Results of the IMO Video Meteor Network – June 2012

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In June we managed once more to improve our observing results from the previous year significantly. The month, which still ranks last in our database due to the short northern hemisphere nights, presented mediocre weather in its first half. Starting from mid-June, however, almost all observers obtained long series of clear observing nights. In twelve June nights, more than 50 out of the 67 camera systems were active. On June 17, even 63 cameras were in operation.
37 cameras managed to obtain twenty or more observing nights in June. Grigoris Maravelias did not even miss a single night with his camera LOOMECON in Greece.
In total, we accumulated over 5,500 observing hours and recorded more than 14,000 meteors, which is a plus of almost 50% compared to June 2011. So we recorded already more than 100,000 meteors in the first half of 2012, and the meteor season is only about to begin!

June is poor of strong but rich in minor meteor showers. Most famous are probably the June Bootids (170 JBO), which presented a number of unexpected outbursts (most recently in 1998 and 2004). In normal years, however, this shower is almost non-existent. Those 120 June Bootids that we recorded in the activity interval of 2012, yield a flux density of less than a tenth of a meteor per 1,000 km^2 and hour, which corresponds to a ZHR of well below one (figure 1). Thus, the shower was practically invisible in this year.

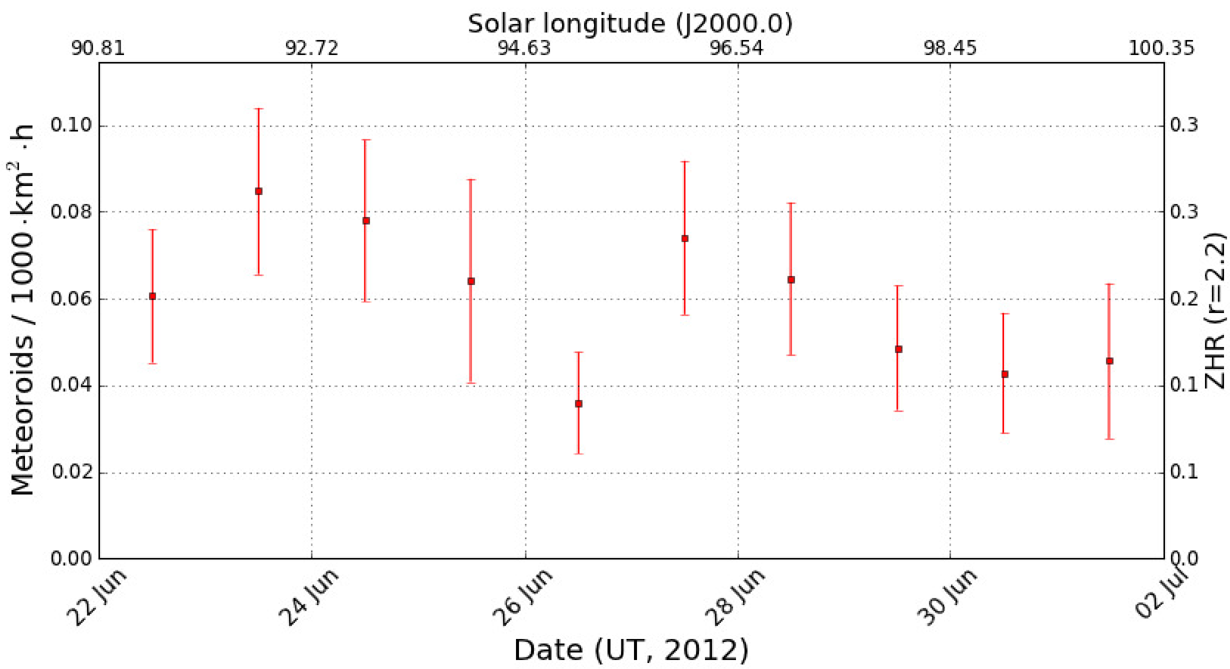

Figure 1: *Flux density profile of the June Bootids in 2012.*

More interesting is the case of the Daytime Arietids (171 ARI), one of the best.known daytime meteor showers, active in the first June decade. You err if you believe, that a daytime shower is only relevant for radar observers. This shower can also be detected in our video meteor database! In the recent analysis, the shower was found between June 5 and 10 with a rank of 27. Usually a shower with only 70 meteors would be regarded as a chance alignment of radiants. In this case, however, the low meteor count meets our expectations, as the Daytime Arietids can only be observed for about an hour at dawn. The radiant position shows only little scatter and the average position matches well to the MDC values. Only the velocity obtained by us is clearly larger than the reference value (table 1).
However, our values agree perfectly with results of the CAMS network, presented recently by Peter Jenniskens and colleagues in WGN. Between June 10 and 15, 2011, the three CAMS stations in California recorded four Daytime Arietids. The mean position and velocity of three meteors is given in table 1, too. The radiant drift was obtained from video data of Fujiwara, SonotaCo and Jenniskens. These values fit much better to our data than the MDC values – in particular the discrepancy in meteor shower velocity disappears. Jenniskens discussed different reasons, why the

MDC data (which are based on radar observations) have a lower velocity than observations in the optical domain, without getting to a conclusive explanation, though.

Table 1: *Parameters of the Daytime Arietids from the MDC Working List, the paper of Jenniskens, and the analysis of the IMO Network 2012.*

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	77	-	40.2	+0.7	+23.8	+0.6	37.4	-
CAMS 2012	81	-	46.5	+0.87	+23.7	+0.07	43.8	-
IMO 2012	77	74-79	44.0	+1.0	+23.5	+0.1	43	-

In the following we want to briefly discuss further showers that were obtained by our recent analysis based on more than a million video meteors.

