Results of the IMO Video Meteor Network – March 2012

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In March, 32 observers participated in the camera network with 62 video systems. Even though some cameras had to pause because of relocation and reconstruction, the outcome was notable. In the first half of the month, only observers in southern and eastern Europe enjoyed great weather. Later almost all observers were lucky and, thus, there were once more a number of nights with more than fifty video systems active in parallel. 37 video systems observed in twenty and more observing nights and the effective observing time accumulated to 9,000 hours, which is the third best monthly total in the video network to date. The hourly meteor rate fell to the annual minimum of only two meteor per hour – in October the hourly rate is thrice as high! Still, those 17,500 meteors recorded in March are a fine result.

You may think that March has nothing to present with respect to meteor showers. That's true for major showers, but looking at minor showers the situation is not that bad.
Already in the February report we checked and confirmed a number of new minor shower that we detected recently by different researchers. Whereas the time-consuming radiant calculations were only carried out for selected solar longitude intervals then, we now analysed the full IMO Video Meteor Database with over a million meteors until the end of 2011. The analysis software RadFind was left almost unchanged compared to the last major analysis of 2009. Further improvements in the code will be implemented soon.
At the current size of the database, the computation time to accumulate the radiant probabilities amounts to about one CPU year on a powerful Windows server. Fortunately I could temporarily employ three servers with 24 CPU cores each, so that the computation was done in less than a week. As preliminary result, the list of radiants was now made available online, so that everyone can check his meteor shower hypothesis against the IMO Video Meteor Database. The list can be found at http://www.imonet.org/radiants.
A detailed analysis of the radiant list is still pending. However, a first search for showers with the default settings of StrmFind identified almost a hundred showers from the working list of the IAU Meteor Data Center (MDC). For sure that there will be more surprises in the data set!

But let's start with March. Three years ago we presented two new shower candidates in Hercules, which resulted from the 2008 data set and analysis. From the MDC they got the designation f Herculids (345 FHE) and chi Herculids (346 XHE). In the subsequent more thorough analysis at the 10th anniversary of the IMO network, neither of the two showers was confirmed even though the data set had further grown.
In the latest issue of WGN, John Greaves analysed once more the data set of the SonotaCo network and confirmed four showers with MDC „working list" status – one of them being the chi Herculids. That was a good reason to check, whether the shower can now be found in the latest data set of the IMO network with over a million meteors. Indeed, the analysis yields a well-fitting chain of radiants from 350 to 355° solar longitude with more than 280 meteors. The basic parameters are given in table 1 and compared with our 2008 data and the results of Greaves.

Table 1: *Parameters of the chi Herculids from the analysis of Greaves and data of the IMO network in 2008 and 2012.*

Source	Mean Solar Longitude [°]	Right Ascension [°]	Declination [°]	V_{inf} [km/s]
IMO 2008	352	254	48	36
Greaves	351.8	252.9	50.1	35.8
IMO 2012	352	255.5	48.1	37

Apparently, Greaves could not confirm the f-Herculids with the SonotaCo network data. In our 2012 data set, this shower is detected again with 280 meteors (table 2). However, similar to the

analysis three years ago, the f-Herculids show strong daily variations in the meteor shower velocity and an unusually high drift in declination (decrease by more than one degree per day). Hence, this shower remains questionable.

Table 2: *Parameters of the f Herculids from IMO network data in 2008 and 2012.*

Source	Mean Solar Longitude [°]	Right Ascension [°]	Declination [°]	V_{inf} [km/s]
IMO 2008	346	268	41	44
IMO 2012	348	266.5	35.6	45

Beside these, the MDC list contains in March some radiants in Virgo, which could be partly confirmed by our current analysis.
First of all there are the eta Virginids (11 EVI), which have the MDC status „established". Our current analysis yields a chain of radiants between 335 and 10° solar longitude based on roughly 1,600 meteors, which fits to the eta Virginids. However, when looking at the data in detail there remain doubts whether this is indeed a single shower, or if there are several sub-radiants in close spatial and temporal vicinity. Neither in right ascension or declination we find a consistent drift (in that interval, the radiant rather drifts in different directions), nor is the meteor shower velocity reasonably stable. Between end of February and end of March, it is decreasing from over 45 to below 30 km/s. Table 3 compares the mean parameters from MDC with our current analysis.

Table 3: *Parameters of the eta Virginids from the MDC working list and IMO network data in 2012.*

Source	Mean Solar Longitude [°]	Right Ascension [°]	Declination [°]	V_{inf} [km/s]
MDC	354	182	2.6	31.3
IMO 2012	354	188.7	0.0	33

The lambda Virginids (49 LVI) and northern March Virginids (123 NVI) have both „working list" status at MDC. Our current analysis shows for both showers a possible counterpart in the IMO network data. Once more, there is no uniform radiant drift in both cases, and also the calculated meteor shower velocity shows larger variations. The Virginid complex is presumably a diffuse, large radiation area. This allows two interpretations for the variable radiant positions given the type of analysis employed here:

- at different solar longitudes, different sub-radiants may become strongest
- if there is only little variation in the accumulated radiant probability over a larger area, the determined maximum will be affected by random variations

Finally there is another MDC „working list" shower in March away from the Virginid complex, which can be found in our data. 300 meteors create a chain of radiants between 3 and 13° solar longitude, which reasonably fits to the zeta-Serpentids (43 ZSE, table 4). Unfortunately, also this shower has no uniform radiant drift and larger variations in the meteor shower velocity.

