Results of the IMO Video Meteor Network – April 2012

Sirko Molau, Abenstalstr. 13b, 84072 Seysdorf *2012/06/05*

April 2012 was the first month since January 2010, where we recorded fewer meteors than in the same month of the preceeding year. The reason was, that April 2011 had presented almost perfect weather conditions to the observers, whereas this April was mediocre at best. Hence, only 17 of the 64 active cameras managed to observe in twenty or more nights. On the other hand, the weather was quite fair, as there was hardly any camera with less than ten observing nights. So this time no observer was given an advantage or disadvantage. Overall we collected about 5,200 hours of effective observing time in those thirty April nights, and recorded 12,200 meteors.

Two new camera systems were installed in Germany in April. At the balcony of his house south of Berlin, Rainer Arlt started to operate LUDWIG1, and used Sony camera equipped with an 8 mm f/0.8 Computar lens. At some time, the camera will probably be replaced by a more powerful system. Also the field of view still has to be synchronized such that LUDWIG1 operates together with REMO1 in Ketzür and ARMEFA in Berlin-Treptow in a multi-station mode.
Jörg Strunk upgraded his old MINCAM4 camera, which was only used to determine the appearance times of fireballs to date. He replaced the fisheye lens by a 2.6 mm f/1.0 Computar lens. Now the accuracy and limiting magnitude is just sufficient for the IMO camera network.

The most important meteor shower of April are the Lyrids. Their maximum was predicted for the morning hours of April 22 and matched perfectly to the new moon - ideal observing conditions if also the weather would be cooperative. Overall there were not many places with clear skies all night long, but April 21/22 was at least one of the more successful nights with fifty active cameras. Figure 1 shows the most interesting part of the activity profile between April 20 and 24, based on 1,600 Lyrids. The activity rose in the European evening hours of April 21 and reached at the next morning at 2 UT a peak with about 5 meteoroids per 1,000 km^2 and hour (equivalent to a ZHR of 20). Thereafter the activity seemed to decline again, but that cannot be stated with full certainty, as there is a larger gap after the European night time hours.
Visual observers could fill in this gap much better. The quick look analysis at the IMO homepage yields a peak ZHR of 25 at 2 o'clock UT on April 22 as well, based on 930 Lyrids. That's a nice mutual confirmation of the results.

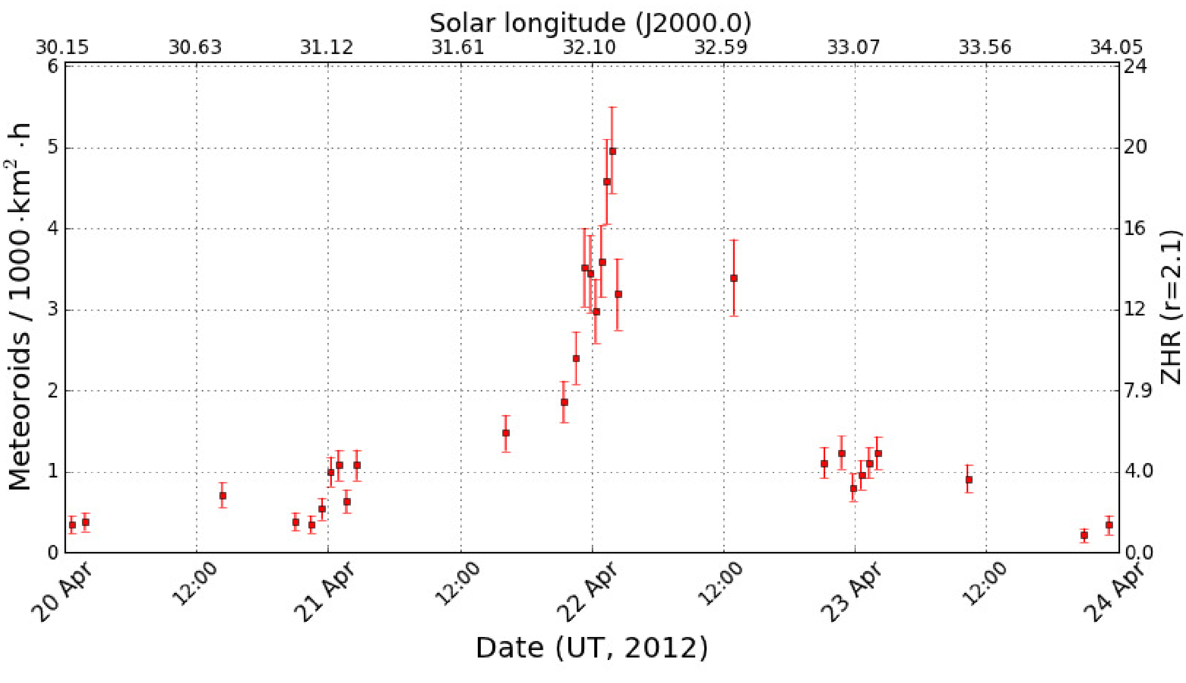

Figure 1: *Flux density profile of the Lyrids in 2012, based on 1,060 shower meteors.*

Just one year ago, we had inaugurated the video flux tool. On the occasion of the 2011 Lyrids, we measured for the first time the flux density of a meteor shower. Thus, we can now compare the results of two years for the first time. Figure 2 shows an overlay of the two profiles between 31 and 33° solar longitude. Up to a solar logitude of 32°, the activity graphs match quite well. Peak activity, however, occured this year a little earlier than last year. Also that is in agreement with visual observations, which yielded a peak at 32.2° solar longitude in 2011, about 0.1° later than this year.

