Consistency of Equations for the Single Scalar Field Case in Second-order Gauge-invariant Cosmological Perturbation Theory, The 19th Workshop on General Relativity and Gravitation in Japan (JGRG19), (Tokyo, Japan, Nov. 30-Dec. 4, 2009).

Nakamura, K.: 2009, Gauge-invariant formulation of the second-order cosmological perturbations: -Single scalar field case-, Workshop in YITP on "Non-linear cosmological perturbations", (Kyoto, Japan, Apr. 13-24, 2010).

Nakamura, K.: 2009, Lithium, Beryllium, and Boron Production in Core-collapse Supernovae, IAU Symp. 268 "Light Elements in the Universe", (Geneva, Switzerland, Nov. 9-13, 2009).

Nakamura, K.: 2009, The neutrino-process and spallation reactions in core-collapse supernovae, Japan-US Theory Institute for Physics with Exotic Nuclei Workshop, (Wako, Japan, Dec. 7, 2009).

Nakayama, H.: 2009, Entire topography of lunar surface, SIGGRAPH Asia 2009, (Yokohama, Japan, Dec. 16-19, 2009).

Nakazato, T.: 2009, Current Status of Single-dish Data Analysis Software for ALMA, Astronomical Data Analysis Software and Systems XIX, (Sapporo, Japan, Oct. 4-8, 2009).

Namiki, N., **Iwata, T.**, **Hanada, H.**, **Matsumoto, K.**, **Goossens, S.**, **Ishihara, Y.**, Sugita, S., **Noda, H.**, **Sasaki, S.**, **Araki, H.**: 2009, Study of Compensation Mechanism of Lunar Impact Basins From New Gravity and Topographic Data of Kaguya, 41st annual meeting of the Division for Planetary Sciences of the American Astronomical Society, (Fajardo, Puerto Rico, Oct. 5-9, 2009).

Namiki, N., Sugita, S., **Matsumoto, K.**, **Goossens, S.**, **Ishihara, Y.**,

Noda, H., **Sasaki, S.**, **Iwata, T.**, **Hanada, H.**, **Araki, H.**, Kubo, N., Mori, A., Sato, M.: 2009, Comparative study of compensation mechanism of lunar impact basin from new gravity field model of SELENE (Kaguya), The Moon, moons & Planets, (Kazan, Russia, Aug. 24-26, 2009).

Namiki, N., Sugita, S., **Matsumoto, K.**, **Goossens, S.**, **Ishihara, Y.**, **Noda, H.**, **Sasaki, S.**, **Iwata, T.**, **Hanada, H.**, **Araki, H.**, Kurosawa, K., Matsumura, M., Yokoyama, M., Kamata, S., Kubo, N., Mori, A., Sato, M.: 2009, Comparative Study of Compensation Mechanism of Lunar Impact Basins, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Namiki, N., Sugita, S., **Matsumoto, K.**, **Goossens, S.**, **Ishihara, Y.**, **Noda, H.**, **Sasaki, S.**, **Iwata, T.**, **Hanada, H.**, **Araki, H.**, Kurosawa, K., Matsumura, M., Yokoyama, M., Kamata, S., Kubo, N., Mori, A., Sato, M.: 2009, Comparative study of compensation mechanism of lunar impact basins from new gravity filed model of SELENE (Kaguya), European Geosciences Union General Assembly 2009, (Vienna, Austria, Apr. 19-24, 2009).

Narukage, N.: 2009, The Thermal Structures of Solar Corona, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Narukage, N.: 2009, Time evolution of coronal structure in T-EM diagram examined with calibrated XRT responses, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Naruse, M., **Sekimoto, Y.**, **Suzuki, T.**, **Hibi, Y.**, **Matsuo, H.**, **Uzawa, Y.**, **Noguchi, T.**: 2009, Design of SIS Imaging Array for Terahertz Astronomy, The 34th Int. Conf. on Infrared, Millimeter, and Terahertz Waves, (Busan, Korea, Sep. 21-25, 2009).

Nishikawa, J., **Yokochi, K.**, **Murakami, N.**, Abe, L., Kotani, T., **Tamura, M.**, Kurokawa, T., Tavrov, A. V., Takeda, M.: 2009, A Coronagraph with an Unbalanced Nulling Interferometer and Adaptive Optics, Pathways towards habitable planets, (Barcelona, Spain, Sep. 14-18, 2009).

Nishizawa, A., Taruya, A., Hayama, K., Kawamura, S., Sakagami, M.: 2009, Searching for nontensorial polarizations of stochastic gravitational waves with laser interferometers, The 19th Workshop on General Relativity and Gravitation in Japan (JGRG19), (Tokyo, Japan, Nov. 30-Dec. 4, 2009).

Nishizawa, A.: 2009, Probing non-tensorial polarizations of stochastic gravitational-wave background, 8th Edoardo Amaldi Conf. on Gravitational Waves, (New York, USA, Jun. 21-26, 2009).

Noda, H., **Araki, H.**, **Goossens, S.**, **Ishihara, Y.**, **Matsumoto, K.**, Haruyama, J., Ohtake, M., Matsunaga, T.: 2009, Lunar global topographic model by Laser Altimeter (LALT) aboard KAGUYA (SELENE), Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Noda, H., **Araki, H.**, **Tazawa, S.**, **Goossens, S.**, **Ishihara, Y.**, **Matsumoto, K.**, Kawano, N., **Sasaki, S.**, Kamiya, I., Oberst, J., Shum, C. K.: 2009, KAGUYA (SELENE) Laser Altimeter (LALT): one year in orbit, European Geosciences Union General Assembly 2009, (Vienna, Austria, Apr. 19-24, 2009).

Noda, H., et al.: 2009, Lunar Global shape and polar topography derived from SELENE (Kaguya), JPL Seminar, (JPL, NASA, USA, Jul. 16, 2009).