The phi Piscids (372 PPS) are detected between June 6 and July 31. From June 11 to July 25 the scatter in radiant position is small enough to assume a safe detection of this shower. Table 2 compares the parameters, which were obtained from more than 4,000 shower meteors, with the reference values from the MDC list. The fast shower reaches highest activity in early July, and between mid-June and mid-July the phi Piscids represent almost uninterruptedly the strongest source in the sky. Only in the second half of July, the shower is outnumbered by the Capricornids, Aquariids and Perseids.

Table 2: *Parameters of the phi Piscids from the MDC Working List and the analysis of the IMO Network 2012.*

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	106	-	20.1	-	+24.1	-	63.9	-
IMO 2012	101	80-122	15.1	+0.8	+25.1	+0.5	68.5	0.0

Between June 10 and 15, the northern June Aquilids (164 NZC) can be found. With a rank of 14 this shower is close to the limits, but the small scatter in position and velocity are a clear sign for its existence. The basic parameters are given in table 3. They match only moderately to the MDC values – in particular the velocity does not fit well.

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

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	86	-	298.3	-	-7.1	-	38.0	-
IMO 2012	81.5	79-84	292.0	+1.0	-11.7	-0.4	43	-

Another long-lasting shower starts on June 18 and ends on July 24. It resembles to the sigma Capricornids (179 SCA), but in particular the declination and velocity of our analysis (based on 2,400 meteors) deviate significantly from the MDC values (table 4). Between end of June and mid-July, the shower belongs to the most active sources in the sky. We found a small but consistent decrease of velocity in the activity interval. Highest activity is observed in the first decade of July.

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

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	110	-	311.1	-	-14.5	-	29.1	-
IMO 2012	105	88-121	313.2	+0.83	-4.5	+0.23	41.6	-0.12

In the last decade of June, the fast shower of the delta Piscids (410 DPI) is active. With a rank of 7 the delta Piscids do not belong to the strongest sources, but the small scatter in the meteor shower parameters (based on 220 meteors) and the perfect match with the MDC values (table 5) make this shower a safe detection.

Table 5: *Parameters of the delta Piscids from the MDC Working List and the analysis of the IMO Network 2012.*

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	92	-	10.9	-	5.5	-	70.9	-
IMO 2012	92	89-95	11.1	+0.4	5.1	+0.4	69.8	-

The c-Andromedids (411 CAN) are active for almost a month. Their activity interval starts on June 27 and ends on July 21. Our shower parameters are based on more than 1,800 shower meteors. They agree well to the MDC values (table 6). Also for this shower we found a small but consistent decrease in velocity. Highest activity is reached in the first decade of July.

Table 6: *Parameters of the c-Andromedids from the MDC Working List and the analysis of the IMO Network 2012.*

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	110	-	32.4	-	48.4	-	60.1	-
IMO 2012	106	95-118	28.1	+1.13	46.3	+0.38	60.1	-0.11

The following four weak showers were detected as well:

- Between May 29 and June 3, the northern omega Scorpiids (66 NSC) are active. At the turn of the month, they are the strongest source in the sky.
- In early June, the June mu Cassiopeiids (362 JMC) can be detected The shower has a rank of 17 and a large scatter in its parameters, but the good agreement to the MDC values supports the existence of this shower.
- The northern mu Sagittariids (67 NSA) are also active in the first half of June. Even though they have a rank of two and belong to the strongest sources between June 2 and 6, their parameters show strong variations from one night to the next. They are probably more like a diffuse radiation area.
- In the middle of June, the southern sigma Sagittariids (168 SSS) can be found, which are the strongest source at the Summer solstitium.

Finally we would like to point to a possibly new shower, that is found at the turn of June/July with a rank of 7. Table 7 lists the basic parameters, based on 350 shower meteors. Please give us feedback if you can confirm this shower by other observations, before we will report it to MDC.

Table 7: *Parameters of a possibly new meteor shower from the analysis of the IMO Network 2012.*

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
IMO 2012	100	96-104	252.5	-	53.6	-	23	-