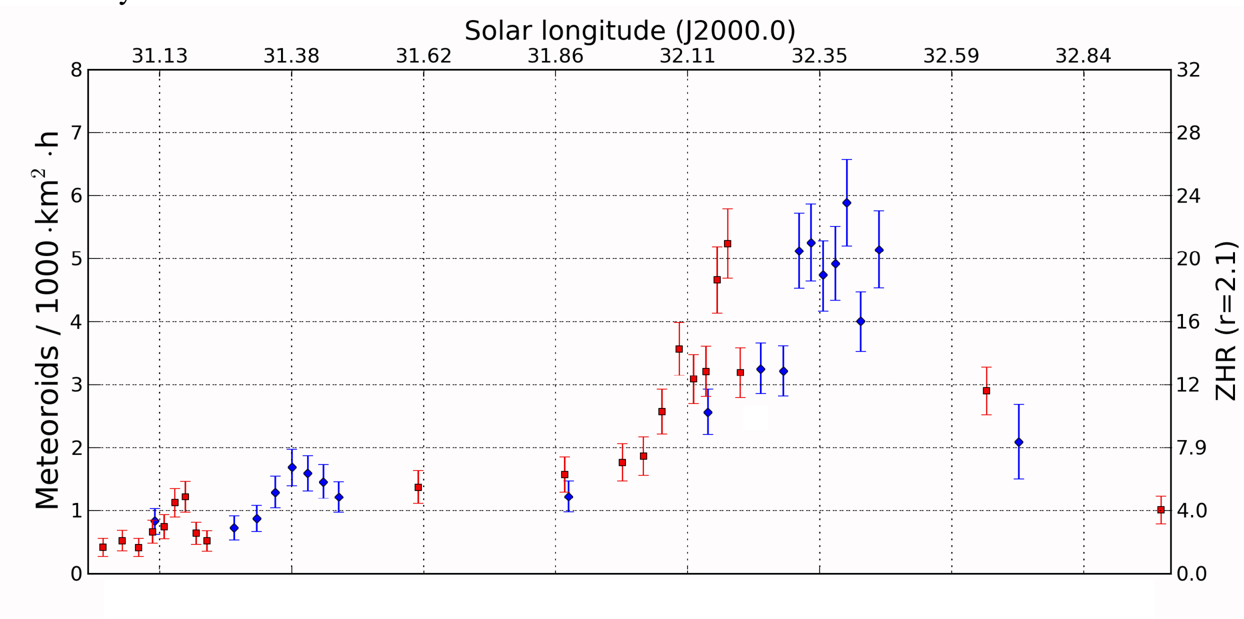

Figure 2: *Comparison of the Lyrid flux density profiles of 2011 (blue diamonds) and 2012 (red squares).*

Overall, the Lyrids are in their activity intervall between April 18 and 25 the most active radiant. The meteor shower parameters derived from 4,000 meteors (table 1) have thus a high precision. It is interesting to see, that the radiant position agrees very well with the values given in the meteor shower list of the IAU Meteor Data Center (MDC), but there is clear discrepancy in the radiant drift. As the individual radiants in our analysis show almost no scatter, we believe in the high precision of our values.

Table 1: *Parameters of the Lyrids from the MDC Working List and the IMO Network analysis in 2012.*

Source	Solar Longitude		Right Ascension		Deklination		V_{inf}	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	32.4	-	272.7	+1.23	33.4	+0.17	48.4	-
IMO 2012	32.5	28-35	272.6	+0.65	33.2	-0.3	46.9	+0.25

The Lyrids, however, are by far not the only meteor shower in April. In the following we want to discuss those additional five meteor showers from the MDC list (all with „working list" status), that could be traced in our data (whereby we disregard the Virginid complex this time).

In our latest meteor shower analysis, there is a shower that can be traced over 31° in solar longitude between April 3 and May 5. More than 1,700 meteors were assigned to that shower, which is quite an amount for the meteor-wise weak spring time. A check with the MDC list revealed a good agreement with the nu Cygnids (409 NCU). The large number is a hint, that this shower was only recently detected, and a short investigation confirmed this result: That is one of the showers which we had detected in the IMO data during the last analysis in 2009!
Table 2 compares the shower parameters of 2009 with the current results. It is obvious, that the shower can no be detected two weeks ealier thanks to the more than doubled data set, whereas the end date stays the same. Also the radiant position could be refined now. The activity of the shower remains weak in the full activity interval – highest rates were observed between April 21 and 30.

Table 2: Parameters of the nu Cygnids from the IMO Network analyses 2009 and 2012.

Source	Solar Longitude		Right Ascension		Declination		V_{inf}	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
IMO 2009	30	28-44	305.2	+1.8	39.4	+0.7	42	-
IMO 2012	28.5	13-44	310.5	+0.8	43.2	+0.3	43.8	0.0

Between April 7 and 13 we found the delta Aquilids (131 DAL) with about 200 meteors. They show a uniform drift in right ascension and declination incident with a significant increase of the meteor shower velocity. All parameters are summarized in table 3 and compared with the MDC values. Whereas there is a good match in right ascension and velocity, there is a deviation of more than 10° in declination. Still we believe that the same shower is meant in both cases.

***Table 3:** Parameters of the delta Aquilids from the MDC Working List and the IMO Network analysis in 2012.*

Source	Solar Longitude		Right Ascension		Declination		V_{inf}	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	23	-	310.6	-	-0.2	-	67.1	-
IMO 2012	20	17-23	308.0	+1.0	11.7	+0.3	64.0	+0.5

Also clearly detected in our data are the sigma Leonids (136 SLE) with more than 1,000 meteors from April 8 to 25. In particular in the first half of the month, this shower often presents the most active radiant in the night sky. Still, there are once more significant deviations between the parameters determined by us and the values from the MDC list (table 4). However, from the MDC website it is not clear, from what data set the values are derived. Often the sources are much less reliable than the observations of the IMO network which span more than a decade of video observations.