Noda, H., et al.: 2009, Lunar surface reflectance by LALT aboard KAGUYA, AGU Fall Meeting, (San Francisco, USA, Dec. 14-18, 2009).

Noda, H., Kunimori, H., **Araki, H.**, **Oya, S.**, **Okita, K.**, **Katayama, M.**, **Sasaki, S.**, **Takato, N.**, **Tazawa, S.**, **Tsuruta, S.**, **Hanada, H.**, **Harada, Y.**, **Watanabe. J.**, Otsubo, T.: 2010, Proposed Lunar Laser Ranging experiment for SELENE-2, Int. Astron. Forum "ASTROKAZAN – 2010", (Kazan, Russia, Feb. 9-10, 2010).

Noda, T., Hashimoto, M., **Yasutake, N.**, Maruyama, T., Tatsumi, T., Fujimoto, M.: 2010, Cooling of Exotic Stars with Quark-Hadron Mixed Phase in the Color Superconductive State, Origin of Matter and Evolution of Galaxies, (Osaka, Japan, Mar. 8-10, 2010).

Noguchi, T., **Suzuki, T.**, Endo, A., **Naruse, M.**, **Hibi, Y.**, **Matsuo, H.**, **Sekimoto, Y.**: 2009, Effect of Lifetime Broadening of Superconducting Energy Gap on Quasiparticle Tunneling Current, 20th Int. Symp. on Space Terahertz Technology, (Charlottesville, VA, USA, Apr. 22-24, 2009).

Noguchi, T., **Suzuki, T.**, Endo, A., **Tamura, T.**: 2009, Investigation of subgap current at low temperature in Nb/Al SIS junctions, 9th European Conf. on Applied Superconductivity, (Dresden, Germany, Sep. 15, 2009).

Noguchi, T.: 2009, A proposal of a new type of pair-breaking detector using a SIS transmission line, 10th Workshop on Submillimeter-Wave Receiver Technologies in Eastern Asia, (Wuxi, China, Nov. 15-18, 2009).

Noguchi, T.: 2009, Contribution of imaginary part of the gap energy on superconducting films and devices, 10th Workshop on Submillimeter-Wave Receiver Technologies in Eastern Asia, (Wuxi, China, Nov. 15-18, 2009).

Noguchi, T.: 2009, Energy-gap Broadening Effect on the SIS Tunneling Current, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Noguchi, T.: 2009, Superconducting tunnel junction detectors for submillimeter-wave astronomy, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Oe, M.: 2009, Proposal from the HOTARU project, ETSI Plugtest 3, (Lannion, France, Oct. 16-23, 2009).

Oguri, M.: 2009, ALMA and Virtual Observatory, ALMA Users Meeting, (Mitaka, Japan, Dec. 21-23, 2009).

Oguri, M.: 2009, Astrobiology Network in Japan, 9th European Workshop on Astrobiology, (Brussels, Belgium, Oct. 12-14, 2009).

Oguri, M.: 2009, Cluster strong lensing, Science Opportunities with Wide-Field Imaging and Spectroscopy of the Distant Universe, (Princeton, New Jersey, USA, Nov. 9-11, 2009).

Oguri, M.: 2009, Cosmology with clusters of galaxies, NIMS-APCTP workshop: String theory and cosmology, (Daejeon, Korea, Sep. 24-26, 2009).

Oguri, M.: 2009, Current Developments in Virtual Observatories for Astronomy, First Meeting of the ICSU Strategic Coordination Committee on Information and data, (Paris, France, Octl. 15-16, 2009).

Oguri, M.: 2009, Finding bright high-z galaxies through gravitational lensing, The 2nd Japan-Korea Joint Workshop: Galaxy Build-Up Across Cosmic Ages and Environments, (Hiraizumi, Japan, Nov. 25-28, 2009).

Oguri, M.: 2009, Gravitational lens time delays: Past, present and future, Dark universe: from cosmology to planets, (Hakone, Japan, Oct. 14-16, 2009).

Oguri, M.: 2009, WG on Astrophysically Important Spectral Lines, IAU XXVII General Assembly, (Rio De Janeiro, Brazil, Aug. 03-14, 2009).

Oguri, M.: 2009, Lessons Learned during the Development and Operation of Virtual Observatory, Astronomical Data Analysis Software and Systems XIX, (Sapporo, Japan, Oct. 4-8, 2009).

Ohsuga, K.: 2009, Global Radiation-Magnetohydrodynamic Simulations of Black Hole Accretion Flow and Outflow: Unified Model of Three States, Accretion and Ejection in AGN: A Global New, (Como, Italy, Jun. 22-26, 2009).

Okamoto, T. J.: 2009, Cool material from the lower atmosphere in a quiescent prominence, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Okamoto, T. J.: 2010, Topology and dynamics of magnetic solar atmosphere, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Okamura, N., Sugita, S., Hong, P. K., Kawakita, H., Sekine, Y., **Terada, H.**, **Takato, N.**, **Hayano, Y.**, **Fuse, T.**, Wooden, D. H., Young, E. F., Lucey, P. G., **Furusho, R.**, **Watanabe, J.**, Haruyama, J., Nakamura, R., Kurosawa, K., Hamura, T., Kadono, T.: 2010, The Estimate of the Amount of Ejecta in LCROSS Mission, 41st Lunar and Planetary Science Conf. (LPSC 2010), (Woodlands, Texas, USA, Mar. 1-5, 2010).

Omukai, K.: 2009, Low-metallicity star formation, Tours 2009: Tours Symp. on Nuclear Physics and Astrophysics VII, (Kobe, Japan, Nov. 16-20, 2009).

Omukai, K.: 2010, Low-metallicity star formation: the Pop III-II transition, The First Stars and Galaxies: Challenges for the Next Decade, (Austin, USA, Mar. 10, 2010).