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	2	7.4	5
BERER	Berko	Ludanyhalaszi/HU	HULUD1 (0.95/3)	2256	4.8	1540	20	76.5	271
			HULUD2 (0.75/6)	4860	3.9	1103	18	59.7	175
			HULUD3 (0.75/6)	4661	3.9	1052	18	53.1	108
BIRSZ	Biro	Agostyan/HU	HUAGO (0.75/4.5)	2427	4.4	1036	24	106.1	189
BOMMA	Bombardini	Faenza/IT	MARIO (1.2/4.0)	5794	3.3	739	27	145.3	437
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	14	39.1	72
			MBB4 (0.8/8)	1470	5.1	1208	15	33.7	47
BRIBE	Brinkmann	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	21	59.0	128
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	17	42.2	84
CASFL	Castellani	Monte Baldo/IT	BMH1 (0.8/6)	2350	5.0	1611	24	81.9	209
			BMH2 (1.5/4.5)*	4243	3.0	371	23	60.0	166
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	27	121.6	369
			C3P8 (0.8/3.8)	5455	4.2	1586	17	69.1	176
			STG38 (0.8/3.8)	5614	4.4	2007	29	107.3	588
CSISZ	Csizmadia	Zalaegerszeg/HU	HUVCSE01 (0.95/5)	2423	3.4	361	21	31.2	121
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	25	137.3	342
GONRU	Goncalves	Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	20	129.6	412
			TEMPLAR2 (0.8/6)	2080	5.0	1508	20	129.2	343
			TEMPLAR3 (0.8/8)	1438	4.3	571	26	141.1	250
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	25	127.0	336
			ORION3 (0.95/5)	2665	4.9	2069	23	90.9	100
			ORION4 (0.95/5)	2662	4.3	1043	26	125.6	204
HINWO	Hinz	Brannenburg/DE	ACR (2.0/35)*	557	7.4	4954	9	30.8	202
IGAAN	Igaz	Baja/HU	HUBAJ (0.8/3.8)	5552	2.8	403	27	111.3	191
		Debrecen/HU	HUDEB (0.8/3.8)	5522	3.2	620	27	120.3	225
		Hodmezovasar./HU	HUHOD (0.8/3.8)	5502	3.4	764	29	137.1	216
		Sopron/HU	HUSOP (0.8/6)	2031	3.8	460	25	81.8	287
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	28	123.4	196
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	19	91.0	340
		Kostanjevec/SI	METKA (0.8/8)*	1372	4.0	361	12	55.2	43
		Ljubljana/SI	ORION1 (0.8/8)	1402	3.8	331	24	105.8	167
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	16	82.0	387
			STEFKA (0.8/3.8)	5471	2.8	379	19	92.4	235
KERST	Kerr	Glenlee/AU	GOCAM1 (0.8/3.8)	5189	4.6	2550	12	70.5	535
LERAR	Leroy	Gretz/FR	SAPHIRA (1.2/6)	3260	3.4	301	13	48.7	33
MACMA	Maciejewski	Chelm/PL	PAV35 (1.2/4)	4383	2.5	253	13	27.4	36
			PAV36 (1.2/4)*	5732	2.2	227	19	63.7	134
			PAV43 (0.95/3.75)*	2544	2.7	176	18	62.6	63
MARGR	Maravelias	Lofoupoli/GR	LOOMECON (0.8/12)	738	6.3	2698	30	174.5	514
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1776	6.1	3817	11	39.2	299
			MINCAM1 (0.8/8)	1477	4.9	1084	19	80.0	162
		Ketzür/DE	REMO1 (0.8/8)	1467	6.0	3139	19	63.6	303
			REMO2 (0.8/8)	1475	5.6	1965	20	63.2	156
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	2522	3.5	532	26	129.9	240
OCAFR	Ocana Gonzales	Madrid/ES	FOGCAM (1.4/7)	1890	3.9	109	27	146.7	134
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	2944	3.5	358	17	27.5	87
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	25	70.7	279
PERZS	Perko	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	23	109.6	417
PUCRC	Pucer	Nova vas nad Dra./SI	MOBCAM1 (0.75/6)	2398	5.3	2976	23	67.6	197
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	10	26.2	26
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	23	123.8	174
			RO2 (0.75/6)	2381	3.8	459	21	112.1	158
			SOFIA (0.8/12)	738	5.3	907	19	82.3	115
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4152	4.5	2052	27	111.4	218
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	13	40.7	65
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	588	-	-	17	55.2	42
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	27	128.9	602
			NOA38 (0.8/3.8)	5609	4.2	1911	28	131.3	460
			SCO38 (0.8/3.8)	5598	4.8	3306	28	130.7	585
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2362	4.6	1152	7	23.2	21
			MINCAM3 (0.8/12)	728	5.7	975	15	34.5	51
			MINCAM4 (1.0/2.6)	9791	2.7	552	10	25.2	23
			MINCAM5 (0.8/6)	2349	5.0	1896	18	40.3	78
TEPIS	Tepliczky	Budapest/HU	HUMOB (0.8/6)	2388	4.8	1607	24	103.9	330
TRIMI	Triglav	Velenje/SI	SRAKA (0.8/6)*	2222	4.0	546	24	73.2	202
ZELZO	Zelko	Budapest/HU	HUVCSE02 (0.95/5)	1606	3.8	390	4	12.9	26
Sum							30	5506.2	14386

