Fireball Monitoring Observation at the Kiso Observatory

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Abstract

Sequential photographic monitor of fireballs was carried out with using an all-sky camera during the period between 1977 and 1990 at Kiso Observatory. Total number of observed fireballs is 742 and their apparent magnitude is brighter than +1 in average. The obtained data are valuable for investigating the annual variation of the number of the fireballs and for unexpected display of the meteor showers in this period. In this paper, we present the detailed data of all the fireballs detected with our system and their images as archival data. Some results of the statistical studies are also presented.

Key words: monitoring observation, fireballs, meteors, meteoroids, all sky camera, Kiso Observatory

1. Introduction

Monitoring observations of fireballs are important in two astronomical aspects. One is for estimating the influx rate of the fireball-class meteoroids into the Earth's atmosphere. This can be useful to the NEA monitoring program recommended by the IAU (Chapman 2008). In order to estimate the probability of impact hazard by the NEA objects, we should know the precise mass distribution of the NEAs, including fireball-class objects. However, the size of such objects is too small to be observed by ground-based telescopes used for the NEA monitoring programs in general. Hence the estimate of the influx rate of such objects should be done by such fireball monitoring observation. The other aspect is to determine the population index of the fireballs. This index is related to the mass index of the fireball-class meteoroids in the space near the Earth's orbit. The discontinuity of the mass index has been pointed out around the mass of fireball-class meteoroids (Chapman 2008). Because of its low flux rate, we cannot carry out any in-situ measurement by artificial satellites. It is appropriate to perform longterm monitoring observations under a uniform condition for determining the mass influx rate of such meteoroids.

An automatic all-sky camera has been operated at the Kiso Observatory since 1977. Although the main purpose of this camera is to monitor the weather condition during the automatic airglow observation by photoelectric zenith photometer (Tanabe et al. 1992; Atlas of Zenith Airglow, National Astr. Obs., 1989), this camera system can be used to monitor fireballs and bright meteors. The aim of this paper is to present all the data of detected fireballs, which could not

be included in the paper presented in 1993 (Miyashita et al. 1993), during our operation period (1977-1990) as an archive for future investigations, along with the results of the basic statistics of the fireballs detected by this all-sky camera at Kiso Observatory.

2. Observation and Data Reduction

The all-sky camera was installed in 1977 at the Kiso Observatory, Institute of Astronomy, University of Tokyo. The location is $\lambda = 137^{\circ}37'39''$ (9h10m30.8s), $\psi = +35^{\circ}47'$ 38.7", and 1130m above sea level. Figure 1 shows the schematic diagram of the camera system, which is operated automatically every night. The camera was set in the observation building to protect from rain. The monitoring observation is performed through the protecting glass, which was coated by transparent conducting of the In_2O_3 in order to warm it up electrically. This device protects the glass (Miyashita et al.1979), and is useful for avoiding dew. The cover upon the glass is operated by a daylight switch. The system consists of 35mm camera (type Nikon F) with a fisheye lens (type Nikkor F/8) with a focal length f=16 mm between 1977 and 1980. After March 1980, another type of fish-eye lens with a focal length f=8mm (F/2.8) was used. The Fuji SSS (Neopan ASA-400) film with 100 feet length, which provides 750 frames, is used along with the motor drive system. The film is developed by Fuji Pandol at the temperature 20°C with 15min. This camera is set to take one-hour exposure per frame. The maximum period of the automatic monitoring is about one month, which is limited by the length of the photographic film.

We checked all the frames taken by all-sky camera by

eye-inspection, and recorded the positions and the maximum apparent brightness of the meteor trails. The apparent magnitudes were estimated by comparing the trails to known stars. The positions of the beginning and ending points were measured by overlaying the transparent measure for the altazimuth coordinates diagram. We inspected the star trails on each frame to determine if the frame can be used for the monitoring observation. All frames were divided into three classes (weight 1, 0.5, 0) according to the observational conditions. The clear condition (weight 1) is calculated in 100%, the cirrus or partly cloudy (weight 0.5) is in 50% and cloudy (weight 0) is in 0%. Adding the weight, we can roughly estimate the total observation time in unit of hour.

During 1977-1990, we obtained 32254 frames in total, and 8900 frames of them could be used to monitor fireballs. Total number of fireballs observed was 742 during the effective observation time of 8900 hours.



Figure 1. Schematic diagram of the all-sky camera system at the Kiso Observatory



Figure 2. Camera with fish-eye lens



Figure 3. Cover operated automatic



Figure 4. Glass cover coated of the In_2O_3

3. Magnitude Calibration

There is a systematic difference between the apparent magnitude of fireballs and the estimated their true magnitude, because of the rapid angular speed and the reciprocallow failure in emulsion. In order to estimate this difference quantitatively, we performed an experiment. The camera was set horizontally on a turn table, and was exposed in the rotation with an appropriate angular speed (22.5°/sec). Such frame contains many trails of bright planets, of which magnitudes are known. Comparing such experimental trail images with the apparent trails in a sidereal speed on the nor-

mal frames, we obtained approximate value of the systematic magnitudes difference as -7.0. This magnitude difference is for the G-type stars, and needs adjustments for color difference. Because we used the panchromatic emulsion for this observation, the color index derived by Ceplecha (1959) was used in this study. Because of the lack of the information, we assumed the constant index of -2.0 for the fireballs of which photographic magnitude is brighter than +2. This assumption may be supported by the result of Davis's photoelectric study (1959). The applied index correction is shown in table 1. Because the limiting apparent magnitude of stars in this camera is about 5, the average threshold of sensitivity of this monitoring observation is approximately +1 in the visual magnitude.

4. Results

All data obtained for each fireball is listed in table 2. It contains date and time, exposure time, the altitude and azimuth information of both starting and ending points of each fireball trail. The direction of the trail was judged from the brightness variation of the trail. It also contains the length of the trails and the apparent magnitude together with the estimated magnitude in the basis of table 1. Using the direction of each trail, we also judged if it belonged to known meteor showers or not. Special comments were also added if they were appropriate. The images of the fireballs are mainly processed for appropriate trimming in order to show them clearly. We did not list the images of faint fireballs in this image archive.

Using the corrected magnitude data, we can obtain the population index r, which indicates the increase of number of fireballs from a magnitude class m to m+1 as N(m+1) = r N(m). Figure 5 shows the cumulative distribution of the magnitude of fireballs detected in our system. The population index of 1.4 ± 0.3 is derived from the fireballs of which magnitude ranges between 2 and -4. This value is comparable with the value of 1.2 to 1.9 derived by Sanchez and Gonzalez (2004). The overall feature of the seasonal variation is consistent with the result obtained by Sanchez and Gonzalez (2004).

Figure 6 shows the seasonal variation of the number of the detected fireballs. The effect of the rainy season in Japan around June and July is clearly shown, and corresponding to this period the actual number of fireballs recorded is small in the figure, while the estimated number after the weather factor correction is not small. The local maxima both in August and November are clearly shown, possibly due to the Perseids and Taurids, respectively.

Inspecting the detected fireballs, we noticed the five cases of the enhancement of fireballs, which may be related to the possible unusual activities of the meteor showers; Lyrids on April 22 in 1980, Ursides on December 22 in 1981, Virginids on April 15 in 1982, Taurids on November in 1988, and Geminids on 14 December in 1988. There are two possibilities for the cases. One is the enhancements of only bright or fireball-class meteors such like the Leonids storm in 1998(Asher et al. 1999). Another is the enhancements occurred over the wide mass range of meteoroids. We do not have enough information to discriminate these two cases for our detected activities. It is definitely the evidence that such all-sky camera is valuable for monitoring the activities of meteor showers, and the detailed investigation can be done by using our archive in the future.

We are grateful to all the staff in the Kiso Observatory for their cooperative efforts to maintain the automatic observation system.





Figure 5. Cumulative distrbution of the visual magnitude

Figure 6. Seasonal variation of the ovserved fireballs. The marks of circle are number of Observed fireballs. The marks of square are corrected number by the weather factor. The marks of lozenge are weather factor (%)

Photographic	Correc	ction	Deduced Visual
Magnitude	Angular Velocity	Color Index	Magnitude
5.0	-7.0	-3.5	1.5
4.0	-7.0	-3.3	0.3
3.0	-7.0	-2.5	-1.5
2.0	-7.0	-2.0	-3.0
1.0	-7.0	-2.0	-4.0
0.0	-7.0	-2.0	-5.0
-1.0	-7.0	-2.0	-6.0
-2.0	-7.0	-2.0	-7.0
-3.0	-7.0	-2.0	-8.0
-4.0	-7.0	-2.0	-9.0

Table 1. Correction between photographic and visual magnitude

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Table 2. List of fireballs detected in our monitor

No.	уууу	mm	dd	Expo	sure	Appear	ance	Disappe	arance	Length	Magnitude	9	Meteor	Note
				Time(h-h)	Az	Al	Az	Al	of trail	Photo.	Deduced	group	
K-1	1977	4	22	2	3	1	29	4	22	7.5	0	-5	Lyrids	
K-2	1977	4	27	1	2	103	45	95	39	8.4	1	-4		
K-3	1977	11	3	1	2	193	31	198	23	9.2	1	-4		
K-4	1977	12	1	21	22	262	17	268	11	8.4	1	-4		
K-5	1977	12	3	22	23	253	49	249	40	9.4	0	-5		
K-6	1977	12	5	2	3	116	10	115	7	3.2	1	-4		to behind mountain
K-7	1977	12	13	1	2	138	20	143	8	12.9	-1	-6		
K-8	1977	12	14	21	22	94	55	87	42	13.8	2	-3		
K-9	1977	12	- 19	0	1	58	29	51	16	14.5	0	-5		
K-10	1978	3	2	3	4	124	18	133	15	9.1	-2	-7		
K-11	1978	3	8	1	2	132	31	136	20	11.6	0	-5		
K-12	1978	3	15	19	20	295	54	300	53	3.1	1	-4		
K-13	1978	3	25	0	1	22	50	18	35	15.3	1	-4		
K-14	1978	3	27	0	1	45	55	69	52	14.5	1	-4		
K-15	1978	3	- 29	23	24	46	43	49	37	6.4	0	-5		
K-16	1978	4	13	22	23	179	28	172	21	9.5	0	-5		
K-17	1978	10	21	21	22	88	31	88	12	19.0	-1	-6		
K-18	1978	10	30	23	24	345	19	347	17	2.8	0	-5		
K-19	1978	10	31	20	21	83	16	84	10	6.1	0	-5		
K-20	1978	10	31	23	24	320	32	319	28	4.1	1	-4	Taurids	
K-21	1978	10	31	23	24	314	23	313	18	5.1	2	-3	Taurids	
K-22	1978	11	1	0	1	85	59	103	34	27.7	-2	-7	Taurids	
K-23	1978	11	5	20	21	140	60	160	49	15.9	1	-4		
K-24	1978	11	6	2	3	22	24	18	19	6.2	0	-5	Taurids	
K-25	1978	11	7	0	1	161	51	163	40	11.1	2	-3	Taurids	
K-26	1978	11	7	0	1	337	15	337	13	2.0	2	-3	Taurids	
K-27	1978	11	7	3	4	72	34	71	30	4.1	2	-3	Taurids	
K-28	1978	11	- 9	21	22	80	30	81	17	13.0	2	-3		
K-29	1978	11	9	22	23	170	19	168	15	4.4	0	-5	Taurids	
K-30	1978	12	31	0	1	167	72	188	61	13.7	0	-5		
K-31	1979	1	4	5	6	198	26	194	19	7.9	-2	-7	Quadrantids	
K-32	1979	1	17	2	3	47	23	45	21	2.7	1	-4		
K-33	1979	1	19	18	19	71	47	75	44	4.1	2	-3		
K-34	1979	1	22	3	4	215	33	219	17	16.4	1	-4		
K-35	1979	1	25	5	6	200	27	203	25	3.4	1	-4		
K-36	1979	2	16	2	3	123	10	124	6	4.1	-2	-7		to bihind Mt. Ontake
K - 37	1979	3	1	20	21	331	19	333	13	6.3	1	-4		
K-38	1979	3	1	21	22	294	22	296	16	6.3	3	-1.5		
K-39	1979	3	8	19	20	147	57	151	55	3.0	3	-1.5		
K-40	1979	4	19	1	2	303	48	263	19	43.4	-5	-10	Virginids	bright, no conparative star
K-41	1979	5	- 19	22	23	268	21	297	28	27.2	1	-4		
K-42	1979	5	20	2	3	343	28	307	15	35.8	-3	-8		bright, no conparative star
K-43	1979	6	17	21	22	262	10	253	6	9.8	-2	-7		
K-44	1979	7	31	2	3	201	30	216	15	20.4	-2	-7		2:37 am S.Kurusu: -6 mag
K-45	1979	8	1	20	21	325	58	335	63	7.0	0	-5		
K-46	1979	10	26	22	23	324	40	327	37	3.8	-3	-8	Taurids	
K-47	1979	11	2	2	3	125	82	163	67	17.4	0	-5		
K-48	1979	11	11	18	19	170	38	169	34	4.1	3	-1.5		
K-49	1979	11	11	19	20	237	58	241	25	33.1	0	-5		
K-50	1980	4	21	22	23	271	24	275	22	4.2	2	-3	Lyrids	
K-51	1980	4	22	0	1	181	31	177	28	4.6	2	-3	Lyrids	
K-52	1980	4	22	0	1	265	23	265	23	0.0	2	-3	Lyrids	
K-53	1980	4	22	2	3	119	37	118	31	6.1	4	0.3	Lyrids	
K-54	1980	4	22	2	3	197	43	195	40	3.4	3	-1.5	Lyrids	
K-55	1980	4	22	2	3	262	48	261	44	4.1	-1	-6	Lyrids	
K-56	1980	7	21	0	1	131	51	140	28	24.0	-10	-15		0:10:20, no conparative star
K-57	1980	9	9	22	23	300	76	9	71	19.0	1	-4		
K-58	1980	10	2	23	24	322	24	326	17	7.9	-2	-7		
K-59	1980	11	1	19	20	166	64	172	58	6.7	2	-3		
K-60	1980	11	3	23	24	307	27	307	18	9.0	-4	-9	Taurids	
K-61	1980	11	14	4	5	119	11	118	8	3.2	-2	-7		
K-62	1980	11	18	4	5	274	17	276	16	2.2	2	-3		
K-63	1980	12	2	2	3	314	23	311	16	7.5	1	-4		
K-64	1980	12	6	18	19	120	60	130	46	15.2	5	1.5		
K-65	1980	12	9	18	19	105	78	125	73	7.0	2	-3		
K-66	1980	12	15	3	4	359	13	357	8	5.4	2	-3	Geminids	
K-67	1980	12	15	3	4	0	73	10	75	3.4	4	0.3	Geminids	
K-68	1980	12	25	19	20	58	27	68	9	20.3	-1	-6		