Onodera, S., **Kuno, N.**, Tosaki, T., **Muraoka, K.**, **Kaneko, H.**, **Sawada, T.**, **Nakanishi, K.**, Komugi, S., **Tamura, Y.**, Kohno, K., **Kawabe, R.**, **Arimoto, N.**, **Okamoto, S.**: 2009, NRO Legacy Project: GMC Survey in M33 – First Year Results, Millimeter and Submillimeter Astronomy at High Angular Resolution, (Taipei, Taiwan, Jun. 8-12, 2009).

Ootsubo, T., **Watanabe, J.**, Honda, M., **Ishiguro, M.**, Sarugaku, Y., Sakon, I.: 2009, Mid-infrared Spectroscopic Observations of Comet 17P/Holmes, IAU Symp. 263 "Icy Bodies in the Solar System,", (Rio de Janeiro, Brazil, Aug. 3-7, 2009).

Orozco Suarez, D.: 2009, Emergence of vertical magnetic fields in quiet Sun granules: statistical properties, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Orozco Suarez, D.: 2009, Center-to-limb variation of the internetwork magnetic field vector distribution derived from Hinode observations, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Oshima, A.: 2009, Study of an angular resolution of the GRAPES-3 array, 31th Int. Cosmic Ray Conf., (Lodz, Poland, Jul. 7-15, 2009).

Oyama, T.: 2009, The Astrometric Feasibility and Accuracy of VERA, New Science Enabled by Microarcsecond Astronmetry, (Socorro, NM, USA, Jul. 21-23, 2009).

Petrova, N., **Hanada, H.**, Akutina, M.: 2009, Computer simulation of star transition across the prime meridian for the future observations by the Lunar polar telescope in the Japanese project ILOM, European Planetary Science Congress 2009, (Potsdam, Germany, Sep. 13-18, 2009).

Pyatakov, N. P., Gorbikov, S. P., **Melnikov, V. F.**: 2009, Modeling of the dynamics of gyrosynchrotron emission from flaring loops, The Pulkovo conf. "The Year of Astronomy: Solar and Solar-Terrestrial Physics – 2009", (Saint-Peterbug, GAO RAS, Russia, Jul. 5-11, 2009).

Pyo, T.-S.: 2009, Studying the Origin of Outflows from YSOs with SUBARU and GEMINI, Joint Subaru/Gemini Science Conf., (Kyoto, Japan, May 18-21, 2009).

Qiu, W., Wang, Z., **Takeda, M.**, Miki, S., Terai, H., Shimakage, H., Kawakami, A.: 2009, Fabrication and Characterization of High Quality Low Critical Current Density NbN/AlN/NbN tunnel junctions, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Reznikova, V. E., **Melnikov, V. F.**, Ji, H.: 2009, Spatial dynamics of flaring loop footpoints, The Pulkovo conf. "The Year of Astronomy: Solar and Solar-Terrestrial Physics – 2009", (Saint-Peterbug, GAO RAS, Russia, Jul. 5-11, 2009).

Reznikova, V. E., **Melnikov, V. F.**, **Shibasaki, K.**: 2009, Microwave diagnostics of the position of an acceleration site and pich-angle anisotropy of energetic electrons in the flare of 24 Aug 2002, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Saito, S., Takeda, M., Shimakage, H., **Uzawa, Y.**, Wang, A., Sekine, N., Hosako, I., Sakai, K.: 2009, Observation of phase transition in niobium nitride with THz time-domain spectroscopy, The 34th Int. Conf. on Infrared, Millimeter, and Terahertz Waves, (Busan, Korea, Sep. 21-25, 2009).

Saitoh, T. R.: 2009, How Should we Choose Star Formation criteria in High-Resolution Simulations, Monthly meeting on GRAPE in Korea, (Seoul, Korea, Apr. 10, 2009).

Saitoh, T. R.: 2009, Shock-Induced Starburst and Star Cluster Formation in Colliding Galaxies, Galaxy Wars: Stellar Populations and Star Formation in Interacting Galaxies, (Johnson City, TN, USA, Jul. 19-22, 2009).

Saitoh, T. R.: 2009, Star Cluster Formation in Interacting Galaxies, Star Formation and Star Clusters, (Seoul, Korea, Apr. 9, 2009).

Sako, S., **Shimojo, M.**, Kitabayashi, T.: 2009, Statistical study for X-ray jets occurred in the polar region, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Sakurai, T.: 2009, Sixty Years of Norikura Solar Observatory, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Sakurai, T.: 2010, Hinode Sciences: Achievements and Prospects, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Sasaki, S., Fujimoto, M., Takashima, T., Yano, H., Kasaba, Y., Takahashi, Y., Kimura, J., Tsuda, Y., Funase, R., Mori, O.: 2009, Exploration of Jovian Magnetosphere and Trojan Asteroids by a Solar Power Sail Mission, European Geosciences Union General Assembly 2009, (Vienna, Austria, Apr. 19-24, 2009).

Sasaki, S., Fujimoto, M., Yano, H., Kimura, J.: 2009, Exploration of the Jovian System by EJSM, Asia-Oceania Geoscience Society

6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Sasaki, S., Fujimoto, M., Yano, H., Takashima, T., Kasaba, Y., Takahashi, Y., Kimura, J., Kawaguchi, J., Kawakatsu, Y., Tsuda, Y.: 2009, Exploration of Jupiter System and Trojan Asteroids, European Planetary Science Congress 2009, (Potsdam, Germany, Sep. 13-18, 2009).

Sasaki, S., **Hanada, H.**, **Kikuchi, F.**, **Noda, H.**, **Araki, H.**, **Matsumoto, K.**, Funazaki, K., **Iwata, T.**, Kunimori, H., RISE Project Team: 2009, Lunar Rotation and Gravity Measurements by SELENE-2, European Planetary Science Congress 2009, (Potsdam, Germany, Sep. 13-18, 2009).