* active field of view smaller than video frame

2. Observing Times (h)

June	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BERER	5.4	2.6	2.6	-	-	1.3	-	-	-	-	-	-	-	4.8	5.5
	3.4	1.7	0.7	-	-	-	-	-	-	-	-	-	-	4.5	3.2
	2.9	2.3	1.6	-	-	-	-	-	-	-	-	-	-	4.7	4.7
BIRSZ	5.1	3.2	3.9	-	2.0	-	5.5	1.9	-	-	2.0	3.9	5.1	4.1	5.5
BOMMA	5.4	6.0	2.0	4.7	5.5	4.7	3.0	-	4.6	-	1.7	6.8	6.2	6.8	5.8
BREMA	-	-	-	2.7	-	-	1.9	3.3	-	-	-	2.5	4.5	3.6	-
	4.2	0.9	-	-	0.3	-	2.0	-	-	3.2	-	-	4.2	-	-
BRIBE	3.5	2.7	-	2.4	1.1	-	2.4	3.2	3.2	3.9	-	-	-	-	-
	1.9	0.5	-	-	1.4	1.2	4.7	2.7	4.3	-	-	-	-	-	-
CASFL	0.3	1.1	-	4.0	0.3	-	2.7	-	-	-	-	2.2	4.3	4.9	3.6
	-	0.7	-	4.8	-	-	3.5	0.3	-	0.3	-	3.2	2.0	4.3	2.5
CRIST	2.4	-	-	3.7	4.8	-	3.9	3.3	2.2	0.2	1.3	6.1	6.1	6.2	6.2
	0.6	-	-	6.4	5.3	-	2.4	3.0	0.6	-	-	6.2	-	6.1	6.2
	2.9	0.3	-	0.3	5.4	0.2	3.2	3.3	1.1	0.2	1.4	6.0	5.8	6.0	6.0
CSISZ	-	-	2.5	-	3.5	-	1.6	0.2	-	-	-	-	0.2	2.9	2.1
ELTMA	-	-	3.0	4.5	5.3	4.1	5.6	-	-	-	6.2	6.3	6.3	6.3	5.2
GONRU	-	-	7.1	3.8	-	-	6.7	7.1	-	-	-	7.1	7.0	7.0	7.0
	-	-	6.6	3.6	-	-	6.7	7.1	-	-	-	7.1	7.1	7.1	7.1
	-	0.3	6.7	4.9	4.8	1.9	6.2	7.2	-	-	5.3	7.0	7.1	7.1	6.7
GOVMI	-	5.4	5.9	-	6.0	5.9	5.9	-	-	-	3.4	2.5	1.5	5.8	5.8
	-	4.1	5.8	-	5.8	4.5	5.9	-	-	-	-	1.3	1.3	2.3	1.0
	-	4.9	6.0	-	6.0	5.9	5.9	1.2	-	-	3.6	2.9	2.4	5.8	5.8
HINWO	-	-	-	-	1.6	-	-	-	-	-	-	-	-	-	3.0
IGAAN	-	0.2	6.1	-	5.4	3.3	4.0	2.7	-	2.5	0.9	0.4	1.1	6.0	5.9
	5.0	0.4	3.8	1.1	-	4.6	5.3	5.1	-	-	3.5	1.0	5.6	5.6	5.2
	3.9	2.8	3.1	0.8	5.7	6.0	3.9	6.1	2.0	1.5	4.1	1.5	3.9	6.0	6.0
	0.9	5.1	2.2	-	5.0	0.8	4.5	1.5	-	-	0.3	0.2	2.0	1.1	4.9
JONKA	5.0	1.8	5.5	-	3.5	1.1	6.0	5.8	-	3.3	3.6	3.7	5.4	5.2	5.9
KACJA	-	-	-	-	-	5.1	1.3	5.5	-	-	2.3	-	-	5.8	5.9
	-	1.6	-	-	5.6	1.8	-	3.0	-	-	-	-	-	6.2	5.9
	-	-	3.6	-	-	6.1	4.5	5.7	0.2	-	2.5	-	0.5	4.3	6.1
	-	-	-	-	-	6.1	1.0	5.8	-	-	-	-	-	-	6.0
	-	-	-	-	-	6.5	1.3	5.0	-	-	2.3	-	-	6.2	6.2
KERST	-	-	-	-	-	-	3.2	1.0	1.2	2.5	-	-	-	6.9	9.4
LERAR	-	-	-	-	-	-	-	-	3.3	-	-	-	0.3	-	-
MACMA	-	0.2	-	-	-	-	-	0.3	-	-	-	-	-	-	2.1
	2.9	2.1	0.2	-	-	-	2.6	-	-	1.9	1.1	-	-	-	5.1
	3.1	4.7	-	-	-	0.2	2.8	-	-	1.4	-	-	-	-	5.1
MARGR	3.8	6.8	3.5	5.9	6.8	3.2	6.9	6.0	4.3	7.6	6.1	7.1	3.8	6.4	5.7
MOLSI	-	-	-	-	4.0	-	-	-	-	-	-	-	-	4.3	4.5
	-	5.2	-	-	5.0	3.8	-	-	2.7	2.7	0.7	-	3.5	5.5	5.5
	4.8	3.8	-	-	4.4	-	-	4.4	4.1	-	-	2.9	3.9	3.7	1.6
	4.7	2.3	-	-	4.4	0.8	-	4.5	4.1	0.8	-	3.2	3.9	3.9	1.7
MORJO	4.3	-	6.0	-	5.8	4.4	5.9	5.3	1.8	3.4	4.1	3.8	-	5.7	5.8
OCAFR	3.8	-	3.4	6.8	6.1	4.6	4.7	6.9	4.6	4.9	6.9	7.0	3.1	7.0	-
OCHPA	-	-	-	-	-	-	-	0.2	-	-	-	-	4.0	5.5	1.1
OTTMI	4.2	4.5	-	0.9	4.6	4.2	6.1	5.3	3.5	2.8	4.8	4.1	-	2.5	0.8
PERZS	-	2.9	-	-	6.2	6.0	6.2	1.1	-	2.6	2.2	3.8	1.8	6.1	6.1
PUCRC	-	1.0	0.3	-	0.8	-	0.2	0.7	0.2	-	1.4	1.6	1.4	3.0	2.1
ROTEC	-	2.3	-	-	4.6	0.4	-	-	2.5	3.7	-	-	-	0.6	-
SARAN	1.8	-	7.3	0.6	1.6	-	5.3	7.3	-	1.4	5.7	7.2	4.0	7.2	-
	-	-	-	-	1.5	-	5.2	7.3	-	1.1	5.5	7.2	4.1	7.1	4.0
	0.6	-	7.4	-	-	-	-	6.8	-	-	4.6	5.9	4.0	5.0	2.1
SCALE	-	0.8	1.4	3.3	4.7	0.5	2.7	2.1	0.8	-	6.1	6.0	6.0	5.4	5.7
SCHHA	3.3	-	-	-	-	-	2.7	-	2.3	-	-	-	-	-	-
SLAST	-	-	0.3	-	-	0.6	-	4.0	-	-	0.7	-	-	3.9	-
STOEN	-	-	-	6.0	2.3	1.3	2.2	4.7	1.4	1.1	5.8	6.6	5.9	6.4	6.4
	-	-	1.0	6.2	2.8	2.0	2.3	4.7	2.0	1.7	5.8	6.3	5.8	6.2	6.2
	-	-	1.6	6.1	3.1	1.9	1.9	4.6	1.7	1.4	5.7	6.3	5.9	6.5	6.3
STRJO	2.8	-	-	-	-	-	-	-	-	3.7	-	-	-	3.6	-
	2.2	3.5	-	-	3.3	-	1.7	2.4	-	3.7	-	-	-	1.6	-
	-	-	-	-	-	-	-	-	-	3.7	-	-	-	3.5	-
	2.9	2.8	-	-	-	-	1.6	2.6	2.1	3.7	-	1.4	-	3.6	-
TEPIS	4.8	2.9	3.9	-	3.4	0.7	5.6	-	-	-	1.7	4.7	4.1	3.1	5.1
TRIMI	-	-	0.1	-	3.1	2.9	2.2	1.7	-	-	1.2	1.5	-	4.9	3.1
ZELZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum	102.8	94.4	115.1	83.5	162.8	108.6	183.5	173.9	60.8	70.9	114.5	164.5	155.1	275.8	246.4