No.	уууу	mm	dd	Expo	sure	Appear	ance	Disappe	arance	Length	Magnitude	e	Meteor	Note
				Time((h-h)	Az	Al	Az	Al	of trail	Photo.	Deduced	group	
K-69	1981	1	1	1	2	156	20	158	15	5.4	2	-3		
K-70	1981	1	30	22	23	184	56	177	39	17.6	2	-3		
K-71	1981	3	6	21	22	208	27	201	12	16.4	1	-4		
K - 72	1981	3	29	2	3	125	38	146	19	26.4	2	-3	Virginids	
K - 73	1981	4	7	2	3	18	50	28	14	36.9	-7	-12		bright, no conparative star
K - 74	1981	4	10	22	23	14	20	20	10	11.6	-3	-8		
K-75	1981	4	22	23	24	285	45	299	45	9.9	-3	-8	Lyrids	
K-76	1981	7	8	1	2	245	31	241	31	3.4	2	-3		
K-77	1981	10	19	22	23	207	25	195	13	16.5		-4		
K-78	1981	10	31	20	21	306	35	302	36	3.4	-1	-6		
K-79	1981	11	1	0	1	133	24	134	17	7.1	-4	-9	Taurids	
K-80	1981	11	8	1	2	49	61	49	61	0.0	2	-3	Taurids	
K-81 1/ 92	1981	11	8	2	3	66 114	33	6/	30	5.1	-2	-/	Taurids Taurida	
N-82 V 92	1981	11	8 0	2	3	208	25	120	30	0.3	-1	-0	Taurida	
K-05 V 94	1981	11	0	3	4	298	23	293	13	2.7	-2	-/	Taurius	
K 95	1981	11	10	4	5	20	13	23	/3	2.7	1	-3	Tauride	
K-86	1981	11	17	22	23	131	10	130	15	/.1	-1	-6	Tauride	
K-80 K-87	1981	11	22	22	23	357	17	357	13	3.0	-1	-0	Taurius	
K-87	1981	11	22	23	24	351	17	351	11	1.0	2	-3	Taurids	
K-89	1981	11	23	0	1	325	82	290	80	5.7	0	-5	Taurids	
K-90	1981	12	14	21	22	117	40	103	21	22.4	_1	_6		<u> </u>
K-91	1981	12	14	23	2.4	75	2.8	77	11	17.1	-4	_9	Geminids	<u> </u>
K-92	1981	12	15	20	21	45	13	47	11	2.8	2	-3		
K-93	1981	12	18	0	1	295	69	270	68	9.2	1	-4		
K-94	1981	12	18	5	6	106	32	107	28	4.1	1	-4		
K-95	1981	12	21	5	6	284	60	280	53	7.3	2	-3		
K-96	1981	12	22	20	21	355	35	357	24	11.1	3	-1.5	Ursids	
K-97	1981	12	22	21	22	285	59	250	60	17.6	4	0.3	Ursids	
K-98	1981	12	22	21	22	10	80	12	52	28.0	5	1.5	Ursids	
K-99	1981	12	22	23	24	96	49	80	43	12.6	2	-3	Ursids	
K-100	1981	12	22	23	24	114	20	118	17	4.8	3	-1.5	Ursids	
K-101	1981	12	24	21	22	285	21	287	14	7.3	-2	-7		
K-102	1981	12	24	21	22	301	25	296	17	9.3	1	-4		
K-103	1981	12	28	21	22	23	57	63	24	43.8	-6	-11		bright, no conparative star
K-104	1982	1	28	0	1	212	29	208	22	7.9	-4	-9		
K-105	1982	1	29	20	21	282	50	325	42	30.5	-8	-13		conparative moon
K-106	1982	3	3	2	3	311	21	314	17	4.9	-1	-6		
K-107	1982	3	- 21	21	22	250	50	288	53	23.6	3	-1.5		
K-108		2			21	266	- 37	2777	25	15.2	4	03		
IZ 100	1982	3	27	20	4	200	2.4	2//	1.7	10.0	7	0.5		
K-109	1982 1982	3	27 29	20 3	4	308	34	298	17	19.2	3	-1.5	X 7* * * 1	
K-109 K-110	1982 1982 1982	3	27 29 15	20 3 22	4 23	308 316	34	298 310	17 23	19.2 5.6	-1	-1.5 -6	Virginids	
K-109 K-110 K-111	1982 1982 1982 1982	3 3 4 4	27 29 15 15	$\begin{array}{r} 20\\ 3\\ 22\\ 23\\ 0 \end{array}$	4 23 24	308 316 11	34 24 32	298 310 13	17 23 20	19.2 5.6 12.1	-1 -3	-1.5 -6 -8	Virginids Virginids Virginida	
K-109 K-110 K-111 K-112	1982 1982 1982 1982 1982	3 3 4 4 4 5	27 29 15 15 16 20	20 3 22 23 0	4 23 24 1	308 316 11 315	34 24 32 45	298 310 13 336	17 23 20 51	19.2 5.6 12.1 15.2	-1 -3 3	-1.5 -6 -8 -1.5	Virginids Virginids Virginids	
K-109 K-110 K-111 K-112 K-113 K-114	1982 1982 1982 1982 1982 1982	3 3 4 4 4 5 6	27 29 15 15 16 29 21	$ \begin{array}{r} 20 \\ 3 \\ 22 \\ 23 \\ 0 \\ 1 \\ 22 \\ 23 \\ 0 \\ 1 \end{array} $	4 23 24 1 22	308 316 11 315 97	34 24 32 45 53	298 310 13 336 95	17 23 20 51 47 21	19.2 5.6 12.1 15.2 6.1	3 -1 -3 3 3	-1.5 -6 -8 -1.5 -1.5	Virginids Virginids Virginids	
K-109 K-110 K-111 K-112 K-113 K-114 K-115	1982 1982 1982 1982 1982 1982 1982	3 3 4 4 4 5 6 6	27 29 15 15 16 29 21 28	20 3 22 23 0 1 22 23 23	4 23 24 1 2 23 24	308 316 11 315 97 313 32	34 24 32 45 53 29 20	298 310 13 336 95 312	$ \begin{array}{r} 17 \\ 23 \\ 20 \\ 51 \\ 47 \\ 21 \\ 22 \end{array} $	19.2 5.6 12.1 15.2 6.1 8.1	-1 -3 3 3 3 3	-1.5 -6 -8 -1.5 -1.5 -1.5 -1.5	Virginids Virginids Virginids	
K-109 K-110 K-111 K-112 K-113 K-114 K-115 K-116	1982 1982 1982 1982 1982 1982 1982 1982	$3 \\ 3 \\ 4 \\ 4 \\ 4 \\ 5 \\ 6 \\ 6 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\$	27 29 15 15 16 29 21 28 23	$ \begin{array}{r} 20 \\ 3 \\ 22 \\ 23 \\ 0 \\ 1 \\ 22 \\ 23 \\ 3 \end{array} $	4 23 24 1 2 23 23 24	308 316 11 315 97 313 33 258	34 24 32 45 53 29 29 29	298 310 13 336 95 312 32 255	$ \begin{array}{r} 17 \\ 23 \\ 20 \\ 51 \\ 47 \\ 21 \\ 23 \\ 37 \end{array} $	19.2 5.6 12.1 15.2 6.1 8.1 6.1 4.6	-1 -3 3 3 3 0 -1	-1.5 -6 -8 -1.5 -1.5 -1.5 -1.5 -1.5 -5 -5	Virginids Virginids Virginids	
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K-109 K-110 K-111 K-112 K-113 K-114 K-115 K-116 K-117 K-118 K-117 K-118 K-120 K-121 K-122 K-123 K-124 K-125 K-125 K-127 K-128 K-129 K-130 K-131	1982 1983 1983 1983 1983 1983 1983 1983 1983 1983 1983 1983 1983 1983 1983 1983 1983	$\begin{array}{c} 3\\ 3\\ 3\\ 4\\ 4\\ 4\\ 4\\ 4\\ 4\\ 4\\ 5\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\$	277 299 155 166 299 211 288 233 133 200 288 44 122 199 3 3 122 144 199 1 1	200 3 222 233 0 0 1 22 233 3 4 4 200 3 3 22 21 200 3 222 233 24 24 24 24 24 24 24 24 24 24	44 23 244 4 5 5 21 21 4 4 23 22 21 21 21 21 21 22 22 22 22 22 22 22	308 316 11 315 97 313 33 258 296 73 191 312 62 37 95 328 97 216 239 227 134 110 210	34 34 24 32 45 53 29 29 29 41 60 42 24 12 24 41 28 66 58 25 25 50 54 71	297 298 310 13 336 95 312 255 2855 766 194 299 67 39 95 331 110 220 237 227 122 99 240	17 23 20 51 47 21 23 37 39 277 200 11 21 13 600 225 55 50 200 377 56 76	19.2 5.6 12.1 15.2 6.1 8.1 6.2 15.2 4.9 12.8 23.4 20.1 1.0 4.0 5.5 3.5 5.0 15.6 6.6 9.7	$\begin{array}{c} & & & & \\ & & & & \\ & & & & \\ & & & & $	$\begin{array}{c} 0.3\\ -1.5\\ -6\\ -8\\ -1.5\\ -1.5\\ -1.5\\ -1.5\\ -5\\ -6\\ -3\\ -3\\ -4\\ -4\\ -4\\ -5\\ -13\\ -7\\ -5\\ -6\\ -1.5\\ -3\\ -4\\ -1.5\\ 0.3\\ -1.5\\ \end{array}$	Virginids Virginids Virginids Taurids Taurids Geminids	
K-109 K-110 K-111 K-112 K-113 K-114 K-115 K-114 K-115 K-116 K-117 K-118 K-117 K-118 K-120 K-121 K-122 K-123 K-124 K-125 K-125 K-127 K-128 K-129 K-130 K-131 K-132	1982 1983 1983 1983 1983 1983 1983 1983 1983 1983 1983 1983	$\begin{array}{c} 3\\ 3\\ 3\\ 4\\ 4\\ 4\\ 4\\ 4\\ 4\\ 4\\ 5\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\ 6\\$	277 299 155 156 299 211 288 233 133 200 288 44 122 199 33 124 144 199 11 110	200 3 222 233 0 0 1 22 233 3 4 200 3 3 222 1 200 3 222 21 201 201 202 203 202 203 202 203 202 203 203	44 233 244 1 223 244 45 5 211 44 199 244 233 22 211 44 233 222 222 222 222 222 222 222 222	308 316 11 315 97 313 33 258 296 73 191 312 62 37 95 328 97 216 239 227 134 110 210 242	34 34 24 32 45 53 29 29 41 60 42 24 41 22 4 44 33 61 28 66 58 55 50 54 71 34	297 298 310 13 336 95 312 255 285 76 194 299 67 39 95 331 110 220 237 227 122 99 9240 243	17 23 20 51 47 21 23 37 39 277 200 111 213 600 255 650 200 377 566 766 32	19.2 5.6 12.1 15.2 6.1 8.1 6.1 4.6 22.1 15.2 4.9 12.8 23.4 20.1 1.0 5.5 3.5 5.0 15.6 6.6 9.7 2.2	$\begin{array}{c} & 3 \\ & 3 \\ & -1 \\ & -3 \\ & 3 \\ & 3 \\ & 3 \\ & 0 \\ & 0 \\ & -1 \\ & 2 \\ & -3 \\ & 1 \\ & 1 \\ & 1 \\ & 0 \\ & -2 \\ & 0 \\ & -1 \\ & 1 \\ & 0 \\ & -8 \\ & -2 \\ & 0 \\ & 0 \\ & -1 \\ & 1 \\ & 3 \\ & 0 \\ & -1 \\ & 1 \\ & 1 \\ & 0 \\ & 0 \\ & -1 \\ & 1 \\ & 1 \\ & 0 \\ & 0 \\ & -1 \\ & 0 \\ & 0 \\ & -1 \\ & 0 $	$\begin{array}{c} 0.3\\ -1.5\\ -6\\ -8\\ -1.5\\ -1.5\\ -1.5\\ -1.5\\ -5\\ -6\\ -3\\ -5\\ -6\\ -3\\ -3\\ -4\\ -4\\ -4\\ -5\\ -13\\ -7\\ -5\\ -6\\ -1.5\\ -1.$	Virginids Virginids Virginids Taurids Taurids Geminids	
K-109 K-110 K-111 K-112 K-113 K-114 K-115 K-116 K-117 K-118 K-119 K-120 K-121 K-120 K-121 K-122 K-123 K-124 K-125 K-126 K-127 K-128 K-129 K-130 K-131 K-132 K-133	1982 1983 1984		277 299 155 156 299 211 288 233 133 200 288 44 122 199 33 124 144 199 111 1100 4	200 3 222 233 0 0 1 22 233 3 4 200 3 22 21 201 201 201 201 202 21 201 20	4 23 24 1 2 23 24 4 4 5 5 21 1 4 4 23 22 21 21 23 22 22 22 22 22 22 22 22 22 22 22 22	308 316 11 315 97 313 33 258 296 73 191 312 62 37 95 328 97 216 239 227 134 110 210 242 340	34 34 24 32 45 53 29 29 41 60 42 24 41 22 4 44 33 61 28 66 58 55 50 554 71 34 67	277 298 3100 13 336 95 312 255 285 76 194 299 67 39 95 331 1100 2200 237 2277 122 99 2240 243 323	17 23 20 51 47 21 23 37 39 277 200 111 213 600 255 650 200 377 566 766 32 69	19.2 5.6 12.1 15.2 6.1 8.1 6.1 4.6 22.1 15.2 4.9 12.8 23.4 20.1 1.0 4.0 5.5 5.0 15.6 6.6 9.7 2.2 6.6	$\begin{array}{c} & 3 \\ & 3 \\ & -1 \\ & -3 \\ & 3 \\ & 3 \\ & 3 \\ & 0 \\ & 0 \\ & -1 \\ & 2 \\ & -3 \\ & -1 \\ & 0 \\ & -1 \\ & 0 \\ & 0 \\ & -1 \\ & 3 \\ & -1 \\ & 3 \\ & -1 \\ &$	$\begin{array}{c} 0.5\\ -1.5\\ -6\\ -8\\ -1.5\\ -1.5\\ -1.5\\ -5\\ -6\\ -3\\ -8\\ -4\\ -4\\ -4\\ -5\\ -1.3\\ -7\\ -5\\ -6\\ -1.5\\ -6\\ -1.5\\ -3\\ -3\\ -1.5\\ -6\\ -1.5\\ -6\\ -1.5\\ -6\\ -6\\ -1.5\\ -6\\ -6\\ -1.5\\ -6\\ -6\\ -6\\ -6\\ -6\\ -6\\ -6\\ -6\\ -6\\ -6$	Virginids Virginids Virginids Taurids Taurids Geminids	
K-109 K-110 K-111 K-112 K-113 K-114 K-115 K-116 K-117 K-118 K-119 K-120 K-121 K-120 K-121 K-122 K-123 K-124 K-125 K-126 K-127 K-128 K-129 K-130 K-131 K-132 K-133 K-134	1982 1983 1984		277 299 155 156 299 211 288 233 133 200 288 44 122 199 33 124 147 77 122 144 199 1 1 100 4 9	200 3 3 222 233 0 0 1 22 233 3 4 200 3 3 222 1 200 3 222 21 201 201 201 202 203 202 203 202 203 202 203 202 203 202 203 202 203 203	44 233 244 4 5 21 24 4 4 5 21 21 24 23 22 22 22 22 22 22 22 22 22 22 22 22	308 316 11 315 97 313 258 296 73 191 312 62 37 95 328 97 216 239 227 134 110 210 242 340 219	34 34 24 32 45 53 29 29 29 41 60 42 24 12 24 44 33 61 28 66 58 25 25 50 50 50 50 50 50 50 50 50 50 50 50 50	2)7 298 310 13 336 95 312 255 285 76 194 299 67 39 95 331 110 220 237 227 122 999 240 243 323 216	17 23 20 51 47 21 23 37 39 277 200 111 213 600 25 650 500 220 200 307 566 766 32 69 57	19.2 5.6 12.1 15.2 6.1 8.1 6.1 8.1 6.1 15.2 6.1 15.2 4.9 12.8 23.4 20.1 1.0 4.0 5.5 5.0 15.6 6.6 9.7 2.2 6.6 1.9	$\begin{array}{c} & 3 \\ & 3 \\ & -1 \\ & -3 \\ & 3 \\ & 3 \\ & 3 \\ & 0 \\ & 0 \\ & -1 \\ & 2 \\ & -3 \\ & -1 \\ & 0 \\ & -2 \\ & 0 \\ & 0 \\ & -1 \\ & 0 \\ & -2 \\ & 0 \\ & 0 \\ & -1 \\ & 3 \\ & 2 \\ & 0 \\ & -1 \\ & 3 \\ & 3 \\ & -1 \\ & -1 \\ & -1 \\ \end{array}$	0.3 -1.5 -6 -8 -1.5 -1.5 -1.5 -5 -6 -3 -3 -8 -4 -4 -4 -4 -4 -5 -1.5 -5 -6 -1.5 -3 -7 -5 -6 -1.5 -3 -1.5 -1.5 -5 -5 -6 -1.5 -1.5 -5 -5 -6 -6 -3 -3 -7 -5 -5 -6 -6 -7 -7 -5 -7 -6 -6 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7	Virginids Virginids Virginids Taurids Taurids Geminids Geminids	
K-109 K-110 K-111 K-112 K-113 K-114 K-115 K-116 K-117 K-118 K-117 K-120 K-121 K-120 K-121 K-122 K-123 K-124 K-125 K-126 K-127 K-126 K-127 K-128 K-129 K-130 K-131 K-132 K-133 K-134 K-135	1982 1983 1984		277 299 155 156 299 211 288 233 133 200 288 44 122 199 33 124 147 77 122 144 199 111 100 4 9 9 13	200 3 3 222 233 0 0 1 22 233 3 4 200 3 3 222 1 200 3 222 233 242 243 242 243 242 243 244 245 245 245 245 245 245 245	44 233 244 4 5 21 24 4 4 5 21 21 24 23 22 22 22 22 22 22 22 22 22 22 22 22	308 316 11 315 97 313 258 296 73 191 312 62 37 95 328 97 216 239 227 134 110 210 242 340 219 134	34 34 24 32 45 53 29 29 29 41 60 42 24 12 24 44 33 61 28 66 58 25 25 50 50 50 50 71 34 67 56 41	2)7 298 310 13 336 95 312 255 285 76 194 299 67 39 95 331 1100 2200 237 227 122 999 992 400 243 323 216 123	17 23 20 51 47 21 23 37 39 277 200 111 213 600 255 650 200 201 21 133 600 255 500 222 200 376 566 766 32 69 57 36	19.2 5.6 12.1 15.2 6.1 8.1 6.1 8.1 6.1 15.2 6.1 15.2 4.9 12.8 23.4 20.1 1.0 4.0 5.5 5.0 15.6 6.6.6 9.7 2.2 6.6.6 1.9 9.9	$\begin{array}{c} & & & & & \\$	$\begin{array}{c} 0.3\\ -1.5\\ -6\\ -8\\ -1.5\\ -1.5\\ -1.5\\ -5\\ -6\\ -3\\ -8\\ -4\\ -4\\ -4\\ -4\\ -5\\ -13\\ -7\\ -5\\ -6\\ -1.5\\ -6\\ -1.5\\ -3\\ -4\\ -1.5\\ -6\\ -6\\ -6\\ -6\\ 0.3\\ \end{array}$	Virginids Virginids Virginids Taurids Taurids Geminids Geminids	