Sasaki, S., Hiroi, T., Arai, T., Helbert, J.: 2009, Space Weathering on Mercury: Simulation of Plagioclase Weathering, European Planetary Science Congress 2009, (Potsdam, Germany, Sep. 13-18, 2009).

Sasaki, S., Hiroi, T., Helbert, J.: 2009, Space Weathering on Mercury: Effect of Impact Mixing and Weathering of Anorthite, Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Sasaki, S., **Ishihara, Y.**, **Araki, H.**, **Noda, H.**, **Goossens, S.**, Namiki, N., **Iwata, T.**, **Hanada, H.**, **Matsumoto, K.**, Kawano, N., **Kikuchi, F.**, **Liu, Q.**, **Harada, Y.**, SELENE Gravity/Topography Group: 2009, Lunar Topography and Crustal Thickness by KAGUYA (SELENE) Selenodesy Observation, 41st annual meeting of the Division for Planetary Sciences of the American Astronomical Society, (Fajardo, Puerto Rico, Oct. 5-9, 2009).

Sasaki, S., **Ishihara, Y.**, **Araki, H.**, **Noda, H.**, **Goossens, S.**, Namiki, N., **Iwata, T.**, **Hanada, H.**, **Matsumoto, K.**: 2009, Topography and Crustal Thickness of the Moon by KAGUYA (SELENE) Selenodesy Observation, European Geosciences Union General Assembly 2009, (Vienna, Austria, Apr. 19-24, 2009).

Sasaki, S., **Ishihara, Y.**, **Araki, H.**, **Noda, H.**, **Hanada, H.**, **Matsumoto, K.**, **Goossens, S.**, Namiki, N., **Iwata, T.**, Ohtake, M.: 2010, Structure of the lunar South Pole-Aitken basin from KAGUYA (SELENE) gravity/topography, 41st Lunar and Planetary Science Conf. (LPSC 2010), (Woodlands, Texas, USA, Mar. 1-5, 2010).

Sasaki, S., **Ishihara, Y.**, **Araki, H.**, **Noda, H.**, **Hanada, H.**, **Matsumoto, K.**, **Goossens, S.**, Namiki, N., **Iwata, T.**, Ohtake, M.: 2010, Structure of the South Pole-Aitken basin from KAGUYA gravity/topography, 4th KAGUYA (SELENE) Science Working Team Meeting, (Tokyo, Japan, Jan. 31-Feb. 2, 2010).

Sasaki, S., **Ishihara, Y.**: 2010, Crustal Thickness and Structure of Impact Basins from Kaguya Data, Brown-Vernadsky Microsymposium 51: Compositional Structure of the Lunar Crust: The New View from the Moon, (Woodlands, Texas, USA, Feb. 27-28, 2010).

Sasaki, S., Namiki, N., **Hanada, H.**, **Araki, H.**, **Iwata, T.**, **Ishihara, Y.**, **Matsumoto, K.**, **Noda, H.**, **Goossens, S.**, KAGUYA topography/gravity team: 2009, Global Topography and Gravity of the Moon Observed by KAGUYA, European Planetary Science Congress 2009, (Potsdam, Germany, Sep. 13-18, 2009).

Sasaki, S., Namiki, N., **Hanada, H.**, **Araki, H.**, **Iwata, T.**, **Ishihara, Y.**, **Noda, H.**, **Matsumoto, K.**, **Goossens, S.**, KAGUYA topography/gravity team: 2009, Global Topography and Gravity of the Moon Observed by KAGUYA, The 2nd Annual NLSI Lunar Science Forum, (Moffett Field, California, USA, Jul. 21-23, 2009).

Sasaki, S.: 2009, Keynote Speech: Icy Moons and Origin of Jupiter and other Giant Planets, Icy Moons and Origin of Jupiter and other Giant Planets, (Sapporo, Japan, Nov. 9-10, 2009).

Sasaki, S.: 2010, Mars Dust Counter on board NOZOMI, CPS Cosmic Dust Workshop, (Kobe, Japan, Mar. 11, 2010).

Sekiguchi, K.: 2009, IYA2009, NUM-ITC-UNESCO Remote Sensing and Space Science Laboratory, (National University of Mongolia, Ulaanbaatar, Jun. 29, 2009).

Sekiguchi, K.: 2010, Evaluations and future plans of IYA2009 activities in Japan, Communicating Astronomy with the Public 2010, (Cape Town, South Africa, Mar. 15-19, 2010).

Sekiguchi, Y.: 2009, Full GR Simulations with Microphysics, Microphysics in Computational Relativistic Astrophysics: MICRA2009, (Copenhagen, Denmark, Aug. 24-28, 2009).

Sekiguchi, Y.: 2009, Rotating PopIII core collapse in Full general relativity, The 19th Workshop on General Relativity and Gravitation in Japan (JGRG19), (Tokyo, Japan, Nov. 30-Dec. 4, 2009).

Sekiguchi, Y.: 2009, Stellar core collapse in general relativity, 2009 Int. School on Numerical Relativity and Gravitation, (Seoul, Korea, Dec. 7-11, 2009).

Sekiguchi, Y.: 2009, Towards constrainging nuclear EOS using gravitational waves from binary, Numerical Relativity and Data Analysis Meeting, (Potsdam, Germany, Jul. 6-9, 2009).

Sekiguchi, Y.: 2010, Formulation and application of general relativistic neutrino leakagw scheme, New Frontiers in QCD 2010, (Kyoto, Japan, Jan. 18-Mar. 19, 2010).

Sekii, T.: 2009, Eigenfrequencies of solar high-degree f modes, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Sekii, T.: 2009, Solar-C and solar dynamo, 3rd Solar Orbiter Workshop, (Sorrent, Italy, May 25-29, 2009).