June	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	-	-	-	-	-	-	4.2	-	-	-	-	-	3.2	-	-
BERER	5.5	4.1	4.7	5.5	1.9	-	4.7	4.1	1.5	1.1	5.5	3.0	5.6	1.9	5.2
	3.9	4.1	3.4	3.1	2.8	-	3.2	3.1	1.6	-	5.5	5.3	4.7	1.8	3.7
	5.7	2.6	3.1	3.4	0.3	-	3.3	1.7	1.5	-	3.7	3.2	2.9	2.1	3.4
BIRSZ	5.5	5.4	5.4	5.4	-	-	5.4	4.1	1.5	5.5	4.4	5.5	4.8	5.5	5.5
BOMMA	-	5.8	5.4	2.8	4.9	6.7	6.7	6.7	6.4	5.8	4.1	6.8	6.4	6.8	6.8
BREMA	-	2.0	2.4	-	1.9	-	4.4	-	2.4	1.7	1.3	-	-	4.5	-
	2.3	1.5	3.0	-	-	-	-	-	2.4	1.7	1.1	0.6	1.8	4.5	-
BRIBE	2.5	4.6	3.1	-	1.4	2.0	4.7	0.9	2.3	4.7	2.2	-	2.3	4.6	1.3
	3.5	3.7	-	-	3.4	2.0	4.5	0.3	1.0	3.6	2.5	-	-	-	1.0
CASFL	5.3	6.8	6.7	2.1	2.3	2.6	4.6	4.3	3.4	2.7	4.9	1.8	2.6	3.3	5.1
	3.2	5.8	3.2	1.0	1.7	0.6	1.2	3.4	1.6	4.0	4.3	2.1	3.0	3.3	-
CRIST	6.2	6.1	6.1	4.0	6.2	4.8	3.1	3.4	4.3	4.5	5.9	5.1	4.0	5.7	5.8
	5.9	6.2	6.2	4.1	6.2	0.2	-	1.9	-	-	-	-	-	-	1.6
	5.6	6.0	5.7	4.1	5.5	3.7	1.5	1.5	3.2	3.9	6.0	5.4	3.8	4.4	4.9
CSISZ	2.9	1.8	1.6	0.5	-	0.7	0.7	1.3	0.2	1.7	0.5	2.3	1.8	1.2	1.0
ELTMA	6.2	6.3	6.1	6.2	4.2	4.9	6.2	6.2	6.0	1.4	6.2	5.9	6.1	6.4	6.2
GONRU	7.0	-	-	5.3	-	7.0	7.0	6.9	6.7	5.1	4.0	6.8	7.0	6.9	7.1
	7.1	-	-	5.3	-	7.1	7.0	6.9	6.7	4.6	4.0	6.8	7.1	7.1	7.1
	7.1	1.8	2.9	4.0	-	7.0	7.0	7.0	7.1	3.4	2.9	6.6	6.5	5.6	7.0
GOVMI	5.8	5.8	5.7	4.1	3.5	5.7	5.7	5.8	4.3	4.0	5.3	5.8	5.8	5.8	5.8
	1.0	2.3	5.7	-	3.0	5.7	5.7	5.8	3.5	2.3	4.6	4.2	4.5	5.6	5.0
	5.8	5.8	5.7	5.8	3.2	5.7	3.7	5.8	4.5	1.1	5.6	5.5	5.8	5.8	5.4
HINWO	-	4.7	1.6	-	-	-	-	4.5	-	-	-	4.7	2.2	4.8	3.7
IGAAN	5.9	5.9	5.9	5.9	5.6	1.6	5.8	5.0	5.3	0.2	5.8	5.9	5.8	5.7	2.5
	5.7	5.6	5.6	5.5	5.6	5.3	4.1	5.1	5.8	0.8	5.6	5.7	4.8	3.7	5.2
	6.0	6.0	6.0	6.0	6.0	4.5	6.0	5.5	6.0	-	6.0	6.0	3.7	6.0	6.1
	5.5	5.4	5.3	5.1	-	0.5	2.3	1.9	-	3.8	5.4	3.8	3.9	5.4	5.0
JONKA	5.9	5.9	5.9	2.5	5.2	0.7	4.7	5.8	3.0	1.3	5.8	5.7	4.1	5.2	5.9
KACJA	5.7	5.8	5.6	5.6	3.6	3.3	5.8	-	1.9	-	5.8	4.9	5.6	5.9	5.6
	6.0	-	-	4.2	-	-	5.6	5.6	-	-	-	-	-	5.9	3.8
	6.1	5.9	5.8	4.6	2.8	6.0	6.0	3.5	3.0	1.9	5.7	4.3	5.7	5.1	5.9
	6.0	6.0	6.1	6.2	3.3	3.9	4.1	-	-	-	6.1	4.4	5.0	6.1	5.9