***Table 4:** Parameters of the sigma Leonids from the MDC Working List and the IMO Network analysis in 2012.*

Source	Solar Longitude		Right Ascension		Declination		V_{inf}	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	27.7	-	192.6	-	3.1	-	25.6	-
IMO 2012	26.5	18-35	201.1	+0.6	2.7	0.0	21.6	-0.16

The southern May-Ophiuchids (17 SOP) are maybe the most prominent shower beside the Lyrids. They can be traced between April 15 and June 6 with more than 5,000 shower members. There is no doubt that this shower is real, since starting from mid-May it is often the strongest radiant in the corresponding solar longitude interval. The question rather is whether this is indeed just one shower, or two or more showers nearby respectively merging into one another. The shower pops up, remains active for a few days, disappears almost completely only to return one day later slightly displaced. If the radiant drift is visualized over the full activity interval, it can be splitted into two segments. There is no break in activity at the reversal point around May 20 (59° solar longitude), but both the drift in right ascension and declination changes that day, and even the rate of velocity change. Thus, both sections of the southern May-Ophiuchids are given separately in table 5.

Table 5: *Parameters of the southern May-Ophiuchids from the MDC Working List and the IMO Network analysis in 2012. The shower is split into two sections.*

Source	**Solar Longitude**		**Right Ascension**		**Declination**		**V_{inf}**	
	Mean [°]	**Interval** [°]	**Mean** [°]	**Drift** [°]	**Mean** [°]	**Drift** [°]	**Mean** [km/s]	**Drift** [km/s]
MDC	56.7	-	258.0	-	-24.0	-	30.0	-
IMO 2012	41.5	25-58	233	+1.2	-13	-0.2	31.2	+0.15
IMO 2012	67	59-75	249	-0.1	-12	+0.5	26.3	-0.58

Finally we want to list the less prominent April chi Librids (22 XLI). They are present between April 21 and May 1 with about 500 shower meteors. The April chi Librids never dominate meteor shower activity at any time, but still show only a relative small scatter in their parameters (table 6). There is a also reasoable agreeement with the MDC values.

Table 6: *Parameters of the April chi Librids from the MDC Working List and the IMO Network analysis in 2012.*

Source	**Solar Longitude**		**Right Ascension**		**Declination**		**V_{inf}**	
	Mean [°]	**Interval** [°]	**Mean** [°]	**Drift** [°]	**Mean** [°]	**Drift** [°]	**Mean** [km/s]	**Drift** [km/s]
MDC	39	-	236.3	-	-18.9	-	36.0	-
IMO 2012	35.5	31-40	235.1	+0.5	-13.3	+0.4	36.2	-

1. Observers

Code	Name	Place	Camera	FOV [°²]	St.LM [mag]	Eff.CA [km²]	Nights	Time [h]	Meteors
ARLRA	Arlt	Ludwigsfelde/DE	LUDWIG1 (0.8/8)	1488	4.8	726	11	62.0	34
BERER	Berko	Ludanyhalaszi/HU	HULUD1 (0.95/3)	2256	4.8	1540	13	69.1	244
			HULUD2 (0.75/6)	4860	3.9	1103	13	46.6	120
			HULUD3 (0.75/6)	4661	3.9	1052	13	43.0	110
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	11	45.9	84
			MBB4 (0.8/8)	1470	5.1	1208	11	45.3	67
BRIBE	Brinkmann	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	14	50.1	82
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	17	54.7	94
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	19	89.5	217
			C3P8 (0.8/3.8)	5455	4.2	1586	18	83.1	154
			STG38 (0.8/3.8)	5614	4.4	2007	21	87.9	220
CSISZ	Csizmadia	Zalaegerszeg/HU	HUVCSE01 (0.95/5)	2423	3.4	361	15	66.5	134
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	12	71.5	200
GONRU	Goncalves	Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	10	65.3	210
			TEMPLAR2 (0.8/6)	2080	5.0	1508	13	87.7	226
			TEMPLAR3 (0.8/8)	1438	4.3	571	21	117.6	141
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	21	150.8	388
			ORION3 (0.95/5)	2665	4.9	2069	20	120.8	103
			ORION4 (0.95/5)	2662	4.3	1043	22	146.8	191
HINWO	Hinz	Brannenburg/DE	ACR (2.0/35)*	557	7.4	4954	14	56.8	323
IGAAN	Igaz	Baja/HU	HUBAJ (0.8/3.8)	5552	2.8	403	22	63.9	166
		Debrecen/HU	HUDEB (0.8/3.8)	5522	3.2	620	21	139.2	199
		Hodmezovasar./HU	HUHOD (0.8/3.8)	5502	3.4	764	22	132.6	175
		Budapest/HU	HUPOL (1.2/4)	3790	3.3	475	16	72.9	43
		Sopron/HU	HUSOP (0.8/6)	2031	3.8	460	26	154.8	499
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	18	113.3	87
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	11	72.1	164
		Kostanjevec/SI	METKA (0.8/8)*	1372	4.0	361	8	58.4	77
		Ljubljana/SI	ORION1 (0.8/8)	1402	3.8	331	18	102.0	149
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	16	90.8	338
KERST	Kerr	Glenlee/AU	GOCAM1 (0.8/3.8)	5189	4.6	2550	29	179.3	988
KOSDE	Koschny	Izana Obs./ES	ICC7 (0.85/25)*	714	5.9	1464	14	59.9	388
		Noordwijkerhout/NL	LIC4 (1.4/50)*	2027	6.0	4509	14	57.5	121
LERAR	Leroy	Gretz/FR	SAPHIRA (1.2/6)	3260	3.4	301	14	88.9	35
MACMA	Maciejewski	Chelm/PL	PAV35 (1.2/4)	4383	2.5	253	17	73.1	53
			PAV36 (1.2/4)*	5732	2.2	227	14	70.9	103
			PAV43 (0.95/3.75)*	2544	2.7	176	15	79.5	75
MARGR	Maravelias	Lofoupoli/GR	LOOMECON (0.8/12)	738	6.3	2698	19	118.1	276
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1776	6.1	3817	12	62.0	411
			MINCAM1 (0.8/8)	1477	4.9	1084	21	110.1	189
		Ketzür/DE	REMO1 (0.8/8)	1467	6.0	3139	25	137.2	522
			REMO2 (0.8/8)	1475	5.6	1965	22	120.7	216
OCAFR	Ocana Gonzales	Madrid/ES	FOGCAM	1890	3.9	109	14	78.0	69
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	1971	-	-	8	25.6	49
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	24	92.2	216
PERZS	Perko	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	18	108.4	373
PUCRC	Pucer	Nova vas nad Dra./SI	MOBCAM1 (0.75/6)	2398	5.3	2976	21	92.7	173
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	16	61.0	93
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	15	70.3	75
			RO2 (0.75/6)	2381	3.8	459	19	78.2	95
			SOFIA (0.8/12)	738	5.3	907	17	79.4	62
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4152	4.5	2052	18	66.8	170
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	16	69.4	78
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	588	-	-	7	10.6	31
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	16	79.4	298
			NOA38 (0.8/3.8)	5609	4.2	1911	15	72.3	197
			SCO38 (0.8/3.8)	5598	4.8	3306	16	83.2	251
STORO	Stork	Kunzak/CZ	KUN1 (1.4/50)*	1913	5.4	2778	3	18.6	220
		Ondrejov/CZ	OND1 (1.4/50)*	2195	5.8	4595	3	16.5	234
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2362	4.6	1152	7	33.1	35
			MINCAM3 (0.8/12)	728	5.7	975	13	57.0	61
			MINCAM4 (1.0/2.6)	9791	2.7	552	8	34.4	21
			MINCAM5 (0.8/6)	2349	5.0	1896	15	65.4	92
TEPIS	Tepliczky	Budapest/HU	HUMOB (0.8/6)	2388	4.8	1607	21	131.7	368
TRIMI	Triglav	Velenje/SI	SRAKA (0.8/6)*	2222	4.0	546	19	55.1	154
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2337	5.5	3574	21	64.5	177
Sum							30	5262.0	12208