Sekii, T.: 2010, Helioseismology and dynamo science, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Sekimoto, Y., **Iizuka, Y.**, **Satou, N.**, **Ito, T.**, **Kumagai, K.**, **Kamikura, M.**, **Naruse, M.**, Shan, W. L.: 2009, Development of ALMA Band 8 Cartridge, 20th Int. Symp. on Space Terahertz Technology, (Charlottesville, VA, USA, Apr. 22-24, 2009).

Shi, S. C., Paine, S., Yao, Q. J., Li, X. X., Zhang, X. G., Lin, Z. H., Zhou, K. M., Huang, Q. G., **Matsuo, H.**, Yang, J., Zhang, Q. Z.: 2010, A THz FTS for Site Testing at Dome A, 21th Int. Symp. on Space Terahertz Technology, (Oxford, UK, Mar. 23-25, 2010).

Shibasaki, K.: 2009, Nonlinear and Diamagnetic Nature of Plasma and Activities in the Solar Atmosphere, SPD 2009 meeting in American Astronomical Society, (Boulder, CO, USA, Jun. 14-18, 2009).

Shibasaki, K.: 2009, Temperature dependent plasma upflows in the solar atmosphere and the coronal temperature, IAGA2009, (Sopron, Hungary, Aug. 23-30, 2009).

Shibasaki, K.: 2009, The flare on December 13, 2006 and the standard solar flare model, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Shiino, T., Todoroki, K., Minh, N., Jiang, L., Shiba, S., **Uzawa, Y.**, Maezawa, H., Sakai, N., Yamamoto, S.: 2009, Improvement of critical temperature of superconducting NbN and NbTiN thin films using an AlN buffer layer, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Shimakage, H., Miki, S., **Takeda, M.**, Wang, Z.: 2009, Fabrication of Superconducting MgB_2 Nanowires for Hot Electron Type Detectors, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Shimojo, M.: 2009, The statistical study of polar X-ray jets based on a thousand events, 2009 XRT Team Meeting, (Boston, USA, Jun. 22-24, 2009).

Shimojo, M.: 2010, Polar region activity, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Shimojo, M.: 2010, Science and possible instrumentation with Normal Incidence Imager, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Shimojo, M.: 2009, The event detection and the apparent velocity estimation based on computer vision, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Shirasaki, Y., Tanaka, M., **Ohishi, M.**, **Mizumoto, Y.**, **Yasuda, N.**, **Takata, T.**: 2009, AGN and Galaxy Clustering at $z = 0.3–3.0$ using the Japanese Virtual Observatory, IAU XXVII General Assembly, (Rio De Janeiro, Brazil, Aug. 03-14, 2009).

Shirasaki, Y., Tanaka, M., **Ohishi, M.**, **Mizumoto, Y.**, **Yasuda, N.**, **Takata, T.**: 2009, AGN and Galaxy Clustering at $z = 0.3$ to 3.0 using the Japanese Virtual Observatory, Joint Subaru/Gemini Science Conf., (Kyoto, Japan, May 18-21, 2009).

Shirasaki, Y., Tanaka, M., **Ohishi, M.**, **Mizumoto, Y.**, **Yasuda, N.**, **Takata, T.**: 2009, Environment Study of AGNs at $z = 0.3$ to 3.0 using the Japanese Virtual Observatory, Astronomical Data Analysis Software and Systems XIX, (Sapporo, Japan, Oct. 4-8, 2009).

Sôma, M., Tanikawa, K.: 2009, The Investigation of the Earth Rotation from Ancient Occultation Records, IAU XXVII General Assembly, (Rio De Janeiro, Brazil, Aug. 03-14, 2009).

Suematsu, Y.: 2009, Comments on Hinode Operation, ATST Science Working Group Meeting, (Boulder, CO, USA, Sep. 9-11, 2009).

Suematsu, Y.: 2009, Hinode Results and on possible Japanese Contribution to ATST project, Open House Discussion on Coordinating International Solar Astronomy Programs, AURA Solar Observatory Council-International Participants, (Freiburg, Germany, Oct. 7, 2009).

Suematsu, Y.: 2009, On magnetic origin and evolution of small-scale jets in the solar chromosphere, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Suematsu, Y.: 2009, On the evaluation of image quality of Hinode Solar Optical Telescope, AGU Fall Meeting, (San Francisco, USA, Dec. 14-18, 2009).

Suematsu, Y.: 2009, Review of Hinode Results, First EAST & ATST Workshop in Solar Physics, (Freiburg, Germany, Oct. 14-16, 2009).

Suematsu, Y.: 2009, Small-Scale Jets in the Solar Chromosphere: Their dynamics and Evolution, NSO Workshop#25, Chromospheric Structure and Dynamics, From Old Wisdom to New Insights, (NSO - Sunspot, NM, USA, Aug. 31-Sep. 4, 2009).

Suematsu, Y.: 2010, 1.5m telescope and focal plane instruments, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Suematsu, Y.: 2010, Magnetic origin of chromospheric small-scale jets, 2nd Meeting of Solar Small-Scale Transient Phenomena and Their Role in Coronal Heating, (ISSI, Bern, Switzerland, Jan. 25-28, 2010).

Suematsu, Y.: 2010, On science with next solar mission Solar-C plan-B, 2nd Meeting of Solar Small-Scale Transient Phenomena and Their Role in Coronal Heating, (ISSI, Bern, Switzerland, Jan. 25-28, 2010).

Sugimoto, K.: 2009, Single dish observation simulator in CASA, Astronomical Data Analysis Software and Systems XIX, (Sapporo, Japan, Oct. 4-8, 2009).

Suzuki, T., Honma, M., Higashiyama, K., Yoshida, T., **Kajino, T.**, Otsuka, T., Umeda, H., Nomoto, K.: 2009, Neutrino-Induced Reactions on Ni and Fe Isotopes and Nucleosynthesis in Stars, Third Joint Meeting of the Nuclear Physics Divisions of the APS and JPS, (Hawaii, Oct. 13-17, 2009).