Table 4: *Parameters of the zeta Serpentids from the MDC working list and IMO network data in 2012.*

Source	Mean Solar Longitude [°]	Right Ascension [°]	Declination [°]	V_{inf} [km/s]
MDC	5	266.3	-6.3	68.3
IMO 2012	8	257.9	-6.1	65

Finally we want to present two candidates for hitherto unknown meteor showers. At this time, we consciously refrain from a report to MDC, as both hypothesis shall first be confirmed by independent sources (e.g. by SonotaCo network data).
On the one hand there is a chain of radiants between 338 and 343° solar longitude in northern Hercules. It shows only little scatter in the radiant position and meteor shower velocity. Overall 170 meteors are assigned to that chain.
A few days later, about 190 meteors between 349 and 356° solar longitude create a chain of radiants south of Leo. It shows a larger scatter in position, but all radiants have a remarkably low meteor shower velocity.
The average parameters of both shower candidates are given in table 5. If there is independent confirmation for these, please let us know so that we can formally register the showers with MDC.

Table 5: *Parameters of possible new meteor showers in March from IMO network data in 2012.*

Solar Longitude Interval [°]	**Mean Solar Longitude** [°]	**Right Ascension** [°]	**Declination** [°]	**V_{inf}** **[km/s]**
338-343	340.5	244.2	43.6	41
349-356	352.5	152.9	4.4	20

1. Observers

Code	Name	Place	Camera	FOV [°²]	St.LM [mag]	Eff.CA [km²]	Nights	Time [h]	Meteors
BERER	Berko	Ludanyhalaszi/HU	HULUD1 (0.95/3)	2256	4.8	1540	25	155.6	428
			HULUD2 (0.75/6)	4860	3.9	1103	26	112.0	261
			HULUD3 (0.75/6)	4661	3.9	1052	24	98.4	237
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	16	124.5	189
			MBB4 (0.8/8)	1470	5.1	1208	15	112.9	98
BRIBE	Brinkmann	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	19	145.0	223
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	17	141.6	196
CASFL	Castellani	Monte Baldo/IT	BMH1 (0.8/6)	2350	5.0	1611	15	54.8	151
			BMH2 (1.5/4.5)*	4243	3.0	371	21	80.0	236
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	26	193.2	425
			C3P8 (0.8/3.8)	5455	4.2	1586	24	164.2	318
			STG38 (0.8/3.8)	5614	4.4	2007	27	205.6	733
CSISZ	Csizmadia	Zalaegerszeg/HU	HUVCSE01 (0.95/5)	2423	3.4	361	23	95.6	139
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	28	246.6	352
GONRU	Goncalves	Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	25	202.6	491
			TEMPLAR2 (0.8/6)	2080	5.0	1508	25	214.8	430
			TEMPLAR3 (0.8/8)	1438	4.3	571	29	242.2	275
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	24	179.0	397
			ORION3 (0.95/5)	2665	4.9	2069	21	83.9	143
			ORION4 (0.95/5)	2662	4.3	1043	17	144.1	122
HINWO	Hinz	Brannenburg/DE	ACR (2.0/35)*	557	7.4	4954	13	75.9	429
IGAAN	Igaz	Baja/HU	HUBAJ (0.8/3.8)	5552	2.8	403	23	154.0	272
		Debrecen/HU	HUDEB (0.8/3.8)	5522	3.2	620	25	206.4	291
		Hodmezovasar./HU	HUHOD (0.8/3.8)	5502	3.4	764	24	194.7	218
		Budapest/HU	HUPOL (1.2/4)	3790	3.3	475	28	153.6	83
		Sopron/HU	HUSOP (0.8/6)	2031	3.8	460	26	173.6	428
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	28	199.3	464
		Kostanjevec/SI	METKA (0.8/8)*	1372	4.0	361	18	143.6	163
		Ljubljana/SI	ORION1 (0.8/8)	1402	3.8	331	26	220.9	217
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	26	192.6	651
KERST	Kerr	Glenlee/AU	GOCAM1 (0.8/3.8)	5189	4.6	2550	8	61.3	407
KOSDE	Koschny	Noordwijkerhout/NL	LIC4 (1.4/50)*	2027	6.0	4509	20	122.7	170
LERAR	Leroy	Gretz/FR	SAPHIRA (1.2/6)	3260	3.4	301	20	165.1	60
MACMA	Maciejewski	Chelm/PL	PAV35 (1.2/4)	4383	2.5	253	16	83.1	67
			PAV36 (1.2/4)*	5732	2.2	227	15	78.7	100
			PAV43 (0.95/3.75)*	2544	2.7	176	14	66.0	69
MARGR	Maravelias	Lofoupoli/GR	LOOMECON (0.8/12)	738	6.3	2698	18	97.0	267
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1776	6.1	3817	16	138.6	981
			MINCAM1 (0.8/8)	1477	4.9	1084	19	164.7	263
		Ketzür/DE	REMO1 (0.8/8)	1467	6.0	3139	23	160.5	551
			REMO2 (0.8/3.8)	5613	4.0	1186	10	51.4	99
OCAFR	Ocana Gonzales	Madrid/ES	FOGCAM	1890	3.9	109	19	162.7	86
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	1971	-	-	5	2.9	19
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	23	133.8	217
PERZS	Perko	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	29	160.3	623
PUCRC	Pucer	Nova vas nad Dra./SI	MOBCAM1 (0.75/6)	2398	5.3	2976	30	250.2	322
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	14	107.1	138
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	20	145.1	154
			RO2 (0.75/6)	2381	3.8	459	23	170.4	201
			SOFIA (0.8/12)	738	5.3	907	19	158.4	117
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4152	4.5	2052	29	202.5	265
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	21	139.3	121
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	588	-	-	19	30.5	72
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	27	230.1	641
			NOA38 (0.8/3.8)	5609	4.2	1911	27	231.3	504
			SCO38 (0.8/3.8)	5598	4.8	3306	27	241.2	740
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2362	4.6	1152	16	113.6	97
			MINCAM3 (0.8/12)	728	5.7	975	17	130.1	125
			MINCAM5 (0.8/6)	2349	5.0	1896	17	125.3	178
TEPIS	Tepliczky	Budapest/HU	HUMOB (0.8/6)	2388	4.8	1607	27	206.4	453
TRIMI	Triglav	Velenje/SI	SRAKA (0.8/6)*	2222	4.0	546	25	68.8	168
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2337	5.5	3574	17	82.2	213
Sum							31	8992.5	17548