No.	уууу	mm	dd	Expo	sure	Appear	ance	Disappe	earance	Length	Magnitude	9	Meteor	Note
				Time(h-h)	Az	Al	Az	Al	of trail	Photo.	Deduced	group	
K-137	1983	8	14	0	1	198	24	195	22	3.4	3	-1.5	Perseids	
K-138	1983	8	14	2	3	27	25	28	20	51	3	-1.5	Perseids	
K-130	1083	8	14	2	4	310	56	300	45	12.7	2	-3	i erseras	1
K-137	1002	0	14	21		215	75	200	43	25.0		- 10		
K=140 V 141	1965	7	19	21	1	313	13	200	03	35.0	-5	-10		
K-141	1983	10	3	0	1	93	1/	101	9	11.2	1	-4		
K-142	1983	10	6	20	21	356	70	318	66	14.5	2	-3		
K-143	1983	10	21	19	20	168	31	197	24	26.6	-1	-6		
K-144	1983	10	27	19	20	311	36	312	34	2.2	3	-1.5		
K-145	1983	11	7	0	1	296	32	294	28	4.4	2	-3	Taurids	
K-146	1983	11	7	2	3	61	63	61	60	3.0	4	0.3	Taurids	
K-147	1983	11	9	0	1	19	41	20	37	4.1	3	-1.5	Taurids	
K 148	1983	11	9	3	4	193	38	178	26	17.4	4	0.3	ruunus	
K = 1.40	1002	11	0	2	4	25	22	170	20	17.4	 1	0.5	Tourida	
K=149 V 150	1965	11	9	3	4	23	33	17	20	9.9	-1	-0	Taurius	
K-150	1983	11	10	0	1	10	/0	0	68	2.5	4	0.3	Taurids	
K-151	1983	11	12	0	I	273	69	210	75	19.3	3	-1.5		
K-152	1983	11	29	23	24	284	55	281	50	5.3	-2	-7	Taurids	
K-153	1983	12	4	18	- 19	15	22	13	14	8.2	-3	-8		
K-154	1983	12	6	23	24	285	71	340	45	36.8	3	-1.5		
K-155	1983	12	7	1	2	336	45	334	43	2.5	3	-1.5		
K-156	1983	12	8	4	5	140	48	150	41	10.0	0	-5		
K-157	1983	12	13	1	2	330	45	3	37	26.0	4	03		1
K-158	1082	12	15	2	2	0	40	356	24	16.4	1	. 4	Geminide	1
K 150	1000	12	1.5	2	3	202	40	220	17	10.4	1	-4	Cominida	1
K-139	1985	12	15	2	3	283	20	283	15	5.0	0	->	Ceminitas	
K-160	1983	12	15	3	4	155	55	164	40	16.2	2	-3	Geminids	
K-161	1983	12	15	3	4	169	55	182	40	17.3	-1	-6	Geminids	
K-162	1983	12	15	4	5	345	53	334	40	15.0	5	1.5	Geminids	
K-163	1983	12	31	1	2	37	14	40	12	3.5	3	-1.5		
K-164	1984	1	6	2	3	90	17	85	14	5.7	1	-4		
K-165	1984	1	8	1	2	178	45	182	36	9.5	3	-1.5		
K-166	1984	1	8	3	4	146	22	143	20	3.4	4	0.3		
K-167	1984	1	9	0	1	322	15	321	12	3.2	_2	_7		
K-167	1094	1	22	22	24	240	27	247	25	12.4	-2	-7		
K-100	1904	1	20	23	24	290	37	270	41	13.4	1	1.5		
K-109	1984	1	29	4	2	280	49	2/8	41	8.1	3	-1.5		
K-170	1984	1	29	23	24	54	55	47	42	13.8	2	-3		
K-171	1984	2	7	22	23	293	40	290	21	19.2	-1	-6		
K-172	1984	2	16	3	4	25	80	240	70	28.7	-2	-7		
K-173	1984	8	31	2	3	223	64	220	56	8.1	3	-1.5		
K-174	1984	8	31	23	24	293	38	300	24	15.2	1	-4		
K-175	1984	9	30	23	24	27	18	29	12	6.3	2	-3		
K-176	1984	10	22	0	1	308	23	313	21	5.0	2	-3	Orionids	
K-177	1984	10	22	4	5	149	31	149	31	0.0	3	-1.5		
K-178	1984	10	22	2	3	343	8	344	6	2.2	2	-3		to behind mountain
K = 170 K = 170	1094	10	23	22	24	60	12	62	7	6.2	2	-5	Tourida	to bennid mountain
K-179 V 190	1004	10	25	23	24	120	50	124	52	0.3	-2	-/	Taurius	
N-16U V 101	1984	10	20	3	4	130	59	134	52	/.4	2	-3		
K-181	1984	10	30	2	3	229	64	223	60	4.9	4	0.3		
K-182	1984	10	30	3	4	16	13	17	10	3.2	2	-3		
K-183	1984	11	5	23	24	323	21	323	18	3.0	0	-5		
K-184	1984	11	6	1	2	132	43	137	35	8.9	-1	-6		
K-185	1984	11	14	2	3	145	15	143	13	2.8	2	-3		
K-186	1984	11	17	21	22	196	18	201	15	5.7	1	-4		
K-187	1984	11	20	21	22	115	17	113	11	6.3	-1	-6		
K-188	1984	11	20	23	24	70	50	70	43	7.0	5	15		
K_190	109/	11	20	25	2- 1 /	720	61	200	۲ ۲ ۸۸	10.2	5	1.5		
K 100	1004	11	21	2	4	230	50	200	51	17.3	5	1.3		1
K=190 K=101	1984	11	21	5	4	230	28	199	52	18.6	3	1.5		
K-191	1984	11	21	4	5	42	8	42	7	1.0	1	-4		
K-192	1984	11	22	22	23	123	22	123	17	5.0	1	-4	Taurids	
K-193	1984	11	23	1	2	75	16	75	12	4.0	1	-4	Taurids	
K-194	1984	11	23	3	4	237	50	232	46	5.2	4	0.3	Taurids	
K-195	1984	11	23	3	4	18	64	1	62	7.9	4	0.3	Taurids	
K-196	1984	11	23	4	5	60	79	70	77	2.9	4	0.3	Taurids	
K-197	1984	11	25	20	21	244	36	249	26	10.9	1	_4		1
K-108	108/	11	25	20	21	244	30	270	20	1 2	່ າ	-7		1
K 100	1004	11	20	∠ 1 1	22	209	39	270	20	1.3	1	-3		
K-199	1984	11	28	1	2	205	23	4	22	1.4	-1	-0	T	
K-200	1984	11	28	21	22	295	22	297	14	8.2	-10	-15	1 aurids	
K-201	1984	11	31	2	3	68	17	68	13	4.0	3	-1.5	Taurids	
K-202	1984	12	4	2	3	168	40	171	39	2.5	5	1.5		
K-203	1984	12	5	4	5	90	85	79	74	11.1	4	0.3		
K-204	1984	12	13	4	5	321	18	317	15	4.9	-2	-7		
· · · ·							- 2							

No.	VVVV	mm	dd	Expo	sure	Appear	ance	Disappe	arance	Length	Magnitude		Meteor	Note
				Time(h-h)	Az	Al	Az	Al	of trail	Photo.	Deduced	group	
K-205	1984	12	15	20	21	320	21	320	18	3.0	-1	-6		
K-206	1984	12	19	0	1	130	71	170	55	23.4	-1	-6		
K-207	1984	12	19	4	5	80	31	80	28	3.0	2	-3		
K-208	1984	12	25	4	5	296	35	292	36	3.4	4	0.3		
K-209	1984	12	25	5	6	298	32	303	29	5.2	-1	-6		
K-210	1984	12	26	19	20	0	46	355	29	17.4	2	-3		
K-211	1984	12	26	22	23	25	48	37	36	14.9	3	-1.5		
K-212	1985	1	4	4	5	70	55	66	42	13.3	2	-3	Quadrantids	
K-213	1985	1	9	18	19	311	39	321	42	8.2	2	-3		
K-214	1985	1	10	18	19	277	31	281	28	4.6	2	-3		
K-215	1985	1	10	19	20	1	73	356	74	1.7	3	-1.5		
K-216	1985	1	15	4	5	167	25	193	17	25.5	-1	-6		
K-217	1985	1	16	19	20	20	62	17	62	1.4	4	0.3		
K-218	1985	1	17	2	3	17	34	25	20	15.7	3	-1.5		
K-219	1985	1	17	5	6	7	48	8	47	1.2	4	0.3		
K-220	1985	1	19	18	19	350	48	340	45	7.5	2	-3		
K-221	1985	1	21	2	3	272	28	280	26	7.4	-1	-6		
K-222	1985	1	21	21	22	191	55	203	30	26.4	0	-5		
K-223	1985	1	22	2	3	180	64	174	51	13.4	1	-4		
K-224	1985	1	25	2	3	289	61	312	40	25.3	3	-1.5		
K-225	1985	1	25	21	22	157	21	156	20	1.4	2	-3		
K-226	1985	2	14	19	20	161	38	158	27	11.3	2	-3		
K-227	1985	2	18	4	5	296	48	292	39	9.5	0	-5		
K-228	1985	2	24	0	1	173	18	176	14	4.9	0	-5		to behind forest
K-229	1985	3	23	3	4	349	53	347	48	5.2	2	-3		
K-230	1985	3	27	0	1	32	67	33	63	4.0	1	-4		
K-231	1985	4	24	0	1	278	37	281	35	3.1	4	0.3		
K-232	1985	5	18	2	3	122	37	114	38	6.4	5	1.5		
K-233	1985	7	16	2	3	204	35	202	32	3.4	4	0.3		
K-234	1985	8	2	21	22	87	60	86	59	1.1	0	-5		
K-235	1985	8	7	20	21	30	20	30	19	1.0	0	-5		
K-236	1985	8	8	2	3	122	17	119	14	4.2	-2	-7		
K-237	1985	8	9	23	24	125	60	125	54	6.0	2	-3	Perseids	
K-238	1985	8	16	0	1	274	45	276	42	3.3	4	0.3		
K-239	1985	8	16	1	2	101	58	95	59	3.3	4	0.3	Kappa-Cygnids	
K-240	1985	8	16	21	22	310	34	307	35	2.7	3	-1.5		
K-241	1985	8	16	23	24	60	35	53	23	13.5	-3	-8	Kappa-Cygnids	
K-242	1985	8	1/	22	23	298	22	300	15	7.3	-2	-/	Kappa-Cygnids	
K-243	1985	9	0	3	4	196	51	185	49	/.3	-1	-0		
K-244 V 245	1985	9	/	23	24	283	18	289	12	8.3	2	-3		
K=245 V 246	1985	9	ð 12	21	22	δ 06	59	12	20	5.4	3	-1.5		
K-240 V 247	1985	9	12	22	24	90	20	92	39	19.2	-2	-/		
K-24/ V 249	1985	9	12	23	24	204	29	200	27	2.1	2	-3		fall of the Corrict actuation in frames
K-240	1965	10	0	19	20	338	10	330	19	5.5	-3	-0	Tourida	Tan of the Soviet satence in frame
K 249	1965	10	21	3	4	20	19	202	42	27.4	-2	-/	Tauride Touride	
K-251	1985	10	21	2	4	310	56	316	42	12.5	3	-1.5	Tauride	
K 252	1985	10	23	2	3	346	42	338	35	Q /	2	-1.5	Taurids	
K-252	1985	11	23	∠ 19	20	228	43	219	36	9.4	2	-3		
K-254	1985	11	4	22	23	306	51	310	42	9.0	1	_4	Taurids	
K-255	1985	11	9	0	1	306	30	302	23	7.9	3	-1.5	Taurids	
K-256	1985	11	9	0	1	327	10	326	9	1.4	3	-1.5	Taurids	
K-257	1985	11	9	0	1	70	11	72	8	3.6	-4	-9	Taurids	1
K-258	1985	11	10	0	1	342	82	327	83	2.2	4	0.3	Taurids	
K-259	1985	11	10	22	23	338	16	339	14	2.2	3	-1.5	Taurids	
K-260	1985	11	10	22	23	324	12	324	11	1.0	1	-4	Taurids	
K-261	1985	11	11	4	5	47	63	333	60	33.5	4	0.3	Taurids	1
K-262	1985	11	15	2	3	298	39	294	32	7.7	5	1.5	Taurids	
K-263	1985	11	16	23	24	349	49	355	42	8.2	4	0.3	Taurids	
K-264	1985	11	17	1	2	316	39	327	34	10.1	5	1.5		
K-265	1985	11	17	1	2	228	40	235	39	5.5	3	-1.5		
K-266	1985	11	18	3	4	355	55	1	53	4.1	3	-1.5		
K-267	1985	11	20	3	4	27	31	20	25	8.6	1	-4	Taurids	
K-268	1985	11	20	19	20	183	64	175	63	3.7	1	-4		
K-269	1985	11	21	18	19	103	48	<u> </u>	47	4.2	3	-1.5		
K-270	1985	12	2	20	21	79	24	85	9	16.1	-5	-10		
K-271	1985	12	4	4	5	247	15	250	10	5.8	1	-4		
K-272	1985	12	4	5	6	6	70	326	64	16.4	1	-4		

No.	уууу	mm	dd	Expo	sure	Appear	ance	Disappe	arance	Length	Magnitude	e	Meteor	Note
				Time(h-h)	Az	Al	Az	Al	of trail	Photo.	Deduced	group	
K-273	1985	12	5	19	20	29	64	27	62	2.2	4	0.3		
K_274	1985	12	5	22	23	343	18	342	15	3.1	2	-3		
K-274	1085	12	6	1	23	4	50	10	59	7.0	2	-5		
K=275	1965	12	11	1	2	222	20	19	20	10.2	1	-1.5	Constation	
K-276	1985	12	11	1	2	222	30	220	20	10.2	1	-4	Geminids	
K-277	1985	12	12	3	4	342	37	349	28	10.8	4	0.3		
K-278	1985	12	12	3	4	103	50	105	41	9.1	2	-3	Geminids	
K-279	1985	12	12	22	23	36	18	40	14	5.5	-1	-6		
K-280	1985	12	13	23	24	340	42	358	25	22.6	-1	-6	Geminids	
K-281	1985	12	15	2	3	162	80	177	71	97	0	-5	Geminids	
K-282	1085	12	15	2	4	228	55	234	35	20.4	-1	-6	Geminids	1
K-202	1965	12	26	5	+	220	33	234	27	20.4	-1	-0	Gemmus	
K-283	1985	12	26	2	6	227	44	222	37	8.0	-1	-6		
K-284	1986	1	7	5	6	4	82	15	82	1.5	3	-1.5		
K-285	1986	1	11	5	6	306	30	305	24	6.1	1	-4		
K-286	1986	1	12	2	3	19	17	21	16	2.2	2	-3		
K-287	1986	1	12	22	23	173	22	170	14	8.5	1	-4		to behind forest
K-288	1986	2	2	0	1	123	17	123	10	7.0	0	-5		
K 200	1096	2	- 6	21	22	206	20	209	15	0.1	3	15		
K=209	1960	2	0	21	22	300	20	290	13	9.1	3	-1.3		
K-290	1986	2	8	19	20	225	43	222	40	3.7	5	1.5		
K-291	1986	2	8	20	21	247	43	227	38	16.0	3	-1.5		
K-292	1986	2	12	4	5	11	39	18	35	6.9	1	-4		
K-293	1986	2	13	3	4	228	44	220	40	7.2	0	-5		
K-294	1986	3	2	20	21	359	9	3	7	4.4	0	-5		to behind mountain
K 295	1986	3			- 1	211	20	200	19	28	2	_3		
K 204	1002	2	-+	0	1	172	20	172	10	2.0 5 1				to behind mountain
K-290	1980	5	4	0	1	1/2	18	1/3	13	5.1	0			to bening mountain
K-297	1986	3	5	0	1	354	31	359	18	13.8	-4	-9		
K-298	1986	3	12	21	22	222	45	191	38	24.1	3	-1.5		
K-299	1986	3	15	23	24	350	53	3	51	8.2	3	-1.5		
K-300	1986	3	16	0	1	16	19	13	24	5.7	4	0.3		
K-301	1986	3	17	1	2	45	65	43	64	13	4	0.3		
K-302	1986	4	1	21	22	235	48	264	30	28.5	3	-1.5		
K-302	1980	4	1	21	24	233	40	204	42	20.5	3	-1.5		
K-303	1986	4	I	23	24	313	45	302	42	8.5	4	0.3		
K-304	1986	4	6	3	4	220	32	218	32	1.7	3	-1.5		
K-305	1986	4	12	1	2	292	32	270	18	24.3	-1	-6		
K-306	1986	5	8	20	21	275	76	300	72	7.9	3	-1.5		
K-307	1986	5	10	21	22	351	25	357	15	11.5	-2	-7		
K-308	1986	5	12	23.5	24.5	133	15	135	14	2.2	1	-4		
K-309	1986	5	15	21.5	22.5	275	32	268	30	63	-1	-6		
K-307	1086	5	16	22.5	24.5	45	47	200	47	0.5	-1	-0		
K-310	1960	5	26	23.5	24.5	45	47	274	4/	0.7	0			
K-311	1986	5	26	20	21	269	57	2/4	56	2.9	4	0.3		
K-312	1986	6	4	2.5	3.5	171	76	172	74	2.0	2	-3		
K-313	1986	6	11	1.5	2.5	223	62	307	62	36.6	1	-4		
K-314	1986	7	2	0	1	320	43	327	34	10.5	3	-1.5		
K-315	1986	8	5	1	2	261	19	263	17	2.8	1	-4	Perseids	
K-316	1986	8	5	2	3	202	51	201	47	4.1	4	0.3		
K-317	1986	8	5	23	24	127	58	105	51	14.5	3	-15		
V 210	1006	0	12	1	21	20	17	22	12	5.4	0	1.5	Dorcoida	
N 210	1700	0	12	1	2	20	1/	22	12	3.4	0	-3	Domoi 1	+
K-319	1980	8	13	1	2	233	45	236	44	2.4	3	-1.5	r erseids	
к-320	1986	8	14	2	3	278	20	280	18	2.8	2	-3	Perseids	l
K-321	1986	9	4	19	20	240	11	240	9	2.0	1	-4		
K-322	1986	9	6	0	1	10	18	9	18	1.0	3	-1.5		
K-323	1986	9	11	3	4	264	18	267	17	3.0	0	-5		
K-324	1986	9	29	23	24	325	20	325	19	1.0	2	_3		
K 325	1986	ý Q	30		- 1	264	23	271	11	13.7	0	_5		1
K-226	1002		20	10	1	157	23	140	50	13.1 5 1	4	<u>-</u> 3		1
K-320	1760	9	50	19	20	13/	33	100	30	3.3	4	0.3		1
K-327	1986	10	1	1	2	0	69	234	74	32.9	1	-4		
K-328	1986	10	6	1	2	82	23	76	19	6.9	3	-1.5		
K-329	1986	10	8	21	22	68	59	39	58	15.1	4	0.3		
K-330	1986	10	8	21	22	232	14	231	13	1.4	0	-5		
K-331	1986	10	14	3	4	311	32	315	27	61	5	15	l	
K 332	1986	10	14	21	22	220	62	230	62	0.1	0	-5		1
V 222	1007	10	14	21	2.Z A	111	02	230	17	0.3	1	-5		1
K-333	1980	10	13	3	4	100	24	191	1/	24.4	- 1	-4		
к-334	1986	10	23	20	- 21	358	31	357	29	2.2	3	-1.5		
K-335	1986	10	27	18	19	153	69	156	68	1.5	4	0.3		
K-336	1986	10	30	23	24	72	34	76	24	10.6	-3	-8	Taurids	
K-337	1986	10	31	4	5	325	78	328	77	1.2	4	0.3		
K-338	1986	10	31	4	5	.3	19	7	16	4.9	1	-4		
K-330	1986	11	1	0	1	288	10	286	16	3.6		_7	1	1
N-337	1007	11	1	1	1	200	19	200	10	20.2	-2	-/		1
N- 340	1980	11	5	1	2	260	28	239	- 30	28.3	-2	-7		