Suzuki, T., **Noguchi, T.**, Endo, A., **Matsuo, H.**: 2009, Origin of Subgap Current in an SIS Junction, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Suzuki, T., **Noguchi, T.**, **Matsuo, H.**: 2009, Origin of subgap current in an SIS junction, 13th Int. Workshop on Low Temperature Detectors LTD-13, (Stanford, USA, Jul. 20-24, 2009).

Tachihara, K.: 2009, Small scale structure of cloud surface perturbed by nearby H II region, Millimeter and Submillimeter Astronomy at High Angular Resolution, (Taipei, Taiwan, Jun. 8-12, 2009).

Takahashi, R., **Arai, K.**, **Tatsumi, D.**, **Izumi, K.**, **Ishizaki, H.**, **Fukushima, M.**, **Yamazaki, T.**, **Fujimoto, M.-K.**, Tsubono, K., Takamori, A., DeSalvo, R., Sannibale, V., Bertolini, A., Márka, S., **Wakabayashi, Y.**, Miyakawa, O., Agatsuma, K., TAMA collaboration: 2009, Development of TAMA300 for LCGT, 8th Edoardo Amaldi Conf. on Gravitational Waves, (New York, USA, Jun. 21-26, 2009).

Takahashi, R., Kato, Y., **Miyoshi M.**: 2009, Imaging Simulations of Quasi-periodic Oscillation of Accretion Discs around Black Holes, Galactic Center Workshop 2009, (Shanghai, China, Oct. 19-23, 2009).

Takeda, M., **Kroug, M.**, **Kojima, T.**, **Fujii, Y.**, **Miyachi, A.**, **Kaneko, K.**, **Uzawa, Y.**, Wang, Z.: 2009, Superconducting properties of NbTiN films, 10th Workshop on Submillimeter-Wave Receiver Technologies in Eastern Asia, (Wuxi, China, Nov. 15-18, 2009).

Takeda, M., Nakayama, S., Saito, A., Shimakage, H., **Uzawa, Y.**, Ohshima, S., Wang, Z.: 2009, Measurements of Microwave Surface Resistances of NbN and NbTiN Thin Films, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Tamura, M., **Nakajima, Y.**, **Kandori, R.**, **Kusakabe, N.**, **Hashimoto, J.**, Sato, Y., **Saito, H.**, Nishiyama, S., **Fukue, T.**: 2009, Infrared Polarimetry of Star Forming Regions: IRSF and Subaru, An Int. Workshop on Interstellar Matter and Star Formation – A Multi-Wavelength Perspective, (Hyderabad, India, Oct. 5-7, 2009).

Tamura, M.: 2009, Direct Explorations of Exoplanets and Disks with Subaru, Joint Subaru/Gemini Science Conf., (Kyoto, Japan, May 18-21, 2009).

Tamura, M.: 2009, Possible Key Sciences of SPICA Mission: Planetary Formation, Exoplanets, and our Solar System, SPICA Joint European-Japanese Workshop, (Oxford, UK, Jul. 6-8, 2009).

Tamura, M.: 2009, Subaru Explorations of Exoplanets and Disks with its IR Coronagraph, New Technologies for Probing the Diversity of Brown Dwarfs and Exoplanets, (Shanghai, China, Jul. 19-24, 2009).

Tamura, M.: 2009, Subaru Explorations of Exoplanets and Steps toward JTPF for Habitable Planets, Pathways towards habitable planets, (Barcelona, Spain, Sep. 14-18, 2009).

Tamura, M.: 2009, Subaru, SPICA, and Future Japanese Space Missions, Missions for Exoplanets: 2010-2020, (Pasadena, USA, Apr. 21-23, 2009).

Tamura, M.: 2010, Status Report of the SEEDS Project, The 6th Exoplanet Conf., (Mitaka, Japan, Jan. 18-20, 2010).

Tamura, Y., Kohno, K., Hatsukade, B., **Kawabe, R.**, **Iono, D.**, **Ezawa, H.**, Tosaki, T., **Oshima, T.**, **Nakanishi, K.**, Takada, T., Wilson, G. W., Yun, M. S., Scott, K. S., Austermann, J. E., Hughes, D. H., Aretxaga, I., Perera, T. A., Matsuda, Y., Tanaka, K., Chung, A., Wilner, D.: 2009, The AzTEC/ASTE Survey for Submillimeter Galaxies in the SSA 22 Proto-Cluster at $z = 3.1$, Millimeter and Submillimeter Astronomy at High Angular Resolution, (Taipei, Taiwan, Jun. 8-12, 2009).

Tamura, Y.: 2009, SG Observations for 20 years, Specialist meeting for establishing gravity observation network, (Hsinchu, Taiwan, Dec. 7, 2009).

Tomida, K.: 2010, High-resolution RMHD simulation of Proto-stellar Collapse, Multi-Phase Interstellar Medium and Dynamics of Star Formation, (Nagoya, Japan, Feb. 28-Mar. 2, 2010).

Tonooka, H.: 2009, The education and public outreach activity of Hinode in Japan, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Tsujimoto, T., Bekki, K.: 2009, Evidence of a Major Merger in the Small Magellanic Cloud Imprinted in the Age-Metallicity Relation, The Milky Way and the Local Group – Now and in the Gaia Era, (The University of Heidelberg, Germany, Aug. 31-Sep. 4. 2009).

Tsujimto, T., Bland-Hawthorn, J., Freeman, K. C.: 2009, Galactic winds and the evolution of the Galactic abundance gradient, JD 5: Modelling the Milky Way in the Era of Gaia at IAU Gneral Assembly 27, (Rio de Janeiro, Brazil, Aug. 6-7, 2009).