* active field of view smaller than video frame

2. Observing Times (h)

March	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
BERER	-	7.2	9.7	7.9	7.5	4.0	-	-	3.2	3.2	6.0	0.9	10.4	9.8	3.6
	-	4.3	4.8	3.9	6.0	2.3	1.3	-	3.1	1.4	4.0	0.9	7.6	7.0	5.7
	-	3.6	4.6	2.2	3.5	1.5	-	-	2.1	2.9	4.7	-	5.3	6.0	1.5
BREMA	-	9.0	-	-	-	4.4	1.7	-	-	-	-	-	-	7.6	10.3
	-	7.9	3.7	-	-	3.8	-	5.6	-	-	-	-	-	7.6	10.0
BRIBE	-	5.4	-	-	-	10.8	-	4.9	-	-	7.4	-	-	10.4	10.3
	-	-	-	-	-	9.8	-	5.4	-	-	4.9	-	-	10.2	10.2
CASFL	6.7	6.1	0.5	0.7	-	5.1	-	-	-	-	-	-	-	-	4.2
	4.4	4.4	-	0.5	-	3.1	-	-	7.7	1.7	2.9	1.5	5.8	6.5	3.2
CRIST	11.1	2.1	-	-	-	3.7	-	1.0	10.6	10.0	10.5	9.3	10.4	10.4	0.3
	7.4	-	-	-	-	5.9	1.3	0.3	10.6	9.8	10.5	10.1	10.4	8.9	-
	11.1	2.2	-	-	-	4.3	3.1	1.7	10.6	10.6	10.5	9.9	10.4	10.4	0.3
CSISZ	4.3	2.9	10.9	0.9	1.8	3.2	-	1.6	2.6	6.6	-	-	9.9	1.6	1.9
ELTMA	11.2	11.3	5.4	-	-	8.0	10.4	1.9	10.4	10.7	10.7	10.7	10.6	8.9	10.3
GONRU	-	7.0	-	10.6	9.1	3.3	2.2	2.6	10.6	10.6	10.6	10.4	10.4	9.9	-
	-	7.0	-	9.9	9.0	3.8	3.7	10.7	10.7	10.6	10.6	10.5	10.4	9.9	-
	5.6	7.2	-	9.0	10.2	3.4	1.7	10.8	10.7	10.7	10.6	10.6	10.5	9.0	7.7
GOVMI	4.8	8.9	11.0	5.5	10.9	3.3	7.3	1.6	7.1	8.6	-	-	5.0	4.2	5.4
	10.4	1.8	9.4	1.5	1.8	5.4	4.5	1.5	3.5	8.7	0.2	-	5.5	-	3.1
	10.6	6.3	8.4	-	10.2	10.3	5.5	-	-	8.6	-	-	8.8	3.5	9.3
HINWO	10.5	-	-	-	-	-	-	-	-	-	-	-	-	8.8	9.8
IGAAN	-	10.4	10.9	6.6	9.8	10.5	4.7	-	8.2	10.4	8.4	-	6.5	6.3	10.5
	-	1.4	11.1	10.3	7.4	11.0	10.9	3.5	-	9.4	10.7	-	-	1.8	10.5
	-	7.3	11.0	10.9	10.9	10.9	0.3	9.1	8.7	10.1	8.7	-	10.5	6.4	10.3
	-	10.5	10.5	8.7	10.4	3.2	-	5.7	9.2	6.1	9.6	0.2	-	9.3	0.7
	2.5	7.1	9.0	3.0	10.1	10.0	0.4	3.1	9.9	4.6	-	-	-	0.2	9.7
KACJA	10.9	9.2	1.9	0.6	7.2	9.9	1.5	6.8	10.7	7.9	0.6	7.1	-	8.6	10.3
	10.7	-	-	-	3.6	6.0	4.4	1.1	7.9	9.2	-	-	8.0	7.8	9.9
	10.3	10.2	6.0	-	5.4	11.0	8.7	8.0	10.7	10.0	-	8.3	5.9	10.3	10.4
	-	9.1	1.5	2.4	6.5	8.4	5.3	5.6	9.3	8.2	-	7.6	-	8.9	10.4