No.	VVVV	mm	dd	Expo	sure	Appear	ance	Disappe	arance	Length	Magnitude	9	Meteor	Note
				Time(h-h)	Az	Al	Az	Al	of trail	Photo.	Deduced	group	
K-341	1986	11	3	2	3	224	26	220	22	5.4	1	-4	<u> </u>	
K-342	1986	11	5	18	- 19	79	19	78	19	0.9	2	-3		
K-343	1986	11	8	2	3	88	56	92	55	2.5	4	0.3	Taurids	
K - 344	1986	11	8	22	23	288	22	288	21	1.0	0	-5	Taurids	
K-345	1986	11	10	3	4	47	27	41	23	6.7	-1	-6	Taurids	
K-346	1986	11	11	20	21	146	46	147	44	2.1	1	-4		
K-347	1986	11	12	4	5	359	64	1	59	5.1	5	1.5		
K-348	1986	11	18	20	21	8	58	2	60	3.7	0	-5		
K-349	1986	11	20	2	3	293	44	296	43	2.4	2	-3		
K-350	1986	11	20	23	24	103	40	105	41	1.8	1	-4	Taurids	
K-351	1986	11	21	18	- 19	77	8	67	7	10.0	1	-4		
K-352	1986	11	27	0	1	170	23	171	21	2.2	2	-3	Taurids	
K-353	1986	11	27	2	3	316	30	320	28	4.0	1	-4		
K-354	1986	11	29	22	23	108	8	108	7	1.0	1	-4		
K-355	1986	11	30	2	3	238	59	245	41	18.5	-1	-6	Taurids	
K-356	1986	12	5	4	5	247	37	248	34	3.1	2	-3	Taurids	
K-357	1986	12	6	4	5	49	12	48	10	2.2	2	-3		
K-358	1986	12	30	5	6	301	48	227	42	50.6	-4	-9		
K-359	1987	1	1	3	4	142	77	141	75	2.0	3	-1.5		
K-360	1987	1	2	3	4	291	53	290	49	4.0	0	-5		
K-361	1987	1	4	0	1	81	14	81	12	2.0	2	-3		
K-362	1987	1	4	3	4	248	24	249	21	3.1	4	0.3	Quadrantids	
K-363	1987	1	4	3	4	337	29	341	26	4.6	3	-1.5	Quadrantids	<u> </u>
K-364	1987	1	4	5	6	115	67	122	62	5.8	5	1.5		
K-365	1987	1	4	5	6	275	29	275	29	0.0	3	-1.5		
K-366	1987	1	20	19	20	14	18	11	14	4.9	0	-5		
K-367	1987	1	24	19	20	292	27	276	24	14.7	3	-1.5		
K-368	1987	1	26	22	23	200	50	198	46	4.2	3	-1.5		
K-369	1987	1	28	2	3	334	41	334	38	3.0	4	0.3		
K-370	1987	2	1	2	3	65	44	91	33	23.0	0	-5		
K-371	1987	3	1	20	21	78	18	79	17	1.4	0	-5		
K-372	1987	3	25	3	4	226	/9	235	/4	5.4	3	-1.5		
K-373	1987	3	25	4	5	342	19	345	18	3.0	2	-3		
K-3/4	1987	3	27	3	4	332	61	33/	63	3.1	3	1.5		
K-375	1987	2	30	0	1	1/2	41	1/3	33	8.0	4	0.3		
K-370	1987	3	30	22	24	82 215	8 70	82	8 70	0.0	1 5	-4		
K-3//	1987	4	27	23	24	515	70	321	10	2.1	3	1.5		
K-370	1987	4	27	23	24	275	23	0	10	3.7	3	-1.5		
K-379	1987	5	4	22	23	100	39	184	28	12.6	2	-3		
K-380	1987	5	7	2		179	32 87	104	20 60	28.4	2	-5		
K-387	1987	5	10	23	24	170	35	3	31	20.4		0.3		
K=383	1987	5	24	23	24	215	67	220	67	2.0	3	-1.5		
K 384	1987	5	29	0	1	213	32	13	26	11.3	-5	-10		
K-385	1987	5	31	21	22	34	77	44	74	3.9	2	-3		
K-386	1987	6	1	21	22	82	49	83	50	1.2	1	-4		
K-387	1987	6	4	1	2	237	60	240	60	1.5	2	-3		
K-388	1987	6	5	1	2	96	43	117	36	17.6	3	-1.5		
K-389	1987	6	17	1	2	75	82	165	78	14.4	-2	-7		
K-390	1987	6	21	23	24	152	56	170	31	28.0	-2	-7		
K-391	1987	6	27	2	3	246	65	242	64	2.0	3	-1.5		
K-392	1987	7	20	23	24	66	77	117	67	17.8	-1	-6		
K-393	1987	7	27	1	2	198	62	226	48	21.0	1	-4		
K-394	1987	7	27	23	24	266	61	252	57	8.2	-4	-9	Alpha-Capricorn	ids
K-395	1987	7	28	22	23	210	17	210	17	0.0	-1	-6		
K-396	1987	8	2	1	2	23	60	24	57	3.0	5	1.5		
K-397	1987	8	10	21	22	37	34	35	30	4.3	1	-4		
K-398	1987	8	27	23	24	37	13	34	11	3.6	1	-4		
K-399	1987	8	29	3	4	25	79	62	68	14.7	2	-3		
K-400	1987	8	29	22	23	1	44	4	39	5.5	3	-1.5		
K-401	1987	9	20	1	2	147	58	154	52	7.2	3	-1.5		
K-402	1987	9	21	0	1	11	12	11	9	3.0	3	-1.5		
K-403	1987	9	22	21	22	188	41	190	41	1.5	4	0.3	L	
K-404	1987	10	4	3	4	240	48	233	48	4.7	3	-1.5		
K-405	1987	10	13	3	4	135	19	135	18	1.0	-2	- 7		
K-406	1987	10	13	20	21	185	59	178	55	5.5	-1	-6		
K-407	1987	10	20	4	5	179	25	176	22	4.1	1	-4		
K-408	1987	10	21	20	21	152	37	135	22	21.0	-2	-7		

No.	уууу	mm	dd	Expo	sure	Appear	ance	Disappe	arance	Length	Magnitude)	Meteor	Note
				Time(h-h)	Az	Al	Az	Al	of trail	Photo.	Deduced	group	
K-409	1987	10	27	2.2	23	279	17	284	14	5.7	0	-5	0 1	
K 410	1087	10	27	22	23	323	27	320	25	3.1	3	15		
K=410 IZ 411	1907	10	27	22	23	525	27	320	25	5.4	3	-1.5	T	
K-411	1987	10	28	2	3	/1	35	12	26	9.0	-2	-/	Taurids	
K-412	1987	10	28	2	3	31	73	42	69	5.4	5	1.5	Taurids	
K-413	1987	10	28	4	5	343	36	349	33	5.8	3	-1.5		
K-414	1987	10	28	20	21	172	16	168	13	4.9	2	-3		
K-415	1987	11	9	20	21	40	45	41	43	2.1	2	-3		
K-416	1987	11	18	3	4	173	57	175	53	4 2	2	-3		
K 417	1087	11	10	3	4	104	55	100	57	3.4	2	3	Touride	
K=417 IZ 410	1907	11	10	10	10	240	33	109	70	15.7	Z		Taurius	
K-418	1987	11	20	18	19	340	80	//	/9	15.7	5	1.5		
K-419	1987	11	21	4	5	226	19	225	18	1.4	1	-4		
K-420	1987	11	21	23	24	236	27	237	22	5.1	1	-4		
K-421	1987	11	24	0	1	285	42	274	34	11.8	3	-1.5		
K-422	1987	11	24	18	19	94	64	101	62	3.8	5	1.5		
K-423	1987	11	24	21	22	244	52	231	48	9.2	3	-1.5	Taurids	
K-424	1987	11	25	18	19	146	59	146	59	0.0	3	-15		
K 425	1087	11	25	23	24	56	15	57	14	1.4	3	1.5		
K=425 V 426	1907	11	25	23	24	205	71	292	50	1.4	5	-1.5		
K=420 K_427	198/	11	20	4	3	283	/1	282	38	13.1	2	1.3		l
K-427	1987	11	29	18	19	186	44	195	31	14.8	3	-1.5		
K-428	1987	12	3	3	4	262	47	256	41	7.4	-4	-9		
K-429	1987	12	8	0	1	205	44	201	23	21.3	-4	-9		
K-430	1987	12	13	21	22	273	48	280	50	5.0	3	-1.5	Geminids	
K-431	1987	12	13	22	23	245	57	240	59	3.3	4	0.3	Geminids	
K-432	1987	12	13	2.2	23	102	12	99	6	67	0	_5		to behind forest
K-433	1987	12	13	23	24	115	45	117	37	8.1	_4	_9	Geminids	
K 434	1987	12	14	3		37	0	36	7	2.1	0	_5		1
K-434 K 425	1007	12	14	4	5	15	64	245	50	21.2	2	-5	Cominida	
K=435 V 426	1907	12	14	- 4	22	15	27	345	30	17.4	2	-5	Cominita	
K=430	1987	12	14	21	22	21	37	33	23	17.4	0	-3	Geminids	
K-43/	1987	12	14	21	22	287	21	294	15	9.0	-3	-8	Geminids	
K-438	1987	12	15	4	5	106	10	107	7	3.2	-3	-8	Geminids	
K-439	1987	12	15	5	6	61	38	48	30	13.4	1	-4	Geminids	
K-440	1987	12	16	23	24	308	26	307	23	3.1	1	-4		
K-441	1987	12	17	4	5	355	27	354	26	1.3	2	-3		
K-442	1987	12	17	4	5	119	22	119	14	8.0	-5	-10		
K-443	1987	12	17	19	20	206	27	206	23	4.0	0	-5		
K-444	1987	12	18	2	3	44	15	47	12	4.2	3	-1.5		
K-445	1987	12	19	2	3	125	15	126	13	2.2	2	-3		
K-446	1987	12	19	- 3	4	32	43	34	36	7.2	1	-4		
K-440 V 447	1007	12	20	2	2	52	+J 64	16	57	0.0	0			
K=447	1907	12	20		5	5	67	10	51	0.0	0	-0.2		
K=448	1987	12	20	4	3	02	0/	39	00	1.0	4	0.3		
K-449	1987	12	22	1	2	306	38	301	39	4.0	4	0.3		
K-450	1987	12	24	0	1	295	68	292	67	1.5	-1	-6		
K-451	1987	12	24	22	23	147	42	148	35	7.0	-2	-7		
K-452	1987	12	25	5	6	285	57	307	49	15.4	2	-3		
K-453	1987	12	26	4	5	229	22	227	19	3.5	0	-5		
K-454	1987	12	26	5	6	278	35	285	32	6.6	2	-3		
K-455	1987	12	27	1	2	105	49	106	48	1.2	4	0.3		
K 456	1987	12	28	1	2	290	20	296	14	6.6	1	0.3		1
K-457	1097	12	20	2	2	2/2	20	220	14	6.0	- T	0.5 7		1
V 450	1000	12	29 1	2	3	342	22	339	10	0.0	-2	-/		
K-438	1988	1	1	3	4	260	20	260	20	0.0		-4		l
<u>K-459</u>	1988	1	4	4	5	0	13	359	8	5.1	0	-5		
K-460	1988	1	10	21	22	114	23	114	23	0.0	3	-1.5		Į
K-461	1988	1	11	4	5	204	22	203	21	1.4	2	-3		l
K-462	1988	1	14	5	6	308	71	318	67	5.4	2	-3		
K-463	1988	1	16	23	24	305	79	350	74	11.2	3	-1.5		
K-464	1988	1	17	4	5	205	52	198	51	4.5	4	0.3		
K-465	1988	1	20	20	21	277	35	277	37	2.0	3	-1.5		
K-466	1988	2	14	1	21	58	26	57	25	1 3	4	03		1
K_467	1988	2	14	3		310	20	377	25	2.5	2	_1.5		
K_160	1000	∠ ר	19	20	-+	222	42	224	20 42	2.0	3	-1.3		
N=400 V 460	1700	2	19	20	21	333	42	354	43	1.2	4	0.5		
K-409	1988	5	8	20	21	216	58	48	3/	1.9	3	-1.5		<u> </u>
K-4/0	1988	3	10	23	24	516	14	318	10	4.5	3	-1.5		l
K-471	1988	3	20	4	5	172	72	172	70	2.0	3	-1.5		
K-472	1988	3	23	19	20	292	43	302	40	8.1	2	-3		
K-473	1988	3	24	4	5	174	76	174	74	2.0	4	0.3		
K-474	1988	4	10	21	22	132	15	134	14	2.2	3	-1.5		
K-475	1988	4	11	1	2	240	33	240	35	2.0	4	0.3		
K-476	1988	4	15	1	2	111	59	109	58	14	5	15		
A. 17 V		r	10	×	-	***	57			1.7	5	1.5		I

No.	VVVV	mm	dd	Expo	sure	Appear	ance	Disappe	arance	Length	Magnitude	9	Meteor	Note
				Time(h-h)	Az	Al	Az	Al	of trail	Photo.	Deduced	group	
K-477	1988	4	16	0	1	101	56	100	55	1.1	5	1.5		
K-478	1988	4	16	0	1	53	46	52	45	1.2	4	0.3		
K-479	1988	4	21	1	2	52	18	47	15	5.7	1	-4		
K-480	1988	4	23	2	3	122	52	121	45	7.0	0	-5	Lyrids	
K-481	1988	4	24	1	2	67	75	39	73	7.9	3	-1.5		
K-482	1988	5	8	21	22	37	13	37	12	1.0	1	-4		
K-483	1988	5	9	0	1	233	23	226	17	8.9	1	-4		
K-484	1988	5	12	21	22	167	72	167	69	3.0	2	-3		
K-485	1988	5	13	21	22	180	24	179	23	1.4	2	-3		
K-486	1988	5	16	21	22	222	61	231	66	6.4	2	-3		
K-487	1988	5	19	0	1	174	62	172	52	10.1	4	0.3		
K-488	1988	5	20	2	3	221	66	221	65	1.0	1	-4		
K-489	1988	5	24	1	2	63	13	65	12	2.2	3	-1.5		
K-490	1988	5	29	0	1	264	14	269	12	5.3	-3	-8		
K-491	1988	6	4	22	23	343	71	345	69	2.1	5	1.5		
K-492	1988	6	5	21	22	280	57	291	54	6.9	1	-4		
K-493	1988	6	13	22	23	140	73	135	74	1.7	5	1.5		
K-494	1988	7	1	21	22	231	73	217	65	9.4	1	-4		
K-495	1988	7	2	21	22	235	73	203	64	14.5	5	1.5		
K-496	1988	7	27	2	3	149	31	150	30	1.3	-1	-6		
K-497	1988	8	3	0	1	23	16	23	13	3.0	1	-4		
K-498	1988	8	3	2	3	188	21	187	19	2.2	2	-3		
K-499	1988	8	12	0	1	117	34	105	26	13.1	0	-5	Perseids	
K-500	1988	8	12	0	1	104	27	100	23	5.4	3	-1.5	Perseids	
K-501	1988	9	9	20	21	132	60	123	47	14.0	2	-3		
K-502	1988	9	9	21	22	304	52	293	56	7.6	2	-3		
K-503	1988	9	14	21	22	53	13	52	13	1.0	2	-3		
K-504	1988	9	15	0	1	228	63	219	64	4.1	3	-1.5		
K-505	1988	9	15	1	2	213	57	215	66	9.0	4	0.3		
K-506	1988	9	18	19	20	178	29	174	19	10.6	1	-4		
K-507	1988	9	20	1	2	242	38	247	35	5.0	1	-4		
K-508	1988	10	3	19	20	213	54	197	44	14.4	4	0.3		
K-509	1988	10	6	19	20	20	56	24	55	2.5	3	-1.5		
K-510	1988	10	7	1	2	331	33	327	27	6.9	4	0.3		
K-511	1988	10	9	2	3	13	33	9	29	5.3	1	-4		
K-512	1988	10	9	19	20	90	22	90	21	1.0	2	-3		
K-513	1988	10	9	21	22	196	67	195	67	0.4	3	-1.5		
K-514	1988	10	10	19	20	82	50	82	47	3.0	5	1.5		
K-515	1988	10	11	2	3	270	88	239	72	16.3	-1	-6		
K-516	1988	10	11	4	5	274	47	275	46	1.2	-1	-6		
K-517	1988	10	13	23	24	198	18	197	15	3.1	0	-5		
K-518	1988	10	14	1	2	324	11	324	10	1.0	2	-3		
K-519	1988	10	14	22	23	167	34	167	29	5.0	3	-1.5		
K-520	1988	10	19	19	20	227	37	228	33	4.1	5	1.5		
K-521	1988	10	27	19	20	70	23	74	16	7.9	-2	-7		
K-522	1988	10	31	21	22	293	18	296	19	3.0	3	-1.5		
K-523	1988	10	31	22	23	286	35	284	30	5.3	2	-3	1 aurids	
K-524	1988	10	51	22	23	349	27	352	23	4.8	3	-1.5	1 aurids	
K-525	1988	11	1	18	19	329	63	323	60	4.1	4	0.3		
K-520	1988	11	2	18	19	33/	59	558	5/	2.1	4	0.3		
N-32/	1988	11	3	3	4	145	/0	220	28	16.3	0	-3	Taunida	
K-528	1988	11	3	21	22	524	22	550	22	5.4	4	0.3	1 aurids	
K-529	1988	11	3	23	24	11/	28	118	26	2.2	0	-5	1 aurids	
N-330 V 521	1988	11	4	1	1	118	20	119	10	4.1		-4	1 aurids	1
N-331 K-522	1988	11	4	1	2	195	88	43	80	0.8	3	1.5	Taurida	1
N-332	1988	11	4	2	3	238	3/	238	24	13.0		-4	1 aurius	1
K-533	1900	11	4	2	4	220	14 51	32	12	3.3	1	-1.5	Taurida	
K-534	1700	11	4	2	4	220	21	230	20	10.0	-1	-0	Taurida	
K-333	1700	11	4	10	4	230	31	230	27	4.0	3	-1.5	r aurids Taurids	
K-530	1700	11	5	19	20	2/1	23	212	23	0.9	1	-5	r aurids Tauride	
K-520	1700	11	6	0	1	247	Q1	24/	9	2.0	1	=4 1	r aurius Tauride	1
K-538	1700	11	0	0	1	204	01 15	240	12	1/.0		-4	Tauride	
K 540	1000	11	6	1	1	332	13	331	12	3.2	-2	-/	1 aut tus	
K 540	1000	11	6	1	2	200	24	200	23	2.9	_2	0	Tauride	
K-541 K-542	1700	11	6	22	23	290	27	290	23	4.0	-3	-8	Tauride	
K 543	1988	11	6	22	23	354		357	44	4.9		15	1 aurrus	
K_544	1088	11	7	23	24	25		20	44	7 1	5	1.5	Taurids	
18-044	1700	11	/	0	1 I	227	55	223	48	/.1	3	1.3	1 aurrus	1