* active field of view smaller than video frame

2. Observing Times (h)

April	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	-	-	-	-	1.8	-	-	-	-	-	7.5	-
BERER	8.4	-	4.4	-	-	-	-	-	6.0	6.3	-	-	-	-	-
	3.3	-	3.0	-	-	-	-	-	3.0	1.5	-	-	-	-	-
	4.9	-	1.8	-	-	-	-	-	6.9	1.7	-	-	-	-	-
BREMA	-	1.0	-	-	-	-	-	-	-	-	1.3	7.1	2.9	-	8.1
	-	-	-	-	-	-	-	-	-	-	-	6.5	-	2.9	8.0
BRIBE	2.7	6.2	0.4	-	-	-	-	-	-	-	-	-	7.2	-	1.5
	7.5	2.0	-	0.6	-	-	-	-	-	-	3.0	5.4	6.8	0.8	1.1
CRIST	6.5	-	0.9	-	-	-	0.3	8.2	3.9	-	7.3	-	-	-	3.9
	7.5	-	0.2	-	-	-	0.3	7.9	4.6	-	8.8	0.3	-	-	7.8
	7.8	1.1	0.9	-	-	0.2	0.8	8.7	4.0	-	5.9	0.7	-	-	1.0
CSISZ	6.9	2.2	2.0	6.0	-	-	-	3.3	3.9	2.3	-	-	-	-	-
ELTMA	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GONRU	-	-	-	5.6	-	-	-	9.2	-	-	-	-	-	8.0	9.0
	-	-	-	9.2	-	-	-	9.3	-	3.6	-	9.1	-	8.3	9.0
	-	-	0.9	9.2	1.2	8.7	9.4	9.4	4.4	3.0	1.4	8.3	-	9.0	8.9
GOVMI	9.3	9.3	8.1	8.7	-	-	-	8.9	8.9	5.6	2.3	8.7	-	-	-
	2.7	-	4.7	7.4	-	-	-	8.6	8.9	3.8	-	8.7	-	-	-
	9.3	9.3	6.7	7.9	-	-	-	8.5	8.9	4.1	2.4	8.7	-	-	-
HINWO	6.3	-	4.5	-	-	-	-	-	-	-	-	-	-	-	-
IGAAN	1.2	6.7	3.9	2.6	0.2	-	-	0.5	3.5	1.1	2.8	2.3	-	-	0.3
	8.6	6.3	7.5	4.7	6.5	6.8	-	7.8	8.9	8.7	-	7.5	-	-	0.2
	1.9	8.2	5.3	8.2	6.1	1.1	-	1.8	8.9	8.9	5.2	8.8	-	-	2.6
	0.4	2.6	0.3	5.7	-	-	-	-	8.9	7.2	-	-	-	0.6	6.5
	8.1	9.1	7.3	9.1	0.8	3.5	2.9	5.1	8.7	5.0	1.9	8.5	-	-	-
JONKA	8.5	8.6	7.8	5.0	-	-	-	-	8.5	-	-	7.1	-	-	5.1
KACJA	9.3	6.7	-	-	-	-	-	9.0	9.0	2.9	-	5.0	-	-	-
	-	-	-	-	-	-	-	3.1	9.2	-	-	-	-	-	-
	9.5	5.4	-	-	-	-	-	8.7	9.2	3.1	1.0	4.4	-	-	-
	9.5	7.1	-	-	-	-	-	9.2	9.1	2.8	-	4.9	-	-	-
KERST	6.4	8.7	6.9	6.3	6.1	6.0	8.0	5.6	7.6	8.8	5.8	6.3	3.1	5.5	4.8
KOSDE	1.5	0.8	-	-	-	1.1	-	7.3	5.6	2.6	0.9	9.2	9.2	-	-
	-	3.6	-	-	3.1	-	-	-	-	3.0	5.2	1.6	5.5	-	5.4
LERAR	9.4	9.3	-	7.6	-	6.7	7.1	-	-	4.2	-	8.7	-	8.1	8.3
MACMA	0.2	0.8	1.3	-	-	-	-	-	2.5	8.8	-	2.3	6.0	-	-
	-	-	2.6	-	-	-	-	-	8.7	3.5	-	0.8	-	-	-
	3.6	-	-	0.5	-	-	-	-	8.8	8.8	-	-	7.0	-	-
MARGR	-	-	-	-	-	-	-	7.4	3.9	-	1.8	-	-	9.2	4.8
MOLSI	5.0	8.1	-	-	-	-	-	-	2.5	1.5	-	-	-	-	-
	9.3	9.2	-	-	-	-	-	7.7	4.2	3.4	1.0	-	-	2.0	-
	-	0.7	-	-	8.7	-	6.8	7.7	-	2.3	2.0	2.5	8.1	8.1	7.2
	-	-	-	-	8.6	-	-	7.6	-	2.3	-	1.7	8.1	8.1	7.1
OCAFR	-	-	-	-	-	-	9.4	9.4	-	6.4	-	-	-	8.3	-
OCHPA	-	0.2	-	-	-	-	-	1.3	-	-	-	-	-	-	-
OTTMI	7.0	5.9	0.5	0.7	3.3	2.5	1.7	2.8	3.4	7.5	7.5	7.3	0.3	-	0.5
PERZS	9.5	8.8	8.1	6.7	0.4	-	-	9.1	9.0	7.9	3.2	8.9	-	-	-
PUCRC	4.3	-	-	3.0	-	2.6	-	8.4	-	1.4	0.5	1.8	-	-	-
ROTEC	-	0.2	-	-	8.8	-	2.2	6.1	-	2.5	1.3	-	-	6.6	2.1
SARAN	-	0.2	-	-	2.8	5.7	9.5	1.2	1.1	2.2	-	4.0	-	7.5	9.1
	-	3.1	-	6.0	2.0	7.6	9.4	7.6	5.7	1.9	-	2.7	-	6.8	5.1
	-	-	-	5.5	2.3	5.1	7.4	4.1	5.6	2.0	-	3.8	-	6.9	9.0
SCALE	-	0.8	-	-	-	5.6	-	4.8	-	-	-	0.3	-	-	-
SCHHA	8.4	-	1.9	-	-	-	2.8	-	-	1.2	-	6.9	-	-	8.0
SLAST	2.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STOEN	2.0	2.1	-	-	-	7.0	-	7.6	4.2	-	-	2.4	-	-	-
	1.1	2.0	-	-	-	5.9	-	6.4	4.4	-	-	1.0	-	-	-
	2.1	2.2	-	-	-	9.2	-	7.3	4.4	-	-	1.8	-	-	-
STORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STRJO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	2.0	-	-	-	3.8	3.8	7.7	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	5.6	1.9	-	-	2.5	3.7	7.7	1.4	-
TEPIS	7.2	7.2	8.0	5.0	-	-	-	8.4	8.7	6.4	2.8	7.8	0.8	-	-
TRIMI	2.1	1.7	-	-	-	-	-	2.7	6.7	0.8	0.9	2.8	-	-	-
YRJIL	1.1	4.8	7.6	5.4	0.9	1.5	2.0	1.7	5.2	3.5	-	1.5	-	-	6.1
Sum	224.3	172.2	107.5	136.6	61.8	86.8	87.6	263.1	249.5	164.5	82.5	205.6	80.4	115.6	150.5