Tsujimto, T., Bland-Hawthorn, J.: 2009, Chemical Evolution of D in the Local Disk, IAU Symp. 268 "Light Elements in the Universe", (Geneva, Switzerland, Nov. 9-13, 2009).

Tsujimto, T.: 2009, Galaxy Formation through Winds, Infall, and Merger: Learning from Galactic Archaeology, Huntinh for the Dark: The Hidden Side of Galaxy Formation, (Malta, Oct, 19-23, 2009).

Tsuneta, S.: 2009, JAXA's Solar-C Mission Opitons and Science Goals, 3rd Solar Orbiter Workshop, (Sorrent, Italy, May 25-29, 2009).

Tsuneta, S.: 2010, Future prospects for Solar-C, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Ueda, H., **Gouda, N.**, **Yano, Y.**, Koyama, H.: 2009, A New Approach to the Construction of Dynamical Structure of our Galaxy, JD 5: Modelling the Milky Way in the Era of Gaia at IAU Gneral Assembly 27, (Rio de Janeiro, Brazil, Aug. 6-7, 2009).

Ueda, K.: 2009, Orientation of X-ray bright points in the quiet Sun, Hinode-3: The 3rd Hinode Science Meeting, (Tokyo, Japan, Dec. 1-4, 2009).

Umemoto, T.: 2009, Concept of VSOP-2 Science Operation Center (SOC: tentative), Astronomical Data Analysis Software and Systems XIX, (Sapporo, Japan, Oct. 4-8, 2009).

Umemoto, T.: 2010, Overview of VSOP-2 (ASTRO-G) Project, The First Asia-Europe Physics Summit, (Tsukuba, Japan, Mar. 24-26, 2010).

Uzawa, Y., **Kojima, T.**, **Kroug, M.**, **Takeda, M.**, **Candotti, M.**, **Fujii, Y.**, **Kaneko, K.**, Shan, W., **Noguchi, T.**, Wang, Z.: 2009, Sensitive Terahertz SIS Receiver for the ALMA Telescope, Int. Superconductive Electronics Conf. 2009, (Fukuoka, Japan, Jun. 16-19, 2009).

Uzawa, Y., **Kojima, T.**, **Kroug, M.**, **Takeda, M.**, **Candotti, M.**, **Fujii, Y.**, Shan, W., **Kaneko, K.**, **Shitov, S.**, Wang, M.: 2009, Development of the 787-950 GHz ALMA Band 10 Cartridge, Int. Symp. on Space THz Technology 2009, (Virginia, USA, Apr. 20-22, 2009).

Wada, K.: 2009, Feedback on the dark domain, IAU Symp. 267 "Evolution of Galaxies and Central Black Holes: Feeding and Feedback", (Rio de Janeiro, Brazil, Aug. 10-14, 2009).

Wang, Z., Miki, S., **Takeda, M.**, Fujiwara, M., Sasaki, M.: 2009, Superconducting nanowire single photon detectors with epitaxial NbTiN thin films, 9th European Conf. on Applied Superconductivity, (Dresden, Germany, Sep. 15, 2009).

Watanabe, J., Honda, M., **Ishiguro, M.**, Ootsubo, T., Sarugaku, Y.: 2009, Early Phase of the Outburst of Comet 17P/Holmes, IAU Symp. 263 "Icy Bodies in the Solar System", (Rio de Janeiro, Brazil, Aug. 3-7, 2009).

Watanabe, J.: 2009, Star Week -A Successful Campaign in Japan-, Astronomy Education between Past and Future, Specail session SpS4, SpS-p:46, (Rio de Janeiro, Brazil, Aug. 3-14, 2009).

Watanabe, J.: 2010, The number is the matter: Great Success of IYA Activities in Japan, Communicating Astronomy with the Public 2010, (Cape Town, South Africa, Mar. 15-19, 2010).

Watanabe, T.: 2009, FeXVII Emission Lines Seen in the Hinode/EIS Observing Wavelengths, AGU Fall Meeting, (San Francisco, USA, Dec. 14-18, 2009).

Watanabe, T.: 2010, Particle acceleration – Non-equilibrium plasma diagnostics, The 2nd SOLAR-C Science Definition Meeting, (Sagamihara, Japan, Mar. 9-12, 2010).

Yagi, M.: 2009, An algorithm of refinement of image alignment for image subtraction, Astronomical Data Analysis Software and Systems XIX, (Sapporo, Japan, Oct. 4-8, 2009).

Yamada, Y., **Gouda, N.**, **Yano, T.**, **Hatsutori, Y.**, **Kobayashi, Y.**, Tsuiki, A., Kamiyoshi, S.: 2009, JASMINE as small satellite, JD 5: Modelling the Milky Way in the Era of Gaia at IAU Gneral Assembly 27, (Rio de Janeiro, Brazil, Aug. 6-7, 2009).

Yamada, Y., **Hatsutori, Y.**, Ushiyama, T., **Kobayashi, Y.**, **Gouda, N.**, **Yano, T.**: 2009, Design and Implementation of Mission On-Board Computer for Nano-JASMINE, 27th Int. Symp. on Space

Technology and Science, (Tsukuba, Japan, Jul. 5-12, 2009).

Yamada, Y., **JASMINE WG**: 2009, Nano-JASMINE –mission status and data analysis–, The Milky Way and the Local Group – Now and in the Gaia Era, (The University of Heidelberg, Germany, Aug. 31-Sep. 4. 2009).

Yamamoto, S., Nakamura, R., Matsunaga, T., Ogawa, Y., **Ishihara, Y.**, Morota, T., Hirata, N., Ohtake, M., Hiroi, T., Yokota, Y., Haruyama, J.: 2010, Global Distribution of Olivine Exposures on the Moon Revealed by SELENE Spectral Profiler, 41st Lunar and Planetary Science Conf. (LPSC 2010), (Woodlands, Texas, USA, Mar. 1-5, 2010).