KERST	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KOSDE	-	-	3.9	-	-	-	-	-	-	1.8	8.0	-	-	9.7	8.4
LERAR	-	-	-	0.7	-	7.7	-	10.1	-	-	-	2.2	10.6	10.5	10.5
MACMA	-	5.3	-	-	3.0	-	5.1	7.9	1.2	-	-	-	-	5.2	-
	-	6.7	6.6	-	-	-	9.3	1.3	-	-	-	0.2	-	-	-
	-	1.8	2.0	-	-	-	0.3	-	-	-	-	-	-	-	-
MARGR	-	10.6	7.9	3.9	-	-	-	0.7	0.2	-	-	-	-	-	6.6
MOLSI	-	-	-	-	-	8.3	-	-	6.4	-	-	-	-	9.7	9.7
	-	-	-	-	-	8.4	-	6.0	10.4	-	-	-	-	10.5	10.4
	-	10.2	5.0	3.3	10.9	8.7	-	10.5	1.0	1.0	-	-	-	-	10.3
	-	9.3	2.3	-	9.9	-	-	8.0	-	0.9	-	-	-	-	9.0
OCAFR	8.7	9.1	-	-	-	-	-	10.4	9.7	10.1	10.0	9.2	9.6	8.2	2.5
OCHPA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	4.6	-	-	3.0	9.4	-	-	7.4	7.6	8.1	-	9.4	8.9	9.8	7.1
PERZS	6.4	9.0	5.8	2.6	5.7	5.9	0.7	2.5	4.7	3.7	2.2	-	9.7	6.3	10.4
PUCRC	11.2	11.1	8.7	5.2	4.6	9.0	10.3	9.0	10.3	1.9	5.7	10.7	10.6	8.7	10.5
ROTEC	-	7.5	-	-	-	7.3	-	10.8	-	-	-	-	-	-	10.3
SARAN	-	-	-	-	-	-	7.5	8.4	9.7	7.8	10.7	10.6	8.0	5.5	1.8
	3.4	9.7	-	-	-	-	1.0	10.8	10.7	8.1	10.6	10.6	8.2	5.2	2.0
	-	9.4	-	-	-	-	-	10.5	7.8	6.8	9.0	10.6	6.5	5.7	-
SCALE	10.8	10.3	3.2	0.6	-	9.4	3.5	2.0	10.4	10.6	10.3	10.5	6.2	8.4	10.3
SCHHA	-	-	1.6	-	-	6.5	5.2	6.4	1.1	-	9.3	-	-	10.5	10.4
SLAST	0.5	-	-	-	2.2	1.3	-	-	-	1.7	-	2.6	0.4	2.9	3.0
STOEN	11.4	10.8	1.2	-	-	8.7	3.4	1.1	10.7	11.0	10.9	10.8	10.7	10.7	10.1
	11.2	11.2	2.5	-	-	10.4	2.5	1.5	10.7	10.8	10.7	10.7	10.6	10.6	10.1
	11.3	11.3	3.9	-	-	10.6	6.1	2.2	10.7	11.0	10.9	10.9	10.8	10.7	10.1
STRJO	-	-	-	-	4.2	-	-	8.3	-	-	-	-	-	-	9.6
	-	6.5	-	-	6.0	-	-	7.1	-	-	-	-	-	-	9.6
	-	5.5	-	-	4.8	-	-	5.4	-	-	-	-	-	-	9.7
TEPIS	2.1	11.0	10.3	4.9	8.9	8.8	4.1	0.3	9.0	4.5	9.8	-	-	0.3	5.9
TRIMI	5.0	1.7	-	2.0	3.0	1.1	2.1	-	3.3	2.7	1.0	1.9	1.5	2.8	2.3
YRJIL	-	1.7	5.4	9.5	6.7	4.4	7.1	6.5	-	-	0.6	9.9	4.9	3.4	-
Sum	226.6	339.5	200.6	130.8	220.6	296.8	147.1	247.6	313.7	293.1	261.8	218.8	279.5	365.5	390.4