April	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	7.3	7.4	-	-	5.6	4.3	7.2	6.3	-	-	-	4.3	-	4.9	5.4
BERER	-	-	-	-	2.2	7.4	0.8	-	-	6.7	5.1	6.1	4.6	5.5	5.6
	-	-	-	-	0.8	5.5	0.9	-	-	1.7	5.9	6.3	5.0	5.2	4.5
	-	-	-	-	1.3	6.4	0.4	-	-	4.4	2.9	2.9	4.2	3.8	1.4
BREMA	8.0	-	-	7.0	2.4	-	5.6	-	0.8	-	-	-	-	-	1.7
	7.9	-	0.8	7.5	2.6	0.8	5.6	-	-	-	-	-	-	1.2	1.5
BRIBE	8.1	1.6	3.2	7.5	3.0	0.5	4.1	0.8	-	-	-	-	3.3	-	-
	7.8	0.5	-	7.2	2.9	1.3	3.1	1.2	-	-	-	-	2.6	0.9	-
CRIST	5.4	2.8	0.9	0.2	8.1	-	5.8	-	7.4	5.2	6.7	8.0	2.2	5.8	-
	1.7	1.3	-	-	8.4	-	0.9	-	7.8	3.2	7.0	8.1	2.5	4.8	-
	6.0	5.7	5.9	0.8	8.0	-	-	-	-	6.6	6.7	8.0	3.1	5.8	0.2
CSISZ	-	-	-	3.2	6.3	5.8	-	5.0	-	1.4	6.4	7.7	-	4.1	-
ELTMA	-	8.7	-	-	6.8	4.5	7.8	-	7.4	7.3	5.3	8.1	6.5	1.8	6.2
GONRU	8.8	-	-	-	-	4.2	3.8	-	2.5	-	-	-	-	6.9	7.3
	8.9	-	-	-	-	7.2	5.7	-	2.5	-	-	0.9	-	6.4	7.6
	8.5	4.6	-	-	-	7.5	6.1	1.5	-	-	-	1.4	0.7	6.6	6.9
GOVMI	5.3	-	-	6.9	7.0	8.1	1.8	6.4	-	7.9	7.9	7.8	7.7	7.7	6.5
	4.9	-	2.1	1.5	6.5	8.1	1.4	6.1	-	7.9	7.5	7.8	7.7	7.7	6.8
	4.6	-	2.8	8.3	6.1	7.8	1.3	5.5	-	7.9	7.8	7.8	7.5	7.7	5.9
HINWO	-	4.0	-	2.7	-	1.9	7.0	0.4	4.6	7.0	6.1	5.9	2.2	2.2	2.0
IGAAN	-	-	1.8	0.1	-	5.0	1.3	-	0.2	2.1	2.7	7.8	7.8	7.8	2.2
	5.1	-	-	-	4.6	7.9	-	-	1.3	8.0	7.9	7.8	7.8	7.7	7.6
	-	-	-	7.4	-	8.2	1.7	1.0	-	8.0	8.0	7.9	7.9	7.8	7.7
	-	-	-	-	-	3.5	0.7	4.0	-	1.3	7.9	7.8	7.8	7.7	-
	-	7.2	4.6	8.1	1.9	7.8	0.9	7.0	4.1	7.8	5.5	7.5	7.5	7.5	7.4
JONKA	2.9	-	-	5.0	-	6.6	2.5	2.0	-	7.2	7.2	7.5	7.4	7.4	7.0
KACJA	3.8	-	-	-	-	-	-	-	-	-	-	7.9	6.9	6.1	5.5
	-	-	-	-	-	7.7	-	-	-	-	8.2	7.8	7.6	7.9	6.9
	6.3	-	-	-	2.7	6.5	-	2.5	2.1	7.4	8.2	8.2	7.4	3.8	5.6
	3.9	-	-	-	0.9	0.8	-	-	1.1	5.5	8.0	8.1	7.8	6.0	6.1
KERST	6.0	8.5	8.5	5.2	8.8	7.2	7.8	6.3	5.0	3.7	1.9	-	2.5	8.3	3.7
KOSDE	-	-	-	-	-	-	-	-	4.4	8.3	1.3	-	6.3	1.4	-
	7.5	3.3	-	4.3	-	-	1.4	-	-	2.4	4.3	-	-	6.9	-
LERAR	7.9	2.3	0.3	4.5	-	-	-	-	-	-	-	-	-	4.5	-