	6.2	6.2	6.0	4.7	2.4	3.4	6.3	-	1.4	-	6.2	4.3	5.7	6.2	5.9
KERST	7.0	11.1	11.1	5.1	6.8	5.2	-	-	-	-	-	-	-	-	-
LERAR	4.5	2.5	2.7	-	2.8	5.5	5.5	-	2.6	-	3.6	-	4.3	5.5	5.6
MACMA	5.0	0.3	2.0	-	-	-	-	1.3	1.3	2.9	2.5	-	3.8	5.0	0.7
	5.2	5.2	5.2	-	1.5	0.9	-	5.1	5.0	3.1	3.3	-	4.2	5.1	4.0
	0.7	5.1	5.1	3.8	2.0	-	-	5.0	4.9	3.5	1.0	-	4.1	5.1	5.0
MARGR	7.5	5.3	2.1	7.2	5.9	6.9	7.3	7.5	4.8	7.0	5.1	6.9	5.9	3.9	7.3
MOLSI	4.4	4.5	1.0	-	-	-	4.0	4.5	-	-	1.7	2.8	-	3.5	-
	4.6	5.5	-	-	2.4	-	-	5.5	-	5.5	5.3	5.1	3.8	4.3	3.4
	0.7	4.2	4.2	-	-	-	4.1	3.1	2.6	-	4.2	0.2	3.5	3.2	-
	0.7	4.3	4.3	-	-	-	4.3	2.6	2.1	-	4.3	-	3.7	2.6	-
MORJO	5.8	5.8	5.8	5.6	5.8	-	5.5	3.6	6.0	1.8	5.8	5.9	4.7	5.6	5.9
OCAFR	7.0	6.9	-	6.9	3.0	7.0	7.0	7.0	3.7	5.6	0.7	7.0	7.0	7.0	1.1
OCHPA	3.4	2.6	1.2	0.5	0.8	-	0.3	0.5	0.2	1.7	3.1	-	1.0	0.6	0.8
OTTMI	0.5	1.1	3.3	-	1.0	2.9	2.6	-	1.5	2.3	2.4	2.0	0.8	2.0	-
PERZS	6.0	5.9	5.9	5.9	3.6	-	-	-	5.1	4.1	4.3	6.1	5.7	6.1	5.9
PUCRC	-	6.0	5.9	5.9	1.9	5.2	5.9	3.4	-	-	2.9	4.4	5.1	4.8	3.5
ROTEC	-	4.3	-	-	-	-	-	4.0	-	-	-	-	3.1	-	0.7
SARAN	7.0	3.2	5.8	6.9	-	7.1	7.1	7.1	6.9	-	-	4.5	6.0	5.7	7.1
	7.2	3.6	5.0	5.7	-	7.2	7.2	7.2	7.2	-	-	0.3	5.7	5.6	7.2
	6.4	2.1	4.5	5.2	-	5.5	5.6	6.7	-	-	-	1.1	4.0	2.0	2.8
SCALE	5.8	6.0	6.0	4.7	1.2	3.8	6.0	4.6	4.9	-	5.5	2.1	5.6	4.8	4.9
SCHHA	-	4.9	-	-	3.8	2.0	4.7	-	2.8	4.8	0.8	-	0.8	4.9	2.9
SLAST	5.5	0.7	4.3	4.6	-	4.0	3.5	2.5	-	-	5.7	3.3	5.7	0.7	5.2
STOEN	6.4	6.4	6.4	6.4	2.9	5.0	5.8	6.2	5.7	1.2	6.4	4.2	6.4	4.0	5.4
	6.2	6.2	6.2	6.2	2.4	5.4	5.7	6.2	5.9	1.2	6.3	4.4	6.3	4.0	5.7
	6.3	6.3	6.3	6.2	2.4	5.4	5.7	6.2	5.1	2.0	6.3	3.3	6.5	3.9	5.8
STRJO	-	3.5	3.1	-	-	-	2.9	-	-	-	3.6	-	-	-	-
	1.4	-	2.9	-	-	-	3.5	-	-	-	3.6	1.1	0.7	1.6	1.3
	2.7	3.6	3.1	-	-	0.2	2.9	-	0.9	-	3.6	-	-	-	1.0
	1.7	3.5	2.9	-	-	0.2	3.5	-	1.1	-	3.6	0.7	0.6	1.8	-
TEPIS	5.1	4.2	5.4	5.4	-	-	5.4	4.3	2.8	5.3	4.7	5.5	4.8	5.5	5.5
TRIMI	6.0	2.9	4.2	1.5	0.8	4.7	3.3	6.1	3.6	1.0	3.2	3.8	4.5	5.1	1.8
ZELZO	-	4.0	4.0	2.0	2.9	-	-	-	-	-	-	-	-	-	-
Sum	287.7	287.6	269.8	212.7	140.8	179.7	264.5	228.2	185.2	123.8	240.4	207.1	254.5	266.7	244.9