No.	уууу	mm	dd	Expo	sure	Appeara	ance	Disappe	arance	Length	Magnitude	e	Meteor	Note
				Time(h-h)	Az	Al	Az	Al	of trail	Photo.	Deduced	group	
K-545	1988	11	7	2	3	267	25	261	21	6.8	3	-1.5	Taurids	
K 546	1088	11	7	2	23	03	21	03	21	0.0	1	1.5	Tauride	
K=540	1000	11	7	22	2.5	202	21	200	12	0.0	1		Taurius	
K-54/	1988	11	/	23	24	302	16	300	12	4.4	1	-4	Taurids	
K-548	1988	11	8	0	1	57	23		20	3.1	2	-3	Taurids	
K-549	1988	- 11	8	18	19	46	52	45	52	0.6	2	-3		
K-550	1988	11	8	21	22	258	80	275	74	7.1	4	0.3	Taurids	
K-551	1988	11	8	21	22	293	26	294	24	2.2	2	-3	Taurids	
K-552	1988	11	8	21	22	2	18	4	16	2.8	1	-4	Taurids	
K-553	1988	11	8	22	23	8	27	12	24	47	1	-4	Taurids	
K-554	1088	11	0	- 22	1	202	27	258	70	11.7	2	-3	Tauride	
K-554	1000	11	0	1	1 2	204	20	200	24	5.4	2	-5	Taurida	
K-333	1900	11	9	1	2	204	20	200	24	3.4	0	-5		
K-556	1988	11	9	2	3	307	56	292	40	18.8	2	-3	Taurids	
K-557	1988	- 11	9	2	3	321	18	317	13	6.3	-3	-8	Taurids	
K-558	1988	11	9	3	4	238	45	242	40	5.8	3	-1.5		
K-559	1988	- 11	9	19	20	207	23	184	17	22.4	1	-4	Taurids	
K-560	1988	11	9	21	22	181	21	177	17	5.5	3	-1.5	Taurids	
K-561	1988	11	10	3	4	190	10	192	8	2.8	2	-3		
K-562	1988	11	10	20	21	95	30	95	30	0.0	- 1	_4		
K_562	1000	11	10	20	21	75	17	75	14	1.0	1 0		Tauride	1
N-505	1000	11	10	20	21	270	1/	270	10	1.0		-3	Taurida	1
N-304	1988	11	10	22	23	252	64	222	58	15.5	-2	-/		
K-565	1988	11	11	1	2	174	61	183	44	17.8	2	-3	Taurids	
K-566	1988	11	11	2	3	64	15	64	12	3.0	-2	-7	Taurids	
K-567	1988	11	11	22	23	50	59	59	49	11.3	2	-3	Taurids	
K-568	1988	11	11	23	24	276	71	249	62	13.8	1	-4	Taurids	
K-569	1988	11	12	3	4	179	24	176	20	4.9	-3	-8		
K-570	1988	11	12	4	5	234	32	230	27	6.1	-1	-6		
K-571	1988	11	13	19	20	123	40	124	39	1.3	2	-3		
K-572	1988	11	14	22	23	348	21	350	17	4.4	-1	-6	Taurids	
K-572	1088	11	14	22	23	353	21	352	35	4.1	-1	-0	Taurids	
K-575	1000	11	15	25	27	250	20	352	25	5.0	2	1.5	1 dui lus	
K-5/4	1988	11	15	22	23	259	30	265	33	5.0	3	-1.5		
K-575	1988	11	15	23	24	341	65	357	64	6.9	0	-5	Taurids	
K-576	1988	- 11	17	0	1	199	43	198	35	8.0	-1	-6	Taurids	
K-577	1988	11	17	5	6	79	18	80	18	1.0	-2	-7		
K-578	1988	11	17	3	4	240	35	240	35	0.0	2	-3		
K-579	1988	- 11	28	21	22	181	55	178	53	2.7	1	-4		
K-580	1988	11	- 29	22	23	43	55	44	52	3.1	4	0.3		
K-581	1988	11	29	5	6	101	41	103	43	2.5	1	-4		
K-582	1988	11	30	18	19	333	64	333	62	2.0	4	0.3		
K 583	1988	11	30	19	20	8	50	7	48	2.1	4	0.3		
K-584	1088	12	1	10	20	71	32	72	31	13	1	-4		
K-504	1000	12	2	19	10	202	52	200	50	2.4	2	1.5		
K 505	1900	12	2	10	19	292	52	290	30	2.4	3	-1.5		
K-580	1988	12	3	3	4	264	56	249	41	17.9	-2	-/		
K-58/	1988	12	6	3	4	277	39	275	37	2.5	3	-1.5		
K-588	1988	12	6	19	20	87	37	88	27	10.0	-4	-9		Į
K-589	1988	12	6	2	3	274	55	276	67	12.0	4	0.3		
K-590	1988	12	8	3	4	1	25	358	21	4.9	1	-4		
K-591	1988	12	10	5	6	319	52	323	53	2.6	-3	-8		
K-592	1988	12	11	3	4	13	18	8	15	5.7	-3	-8		
K-593	1988	12	12	- 0	1	213	50	2.08	42	8.7	3	-1.5		İ
K 594	1988	12	12	0 0	1	213	21	200	12	<u>8</u> 1	2	_3	Geminids	
K-505	1090	12	12	1	1 2	200	21 64	202	50	14 5	2	-3	Geminide	
N 500	1700	12	12	1	2	321	22	328	25	14.3	-2	-/	Gemmus	1
N-390	1988	12	12	21		210	32	213	33	3.9	4	0.3		l
K-397	1988	12	13	0	1	10	41	1	31	10.3	2	-3	a · · ·	l
К-598	1988	12	13	1	2	199	23	198	15	8.1	0	-5	Geminids	
K-599	1988	12	13	22	23	162	45	154	39	8.4	3	-1.5		
K-600	1988	12	13	23	24	282	70	288	72	2.8	5	1.5	Geminids	
K-601	1988	12	13	23	24	281	31	282	28	3.1	5	1.5	Geminids	
K-602	1988	12	14	0	1	332	70	345	70	4.4	3	-1.5	Geminids	
K-603	1988	12	14	0	1	249	42	248	34	8.0	2	-3	Geminids	
K-604	1988	12	14	0	1	249	31	247	18	13.1	-4	_9	Geminids	İ
K-605	1988	12	14	Ň	1	214	28	217	22	63	4	03	Geminids	1
K-606	1000	12	14	2	2	<u></u>	20 73	212	61	0.3	+ 1	0.5	Geminide	1
K 600	1700	12	14	2	3	41	/ 3	22	24	9.3	-Z	-/	Cominida	1
K-00/	1760	12	14	3	4	/3	41	/3	30	5.0	4	0.3	Cominitation	1
K-608	1988	12	14	4	5	5	21	4	18	3.1		-4	Geminids	
K-609	1988	12	14	4	5	32	33	30	31	2.6	5	1.5	Geminids	
K-610	1988	12	14	4	5	39	40	32	36	6.8	4	0.3	Geminids	
K-611	1988	12	14	4	5	230	46	235	38	8.8	4	0.3	Geminids	
K-612	1988	12	14	4	5	250	21	251	16	5.1	5	1.5	Geminids	