MACMA	-	-	-	-	7.9	3.6	3.3	4.4	-	7.5	1.0	7.3	7.5	3.1	5.6
	-	-	-	-	7.8	3.2	4.1	0.3	-	7.4	3.5	7.3	7.3	7.3	7.1
	-	-	-	-	8.1	2.0	3.9	4.2	2.7	0.7	-	7.5	7.5	7.2	7.0
MARGR	7.9	-	6.2	6.3	4.2	8.2	6.9	6.6	5.3	6.5	8.5	6.6	8.7	7.8	1.3
MOLSI	-	-	-	-	-	-	3.6	3.1	-	7.0	7.0	7.0	5.9	4.6	6.7
	1.5	8.3	2.9	2.0	1.9	-	7.0	4.4	3.8	7.8	7.8	7.7	5.8	4.9	7.5
	7.9	7.8	6.1	5.6	6.3	4.9	7.1	6.8	2.8	2.7	0.4	5.0	6.9	6.7	6.1
	7.9	7.8	6.0	4.8	6.5	3.4	6.9	6.5	2.3	2.6	0.4	4.4	7.0	6.4	4.3
OCAFR	9.0	3.8	-	-	-	8.3	4.8	5.9	4.6	0.4	-	-	0.8	1.5	5.4
OCHPA	1.3	-	-	-	2.1	-	-	-	-	3.1	7.0	7.9	2.7	-	-
OTTMI	1.7	1.2	0.4	-	1.4	-	7.6	4.0	6.6	7.2	-	-	3.3	-	7.9
PERZS	3.2	-	1.5	-	7.5	4.6	2.8	5.0	-	8.1	-	-	-	-	4.1
PUCRC	5.8	3.8	1.3	0.8	2.0	4.9	7.7	3.2	5.7	7.0	8.2	8.1	6.2	-	6.0
ROTEC	-	-	-	0.9	6.9	3.4	-	5.9	-	2.1	-	4.5	-	2.8	4.7
SARAN	8.1	-	-	-	-	-	6.7	1.5	-	-	-	-	-	6.3	4.4
	8.1	1.2	-	-	-	0.6	2.7	1.1	-	-	-	-	2.8	0.5	3.3
	8.0	1.1	-	-	-	0.5	5.1	-	-	-	-	-	2.6	6.8	3.6
SCALE	1.6	6.6	2.2	-	4.4	4.5	6.6	0.2	5.2	5.0	4.5	7.0	3.0	0.2	4.3
SCHHA	8.2	5.5	-	6.5	3.2	2.3	7.7	-	0.6	-	-	-	0.9	4.2	1.1
SLAST	-	-	-	-	0.3	0.9	-	-	-	2.1	1.3	2.8	-	0.3	-
STOEN	-	5.5	1.9	-	7.1	-	5.9	0.8	-	8.4	6.6	8.3	4.7	-	4.9
	-	5.3	2.3	-	6.8	-	5.9	-	-	8.1	6.1	7.9	4.3	-	4.8
	-	6.2	2.0	-	7.4	-	5.9	0.8	-	8.3	8.1	8.3	4.7	-	4.5
STORO	-	-	-	-	-	5.4	6.0	3.0	-	-	-	-	-	-	-
	-	-	-	-	-	4.3	7.3	7.2	-	-	-	-	-	-	-
STRJO	7.2	-	5.9	6.5	-	2.9	-	2.8	-	-	-	-	4.8	-	3.0
	7.3	-	7.2	7.1	3.3	3.1	1.3	3.3	-	-	-	-	-	2.2	4.9
	7.2	-	5.9	6.5	3.0	2.8	-	-	-	-	-	-	3.9	1.6	3.5
	7.3	-	6.9	7.3	2.7	3.1	1.6	3.5	-	-	-	-	5.2	-	5.0
TEPIS	-	1.9	-	6.5	-	8.0	2.3	5.3	-	7.7	7.7	7.6	7.5	7.5	7.4
TRIMI	1.2	-	0.3	2.2	1.8	6.7	-	1.2	-	4.4	4.5	4.1	4.5	5.0	1.5
YRJIL	-	-	2.1	0.1	-	5.5	5.1	-	2.5	1.3	-	1.9	-	2.0	2.7
Sum	247.0	123.9	92.0	150.5	199.5	239.6	221.4	148.9	93.3	244.3	229.0	290.6	263.0	268.7	261.8

