

# Subaru Imaging of Asymmetric Features in a Transitional Disk in Upper Scorpius

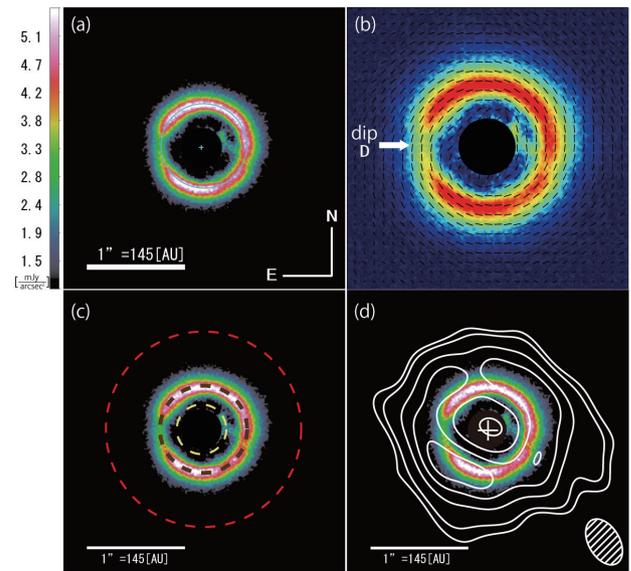
MAYAMA, S. (The Graduate University for Advanced Studies) MUTO, T. (Kogakuin University) TSUKAGOSHI, T., MOMOSE, M. (Ibaraki University)

KUSAKABE, N., KUDO, T., SUTO, H. (NAOJ) TAKAHASHI, Y., TAMURA, M. (University of Tokyo/NAOJ)

KUZUHARA, M. (TITECH) FUKAGAWA, M. (Osaka University) DONG, R. (Princeton University) TAKAMI, M. (ASIAA)

HASHIMOTO, J., WISNIEWSKI, J. P. (University of Oklahoma) FOLLETTE, K. (The University of Arizona) SEEDS team

We report high-resolution (0.07 arcsec) near-infrared polarized intensity images of the circumstellar disk around the star 2MASS J16042165-2130284 obtained with HiCIAO mounted on the Subaru 8.2 m telescope [1]. We present our  $H$ -band data, which clearly exhibits a resolved, face-on disk with a large inner hole for the first time at infrared wavelengths (Figure 1). We detect the centrosymmetric polarization pattern in the circumstellar material as has been observed in other disks. Elliptical fitting gives the semimajor axis, semiminor axis, and position angle of the disk as 63 AU, 62 AU, and  $-14^\circ$ , respectively. The disk is asymmetric, with one dip located at position angles of  $\sim 85^\circ$ . Our observed disk size agrees well with a previous study of dust and CO emission at submm wavelength with SMA. Hence, the near-infrared light is interpreted as scattered light reflected from the inner edge of the disk. We discuss the possibility that the asymmetric features which we have observed may be related to the existence of unseen bodies within the disk.



**Figure 1:**  $H$ -band HiCIAO images of J1604-2130. The saturated central area (radius =  $0''.2$ ) is masked in black. (a): the PI image of J1604-2130. The field of view (FOV) is  $2''.9 \times 2''.9$ . The unit of the color bar is  $\text{mJy}/\text{arcsec}^2$ . The light blue ellipse and plus sign are the best fit result of our elliptical disk model and the ellipse center. (b):  $H$ -band polarization vectors super-posed on the PI image. The vector directions indicate angles of polarization. The plotted vectors are based on  $7 [\text{pixel}] \times 7 [\text{pixel}]$  binning corresponding to the spatial resolution. The FOV is  $2'' \times 2''.0$ . The vector's lengths are arbitrary. (c): Red ( $r = 145 \text{ AU}$ ), brown ( $r = 63 \text{ AU}$ ), and yellow ( $r = 33 \text{ AU}$ ) circles superimposed on the PI image. (d): SMA  $880 \mu\text{m}$  continuum map [2] superimposed on the PI image. White color contours indicate 2, 3, 6, 9, and  $12\sigma$  intensity ( $1\sigma = 1.3 \text{ mJy}/\text{beam}$ ). The  $\sim 0''.5 \times 0''.3$  beam of SMA is shown in the bottom right.

## Reference

- [1] Mayama, S., et al.: 2012, *ApJ*, **760**, L26.  
 [2] Mathews, G. J., et al.: 2012, *ApJ*, **753**, 59.