box box <th>No.</th> <th>уууу</th> <th>mm</th> <th>dd</th> <th>Expo</th> <th>sure</th> <th>Appear</th> <th>ance</th> <th>Disappe</th> <th>arance</th> <th>Length</th> <th>Magnitude</th> <th>e</th> <th>Meteor</th> <th>Note</th>	No.	уууу	mm	dd	Expo	sure	Appear	ance	Disappe	arance	Length	Magnitude	e	Meteor	Note
Sec10 1988 12 14 11 23 <t< td=""><td></td><td></td><td></td><td></td><td>Time(</td><td>h-h)</td><td>Az</td><td>Al</td><td>Az</td><td>Al</td><td>of trail</td><td>Photo.</td><td>Deduced</td><td>group</td><td></td></t<>					Time(h-h)	Az	Al	Az	Al	of trail	Photo.	Deduced	group	
Kenta UBB 12 18 1 1 2 2 3 2 3 3 1 Kenta UBB 12 2 1 10 100 74 108 6.6 3 3 1.5 Kenta UBB 12 2 1 1 2 1 1 100 <td>K-613</td> <td>1988</td> <td>12</td> <td>14</td> <td>21</td> <td>22</td> <td>30</td> <td>43</td> <td>37</td> <td>36</td> <td>8.8</td> <td>4</td> <td>0.3</td> <td>Geminids</td> <td></td>	K-613	1988	12	14	21	22	30	43	37	36	8.8	4	0.3	Geminids	
Sends Jugal L2 21 1 1 2 64 Jugal 12 64 Jugal 13 2 10 74 100 74	K-614	1988	12	18	1	2	52	29	50	26	3.5	-2	-7		
Kadb 198 12 28 0 1 102 74 108 66 5 1.5 Kalls 1988 12 31 3 4 12 21 13 14 12 13 14 12 13 14 12 13 14 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 13 14 <t< td=""><td>K-615</td><td>1988</td><td>12</td><td>21</td><td>1</td><td>2</td><td>64</td><td>12</td><td>63</td><td>7</td><td>5.1</td><td>-2</td><td>-7</td><td></td><td></td></t<>	K-615	1988	12	21	1	2	64	12	63	7	5.1	-2	-7		
KarD 1988 12 31 3 4 15 28 15 27 2.0 0 5 K410 1988 1 222 27 103 70 110 2 1-15 K410 1989 1 12 21 22 22 22 33 1-15 Constraints K421 1989 1 12 22 23 103 110 1 -4 K422 1999 1 15 4 5 10 13 8.1 -1 -6 K423 1999 1 15 4 5 10 2 -5 2 -5 2 2 10 2 13 3 4 15 0 13 14 14 14 14 14 14 14 2 -5 2 2 2 2 2 2 2 2 2 2 2 <	K-616	1988	12	28	0	1	102	74	108	68	6.3	3	-1.5		
Constr Constr <thconst< th=""> <thconst< th=""> Const</thconst<></thconst<>	K-617	1988	12	31	3	4	13	28	15	27	2.0	0	-5		1
Example Inst. P1 P2 P3	K-618	1988	12	31	3	4	227	27	228	27	0.9	3	-1.5		1
School 1989 1 4 5 6 278 65 278 65 271 7	K-619	1989	1	2	4	5	163	71	163	70	1.0	3	-1.5		1
Kac2 1990 1 12 22 22 360 365 15 100 3 1.4 Kac3 1980 1 12 23 23 56 16 56 15 100 3 1.5 1.5 Kac3 1980 1 11 12 23 199 202 21 97 3 1.5 1.5 Kac3 1980 1 17 0 1 282 17 100 0 45 1.5 Kac3 1980 1 31 2 2 32 35 53 3 1.5 1.5 Kac3 1980 2 1 32 2 32 32 35 33 31 14 4 14 14 2 33 1.5 1.5 Kac3 1980 2 11 2 33 34 31 10 33 1.5 1.5 1.	K-620	1989	1	4	5	6	273	65	278	65	2.1	3	-1.5	Quadrantids	1
Kar21 1998 1 11 12 12 12 13 14 <th< td=""><td>K-621</td><td>1989</td><td>1</td><td>12</td><td>21</td><td>22</td><td>322</td><td>30</td><td>323</td><td>19</td><td>11.0</td><td>1</td><td>-4</td><td>Quadrantico</td><td>1</td></th<>	K-621	1989	1	12	21	22	322	30	323	19	11.0	1	-4	Quadrantico	1
Sec3 1989 1 1 2 2 2 9 21 9 1 8 1 1 6 1 K-63 1989 1 1 2 1 2 2 2 2 2 2 2 3 1-15 1 K-62 1989 1 2 2 2 2 3 1-15 1 1 2 3 1 5 1 1 1 2 3 1 1 1 2 3 1 </td <td>K-622</td> <td>1989</td> <td>1</td> <td>12</td> <td>23</td> <td>24</td> <td>356</td> <td>16</td> <td>356</td> <td>15</td> <td>1.0</td> <td>3</td> <td>-15</td> <td></td> <td></td>	K-622	1989	1	12	23	24	356	16	356	15	1.0	3	-15		
Kad2 1989 1 15 1 1 1 1 2 1 2 2 1 2 1	K-623	1989	1	13	21	22	96	21	97	13	8.1	-1	-6		1
K.AC3 1980 1 17 0 1 282 29 28 10 2 -5 K.AC3 1980 1 31 2 17 82 17 00 0 -5 K.AC3 1980 1 31 2 30 2 30 -5 - K.AC3 1980 2 2 5 188 68 4.3 2 -5 K.AC3 1980 2 4 32 34 37 10 3 -5 - K-631 1980 2 11 2 33 34 37 10 3 -15 - K-641 1980 3 10	K-624	1989	1	15	4	5	196	29	202	21	9.7	3	-15		
$ \begin{array}{c ccccc} 1 & 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 &$	K-625	1989	1	17	0	1	282	29	282	21	1.0	2	-3		
CACC 1980 1 30 2 6 101 73 77 7	K-626	1989	1	27	20	21	82	17	82	17	0.0	0	-5		
Second 1989 1 2 3 3 5 1 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 1 4 1	K-627	1989	1	30	20	1	181	73	178	71	2.0	3	-1.5		
6.402 1 (198) 2 2 3 -103 -103 K-601 1989 2 4 23 24 23 26 23 64 14 14 0.3 -103 -103 K-601 1989 2 10 23 24 7 10 7 3.0 1 -4 -4 K-632 1989 2 11 2 120 121 107 12 20.3 0 -5 K-634 1989 2 11 2 1107 12 20.3 0 -5 -5 100 10 20 2 -3 100 10 2 -3 100 10 2 -3 100 10 2 -3 100 10 2 -3 100 10 2 10 10 10 10 10 10 10 11 2 10 10 10 10 10	K-628	1989	1	31	2	3	230	55	238	58	5.3	3	-1.5		
Society Loss Loss <thloss< th=""> Loss Loss <</thloss<>	K-620	1989	2	21	5	6	190	72	185	68	4.3	2	-1.5		
Sold 1 1200 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 2 3 2 3 2 3 1 <th1< td=""><td>K-630</td><td>1080</td><td>2</td><td></td><td>23</td><td>24</td><td>32</td><td>62</td><td>33</td><td>61</td><td>1.1</td><td></td><td>0.3</td><td></td><td></td></th1<>	K-630	1080	2		23	24	32	62	33	61	1.1		0.3		
Solar 100 2 1<	K-631	1080	2		23	24		15	40	14	1.1	4	-3		
Soc. 1 - 20 1 - 20 1 - 20 1 - 20 1 - 40 1 - 40 K-633 1689 2 11 4 5 3126 0 -5 K-634 1689 2 11 4 5 3126 0 -5 K-635 1689 2 26 20 21 300 15 308 10 9.3 2 -3 0 behind mountain K-636 1898 3 10 20 21 7 33 43 11 39.6 4 -9 K-640 1989 3 10 20 21 7 33 43 11 22 -3 - - K-641 1989 3 11 22 37 17 32 12 7 2 -3 - - - - - - - - - - - - - - - <td>K-632</td> <td>1980</td> <td>∠ 2</td> <td>10</td> <td>2</td> <td>2/</td> <td>- 41 - 7</td> <td>13</td> <td>40</td> <td>14</td> <td>3.0</td> <td></td> <td>-3</td> <td></td> <td>1</td>	K-632	1980	∠ 2	10	2	2/	- 41 - 7	13	40	14	3.0		-3		1
3.32. $1.24.$ 2 11 12 22.3 0 2 12 22.3 0 2 11 4 5 33 33 33 31 10 3 -1.5 K-635 1989 2 2 2 2 2 2 2 3 10 22 23 10 12 12 14 5 11 24 11 21 73 43 11 30 4 21 73 43 11 20 4 2 33 11 10 41 41 21 41 21 41 21 41 21 41 41 21 31 31 30 41 21 31 31 30 41 21 31 41 31 31 31 31 31 31 31 31 31 <td>K-632</td> <td>1000</td> <td>∠ 2</td> <td>10</td> <td>23</td> <td>24</td> <td>126</td> <td>21</td> <td>107</td> <td>12</td> <td>20.2</td> <td>1</td> <td>-4</td> <td></td> <td>+</td>	K-632	1000	∠ 2	10	23	24	126	21	107	12	20.2	1	-4		+
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	K_624	1709	2	11		5	120	20	224	12	20.3	2	-3		+
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	N=034 V 625	1787	2	11	4	2	334	38	214	21	1.0	3	-1.5		<u> </u>
Network 1 2007 20 201 10 2001 11 2002 12 24 111 21 3.1 1 1 44 K-638 1989 3 10 20 21 7 33 43 11 39.6 44 49 K-640 1989 3 12 4 5 78 64 94 63 7.2 4 0.3 K-641 1989 3 29 20 21 357 17 352 12 7.0 2 -3 K-641 1989 4 4 5 24 28 68 290 64 16.8 3 -1.5 Virginids K-644 1989 4 13 3 4 61 20 21 14 0.3 -1.5 Virginids K-647 1989 4 26 21 114 20 -1 -4 0.3 -1	N-033	1989	2	14	2	21	200	40	214	01	22.9	2	-3		to babind mountain
Secon 1 1097 2 9 4 3 112 24 111 21 3.1 1 1 44 K-639 1989 3 10 20 21 7 33 43 111 30 6 4 9 K-640 1989 3 12 4 5 78 64 94 63 7.2 4 0.3 K-641 1989 3 20 21 357 17 352 12 7.0 2 -3 K-644 1989 4 13 3 4 14 20 64 16.8 3 -1.5 Virginids K-646 1989 4 12 3 14 64 16 7.1 4 0.3 1.5 Virginids K-647 1989 4 22 20 21 12 14 9.0 -1 -6 K K-646 1989	K-030	1989	2	26	20	21	300	15	308	10	9.3	2	-3		to benina mountain
Sector 1 as 2 2 b 1 as 22 2 b 2 b	N-03/	1989	3	9	4	21	112	24	42	21	3.1	1	-4		
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Ke-H0 1989 3 16 4 5 7.2 4 0.3 Ke-H01 1989 3 16 4 5 30 6.5 4 0.3 Ke-411 1989 4 2 3 4 27 47 28 43 41 2 -3 Ke-641 1989 4 5 23 24 258 68 299 64 16.8 3 -1.5 Ke-641 1989 4 13 3 4 61 20 61 14.4 0.3 Ke-647 1989 4 22 3 4 105 64 106 79 2 1 -4 0.3 Ke-647 1989 4 26 20 21 114 20 11 14 3 -1.5 Ke-648 1989 4 26 20 21 22 58 52 23 14	K-639	1989	3	11	22	23	301	44	297	40	5.0	3	-1.5		
Ke41 1989 3 10 4 3 102 34 105 30 6.5. 4 0.5 Ke412 1989 4 2 3 4 27 47 28 43 4.1 2 -3 Ke43 1989 4 13 3 4 61 20 60 19 1.4 3 -1.5 Virginids Ke441 1989 4 12 3 63 52 64 50 2.1 4 0.3 Ke461 1989 4 22 3 4 105 64 106 7.2.1 4 0.3 Ke461 1989 4 26 12 114 20 11 14 9.0 -1 -6 Ke430 1989 4 26 20 21 12 11 4 9.0 -1 -6 Ke451 1989 4 26 20	K-640	1989	3	12	4	5	78	64	94	63	1.2	4	0.3		
Ke643 J989 J J29 J20 J21 J32 J11 J32 J12 J00 J2 -s Ke641 J989 4 2 3 4 C C S S	K-641	1989	3	16	4	3	162	34	156	30	6.5	4	0.3		
K-644 1989 4 2 3 4 2 4 4 4 2	K-642	1989	3	29	20	21	357	17	352	12	7.0	2	-3		
K-645 1989 4 15 2.3 2.4 2.8 68 2.99 64 16.8 3 4 61 200 600 19 1.4 3 1.5 5 K-646 1989 4 12 2 3 63 52 64 50 2.1 4 0.3	K-643	1989	4	2	3	4	27	47	28	43	4.1	2	-3	*** * * *	
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K-647 1989 4 22 3 4 195 64 216 67 9.2 1 -4 K-648 1989 4 26 1 2 114 20 121 14 9.0 -1 -6 K-649 1989 4 26 1 2 114 20 121 14 9.0 -1 -6 K-651 1989 4 26 20 21 113 61 124 91 11 14 3 -1.5 K-652 1989 5 9 21 22 58 83 52 3.1 4 0.3 K-655 1989 6 1 21 22 15 83 359 73 10.4 3 -1.5 K-655 1989 6 1 21 22 15 25 26 24 1.4 -1 -6 11 14 14	K-646	1989	4	14	2	3	63	52	64	50	2.1	4	0.3		
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K-650 1989 4 26 20 21 113 61 124 55 8.3 2 -3 K-651 1989 5 9 21 22 50 58 60 53 7.5 1 -4 K-653 1989 5 29 21 22 50 58 60 53 7.5 1 -4 K-653 1989 6 1 21 22 15 83 359 73 10.4 3 -1.5 K-655 1989 6 1 21 22 15 83 359 73 10.4 3 -1.5 K-656 1989 6 1 21 22 15 25 256 3.4 4 0.3 -	K-649	1989	4	26	1	2	114	20	121	14	9.0	-1	-6		
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K-653 1989 5 29 21 22 78 52 83 52 3.1 4 0.3 K-654 1989 6 1 21 22 15 83 359 73 10.4 3 -1.5 K-655 1989 6 1 23 24 229 58 234 56 3.4 4 0.3 K-657 1989 6 1 23 24 229 58 234 56 3.4 4 0.3 K-657 1989 6 1 23 24 229 58 234 56 3.4 4 0.3 K-657 1989 7 1 1 2 257 256 24 1.4 -1 -6 K-6661 1989 7 28 21 22 137 45 140 42 3.7 3 -1.5 K-661 1989 7 28 23 24 23 19 22 1.4 0 -5 <td>K-652</td> <td>1989</td> <td>5</td> <td>9</td> <td>21</td> <td>22</td> <td>50</td> <td>58</td> <td>60</td> <td>53</td> <td>7.5</td> <td>1</td> <td>-4</td> <td></td> <td></td>	K-652	1989	5	9	21	22	50	58	60	53	7.5	1	-4		
K-654 1989 6 1 21 22 16 19 60 4.9 2 -3 K-655 1989 6 1 21 22 15 83 359 73 10.4 3 -1.5 K-656 1989 6 1 23 24 229 58 234 56 3.4 4 0.3 K-657 1989 6 2 23 24 40 81 154 44 50.2 -6 -11 K-658 1989 7 21 12 257 25 256 24 1.4 -1 -6 K-660 1989 7 21 22 137 45 140 42 3.7 3 -1.5 K-661 1989 7 28 21 22 137 45 140 42 3.7 3 -1.5 K-661 1989 7 30 22 23 97 23 98 22 1.4 0 -5 -5 <	K-653	1989	5	29	21	22	78	52	83	52	3.1	4	0.3		
K-655 1989 6 1 21 22 15 83 359 73 10.4 3 -1.5 K-656 1989 6 1 23 24 229 58 234 56 3.4 4 0.3 K-657 1989 6 2 23 24 40 81 154 44 50.2 -6 -11 K-658 1989 7 1 1 2 257 25 256 24 1.4 -1 -6 K-650 1989 7 5 21 22 112 65 105 67 3.5 2 -3 K-660 1989 7 28 21 22 137 45 140 42 3.7 3 -1.5 K-661 1989 7 28 23 24 233 19 222 17 2.2 -1 -6 -6 K-664 1989 8 4 1 2 351 24 347 21 <t< td=""><td>K-654</td><td>1989</td><td>5</td><td>30</td><td>20</td><td>21</td><td>25</td><td>64</td><td>19</td><td>60</td><td>4.9</td><td>2</td><td>-3</td><td></td><td></td></t<>	K-654	1989	5	30	20	21	25	64	19	60	4.9	2	-3		
K-656 1989 6 1 2.3 2.4 2.29 58 2.24 56 3.4 4 0.3 K-657 1989 6 2 2.3 2.4 40 81 154 44 50.2 -6 -11 K-657 1989 7 1 1 2 27 25 256 24 1.4 -1 -6 K-650 1989 7 25 21 0.5 105 67 3.5 2 -3 -3 K-660 1989 7 28 21 22 137 45 140 42 3.7 3 -1.5 K-661 1989 7 28 23 24 23 19 222 17 2.2 -1 -6 K-664 1989 8 4 1 2 351 24 347 21 4.8 -3 -8 K-666 1989 8 4 1 2 351 77 56 6.9 1 -4 <td>K-655</td> <td>1989</td> <td>6</td> <td>1</td> <td>21</td> <td>22</td> <td>15</td> <td>83</td> <td>359</td> <td>73</td> <td>10.4</td> <td>3</td> <td>-1.5</td> <td></td> <td></td>	K-655	1989	6	1	21	22	15	83	359	73	10.4	3	-1.5		
K-657 1989 6 2 23 24 40 81 154 44 50.2 -6 -11 K-658 1989 7 1 1 2 257 25 256 24 1.4 -1 -6 K-659 1989 7 5 21 22 112 65 105 67 3.5 2 -3 K-660 1989 7 28 21 22 1137 45 140 42 3.7 3 -1.5 K-661 1989 7 28 23 24 223 19 222 17 2.2 -1 -6 K-661 1989 7 30 22 23 97 23 98 22 1.4 0 -5 K-666 1989 8 4 1 2 351 24 347 21 4.8 -3 -8 K-666 1989 8 4 1 2 351 77 56 6.9 1 -4<	K-656	1989	6	1	23	24	229	58	234	56	3.4	4	0.3		
K-658 1989 7 1 1 2 257 25 256 24 1.4 -1 -6 K-659 1989 7 25 21 12 121 122 112 123 114 -1 -6 K-660 1989 7 27 3 4 65 66 48 64 7.4 1 -4 K-660 1989 7 28 21 22 137 45 140 42 3.7 3 -1.5 K-661 1989 7 30 22 23 97 23 98 22 1.4 0 -5 K-664 1989 8 4 1 2 351 24 347 21 4.8 3.5 -1 -6 K-666 1989 8 4 20 21 85 51 77 56 6.9 1 -4 K-666 1989 8 10 3 4 8 40 5 41 2.5	K-657	1989	6	2	23	24	40	81	154	44	50.2	-6	-11		
K-65919897521221126510567 3.5 2 -3 K-660198972734656648647.41 -4 K-6611989728212213745140423.73 -1.5 K-6621989728232422319222172.2 -1 -6 K-6631989730222397239822 1.4 0 -5 K-664198984123512434721 4.8 -3 -8 K-664198984222346214818 3.5 -1 -6 K-665198984222346214818 3.5 -1 -6 K-66619898901265562895813.20 -5 PerseidsK-6661989810348405412.51 -4 K-6671989810348405412.51 -4 K-6681989810348405412.51 -4 K-670198981112297453014	K-658	1989	7	1	1	2	257	25	256	24	1.4	-1	-6		
K-660 1989 7 27 3 4 65 66 48 64 7.4 1 -4 K-661 1989 7 28 21 22 137 45 140 42 3.7 3 -1.5 K-662 1989 7 28 23 24 223 19 222 17 2.2 -1 -6 K-663 1989 7 30 22 351 24 347 21 4.8 -3 -8 K-665 1989 8 4 12 351 24 347 21 4.8 -3 -8 K-666 1989 8 4 22 23 46 21 48 18 3.5 -1 -6 K-666 1989 8 20 21 85 51 77 56 6.9 1 -4 -4 K-666 1989 8 10 3 4 8 40 5 41 2.5 1 -4	K-659	1989	7	5	21	22	112	65	105	67	3.5	2	-3		ļ
K-6611989728212213745140423.73 -1.5 K-6621989728232422319222172.2 -1 -6 K-66319897302223972398221.40 -5 K-6641989841235124347214.8 -3 -8 K-6641989842223462148183.5 -1 -6 K-6661989842223462148183.5 -1 -6 K-66619898202185517756 6.9 1 -4 K-6671989810348405412.51 -4 K-6691989810348405412.51 -4 K-6701989811014549781543.41 -4 K-6711989813234642443210.1 -3 -8 PerseidsK-671198981323325523344410.02 -3 PerseidsK-6721989912212210060106 <td>K-660</td> <td>1989</td> <td>7</td> <td>27</td> <td>3</td> <td>4</td> <td>65</td> <td>66</td> <td>48</td> <td>64</td> <td>7.4</td> <td>1</td> <td>-4</td> <td></td> <td>ļ</td>	K-660	1989	7	27	3	4	65	66	48	64	7.4	1	-4		ļ
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K-663 1989 7 30 22 23 97 23 98 22 1.4 0 -5 K-664 1989 8 4 1 2 351 24 347 21 4.8 -3 -8	K-662	1989	7	28	23	24	223	19	222	17	2.2	-1	-6		
K-664 1989 8 4 1 2 351 24 347 21 4.8 -3 -8 K-665 1989 8 4 22 23 46 21 48 18 3.5 -1 -6 K-666 1989 8 8 20 21 85 51 77 56 6.9 1 -4 K-667 1989 8 9 0 1 265 56 289 58 13.2 0 -5 Perseids K-667 1989 8 10 3 4 8 40 5 41 2.5 1 -4 K-669 1989 8 11 0 1 45 49 78 15 43.4 1 -4 K-670 1989 8 13 2 3 46 42 44 32 10.1 -3 -8 Perseids K-671 1989 8 14 2 3 325 52 334 44	K-663	1989	7	30	22	23	97	23	98	22	1.4	0	-5		ļ
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K-666 1989 8 8 20 21 85 51 77 56 6.9 1 -4 K-667 1989 8 9 0 1 265 56 289 58 13.2 0 -5 Perseids K-668 1989 8 10 3 4 8 40 5 41 2.5 1 -4 K-669 1989 8 11 0 1 45 49 78 15 43.4 1 -4 K-670 1989 8 11 1 2 297 45 301 42 4.2 -2 -7 Perseids K-671 1989 8 13 2 3 46 42 44 32 10.1 -3 -8 Perseids K-671 1989 8 14 2 3 325 52 334 44 10.0 2 -3 Perseids K-671 1989 9 12 21 22 131	K-665	1989	8	4	22	23	46	21	48	18	3.5	-1	-6		I
K-667 1989 8 9 0 1 265 56 289 58 13.2 0 -5 Perseids K-668 1989 8 10 3 4 8 40 5 41 2.5 1 -4 K-669 1989 8 11 0 1 45 49 78 15 43.4 1 -4 K-670 1989 8 11 1 2 297 45 301 42 4.2 -2 -7 Perseids K-671 1989 8 13 2 3 46 42 44 32 10.1 -3 -8 Perseids K-671 1989 8 14 2 3 325 52 334 44 10.0 2 -3 Perseids K-671 1989 8 14 2 3 325 52 334 44 10.0 2 -3 Perseids K-673 1989 10 1 1 2 <td>K-666</td> <td>1989</td> <td>8</td> <td>8</td> <td>20</td> <td>21</td> <td>85</td> <td>51</td> <td>77</td> <td>56</td> <td>6.9</td> <td>1</td> <td>-4</td> <td></td> <td></td>	K-666	1989	8	8	20	21	85	51	77	56	6.9	1	-4		
K-668 1989 8 10 3 4 8 40 5 41 2.5 1 -4 K-669 1989 8 11 0 1 45 49 78 15 43.4 1 -4 K-670 1989 8 11 1 2 297 45 301 42 4.2 -2 -7 Perseids K-671 1989 8 13 2 3 46 42 44 32 10.1 -3 -8 Perseids K-671 1989 8 14 2 3 325 52 334 44 10.0 2 -3 Perseids K-671 1989 8 14 2 3 325 52 334 44 10.0 2 -3 Perseids K-671 1989 9 12 21 22 100 60 106 45 15.4 -4 -9 K-673 1989 10 1 18 19 45 <td>K-667</td> <td>1989</td> <td>8</td> <td>9</td> <td>0</td> <td>1</td> <td>265</td> <td>56</td> <td>289</td> <td>58</td> <td>13.2</td> <td>0</td> <td>-5</td> <td>Perseids</td> <td></td>	K-667	1989	8	9	0	1	265	56	289	58	13.2	0	-5	Perseids	
K-669 1989 8 11 0 1 45 49 78 15 43.4 1 -4 K-670 1989 8 11 1 2 297 45 301 42 4.2 -2 -7 Perseids K-671 1989 8 13 2 3 46 42 44 32 10.1 -3 -8 Perseids K-671 1989 8 14 2 3 325 52 334 44 10.0 2 -3 Perseids K-671 1989 8 14 2 3 325 52 334 44 10.0 2 -3 Perseids K-671 1989 9 12 21 22 100 60 106 45 15.4 -4 -9 K-673 1989 10 1 12 132 25 131 22 3.1 1 -4 K-674 1989 10 1 18 19 45	K-668	1989	8	10	3	4	8	40	5	41	2.5	1	-4		
K-670 1989 8 11 1 2 297 45 301 42 4.2 -2 -7 Perseids K-671 1989 8 13 2 3 46 42 44 32 10.1 -3 -8 Perseids K-671 1989 8 14 2 3 325 52 334 44 10.0 2 -3 Perseids K-673 1989 9 12 21 22 100 60 106 45 15.4 -4 -9 K-674 1989 10 1 1 2 132 25 131 22 3.1 1 -4 K-674 1989 10 1 18 19 45 67 61 66 6.4 2 -3 K-675 1989 10 8 20 21 222 18 223 17 1.4 0 -5 K-676 1989 10 8 20 21 228 30 <td>K-669</td> <td>1989</td> <td>8</td> <td>11</td> <td>0</td> <td>1</td> <td>45</td> <td>49</td> <td>78</td> <td>15</td> <td>43.4</td> <td>1</td> <td>-4</td> <td></td> <td></td>	K-669	1989	8	11	0	1	45	49	78	15	43.4	1	-4		
K-671 1989 8 13 2 3 46 42 44 32 10.1 -3 -8 Perseids K-672 1989 8 14 2 3 325 52 334 44 10.0 2 -3 Perseids K-673 1989 9 12 21 22 100 60 106 45 15.4 -4 -9 K-674 1989 10 1 1 2 132 25 131 22 3.1 1 -4 K-674 1989 10 1 18 19 45 67 61 66 6.4 2 -3 K-675 1989 10 1 18 19 45 67 61 66 6.4 2 -3 K-676 1989 10 8 20 21 222 18 223 17 1.4 0 -5 K-677 1989 10 9 4 5 287 30 293	K-670	1989	8	11	1	2	297	45	301	42	4.2	-2	-7	Perseids	
K-672 1989 8 14 2 3 325 52 334 44 10.0 2 -3 Perseids K-673 1989 9 12 21 22 100 60 106 45 15.4 -4 -9 K-674 1989 10 1 1 2 132 25 131 22 3.1 1 -4 -9 K-674 1989 10 1 12 132 25 131 22 3.1 1 -4 K-675 1989 10 1 18 19 45 67 61 66 6.4 2 -3 K-676 1989 10 8 20 21 222 18 223 17 1.4 0 -5 K-677 1989 10 9 4 5 287 30 293 12 18.8 -4 -9 -9 K-678 1989 10 18 0 1 245 55 239	K-671	1989	8	13	2	3	46	42	44	32	10.1	-3	-8	Perseids	
K-673 1989 9 12 21 22 100 60 106 45 15.4 -4 -9 K-674 1989 10 1 1 2 132 25 131 22 3.1 1 -4 K-674 1989 10 1 18 19 45 67 61 66 6.4 2 -3 K-675 1989 10 8 20 21 222 18 223 17 1.4 0 -5 K-676 1989 10 9 4 5 287 30 293 12 18.8 -4 -9 K-678 1989 10 18 0 1 245 55 239 50 6.2 -2 -7 K-678 1989 10 20 23 24 357 47 356 46 1.2 3 -1.5 K-680 1989 10 21 3 4 215 36 214 35 1.3 <	K-672	1989	8	14	2	3	325	52	334	44	10.0	2	-3	Perseids	
K-674 1989 10 1 1 2 132 25 131 22 3.1 1 -4 K-675 1989 10 1 18 19 45 67 61 66 6.4 2 -3 K-676 1989 10 8 20 21 222 18 223 17 1.4 0 -5 K-677 1989 10 9 4 5 287 30 293 12 18.8 -4 -9 K-678 1989 10 18 0 1 245 55 239 50 6.2 -2 -7 K-679 1989 10 20 23 24 357 47 356 46 1.2 3 -1.5 K-680 1989 10 21 3 4 215 36 214 35 1.3 1 -4	K-673	1989	9	12	21	22	100	60	106	45	15.4	-4	-9		
K-675 1989 10 1 18 19 45 67 61 66 6.4 2 -3 K-676 1989 10 8 20 21 222 18 223 17 1.4 0 -5 K-677 1989 10 9 4 5 287 30 293 12 18.8 -4 -9 K-678 1989 10 18 0 1 245 55 239 50 6.2 -2 -7 K-679 1989 10 20 23 24 357 47 356 46 1.2 3 -1.5 K-680 1989 10 21 3 4 215 36 214 35 1.3 1 -4	K-674	1989	10	1	1	2	132	25	131	22	3.1	1	-4		
K-676 1989 10 8 20 21 222 18 223 17 1.4 0 -5 K-677 1989 10 9 4 5 287 30 293 12 18.8 -4 -9 K-678 1989 10 18 0 1 245 55 239 50 6.2 -2 -7 K-679 1989 10 20 23 24 357 47 356 46 1.2 3 -1.5 K-680 1989 10 21 3 4 215 36 214 35 1.3 1 -4	K-675	1989	10	1	18	19	45	67	61	66	6.4	2	-3		
K-677 1989 10 9 4 5 287 30 293 12 18.8 -4 -9 K-678 1989 10 18 0 1 245 55 239 50 6.2 -2 -7 K-679 1989 10 20 23 24 357 47 356 46 1.2 3 -1.5 K-680 1989 10 21 3 4 215 36 214 35 1.3 1 -4	K-676	1989	10	8	20	21	222	18	223	17	1.4	0	-5		
K-678 1989 10 18 0 1 245 55 239 50 6.2 -2 -7 K-679 1989 10 20 23 24 357 47 356 46 1.2 3 -1.5 K-680 1989 10 21 3 4 215 36 214 35 1.3 1 -4	K-677	1989	10	9	4	5	287	30	293	12	18.8	-4	-9		
K-679 1989 10 20 23 24 357 47 356 46 1.2 3 -1.5 K-680 1989 10 21 3 4 215 36 214 35 1.3 1 -4	K-678	1989	10	18	0	1	245	55	239	50	6.2	-2	-7		
K-680 1989 10 21 3 4 215 36 214 35 1.3 1 -4	K-679	1989	10	20	23	24	357	47	356	46	1.2	3	-1.5		
	K-680	1989	10	21	3	4	215	36	214	35	1.3	1	-4		