3. Results (Meteors)

April	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	-	-	-	-	1	-	-	-	-	-	3	-
BERER	19	-	10	-	-	-	-	-	22	17	-	-	-	-	-
	8	-	7	-	-	-	-	-	7	3	-	-	-	-	-
	11	-	5	-	-	-	-	-	10	4	-	-	-	-	-
BREMA	-	2	-	-	-	-	-	-	-	-	1	6	5	-	21
	-	-	-	-	-	-	-	-	-	-	-	7	-	1	12
BRIBE	6	4	2	-	-	-	-	-	-	-	-	-	8	-	3
	12	4	-	3	-	-	-	-	-	-	3	2	5	1	2
CRIST	11	-	3	-	-	-	2	16	1	-	10	-	-	-	9
	8	-	1	-	-	-	2	9	2	-	25	2	-	-	14
	10	1	4	-	-	1	5	29	3	-	6	2	-	-	3
CSISZ	9	6	4	7	-	-	-	7	8	3	-	-	-	-	-
ELTMA	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GONRU	-	-	-	12	-	-	-	20	-	-	-	-	-	19	30
	-	-	-	17	-	-	-	20	-	3	-	26	-	17	23
	-	-	1	11	1	8	12	7	1	2	2	11	-	8	9
GOVMI	22	14	8	13	-	-	-	23	24	9	6	33	-	-	-
	4	-	2	3	-	-	-	2	4	4	-	8	-	-	-
	5	13	3	8	-	-	-	7	13	4	3	12	-	-	-
HINWO	30	-	20	-	-	-	-	-	-	-	-	-	-	-	-
IGAAN	6	11	7	7	1	-	-	1	9	4	2	8	-	-	1
	14	18	8	8	6	6	-	12	3	10	-	4	-	-	1
	4	7	6	8	1	1	-	1	11	4	2	6	-	-	3
	3	2	1	1	-	-	-	-	2	4	-	-	-	1	1
	30	19	19	21	2	2	5	11	16	13	2	35	-	-	-
JONKA	3	1	6	4	-	-	-	-	4	-	-	2	-	-	4
KACJA	27	17	-	-	-	-	-	12	33	4	-	5	-	-	-
	-	-	-	-	-	-	-	2	8	-	-	-	-	-	-
	13	3	-	-	-	-	-	11	13	3	2	5	-	-	-
	37	17	-	-	-	-	-	31	31	1	-	14	-	-	-
KERST	30	44	40	45	44	30	35	31	37	47	35	34	17	26	17
KOSDE	10	7	-	-	-	11	-	40	32	18	4	54	65	-	-
	-	3	-	-	8	-	-	-	-	4	11	3	7	-	11
LERAR	4	2	-	1	-	1	3	-	-	4	-	4	-	2	1
MACMA	1	1	3	-	-	-	-	-	3	6	-	1	1	-	-
	-	-	2	-	-	-	-	-	10	6	-	2	-	-	-
	1	-	-	3	-	-	-	-	10	8	-	-	1	-	-
MARGR	-	-	-	-	-	-	-	10	5	-	1	-	-	18	16
MOLSI	58	36	-	-	-	-	-	-	5	4	-	-	-	-	-
	29	8	-	-	-	-	-	17	4	4	1	-	-	1	-
	-	1	-	-	42	-	17	30	-	3	3	2	26	41	11
	-	-	-	-	10	-	-	17	-	2	-	3	10	18	7
OCAFR	-	-	-	-	-	-	4	9	-	7	-	-	-	3	-
OCHPA	-	1	-	-	-	-	-	8	-	-	-	-	-	-	-
OTTMI	8	12	3	3	9	18	12	16	16	13	14	8	1	-	4
PERZS	37	18	28	17	1	-	-	22	21	21	5	26	-	-	-
PUCRC	4	-	-	2	-	2	-	12	-	1	2	2	-	-	-
ROTEC	-	1	-	-	13	-	3	12	-	2	1	-	-	9	1
SARAN	-	1	-	-	7	7	5	2	1	2	-	3	-	5	10
	-	2	-	7	1	12	10	10	6	1	-	2	-	5	6
	-	-	-	3	5	6	3	3	3	1	-	3	-	3	6
SCALE	-	2	-	-	-	11	-	12	-	-	-	2	-	-	-
SCHHA	6	-	2	-	-	-	4	-	-	1	-	2	-	-	5
SLAST	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STOEN	5	13	-	-	-	8	-	29	6	-	-	5	-	-	-
	3	8	-	-	-	7	-	18	7	-	-	8	-	-	-
	5	8	-	-	-	20	-	28	5	-	-	3	-	-	-
STORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STRJO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	1	-	-	-	4	3	5	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	8	3	-	-	3	3	5	1	-
TEPIS	17	20	10	12	-	-	-	18	20	20	7	23	1	-	-
TRIMI	6	5	-	-	-	-	-	7	17	2	3	10	-	-	-
YRJIL	1	6	20	19	3	6	6	8	8	6	-	3	-	-	13
Sum	526	338	225	235	154	157	137	584	441	275	158	397	157	182	244