March	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
BERER	4.4	8.9	5.1	9.1	5.6	7.5	9.9	4.8	4.2	7.3	5.8	6.7	2.9	-	-	-
	6.1	4.0	4.1	4.9	6.0	5.0	5.3	3.8	2.0	4.6	8.4	2.8	2.7	-	-	-
	10.3	5.1	7.5	7.9	3.7	4.7	5.5	1.8	1.7	3.0	3.2	5.0	1.1	-	-	-
BREMA	6.2	-	6.4	10.1	3.6	9.9	9.8	9.7	-	9.4	9.6	9.5	7.3	-	-	-
	-	-	6.3	10.1	2.7	9.7	-	9.5	-	9.3	9.3	8.7	-	-	-	8.7
BRIBE	7.9	1.3	-	9.8	6.1	9.4	9.1	8.8	1.6	4.2	9.6	9.4	9.4	-	-	9.2
	8.8	-	-	9.9	7.2	9.7	9.8	9.7	0.9	8.3	9.1	9.5	9.2	-	-	9.0
CASFL	3.8	4.9	-	4.4	1.1	2.7	5.5	2.7	3.1	3.3	-	-	-	-	-	-
	3.6	2.5	-	4.8	1.7	5.8	3.2	2.8	3.3	4.7	5.9	-	-	-	-	-
CRIST	9.9	1.6	-	9.3	2.0	10.0	10.0	9.3	4.2	9.6	9.7	9.7	9.6	7.4	6.0	5.5
	5.2	-	-	7.4	0.7	8.3	10.0	3.7	9.9	9.8	9.8	9.7	9.4	0.7	3.5	0.9
	9.1	2.8	-	9.6	1.8	10.0	10.0	9.9	7.3	9.8	9.7	9.7	9.6	7.9	7.0	6.3
CSISZ	4.0	9.3	2.6	-	3.5	9.0	2.7	1.5	-	2.9	1.9	3.3	6.7	-	-	-
ELTMA	5.1	-	6.3	5.1	9.3	10.2	10.1	7.6	9.7	9.7	9.9	9.8	9.8	8.2	9.7	5.6
GONRU	7.1	8.0	10.2	10.2	9.9	9.7	-	7.8	-	7.5	9.9	3.6	9.8	-	7.4	4.2
	7.1	8.0	10.3	10.2	10.0	9.7	-	7.4	-	7.2	10.0	9.5	9.9	-	7.2	1.5
	6.5	7.2	10.3	10.3	10.2	10.2	5.9	6.1	-	7.1	10.0	9.9	9.9	8.2	7.6	5.1
GOVMI	9.2	10.0	5.6	-	7.8	10.0	8.6	9.9	-	-	7.7	8.3	9.5	-	8.8	-
	3.5	3.7	3.1	-	-	-	1.5	2.6	6.1	-	4.9	1.2	-	-	-	-
	-	-	-	-	6.9	10.0	9.9	9.9	-	9.0	9.1	7.8	-	-	-	-
HINWO	8.8	6.6	-	0.6	8.9	0.2	5.7	5.3	7.6	-	-	2.0	1.1	-	-	-
IGAAN	10.4	10.4	0.8	1.2	3.5	10.2	9.8	2.0	-	0.9	1.5	-	-	-	-	0.1
	10.4	10.2	10.1	10.2	10.2	10.1	10.0	7.3	5.5	-	9.1	7.3	8.9	-	6.0	3.1
	10.3	1.6	10.0	8.7	10.0	10.0	9.9	9.9	4.3	4.2	-	-	0.7	-	-	-
	10.1	10.0	10.0	6.0	0.3	9.9	9.8	9.8	1.3	0.8	0.3	0.7	0.1	0.2	0.1	0.1
	9.7	9.7	9.6	2.7	9.6	9.5	2.9	7.4	3.4	8.5	8.9	9.0	9.6	-	-	3.5
KACJA	10.3	9.7	-	0.5	9.4	9.9	8.8	10.0	-	7.9	9.8	9.5	9.2	2.7	6.5	1.9
	10.4	10.1	6.3	-	9.2	10.1	10.0	9.0	-	-	-	-	9.9	-	-	-
	10.3	7.6	-	-	6.6	10.0	10.0	10.0	-	8.7	9.8	9.8	9.7	2.9	7.0	3.3
	10.4	9.8	-	0.9	7.9	10.1	9.3	10.0	-	8.0	10.0	9.4	9.3	2.7	9.3	2.3
KERST	-	-	-	-	-	-	-	-	6.2	-	8.4	4.7	8.1	9.7	8.8	7.9