Yamashita, T.: 2009, SPICA observations of transiting extra-solar planets, SPICA Joint European - Japanese Workshop, (Oxford, UK, Jul. 6-8, 2009).

Yano, T., **Araki, H.**, **Hanada, H.**, **Tazawa, S.**, **Asari, K.**, **Gouda, N.**, **Kobayashi, Y.**, Yamada, Y., Niwa, Y.: 2009, Centroiding experiment for determining the positions of stars with high precision, Astronomical Data Analysis Software and Systems XIX, (Sapporo, Japan, Oct. 4-8, 2009).

Yano, T., **Gouda, N.**, Ueda, H., Koyama, H.: 2009, A Method of the Estimation of Dynamical Structure of our Galaxy from Astrometric Data, JD 5: Modelling the Milky Way in the Era of Gaia at IAU Gneral Assembly 27, (Rio de Janeiro, Brazil, Aug. 6-7, 2009).

Yasutake, N., Maruyama, T., Tatsumi, T.: 2009, Hot hadron-quark mixed phase including hyperons, APS&APS joint meetings on Nuclear Physics 4th, (Hawaii, USA, Oct. 20, 2009).

Yasutake, N., Maruyama, T., Tatsumi, T.: 2009, The pasta structure in the hadron-quark phase transition and the effects on magnetized compact stars, Compact stars in the QCD phase diagram II, (Beijin, China, Jun. 19, 2009).

Yasutake, N., Maruyama, T., Tatsumi, T.: 2010, Finite size effects on hot hadron-quark mixed phase including hyperons, Origin of Matter and Evolution of Galaxies, (Osaka, Japan, Mar. 8-10, 2010).

Yasutake, N., Maruyama, T., Tatsumi, T.: 2010, Quark-hadron phase transition and the effects on the structures of compact stars, New Frontiers in QCD 2010, (Kyoto, Japan, Jun.19, 2010).

Yokochi, K., **Nishikawa, J.**, **Murakami, N.**, Abe, L., Kotani, T., **Tamura, M.**, Tavrov, V. A., Takeda, M., Kurokawa, T.: 2009, High dynamic range optical system for direct detection of exoplanets by unbalanced nulling interferometer and adaptive optics, Conf. on Lasers and Electro-Optics (CLEO), (Baltimore, USA, May 31-Jun. 5, 2009).

Yoshida, F., **Ito, T.**, **Takahashi, S.**, Nozawa, Y., Ibrahimov, M. A., Marshalkina, A. L.: 2009, Photometric observations of Young asteroid families at Maidanak Observatory, UBAI Seminar, (UBAI, Uzbekistan, Nov. 21, 2009).

Yoshida, F., The HSC Solar System Science Group: 2009, Survey Design for the Small Solar System Objects with the Hyper Suprime-Cam (HSC), Asia-Oceania Geoscience Society 6th Annual Meeting, (Suntech, Singapore, Aug. 11-15, 2009).

Yoshida, F., **Yagi, M.**, **Komiyama, Y.**, **Nakata, F.**, **Furusawa, H.**, Ohno, T., Okamura, S., Nakamura, T.: 2010, A possible collaboration with the Slitless Spectroscopic survey of Small Solar System Bodies by Subaru Telescope, 2010 Asian asteroid observation network workshop, (Lijiang, China, Mar. 11-13, 2010).

Yoshida, F.: 2009, 君もガリレオプロジェクト, 世界天文年イベント「君もガリレオプロジェクトinウズベキスタン」, (Uzbekistan, Oct. 22, 2009).

Yoshida, F.: 2009, An Insight into the Solar System History through the Size Distribution of Jupiter Trojans, CPS Workshop on Icy Moons and Origin of Jupiter and other Giant Planets, (Sapporo, Japan, Nov. 9-10, 2009).

Yoshida, F.: 2009, Asia-wide observational network for NEO observation, Asian Asteroid Observation Network Workshop, (Purple Mountain Observatory, China, Jul. 25-26, 2009).

Yoshida, F.: 2009, Asia-wide observational network for NEO observation, Maidanak User's Meeting, (Seoul, Korea, Jun. 30, 2009).

Yoshida, F.: 2009, Collaborations between NCU and NAOJ - 1. Improvements of the Maidanak observatory 2. The HSC survey for small solar system bodies, NCU-CPS Japan-Taiwan Planetary Science Workshop, (NCU, Taiwan, Dec. 8-9, 2009).

Yoshida, F.: 2009, Photometric observations of young asteroids families at Maidanak Observatory, Asian Asteroid Observation Network Workshop, (Purple Mountain Observatory, China, Jul. 25-26, 2009).

Yoshida, F.: 2009, Photometric observations of young asteroids families at Maidanak Observatory, Maidanak User's Meeting, (Seoul, Korea, Jun. 30, 2009).

Yoshida, F., **Yagi, M.**, **Komiyama, Y.**, **Nakata, F.**, **Furusawa, H.**, Ohno, T., Okamura, S., Nakamura, T.: 2010, Slitless Spectroscopy of Small Solar System Bodies on a Dark Cloud Curtain, 41st Lunar and Planetary Science Conf. (LPSC 2010), (Woodlands, Texas, USA, Mar. 1-5, 2010).

Yoshida, H.: 2009, Necessary conditions for super-integrability of Hamiltonian systems with homogeneous potential, CELMEC 5, (Viterbo, Italy, Sep. 6-11, 2009).

Yoshida, H.: 2010, Criteria for integrability of Hamiltonian systems based on differential Galois theory vs singular point analysis, China-Japan Joint workshop on Integrable Systems, (Shaoxing, China, Jan. 7-10, 2010).

Annual Report of the National Astronomical Observatory of Japan

Volume 12 Fiscal 2009