3. Results (Meteors)

June	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BERER	13	6	5	-	-	2	-	-	-	-	-	-	-	20	20
	7	4	2	-	-	-	-	-	-	-	-	-	-	13	13
	7	3	2	-	-	-	-	-	-	-	-	-	-	10	11
BIRSZ	4	4	4	-	3	-	11	1	-	-	3	6	8	7	10
BOMMA	17	23	5	17	14	18	13	-	12	-	4	20	22	28	19
BREMA	-	-	-	1	-	-	1	6	-	-	-	5	11	2	-
	3	1	-	-	1	-	2	-	-	2	-	-	7	-	-
BRIBE	4	2	-	3	1	-	5	5	6	7	-	-	-	-	-
	2	2	-	-	3	2	12	5	6	-	-	-	-	-	-
CASFL	1	4	-	13	1	-	5	-	-	-	-	7	13	18	8
	-	4	-	13	-	-	10	1	-	1	-	9	7	13	7
CRIST	6	-	-	7	11	-	7	5	3	1	1	26	20	24	23
	4	-	-	18	8	-	11	3	3	-	-	14	-	21	17
	14	1	-	2	21	1	7	6	5	1	4	43	30	37	41
CSISZ	-	-	8	-	7	-	10	1	-	-	-	-	1	3	9
ELTMA	-	-	5	14	10	4	11	-	-	-	17	16	25	14	14
GONRU	-	-	16	10	-	-	10	9	-	-	-	26	24	26	37
	-	-	12	10	-	-	12	17	-	-	-	30	21	19	18
	-	1	10	9	5	1	6	23	-	-	6	9	11	11	13
GOVMI	-	4	13	-	14	15	5	-	-	-	9	2	1	18	23
	-	4	2	-	6	2	4	-	-	-	-	2	1	5	5
	-	4	7	-	12	6	4	3	-	-	4	3	3	11	16
HINWO	-	-	-	-	3	-	-	-	-	-	-	-	-	-	34
IGAAN	-	1	2	-	8	7	4	5	-	4	1	1	3	10	14
	10	1	1	1	-	4	6	7	-	-	4	2	15	18	5
	3	4	4	3	6	10	7	5	1	1	5	2	3	10	15
	4	9	4	-	24	4	12	5	-	-	1	1	6	6	28
JONKA	6	2	3	-	4	2	7	6	-	4	5	9	8	9	15
KACJA	-	-	-	-	-	12	1	21	-	-	14	-	-	23	32
	-	1	-	-	4	3	-	1	-	-	-	-	-	5	3
	-	-	3	-	-	6	6	9	1	-	2	-	1	10	13
	-	-	-	-	-	18	1	14	-	-	-	-	-	-	33
	-	-	-	-	-	10	4	13	-	-	5	-	-	14	13
KERST	-	-	-	-	-	-	24	8	13	25	-	-	-	71	77
LERAR	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-
MACMA	-	1	-	-	-	-	-	2	-	-	-	-	-	-	4
	3	3	1	-	-	-	4	-	-	1	4	-	-	-	9
	3	3	-	-	-	1	1	-	-	2	-	-	-	-	9
MARGR	3	6	5	7	9	14	18	19	28	21	19	19	17	16	14
MOLSI	-	-	-	-	7	-	-	-	-	-	-	-	-	39	24
	-	11	-	-	7	5	-	-	1	3	1	-	7	14	8
	23	15	-	-	22	-	-	19	12	-	-	1	11	21	5
	10	1	-	-	11	1	-	12	10	1	-	2	1	9	3
MORJO	4	-	5	-	6	4	9	3	2	4	7	13	-	9	20
OCAFR	2	-	3	6	5	5	5	7	4	1	5	10	1	7	-
OCHPA	-	-	-	-	-	-	-	1	-	-	-	-	6	9	3
OTTMI	11	14	-	3	11	14	7	18	13	11	24	10	-	13	4
PERZS	-	14	-	-	17	13	14	2	-	2	8	14	6	26	26
PUCRC	-	7	2	-	5	-	1	5	1	-	9	11	9	19	15
ROTEC	-	1	-	-	4	1	-	-	3	1	-	-	-	1	-
SARAN	5	-	7	1	1	-	4	9	-	1	4	10	5	10	-
	-	-	-	-	2	-	4	5	-	1	5	8	4	11	6
	3	-	5	-	-	-	-	8	-	-	6	6	1	7	2
SCALE	-	4	3	9	7	1	6	3	4	-	12	13	9	14	2
SCHHA	2	-	-	-	-	-	5	-	1	-	-	-	-	-	-
SLAST	-	-	2	-	-	2	-	1	-	-	1	-	-	3	-
STOEN	-	-	-	31	4	2	11	13	5	4	32	32	38	36	30
	-	-	1	25	8	2	8	10	2	10	27	25	30	28	11
	-	-	4	41	11	1	12	9	3	6	44	29	35	26	21
STRJO	2	-	-	-	-	-	-	-	-	3	-	-	-	1	-
	2	2	-	-	2	-	1	2	-	5	-	-	-	3	-
	-	-	-	-	-	-	-	-	-	2	-	-	-	4	-
	5	4	-	-	-	-	3	2	5	4	-	4	-	12	-
TEPIS	11	5	4	-	9	1	9	-	-	-	7	13	20	10	15
TRIMI	-	-	1	-	7	6	4	4	-	-	3	6	-	14	9
ZELZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum	194	176	151	244	321	200	344	333	145	129	303	459	442	838	826