KOSDE	1.5	-	8.5	10.0	3.6	9.6	9.5	5.6	2.2	9.5	9.4	7.3	6.0	2.4	0.6	5.2
LERAR	0.6	-	-	10.2	9.5	-	10.0	9.9	9.9	9.8	9.8	9.7	9.6	9.6	7.9	6.3
MACMA	10.5	0.7	0.4	10.3	-	-	3.0	9.1	8.8	6.0	-	-	4.3	2.3	-	-
	10.6	1.7	9.4	10.3	-	1.4	-	3.2	8.1	3.8	3.2	2.9	-	-	-	-
	0.3	8.5	9.2	10.2	-	1.2	-	7.2	10.0	5.5	5.1	-	-	3.4	1.3	-
MARGR	-	8.9	7.7	1.9	2.7	5.0	6.0	-	4.0	7.7	7.2	-	3.0	8.4	-	4.6
MOLSI	9.7	8.6	-	8.9	9.4	9.4	9.3	9.2	7.1	9.1	9.1	9.0	5.7	-	-	-
	10.4	8.3	-	9.6	10.1	10.0	10.0	9.4	7.5	9.8	9.7	9.3	9.6	-	0.4	4.9
	10.2	7.0	4.4	9.8	-	1.2	9.8	9.7	8.7	9.6	8.2	9.4	6.5	-	0.3	4.8
	5.6	2.5	2.4	-	-	-	-	-	-	-	-	-	-	-	-	1.5
OCAFR	10.1	10.1	10.3	10.1	-	-	6.5	3.3	8.5	6.6	9.7	-	-	-	-	-
OCHPA	-	-	-	-	-	-	-	-	-	-	0.4	-	0.8	0.4	1.0	0.3
OTTMI	6.3	6.1	3.8	6.1	5.9	0.7	-	2.9	1.5	2.8	3.4	8.3	6.7	-	-	4.0
PERZS	9.1	9.4	10.2	3.9	8.3	10.1	7.7	7.6	2.7	3.4	0.3	3.3	2.8	-	5.3	0.6
PUCRC	10.4	-	2.2	8.4	8.7	10.2	10.1	7.7	1.2	9.8	9.8	9.8	9.7	7.9	9.6	7.2
ROTEC	10.2	5.3	-	-	-	-	-	9.7	8.7	9.6	9.5	9.4	4.4	0.7	-	3.7
SARAN	1.4	6.6	10.2	10.3	-	9.9	6.0	1.4	0.3	9.3	-	9.9	9.8	-	-	-
	-	6.6	10.3	10.3	10.2	10.0	5.0	0.5	0.3	9.1	8.0	9.9	9.9	-	-	-
	1.4	6.4	10.1	9.8	10.2	10.1	5.7	-	-	9.5	9.2	9.9	9.8	-	-	-
SCALE	3.9	-	7.1	2.0	2.3	9.5	9.3	6.9	5.9	9.8	9.5	9.2	8.3	3.0	5.2	4.1
SCHHA	6.2	-	1.0	10.2	9.7	10.0	10.0	9.9	7.3	9.8	1.2	9.6	1.9	-	-	1.5
SLAST	0.3	0.6	-	-	-	-	1.0	0.6	-	2.1	1.3	1.3	5.0	0.8	1.7	1.2
STOEN	6.4	-	-	6.0	8.7	10.4	10.2	8.5	3.3	10.1	10.1	9.7	9.9	9.4	9.8	6.1
	6.3	-	-	6.1	9.6	10.2	10.1	9.0	6.5	9.4	9.9	9.6	9.8	7.7	8.1	5.5
	6.4	-	-	6.7	10.0	10.4	10.3	8.8	4.2	9.0	10.1	9.6	9.9	9.4	9.8	6.1
STRJO	9.8	-	1.0	9.0	0.7	9.3	9.2	9.3	5.1	8.4	8.3	8.7	5.3	-	-	7.4
	9.8	1.4	-	9.6	4.7	9.4	9.3	9.3	7.5	8.7	9.1	9.1	5.3	-	-	7.7
	9.8	2.0	-	9.6	3.2	9.4	9.3	9.3	7.5	8.6	9.1	9.1	5.4	-	-	7.6
TEPIS	9.9	10.1	10.0	9.7	10.0	9.9	9.8	9.8	8.7	9.7	9.6	8.3	8.2	-	-	2.8
TRIMI	3.5	4.9	-	0.3	1.7	2.8	5.3	5.4	-	1.9	2.0	5.3	4.8	-	0.5	-
YRJIL	-	-	0.5	-	3.6	-	-	-	-	6.4	-	-	2.0	1.6	-	8.0
Sum	399.5	278.7	243.3	373.2	318.2	431.6	405.4	393.2	227.8	390.5	403.5	384.1	357.8	117.6	156.4	179.3