April	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	5	1	-	-	2	2	11	2	-	-	-	1	-	3	3
BERER	-	-	-	-	8	66	3	-	-	17	13	17	16	18	18
	-	-	-	-	3	27	3	-	-	3	11	11	11	17	9
	-	-	-	-	3	23	2	-	-	9	11	10	8	11	3
BREMA	12	-	-	18	4	-	10	-	3	-	-	-	-	-	2
	12	-	1	11	3	4	12	-	-	-	-	-	-	1	3
BRIBE	18	2	2	20	7	1	5	2	-	-	-	-	2	-	-
	15	1	-	16	11	5	9	3	-	-	-	-	1	1	-
CRIST	18	5	5	1	33	-	25	-	17	10	12	20	2	17	-
	7	4	-	-	26	-	3	-	12	3	8	13	3	12	-
	18	7	6	2	23	-	-	-	-	14	26	30	4	25	1
CSISZ	-	-	-	8	16	20	-	10	-	4	11	10	-	11	-
ELTMA	-	14	-	-	27	39	25	-	22	14	6	16	9	3	23
GONRU	25	-	-	-	-	42	22	-	2	-	-	-	-	14	24
	18	-	-	-	-	54	14	-	3	-	-	1	-	11	19
	11	7	-	-	-	18	13	2	-	-	-	1	1	6	9
GOVMI	7	-	-	17	20	65	1	11	-	18	31	16	20	17	13
	3	-	2	6	11	26	2	2	-	7	5	2	3	4	3
	6	-	5	13	11	29	2	6	-	9	9	10	3	14	6
HINWO	-	18	-	12	-	9	45	1	24	49	36	39	9	11	20
IGAAN	-	-	1	1	-	35	7	-	1	7	7	16	10	17	7
	5	-	-	-	6	30	-	-	2	18	6	13	6	11	12
	-	-	-	11	-	32	6	4	-	7	16	13	11	15	6
	-	-	-	-	-	10	2	2	-	2	3	3	4	2	-
	-	23	19	34	8	67	3	27	9	29	17	14	24	24	26
JONKA	1	-	-	9	-	15	2	3	-	6	12	4	3	5	3
KACJA	10	-	-	-	-	-	-	-	-	-	-	24	6	8	18
	-	-	-	-	-	24	-	-	-	-	12	11	10	5	5
	15	-	-	-	4	23	-	3	2	13	11	11	5	4	8
	32	-	-	-	1	2	-	-	1	33	36	42	26	11	23
KERST	31	65	57	38	52	60	27	17	15	6	9	-	29	51	19
KOSDE	-	-	-	-	-	-	-	-	37	61	6	-	40	3	-
	24	9	-	9	-	-	5	-	-	8	9	-	-	10	-
LERAR	4	6	1	1	-	-	-	-	-	-	-	-	-	1	-
MACMA	-	-	-	-	7	5	4	2	-	5	3	3	2	1	5
	-	-	-	-	12	2	10	1	-	9	7	10	9	12	11
	-	-	-	-	9	2	6	4	2	3	-	6	2	9	9
MARGR	7	-	8	13	7	57	23	10	4	16	16	18	18	16	13
MOLSI	-	-	-	-	-	-	55	13	-	61	52	59	20	10	38
	1	8	1	2	1	-	24	5	2	25	13	25	4	4	10
	42	33	22	27	22	19	37	40	2	11	2	16	31	19	23
	24	8	10	9	11	7	15	9	6	4	1	7	18	6	14
OCAFR	11	2	-	-	-	11	7	4	3	1	-	-	1	4	2
OCHPA	8	-	-	-	5	-	-	-	-	1	8	11	7	-	-
OTTMI	11	8	3	-	9	-	18	1	4	15	-	-	5	-	5
PERZS	7	-	4	-	30	84	4	10	-	23	-	-	-	-	15
PUCRC	13	11	4	3	4	24	21	2	9	16	10	16	4	-	11
ROTEC	-	-	-	3	11	12	-	6	-	4	-	4	-	5	6
SARAN	11	-	-	-	-	-	4	1	-	-	-	-	-	13	3
	7	4	-	-	-	4	3	3	-	-	-	-	4	2	6
	7	1	-	-	-	3	2	-	-	-	-	-	3	7	3
SCALE	8	5	3	-	21	33	24	1	12	3	4	14	5	1	9
SCHHA	6	8	-	6	4	5	21	-	1	-	-	-	1	3	3
SLAST	-	-	-	-	1	4	-	-	-	6	2	10	-	1	-
STOEN	-	16	10	-	42	-	44	3	-	33	21	25	20	-	18
	-	7	5	-	21	-	31	-	-	19	11	27	14	-	11
	-	12	9	-	36	-	28	1	-	21	19	27	15	-	14
STORO	-	-	-	-	-	88	53	79	-	-	-	-	-	-	-
	-	-	-	-	-	68	118	48	-	-	-	-	-	-	-
STRJO	8	-	5	13	-	3	-	1	-	-	-	-	2	-	3
	9	-	12	6	3	6	3	3	-	-	-	-	-	2	4
	3	-	7	2	4	2	-	-	-	-	-	-	1	1	1
	19	-	13	14	5	8	2	1	-	-	-	-	4	-	3
TEPIS	-	4	-	26	-	64	9	27	-	15	17	12	19	15	12
TRIMI	4	-	1	5	5	23	-	3	-	8	8	14	9	17	7
YRJIL	-	-	7	1	-	29	17	-	4	3	-	4	-	7	6
Sum	503	289	223	357	549	1291	842	373	199	649	517	656	484	518	548