No.	уууу	mm	dd	Expo	sure	Appear	ance	Disappe	arance	Length	Magnitude	e	Meteor	Note
				Time(h-h)	Az	Al	Az	Al	of trail	Photo.	Deduced	group	
K-681	1989	10	27	19	20	36	40	37	40	0.8	2	-3		
K-682	1989	10	27	20	21	341	39	350	27	14.2	3	-1.5		
K-683	1989	10	29	22	23	5	15	8	8	7.6	4	0.3		
K-684	1989	11	2	2	3	146	75	181	68	12.8	3	-15		
K=685	1989	11	2	- 3	4	287	41	290	39	3.0	3	-1.5		
K 686	1080	11	2	18	10	230	24	231	24	0.0	3	-1.5		
K-000 K 697	1080	11	2	10	20	250	15	251	15	0.9	1	-1.5		
N-00/	1989	11) 11	19	20	230	13	230	15	0.0	1	-4		
K-088	1989	11	20	21	2	84	44	/9	38	/.1	0	-3	T '1	
K-689	1989	11	20	21	22	266	68	280	60	10.0	2	-3	Taurids	
K-690	1989	11	20	22	23	318	53	320	46	7.1	4	0.3	Taurids	
K-691	1989	11	21	0	1	57	10	57	9	1.0	1	-4	Taurids	
K-692	1989	11	21	2	3	39	32	41	29	3.5	4	0.3		
K-693	1989	11	21	3	4	3	32	357	21	12.2	-4	-9		
K-694	1989	11	21	3	4	158	25	157	24	1.4	2	-3		
K-695	1989	11	21	18	19	160	16	154	14	6.1	2	-3		to behind forest
K-696	1989	11	22	18	19	316	18	325	15	9.1	1	-4		
K-697	1989	11	24	1	2	7	45	8	44	1.2	3	-1.5		
K-698	1989	11	24	18	19	200	60	199	59	1.1	5	1.5		
K-699	1989	12	2	1	2	323	28	323	26	2.0	2	-3		1
K 700	1980	12	2	1	2	342	28	346	20	5.4		-6		<u> </u>
K-701	1080	12	2	23	2	374	12	225	11	1.4	-1	-0		1
K 702	1000	12	2	23	24	214	12	212	0	1.4	2	-3		to behind mountain
K 702	1707	12	2 2	2 10	10	122	10	120	δ 1.6	157	0	-3		
K-/03	1989	12	5	18	19	123	20	139	16	15.7	0	->		
K-/04	1989	12	4	3	4	183	84	183	80	4.0	4	0.3		
K-705	1989	12	5	2	3	79	43	80	38	5.1	-1	-6		
K-706	1989	12	6	3	4	181	62	155	66	12.0	-2	-7		
K-707	1989	12	9	21	22	355	35	356	25	10.0	-2	-7		
K-708	1989	12	11	0	1	329	46	329	44	2.0	1	-4		
K-709	1989	12	17	23	24	78	36	74	30	6.9	-2	-7		
K-710	1989	12	18	20	21	299	13	291	12	7.9	3	-1.5		
K-711	1989	12	19	1	2	335	62	35	49	34.9	3	-1.5		
K-712	1989	12	21	0	1	137	24	137	24	0.0	2	-3		
K-713	1989	12	21	1	2	200	64	198	54	10.1	5	1.5		
K-714	1989	12	21	22	23	46	42	48	39	3.4	4	0.3		
K-715	1989	12	22	21	22	211	34	212	34	0.8	3	-1.5		
K-716	1989	12	23	18	19	63	73	66	71	2.2	1	-4		
K-717	1989	12	23	22	23	270	66	255	73	8.7	3	-15		1
K-718	1989	12	23	22	23	256	55	255	55	0.0	-3	-8		1
K 710	1080	12	27	22	2.5	230	26	230	18	0.0	-5	-0		
K-719	1989	12	27	23	24	142	20	140	20	0.0	4	0.3		
K 721	1989	12	27	23	Z4 A	143	3/	140	30	/.4	3	-1.3		
K=/21	1989	12	28	5	4	298	41	290	36	8.0	1	-4		<u> </u>
K-722	1990	1	3	5	6	316	71	314	69	2.1	3	-1.5		
K-723	1990	1	4	0	1	247	22	249	22	1.9	4	0.3	Quadrantids	
K-724	1990	1	4	3	4	331	21	335	18	4.8	5	1.5	Quadrantids	<u> </u>
K-725	1990	1	11	23	24	354	54	9	30	26.3	-6	-11		ļ
K-726	1990	1	20	20	21	150	30	156	28	5.6	-1	-6		
K-727	1990	1	21	5	6	212	23	209	22	2.9	1	-4		<u> </u>
K-728	1990	1	21	19	20	171	10	168	9	3.1	2	-3		to behind mountain
K-729	1990	1	22	2	3	237	18	236	17	1.4	3	-1.5		
K-730	1990	1	27	1	2	128	40	120	36	7.5	3	-1.5		
K-731	1990	1	27	22	23	130	23	139	12	13.9	-4	-9		to behind forest
K-732	1990	2	1	22	23	312	13	313	9	4.1	-1	-6		to behind mountain
K-733	1990	2	2	23	2.4	3	29	3	2.8	1.0	1	-4		
K-734	1990	2	13	19	20	125	38	141	19	23.6	1	-6	1	1
K-735	1000	2	21	10	20	282	50	256	27	23.0	1	-0		1
K 726	1000	2	21	19	20	202	50	2.30	12	22.7	-1	-0		+
N-730	1990	2	21	21	ZZ	339	10	341	13	2.8	0			
K-/5/	1990	3	17	3	4	167	40	185	27	19.8		-4		_
K-738	1990	3	19	21	22	300	37	299	35	2.2	2	-3		
K-739	1990	3	21	0	1	299	47	297	45	2.4	4	0.3		Į
K-740	1990	3	26	19	20	150	49	151	47	2.1	2	-3		ļ
K-741	1990	3	26	22	23	299	22	298	21	1.4	3	-1.5		
K-742	1990	3	27	0	1	116	17	107	13	9.6	1	-4		







K-7 Time (JST): 1977-12-13 01:00-02:00



K-9 Time (JST): 1977-12-19 00:00-01:00



K-12 Time (JST) : 1978-3-15 19:00-20:00



K-4 Time (JST) : 1977-12-1 21:00-22:00



K-8 Time (JST): 1977-12-14 21:00-22:00



K-11 Time (JST): 1978-3-8 01:00-02:00



K-15 Time (JST) : 1978-3-29 23:00-24:00

Figure 7. Fireball Images [#1]



K-16 Time (JST): 1978-4-13 22:00-23:00











K-30 Time (JST): 1978-12-31 00:00-01:00



K-17 Time (JST): 1978-10-21 21:00-22:00



K-22 Time (JST) : 1978-11-1 00:00-01:00





K-31 Time (JST) : 1979-1-4 05:00-06:00

Figure 8. Fireball Images [#2]



K-33 Time (JST) : 1979-1-19 18:00-19:00



K-36 Time (JST): 1979-2-16 02:00-03:00







K-44 Time (JST): 1979-7-31 02:00-03:00



K-34 Time (JST) : 1979-1-22 03:00-04:00



K-40 Time (JST) : 1979-4-19 01:00-02:00



K-42 Time (JST) : 1979-5-20 02:00-03:00



K-49 Time (JST): 1979-11-11 19:00-20:00

Figure 9. Fireball Images [#3]















Time (JST) : 1980–11–14 04:00–05:00



K-54,K-55 Time (JST): 1980-4-22 02:00-03:00



K-57 Time (JST) : 1980-9-9 22:00-23:00



K-60 Time (JST) : 1980-11-3 23:00-24:00



K-63 Time (JST): 1980-12-2 02:00-03:00

Figure 10. Fireball Images [#4]



K-64 Time (JST) : 1980-12-6 18:00-19:00



K-69 Time (JST): 1981-1-1 01:00-02:00





K-73 Time (JST) : 1981-4-7 02:00-03:00



K-68 Time (JST): 1980-12-25 19:00-20:00



K-70 Time (JST) : 1981-1-30 22:00-23:00





K-74 Time (JST): 1981-4-10 22:00-23:00

Figure 11. Fireball Images [#5]







K-77 Time (JST): 1981-10-19 22:00-23:00



K-82 Time (JST) : 1981-11-8 02:00-03:00







K-76 Time (JST): 1981-7-8 01:00-02:00



K-79 Time (JST) : 1981-11-1 00:00-01:00



K-83 Time (JST) : 1981-11-8 03:00-04:00



K-86 Time (JST): 1981-11-17 22:00-23:00

Figure 12. Fireball Images [#6]







K-91 Time (JST) : 1981-12-14 23:00-24:00



K-95 Time (JST): 1981-12-21 05:00-06:00



K-99,K-100 Time (JST): 1981-12-22 23:00-24:00



K-90 Time (JST): 1981-12-14 21:00-22:00



K-93 Time (JST) : 1981-12-18 00:00-01:00



K-97,K-98 Time (JST): 1981-12-22 21:00-22:00



K-101,K-102 Time (JST) : 1981-12-24 21:00-22:00

Figure 13. Fireball Images [#7]



K-103 Time (JST): 1981-12-28 21:00-22:00



K-105 Time (JST) : 1982-1-29 20:00-21:00



K-109 Time (JST) : 1982-3-29 03:00-04:00



K-111 Time (JST): 1982-4-15 23:00-24:00



K-104 Time (JST): 1982-1-28 00:00-01:00



K-107 Time (JST) : 1982-3-21 21:00-22:00



K-110 Time (JST) : 1982-4-15 22:00-23:00



K-113 Time (JST): 1982-5-29 01:00-02:00

Figure 14. Fireball Images [#8]



K-115 Time (JST) : 1982-6-28 23:00-24:00



K-117 Time (JST): 1982-11-13 04:00-05:00



K-119 Time (JST) : 1982-11-28 03:00-04:00



K-121 Time (JST) : 1982-12-12 23:00-24:00



K-116 Time (JST): 1982-10-23 03:00-04:00



K-118 Time (JST) : 1982-11-20 20:00-21:00



K-120 Time (JST) : 1982-12-4 18:00-19:00



K-122 Time (JST) : 1983-3-19 22:00-23:00

Figure 15. Fireball Images [#9]



K-123 Time (JST) : 1983-4-3 01:00-02:00



K-127 Time (JST) : 1983-5-12 21:00-22:00



K-131 Time (JST) : 1983-6-1 21:00-22:00



K-134 Time (JST) : 1983-8-9 02:00-03:00



K-125 Time (JST): 1983-4-14 03:00-04:00



K-129 Time (JST): 1983-5-19 01:00-02:00



K-133 Time (JST) : 1983-7-4 00:00-01:00



K-136 Time (JST) : 1983-8-14 00:00-01:00

Figure 16. Fireball Images [#10]



K-140 Time (JST) : 1983-9-19 21:00-22:00



K-143 Time (JST): 1983-10-21 19:00-20:00







K-152 Time (JST) : 1983-11-29 23:00-24:00



K-141 Time (JST) : 1983-10-3 00:00-01:00



K-147 Time (JST) : 1983-11-9 00:00-01:00



K-151 Time (JST) : 1983-11-12 00:00-01:00



K-153 Time (JST): 1983-12-4 18:00-19:00

Figure 17. Fireball Images [#11]







K-158 Time (JST): 1983-12-15 02:00-03:00



K-164 Time (JST) : 1984-1-6 02:00-03:00



K-167 Time (JST) : 1984-1-9 00:00-01:00



K-156 Time (JST) : 1983-12-8 04:00-05:00



K-160,K-161 Time (JST): 1983-12-15 03:00-04:00



K-165 Time (JST) : 1984-1-8 01:00-02:00



K-168 Time (JST) : 1984-1-23 23:00-24:00

Figure 18. Fireball Images [#12]



K-169 Time (JST): 1984-1-29 04:00-05:00



K-172 Time (JST) : 1984-2-16 03:00-04:00



K-174 Time (JST): 1984-8-31 23:00-24:00







K-170 Time (JST) : 1984-1-29 23:00-24:00



K-173 Time (JST): 1984-8-31 02:00-03:00



K-176 Time (JST): 1984-10-22 00:00-01:00



K-182 Time (JST) : 1984-10-30 03:00-04:00

Figure 19. Fireball Images [#13]



K-183 Time (JST) : 1984-11-5 23:00-24:00



K-187 Time (JST) : 1984-11-20 21:00-22:00



K-192 Time (JST): 1984-11-22 22:00-23:00



K-197 Time (JST) : 1984-11-25 20:00-21:00



K-184 Time (JST): 1984-11-6 01:00-02:00



K-191 Time (JST): 1984-11-21 04:00-05:00



Time (JST) : 1984–11–23 01:00–02:00



Time (JST) : 1984–11–26 21:00–22:00

Figure 20. Fireball Images [#14]







K-201 Time (JST): 1984-12-1 02:00-03:00





K-209 Time (JST) : 1984-12-25 05:00-06:00



K-200 Time (JST) : 1984-11-28 21:00-22:00



K-204 Time (JST): 1984-12-13 04:00-05:00



K-206 Time (JST): 1984-12-19 00:00-01:00



K-210 Time (JST) : 1984-12-26 19:00-20:00

Figure 21. Fireball Images [#15]



K-211 Time (JST): 1984-12-26 22:00-23:00



K-213 Time (JST) : 1985-1-9 18:00-19:00



K-215 Time (JST) : 1985-1-10 19:00-20:00



K-217 Time (JST): 1985-1-16 19:00-20:00



K-212 Time (JST) : 1985-1-4 04:00-05:00



K-214 Time (JST) : 1985-1-10 18:00-19:00



K-216 Time (JST) : 1985-1-15 04:00-05:00



K-218 Time (JST): 1985-1-17 02:00-03:00

Figure 22. Fireball Images [#16]



K-219 Time (JST) : 1985-1-17 05:00-06:00



K-221 Time (JST): 1985-1-21 02:00-03:00





K-225 Time (JST) : 1985-1-25 21:00-22:00



K-220 Time (JST): 1985-1-19 18:00-19:00



K-222 Time (JST) : 1985-1-21 21:00-22:00



K-224 Time (JST) : 1985-1-25 02:00-03:00



K-226 Time (JST) : 1985-2-14 19:00-20:00

Figure 23. Fireball Images [#17]



K-227 Time (JST) : 1985-2-18 04:00-05:00



K-229 Time (JST) : 1985-3-23 03:00-04:00







K-233 Time (JST) : 1985-7-16 02:00-03:00



K-228 Time (JST) : 1985-2-24 00:00-01:00



K-230 Time (JST) : 1985-3-27 00:00-01:00



K-232 Time (JST): 1985-5-18 02:00-03:00



Time (JST) : 1985-8-2 21:00-22:00

Figure 24. Fireball Images [#18]



K-235 Time (JST) : 1985-8-7 20:00-21:00



K-237 Time (JST) : 1985-8-9 23:00-24:00







K-243 Time (JST) : 1985-9-6 03:00-04:00



K-236 Time (JST) : 1985-8-8 02:00-03:00



K-240 Time (JST) : 1985-8-16 21:00-22:00



K-242 Time (JST) : 1985-8-17 22:00-23:00



K-244 Time (JST) : 1985-9-7 23:00-24:00

Figure 25. Fireball Images [#19]



K-245 Time (JST) : 1985-9-8 21:00-22:00



K-247 Time (JST) : 1985-9-12 23:00-24:00



K-250 Time (JST) : 1985-10-21 03:00-04:00



Time (JST) : 1985–11–3 19:00–20:00



K-246 Time (JST): 1985-9-12 02:00-03:00



K-248 Time (JST) : 1985-10-8 19:00-20:00



K-251,K-252 Time (JST): 1985-10-23 02:00-03:00



K-255,K-256,K-257 Time (JST) : 1985-11-9 00:00-01:00

Figure 26. Fireball Images [#20]