3. Results (Meteors)

March	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
BERER	-	18	43	21	26	10	-	-	12	7	27	2	10	22	12
	-	9	17	10	14	4	3	-	7	1	16	1	11	15	13
	-	7	15	6	15	4	-	-	4	6	14	-	13	14	5
BREMA	-	6	-	-	-	8	1	-	-	-	-	-	-	3	20
	-	4	7	-	-	2	-	3	-	-	-	-	-	5	8
BRIBE	-	6	-	-	-	10	-	1	-	-	8	-	-	15	9
	-	-	-	-	-	10	-	5	-	-	4	-	-	12	11
CASFL	14	16	2	4	-	17	-	-	-	-	-	-	-	-	15
	17	18	-	4	-	15	-	-	18	11	12	10	17	9	7
CRIST	30	3	-	-	-	10	-	3	15	22	27	19	26	25	1
	11	-	-	-	-	15	1	2	16	16	25	20	22	15	-
	43	6	-	-	-	2	7	6	32	33	46	54	43	33	1
CSISZ	4	7	13	1	5	5	-	2	8	3	-	-	8	2	6
ELTMA	21	18	3	-	-	9	7	4	23	16	18	20	12	15	14
GONRU	-	18	-	32	23	8	1	8	20	28	24	23	21	27	-
	-	5	-	19	19	13	1	24	28	22	22	22	27	17	-
	2	5	-	10	14	3	1	11	11	15	16	15	16	8	9
GOVMI	10	9	24	8	19	8	2	4	19	15	-	-	14	3	20
	8	4	9	3	7	10	4	4	7	9	1	-	10	-	6
	6	2	8	-	7	8	2	-	-	5	-	-	6	3	9
HINWO	52	-	-	-	-	-	-	-	-	-	-	-	-	35	60
IGAAN	-	15	22	16	28	20	6	-	14	11	12	-	5	8	16
	-	3	16	14	8	11	13	5	-	10	17	-	-	4	21
	-	3	18	8	20	13	1	1	9	10	12	-	11	7	11
	-	4	9	3	7	1	-	4	4	2	3	1	-	3	2
	8	13	37	19	21	24	2	10	30	7	-	-	-	1	21
KACJA	22	22	6	2	25	20	6	16	35	14	1	7	-	19	22
	19	-	-	-	9	6	3	1	11	5	-	-	10	6	15
	10	16	3	-	3	12	4	6	9	11	-	6	4	10	11
	-	19	2	4	29	40	10	17	29	22	-	19	-	24	44
KERST	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KOSDE	-	-	7	-	-	-	-	-	-	3	8	-	-	13	8
LERAR	-	-	-	1	-	3	-	4	-	-	-	4	2	4	4
MACMA	-	5	-	-	2	-	3	4	1	-	-	-	-	8	-
	-	6	13	-	-	-	9	3	-	-	-	1	-	-	-
	-	6	14	-	-	-	2	-	-	-	-	-	-	-	-
MARGR	-	15	24	7	-	-	-	4	1	-	-	-	-	-	13
MOLSI	-	-	-	-	-	11	-	-	5	-	-	-	-	59	80
	-	-	-	-	-	21	-	11	4	-	-	-	-	12	12
	-	40	8	4	37	23	-	32	1	1	-	-	-	-	28
	-	16	1	-	16	-	-	14	-	1	-	-	-	-	18
OCAFR	6	2	-	-	-	-	-	5	4	6	6	3	2	6	2
OCHPA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	11	-	-	6	15	-	-	20	7	17	-	16	9	7	12
PERZS	25	35	29	9	23	30	3	8	17	12	4	-	29	16	31
PUCRC	16	13	8	4	5	14	4	7	13	6	11	22	12	18	25
ROTEC	-	14	-	-	-	7	-	12	-	-	-	-	-	-	8
SARAN	-	-	-	-	-	-	8	11	8	9	13	12	8	5	3
	6	13	-	-	-	-	3	7	15	12	9	11	10	6	4
	-	3	-	-	-	-	-	6	7	13	4	4	2	3	-
SCALE	14	16	1	3	-	17	1	3	12	12	21	16	12	17	5
SCHHA	-	-	2	-	-	9	7	3	3	-	4	-	-	7	9
SLAST	2	-	-	-	4	3	-	-	-	3	-	5	2	6	6
STOEN	43	21	3	-	-	27	13	1	35	40	36	37	43	20	33
	31	18	2	-	-	28	2	5	24	23	29	29	26	20	13
	42	40	5	-	-	38	10	8	47	46	50	43	39	29	25
STRJO	-	-	-	-	4	-	-	7	-	-	-	-	-	-	9
	-	4	-	-	5	-	-	8	-	-	-	-	-	-	11
	-	5	-	-	8	-	-	7	-	-	-	-	-	-	18
TEPIS	3	26	29	13	23	16	4	2	18	5	31	-	-	1	23
TRIMI	13	5	-	2	8	3	3	-	10	5	1	4	5	6	7
YRJIL	-	12	19	20	16	13	14	20	-	-	1	25	10	11	-
Sum	545	571	419	253	465	581	161	349	593	515	533	451	497	634	796