June	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	-	-	-	-	-	-	4	-	-	-	-	-	1	-	-
BERER	26	15	20	22	3	-	11	15	1	2	26	10	26	10	18
	17	13	5	10	4	-	7	11	2	-	15	16	20	9	7
	15	6	8	4	1	-	4	3	1	-	7	5	6	9	6
BIRSZ	20	8	11	13	-	-	13	8	3	8	9	9	3	14	9
BOMMA	-	21	13	11	17	17	14	12	17	11	22	19	17	15	19
BREMA	-	5	8	-	3	-	9	-	6	2	2	-	-	11	-
	3	2	3	-	-	-	-	-	3	3	3	1	2	11	-
BRIBE	2	14	8	-	2	6	15	2	5	13	3	-	7	17	1
	6	5	-	-	12	5	12	1	2	3	4	-	-	-	2
CASFL	9	21	14	5	5	9	7	9	8	5	17	8	6	6	10
	12	11	9	3	5	2	5	7	5	7	12	7	7	9	-
CRIST	22	27	20	14	21	16	4	7	5	7	30	19	18	14	11
	10	22	13	8	11	1	-	3	-	-	-	-	-	-	9
	28	37	29	24	32	24	7	10	10	14	49	32	29	24	26
CSISZ	10	6	6	3	-	4	6	7	1	5	2	13	6	7	6
ELTMA	22	15	15	18	10	7	13	23	14	5	30	7	9	15	9
GONRU	22	-	-	19	-	25	24	40	11	5	14	9	30	26	29
	20	-	-	15	-	20	25	22	20	2	4	8	19	25	24
	20	6	8	4	-	13	8	9	21	4	2	6	9	20	15
GOVMI	18	24	14	10	6	13	24	31	7	11	19	16	7	17	15
	3	4	4	-	2	3	6	13	3	1	7	13	3	3	4
	12	12	10	6	6	5	10	14	9	1	16	6	5	12	7
HINWO	-	37	3	-	-	-	-	47	-	-	-	30	16	18	14
IGAAN	14	9	13	7	5	1	8	7	20	1	15	9	10	7	5
	15	16	8	12	10	7	9	7	13	1	15	10	12	8	8
	10	9	8	9	7	5	9	7	12	-	12	16	12	11	10
	18	27	14	10	-	1	2	7	-	22	26	15	11	15	15
JONKA	9	11	12	8	4	1	5	11	5	1	13	15	6	10	5
KACJA	23	28	11	16	3	5	17	-	4	-	30	24	20	30	26
	5	-	-	2	-	-	6	4	-	-	-	-	-	6	3
	13	8	4	4	7	7	13	4	9	4	11	14	6	5	7
	40	29	17	23	8	19	31	-	-	-	33	31	18	30	42
	18	23	9	15	3	5	21	-	1	-	32	11	6	10	22
KERST	31	59	81	27	73	46	-	-	-	-	-	-	-	-	-
LERAR	3	1	3	-	4	2	3	-	1	-	4	-	2	4	4
MACMA	3	1	4	-	-	-	-	1	1	2	4	-	5	6	2
	9	13	14	-	3	3	-	15	11	5	8	-	6	15	7
	1	5	6	1	3	-	-	7	3	2	1	-	6	3	6
MARGR	10	12	10	20	17	23	23	26	22	26	19	23	28	21	19
MOLSI	36	47	5	-	-	-	35	50	-	-	21	18	-	17	-
	9	11	-	-	6	-	-	13	-	9	9	16	20	6	6
	4	29	29	-	-	-	36	9	7	-	30	2	20	8	-
	2	22	14	-	-	-	15	7	5	-	20	-	9	1	-
MORJO	13	10	17	9	6	-	9	6	14	6	18	16	14	8	8
OCAFR	6	6	-	7	2	9	5	3	3	8	4	2	8	9	1
OCHPA	7	11	9	2	5	-	2	1	2	6	11	-	6	2	4
OTTMI	2	7	12	-	7	20	16	-	9	15	16	11	5	6	-
PERZS	39	21	28	16	12	-	-	-	26	15	14	31	27	33	13
PUCRC	-	13	10	14	2	5	18	16	-	-	12	5	7	7	4
ROTEC	-	4	-	-	-	-	-	8	-	-	-	-	2	-	1
SARAN	7	2	9	9	-	11	11	18	13	-	-	1	9	11	16
	13	4	7	11	-	8	10	18	7	-	-	1	6	10	17
	11	2	9	7	-	5	6	5	-	-	-	3	9	7	13
SCALE	12	12	9	2	7	8	11	12	11	-	18	5	10	6	8
SCHHA	-	9	-	-	2	11	7	-	4	8	1	-	3	8	4
SLAST	6	2	2	2	-	1	3	3	-	-	4	4	3	1	2
STOEN	32	28	32	30	15	11	30	38	18	8	49	16	19	23	15
	27	22	21	17	11	15	14	24	19	5	40	7	25	15	11
	27	36	18	19	15	15	26	31	14	15	45	11	30	25	16
STRJO	-	5	3	-	-	-	3	-	-	-	4	-	-	-	-
	1	-	4	-	-	-	10	-	-	-	9	1	3	2	4
	1	4	4	-	-	1	2	-	1	-	3	-	-	-	1
	1	12	5	-	-	1	2	-	1	-	7	1	3	6	-
TEPIS	21	20	19	18	-	-	23	22	5	31	7	16	15	13	16
TRIMI	21	11	7	4	5	14	10	11	11	3	9	10	8	11	13
ZELZO	-	7	8	7	4	-	-	-	-	-	-	-	-	-	-
Sum	817	919	716	517	386	430	679	685	426	302	867	579	655	708	595