K-259,K-260 Time (JST): 1985-11-10 22:00-23:00



K-267 Time (JST): 1985-11-20 03:00-04:00



K-270 Time (JST): 1985-12-2 20:00-21:00



K-272 Time (JST): 1985-12-4 05:00-06:00



K-261 Time (JST) : 1985-11-11 04:00-05:00





K-271 Time (JST) : 1985-12-4 04:00-05:00



K-274 Time (JST): 1985-12-5 22:00-23:00

Figure 27. Fireball Images [#21]



K-275 Time (JST): 1985-12-6 01:00-02:00



K-277,K-278 Time (JST): 1985-12-12 03:00-04:00



K-280 Time (JST) : 1985-12-13 23:00-24:00



K-282 Time (JST) : 1985-12-15 03:00-04:00



K-276 Time (JST) : 1985-12-11 01:00-02:00



K-279 Time (JST): 1985-12-12 22:00-23:00



K-281 Time (JST) : 1985-12-15 02:00-03:00



K-283 Time (JST) : 1985-12-26 05:00-06:00

Figure 28. Fireball Images [#22]







K-287 Time (JST): 1986-1-12 22:00-23:00



K-289 Time (JST) : 1986-2-6 21:00-22:00



K-292 Time (JST) : 1986-2-12 04:00-05:00



K-286 Time (JST) : 1986-1-12 02:00-03:00



K-288 Time (JST) : 1986-2-2 00:00-01:00



K-291 Time (JST) : 1986-2-8 20:00-21:00



Time (JST) : 1986-2-13 03:00-04:00

Figure 29. Fireball Images [#23]



K-294 Time (JST) : 1986-3-2 20:00-21:00



K-297 Time (JST) : 1986-3-5 00:00-01:00



K-299 Time (JST) : 1986-3-15 23:00-24:00







K-295,K-296 Time (JST) : 1986-3-4 00:00-01:00



K-298 Time (JST) : 1986-3-12 21:00-22:00



K-302 Time (JST): 1986-4-1 21:00-22:00



K-307 Time (JST) : 1986-5-10 21:00-22:00

Figure 30. Fireball Images [#24]







K-312 Time (JST) : 1986-6-4 02:30-03:30



K-315 Time (JST) : 1986-8-5 01:00-02:00



K-318 Time (JST): 1986-8-12 01:00-02:00



K-310 Time (JST) : 1986-5-16 23:30-00:30



K-313 Time (JST) : 1986-6-11 01:30-02:30



Time (JST) : 1986-8-5 23:00-24:00



K-320 Time (JST): 1986-8-14 02:00-03:00

Figure 31. Fireball Images [#25]







K-323 Time (JST) : 1986-9-11 03:00-04:00



K-327 Time (JST) : 1986-10-1 01:00-02:00



K-336 Time (JST) : 1986-10-30 23:00-24:00



K-322 Time (JST) : 1986-9-6 00:00-01:00



K-325 Time (JST) : 1986-9-30 00:00-01:00



Time (JST) : 1986–10–15 03:00–04:00



Time (JST) : 1986-10-31 04:00-05:00

Figure 32. Fireball Images [#26]



K-339 Time (JST): 1986-11-1 00:00-01:00



K-341 Time (JST): 1986-11-3 02:00-03:00











K-340 Time (JST) : 1986-11-3 01:00-02:00



K-344 Time (JST) : 1986-11-8 22:00-23:00



K-350 Time (JST) : 1986-11-20 23:00-24:00



K-353 Time (JST) : 1986-11-27 02:00-03:00

Figure 33. Fireball Images [#27]



K-354 Time (JST): 1986-11-29 22:00-23:00



K-356 Time (JST) : 1986-12-5 04:00-05:00



K-358 Time (JST): 1986-12-30 05:00-06:00



K-361 Time (JST) : 1987-1-4 00:00-01:00



K-355 Time (JST): 1986-11-30 02:00-03:00





K-360 Time (JST) : 1987-1-2 03:00-04:00



K-362,K-363 Time (JST): 1987-1-4 03:00-04:00

Figure 34. Fireball Images [#28]



K-366 Time (JST) : 1987-1-20 19:00-20:00



K-370 Time (JST) : 1987-2-7 02:00-03:00



K-375 Time (JST) : 1987-3-30 00:00-01:00



K-381 Time (JST) : 1987-5-7 03:00-04:00



K-367 Time (JST): 1987-1-24 19:00-20:00



K-371 Time (JST) : 1987-3-1 20:00-21:00



K-376 Time (JST) : 1987-3-30 02:00-03:00



K-384 Time (JST): 1987-5-29 00:00-01:00

Figure 35. Fireball Images [#29]



K-385 Time (JST): 1987-5-31 21:00-22:00



K-389 Time (JST) : 1987-6-17 01:00-02:00











K-386 Time (JST) : 1987-6-1 21:00-22:00



K-390 Time (JST) : 1987-6-21 23:00-24:00



K-393 Time (JST) : 1987-7-27 01:00-02:00



Time (JST) : 1987-7-28 22:00-23:00

Figure 36. Fireball Images [#30]



K-399 Time (JST): 1987-8-29 03:00-04:00



K-405 Time (JST): 1987-10-13 03:00-04:00



Time (JST) : 1987-10-21 20:00-21:00



K-411,K-412 Time (JST): 1987-10-28 02:00-03:00



K-404 Time (JST) : 1987-10-4 03:00-04:00



K-406 Time (JST) : 1987-10-13 20:00-21:00



K-409,K-410 Time (JST): 1987-10-27 22:00-23:00



K-414 Time (JST) : 1987-10-28 20:00-21:00

Figure 37. Fireball Images [#31]



K-416,K-417 Time (JST): 1987-11-18 03:00-04:00



K-420 Time (JST): 1987-11-21 23:00-24:00



K-423 Time (JST): 1987-11-24 21:00-22:00



K-425 Time (JST) : 1987-11-25 23:00-24:00



K-419 Time (JST) : 1987-11-21 04:00-05:00



K-421 Time (JST): 1987-11-24 00:00-01:00



K-424 Time (JST): 1987-11-25 18:00-19:00



K-428 Time (JST): 1987-12-3 03:00-04:00

Figure 38. Fireball Images [#32]



K-429 Time (JST) : 1987-12-8 00:00-01:00



K-431,K-432 Time (JST): 1987-12-13 22:00-23:00



K-435 Time (JST): 1987-12-14 04:00-05:00



K-438 Time (JST) : 1987-12-15 04:00-05:00



K-430 Time (JST): 1987-12-13 21:00-22:00



K-433 Time (JST): 1987-12-13 23:00-24:00



K-436,K-437 Time (JST) : 1987-12-14 21:00-22:00



K-439 Time (JST): 1987-12-15 05:00-06:00

Figure 39. Fireball Images [#33]



K-442 Time (JST) : 1987-12-17 04:00-05:00



K-445 Time (JST): 1987-12-19 02:00-03:00



K-447 Time (JST): 1987-12-20 02:00-03:00



K-451 Time (JST) : 1987-12-24 22:00-23:00



K-443 Time (JST): 1987-12-17 19:00-20:00



K-446 Time (JST): 1987-12-19 03:00-04:00



K-450 Time (JST): 1987-12-24 00:00-01:00



K-452 Time (JST): 1987-12-25 05:00-06:00

Figure 40. Fireball Images [#34]



K-453 Time (JST): 1987-12-26 04:00-05:00



K-457 Time (JST): 1987-12-29 02:00-03:00







K-463 Time (JST) : 1988-1-16 23:00-24:00



K-454 Time (JST) : 1987-12-26 05:00-06:00



K-458 Time (JST) : 1988-1-1 03:00-04:00



K-462 Time (JST) : 1988-1-14 05:00-06:00



K-469 Time (JST): 1988-3-8 20:00-21:00

Figure 41. Fireball Images [#35]



K-472 Time (JST) : 1988-3-23 19:00-20:00



K-480 Time (JST) : 1988-4-23 02:00-03:00



K-482 Time (JST): 1988-5-8 21:00-22:00



K-484 Time (JST) : 1988-5-12 21:00-22:00



K-479 Time (JST): 1988-4-21 01:00-02:00



K-481 Time (JST) : 1988-4-24 01:00-02:00



K-483 Time (JST) : 1988-5-9 00:00-01:00



Time (JST) : 1988-5-13 21:00-22:00

Figure 42. Fireball Images [#36]



K-486 Time (JST): 1988-5-16 21:00-22:00



K-490 Time (JST): 1988-5-29 00:00-01:00



K-496 Time (JST): 1988-7-27 02:00-03:00



K-499,K-500 Time (JST): 1988-8-12 00:00-01:00



K-487 Time (JST): 1988-5-19 00:00-01:00



K-494 Time (JST) : 1988-7-1 21:00-22:00



K-497 Time (JST): 1988-8-3 00:00-01:00



K-501 Time (JST) : 1988-9-9 20:00-21:00

Figure 43. Fireball Images [#37]



K-502 Time (JST) : 1988-9-9 21:00-22:00



K-507 Time (JST) : 1988-9-20 01:00-02:00



K-511 Time (JST): 1988-10-9 02:00-03:00



K-515 Time (JST) : 1988-10-11 02:00-03:00



K-506 Time (JST) : 1988-9-18 19:00-20:00



K-508 Time (JST) : 1988-10-3 19:00-20:00



K-512 Time (JST): 1988-10-9 19:00-20:00



Time (JST) : 1988-10-11 04:00-05:00

Figure 44. Fireball Images [#38]



K-517 Time (JST) : 1988-10-13 23:00-24:00



K-523,K-<mark>5</mark>24 Time (JST): 1988-10-31 22:00-23:00



K-529 Time (JST) : 1988-11-3 23:00-24:00



K-532 Time (JST) : 1988-11-4 02:00-03:00



K-521 Time (JST): 1988-10-27 19:00-20:00



K-527 Time (JST) : 1988-11-3 03:00-04:00



K-530 Time (JST): 1988-11-4 00:00-01:00



K-534,K-535 Time (JST) : 1988-11-4 03:00-04:00

Figure 45. Fireball Images [#39]







K-541,K-542 Time (JST) : 1988-11-6 22:00-23:00



K-547 Time (JST) : 1988-11-7 23:00-24:00



K-550,K-551,K-552 Time (JST) : 1988-11-8 21:00-22:00



K-537,K-538,K-539 Time (JST): 1988-11-6 00:00-01:00



K-546 Time (JST) : 1988-11-7 22:00-23:00



K-548 Time (JST): 1988-11-8 00:00-01:00



K-553 Time (JST) : 1988-11-8 22:00-23:00

Figure 46. Fireball Images [#40]



K-554 Time (JST): 1988-11-9 00:00-01:00



K-556,K-557 Time (JST) : 1988-11-9 02:00-03:00



K-559 Time (JST): 1988-11-9 19:00-20:00



K-561 Time (JST) : 1988-11-10 03:00-04:00



K-555 Time (JST) : 1988-11-9 01:00-02:00



K-558 Time (JST) : 1988-11-9 03:00-04:00



Time (JST) : 1988–11–9 21:00–22:00



K-563 Time (JST) : 1988-11-10 20:00-21:00

Figure 47. Fireball Images [#41]



K-564 Time (JST) : 1988-11-10 22:00-23:00



K-566 Time (JST): 1988-11-11 02:00-03:00



K-568 Time (JST): 1988-11-11 23:00-24:00



K-570 Time (JST): 1988-11-12 04:00-05:00



K-565 Time (JST) : 1988-11-11 01:00-02:00



K-567 Time (JST): 1988-11-11 22:00-23:00



K-569 Time (JST): 1988-11-12 03:00-04:00



K-572 Time (JST) : 1988-11-14 22:00-23:00

Figure 48. Fireball Images [#42]



K-575 Time (JST): 1988-11-15 23:00-24:00



K-577 Time (JST): 1988-11-17 05:00-06:00



K-586 Time (JST): 1988-12-3 03:00-04:00



K-590 Time (JST) : 1988-12-8 03:00-04:00



K-576 Time (JST) : 1988-11-17 00:00-01:00



K-584 Time (JST) : 1988-12-1 19:00-20:00



K-588 Time (JST) : 1988-12-6 19:00-20:00



Time (JST) : 1988–12–10 05:00–06:00

Figure 49. Fireball Images [#43]



K-592 Time (JST): 1988-12-11 03:00-04:00



K-595 Time (JST): 1988-12-12 01:00-02:00



K-598 Time (JST) : 1988-12-13 01:00-02:00



K-606 Time (JST): 1988-12-14 02:00-03:00



K-593,K-594 Time (JST): 1988-12-12 00:00-01:00



K-597 Time (JST): 1988-12-13 00:00-01:00



K-602,K-603,K-604,K-605 Time (JST): 1988-12-14 00:00-01:00



K-608,K-609,K-610 Time (JST): 1988-12-14 04:00-05:00

Figure 50. Fireball Images [#44]



K-614 Time (JST) : 1988-12-18 01:00-02:00



K-617 Time (JST): 1988-12-31 03:00-04:00



K-621 Time (JST) : 1989-1-12 21:00-22:00



K-624 Time (JST): 1989-1-15 04:00-05:00



K-615 Time (JST): 1988-12-21 01:00-02:00



K-620 Time (JST) : 1989-1-4 05:00-06:00



K-623 Time (JST) : 1989-1-13 21:00-22:00



K-625 Time (JST): 1989-1-17 00:00-01:00

Figure 51. Fireball Images [#45]



K-626 Time (JST) : 1989-1-27 20:00-21:00



K-632 Time (JST) : 1989-2-10 23:00-24:00







K-637 Time (JST) : 1989-3-9 04:00-05:00



K-628 Time (JST) : 1989-1-31 02:00-03:00



K-633 Time (JST) : 1989-2-11 02:00-03:00



K-636 Time (JST): 1989-2-26 20:00-21:00



K-638 Time (JST) : 1989-3-10 20:00-21:00

Figure 52. Fireball Images [#46]



K-642 Time (JST) : 1989-3-29 20:00-21:00



K-644 Time (JST) : 1989-4-5 23:00-24:00



K-649 Time (JST): 1989-4-26 01:00-02:00







K-643 Time (JST) : 1989-4-2 03:00-04:00



K-647 Time (JST): 1989-4-22 03:00-04:00



K-650 Time (JST) : 1989-4-26 20:00-21:00



K-657 Time (JST): 1989-6-2 23:00-24:00

Figure 53. Fireball Images [#47]



K-658 Time (JST): 1989-7-1 01:00-02:00



K-660 Time (JST) : 1989-7-27 03:00-04:00



K-662 Time (JST) : 1989-7-28 23:00-24:00



K-664 Time (JST) : 1989-8-4 01:00-02:00



K-659 Time (JST): 1989-7-5 21:00-22:00



K-661 Time (JST) : 1989-7-28 21:00-22:00



K-663 Time (JST): 1989-7-30 22:00-23:00



Time (JST) : 1989-8-4 22:00-23:00

Figure 54. Fireball Images [#48]



K-666 Time (JST) : 1989-8-8 20:00-21:00



K-669 Time (JST): 1989-8-11 00:00-01:00











K-667 Time (JST) : 1989-8-9 00:00-01:00



K-670 Time (JST) : 1989-8-11 01:00-02:00



K-672 Time (JST) : 1989-8-14 02:00-03:00



K-674 Time (JST) : 1989-10-1 01:00-02:00

Figure 55. Fireball Images [#49]



K-676 Time (JST) : 1989-10-8 20:00-21:00



K-678 Time (JST): 1989-10-18 00:00-01:00



K-687 Time (JST) : 1989-11-3 19:00-20:00



K-689 Time (JST) : 1989-11-20 21:00-22:00



K-677 Time (JST): 1989-10-9 04:00-05:00



K-684 Time (JST) : 1989-11-2 02:00-03:00



K-688 Time (JST): 1989-11-11 01:00-02:00



K-693 Time (JST): 1989-11-21 03:00-04:00

Figure 56. Fireball Images [#50]



K-696 Time (JST): 1989-11-22 18:00-19:00



K-699,K-700 Time (JST): 1989-12-2 01:00-02:00



K-705 Time (JST) : 1989-12-5 02:00-03:00



K-707 Time (JST) : 1989-12-9 21:00-22:00



K-697 Time (JST): 1989-11-24 01:00-02:00



K-703 Time (JST) : 1989-12-3 18:00-19:00



K-706 Time (JST) : 1989-12-6 03:00-04:00



K-709 Time (JST) : 1989-12-17 23:00-24:00

Figure 57. Fireball Images [#51]





K-710 Time (JST) : 1989-12-18 20:00-21:00



K-716 Time (JST): 1989-12-23 18:00-19:00



K-718 Time (JST): 1989-12-24 22:00-23:00



K-721 Time (JST) : 1989-12-28 03:00-04:00



K-711 Time (JST): 1989-12-19 01:00-02:00



K-717 Time (JST): 1989-12-23 22:00-23:00



K-719,K-720 Time (JST): 1989-12-27 23:00-24:00



K-722 Time (JST) : 1990-1-3 05:00-06:00

Figure 58. Fireball Images [#52]



K-723 Time (JST) : 1990-1-4 00:00-01:00



K-726 Time (JST): 1990-1-20 20:00-21:00



K-728 Time (JST): 1990-1-21 19:00-20:00



K-730 Time (JST) : 1990-1-27 01:00-02:00



K-725 Time (JST): 1990-1-11 23:00-24:00



K-727 Time (JST) : 1990-1-21 05:00-06:00



K-729 Time (JST) : 1990-1-22 02:00-03:00



K = 7.31Time (JST) : 1990-1-27 22:00-23:00

Figure 59. Fireball Images [#53]







K-734 Time (JST): 1990-2-13 19:00-20:00



K-736 Time (JST): 1990-2-21 21:00-22:00



K-738 Time (JST) : 1990-3-19 21:00-22:00



K-733 Time (JST): 1990-2-2 23:00-24:00



K-735 Time (JST) : 1990-2-21 19:00-20:00



K-737 Time (JST): 1990-3-17 03:00-04:00



K-739 Time (JST): 1990-3-21 00:00-01:00

Figure 60. Fireball Images [#54]



K-740 Time (JST) : 1990-3-26 19:00-20:00



K-742 Time (JST) : 1990-3-27 00:00-01:00



K-741 Time (JST) : 1990-3-26 22:00-23:00