March	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
BERER	12	28	17	26	24	18	20	14	8	20	15	12	4	-	-	-
	16	11	11	11	16	14	11	10	3	7	15	8	7	-	-	-
	10	16	16	15	11	15	9	7	3	9	10	9	4	-	-	-
BREMA	3	-	9	19	9	21	20	24	-	9	19	13	5	-	-	-
	-	-	10	6	4	9	-	6	-	9	12	8	-	-	-	5
BRIBE	10	2	-	15	10	16	17	21	4	13	20	11	21	-	-	14
	7	-	-	14	13	11	12	13	5	12	19	16	18	-	-	14
CASFL	11	8	-	11	3	9	15	7	11	8	-	-	-	-	-	-
	7	4	-	13	4	14	11	7	10	14	14	-	-	-	-	-
CRIST	37	3	-	23	2	14	14	19	16	21	17	25	18	8	12	15
	11	-	-	23	3	11	10	7	17	19	20	21	23	3	1	6
	33	7	-	46	5	25	33	30	32	40	39	42	43	14	22	16
CSISZ	10	12	4	-	4	12	5	4	-	5	6	5	8	-	-	-
ELTMA	2	-	8	6	7	17	14	3	8	22	13	18	16	14	16	8
GONRU	8	20	30	30	32	30	-	11	-	13	31	11	29	-	12	1
	7	10	25	24	30	29	-	10	-	7	15	20	23	-	8	3
	1	5	20	17	17	12	5	5	-	8	13	16	12	2	4	2
GOVMI	26	27	16	-	16	26	19	25	-	-	19	15	31	-	22	-
	11	9	7	-	-	-	3	5	15	-	8	3	-	-	-	-
	-	-	-	-	10	5	5	9	-	15	12	10	-	-	-	-
HINWO	64	39	-	4	47	19	36	26	16	-	-	9	22	-	-	-
IGAAN	16	18	5	3	8	13	10	7	-	6	12	-	-	-	-	1
	12	19	8	10	19	15	15	5	25	-	16	10	7	-	4	4
	10	5	8	6	12	12	11	11	8	9	-	-	2	-	-	-
	2	4	6	1	1	5	2	1	2	5	2	5	1	1	1	1
	34	13	24	3	26	23	7	4	16	27	16	15	17	-	-	10
KACJA	36	20	-	2	8	11	17	30	-	28	30	27	25	2	6	5
	15	14	4	-	3	12	8	10	-	-	-	-	12	-	-	-
	17	4	-	-	4	9	8	14	-	15	10	15	9	4	2	1
	48	36	-	3	17	37	33	41	-	40	36	48	30	6	12	5
KERST	-	-	-	-	-	-	-	-	54	-	61	20	57	52	59	48
KOSDE	4	-	13	14	6	12	14	10	4	11	18	7	5	3	2	8
LERAR	1	-	-	3	3	-	5	2	1	5	3	4	3	2	3	3
MACMA	6	2	1	11	-	-	1	6	13	2	-	-	1	1	-	-
	10	5	7	12	-	1	-	6	18	3	1	5	-	-	-	-
	2	3	6	9	-	1	-	7	5	5	4	-	-	4	1	-
MARGR	-	19	19	13	26	15	18	-	9	27	15	-	7	27	-	8
MOLSI	75	53	-	60	79	77	46	53	54	101	88	75	65	-	-	-
	23	11	-	14	16	21	20	7	10	17	17	22	18	-	1	6
	46	6	7	41	-	2	45	54	33	30	30	49	11	-	1	22
	17	5	2	-	-	-	-	-	-	-	-	-	-	-	-	9
OCAFR	8	3	5	6	-	-	4	3	3	8	4	-	-	-	-	-
OCHPA	-	-	-	-	-	-	-	-	-	-	3	-	5	3	6	2
OTTMI	10	3	3	17	3	2	-	6	4	2	5	18	15	-	-	9
PERZS	48	35	38	12	28	31	30	32	5	24	1	24	24	-	19	1
PUCRC	18	-	2	15	5	18	11	8	3	13	6	18	9	4	12	2
ROTEC	10	2	-	-	-	-	-	22	8	13	10	18	1	2	-	11
SARAN	1	6	10	10	-	15	11	2	2	5	-	8	7	-	-	-
	-	9	12	16	18	10	5	2	2	11	8	9	3	-	-	-
	1	5	12	15	11	10	1	-	-	3	4	8	5	-	-	-
SCALE	1	-	8	2	3	13	10	6	10	9	15	12	10	4	8	4
SCHHA	3	-	1	9	5	7	2	4	11	10	6	11	3	-	-	5
SLAST	1	2	-	-	-	1	3	2	-	4	6	5	8	3	4	2
STOEN	7	-	-	18	14	35	33	13	11	19	21	30	23	20	31	14
	8	-	-	17	12	27	21	10	12	30	33	22	15	13	21	13
	9	-	-	19	15	35	26	19	16	38	25	30	28	21	26	11
STRJO	6	-	1	9	2	12	9	8	2	5	6	8	2	-	-	7
	12	1	-	9	12	7	3	4	15	8	10	6	5	-	-	5
	15	4	-	14	6	13	13	17	7	9	5	21	4	-	-	12
TEPIS	19	20	16	23	24	15	25	14	23	21	16	17	19	-	-	7
TRIMI	8	11	-	2	5	7	15	10	-	5	5	16	10	-	2	-
YRJIL	-	-	1	-	8	-	-	-	-	14	-	-	2	7	-	20
Sum	845	539	392	721	666	851	741	713	534	833	865	855	752	220	318	340