

## Results of the IMO Video Meteor Network – March 2013

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2013/05/22

After a slow start into the year 2013, the weather did not improve significantly in March. Only the distribution was a little different, as this time observers in southern Europe had to fight with particularly poor weather conditions, whereas it was still acceptable farther north. Overall we collected far less data than in 2012. 11,000 recorded meteors and almost 5,900 hour of effective observing time are a reduction of roughly 40% compared to the results from the previous year. Only seven out of 69 active camera systems obtained data in twenty or more nights, which is even worse than in February, as there were more cameras and three more observing nights in March.

With Karl-Heinz Gansel from Dingden in Germany we could win another observer for our camera network. Karl-Heinz is an active radio meteor observer and gained some experiences with UFOCapture before. Now he operates another camera station in the western part of Germany. DARO01 consists of a Watec 902H2 with a 3.6 mm lens (f/1.4). Karl-Heinz plans to switch to a more powerful lens in the future.

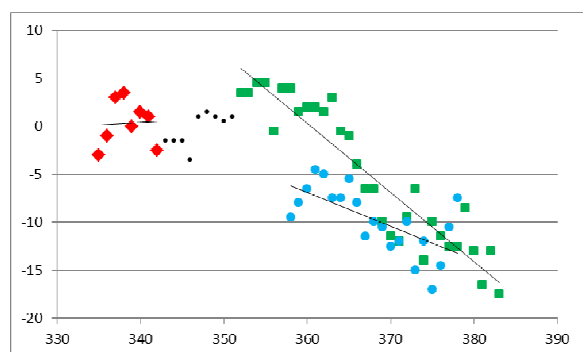
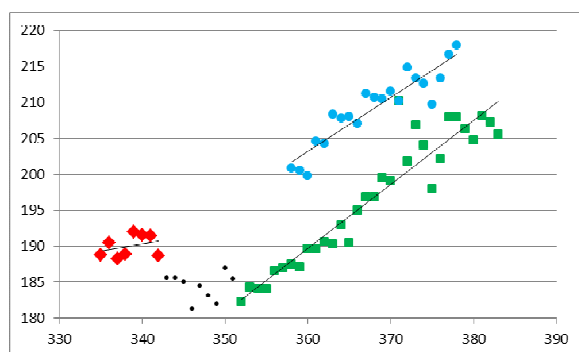
As March does not present any larger meteor showers, we will now look directly at the results of the long-term analysis in spring 2012 for this month.

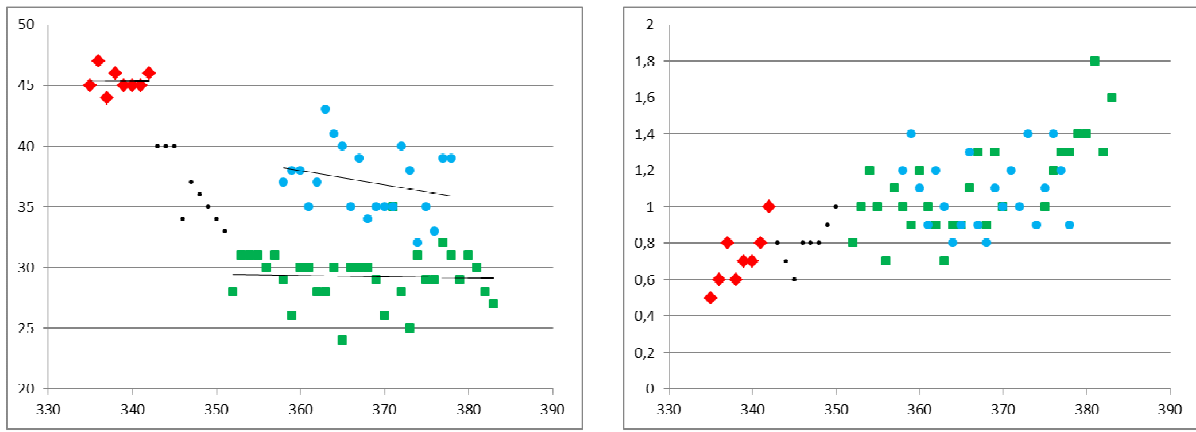
The  $\alpha$  Herculids (346 XHE) are short-time active. Their activity interval spans only five degrees in solar longitude. However, between March 11 and 16 the Herculids are the strongest or second strongest source in the sky, which is why their detection is doubtless. Our shower parameters, which were derived from 300 meteors, show clear scatter in right ascension, but only little deviation in declination and velocity. There is a good agreement with the MDC list values (table 1) which is no surprise given that we detected the shower on our own in 2009.

**Table 1:** Parameters of the  $\alpha$  Herculids from the MDC Working List and the analysis of the IMO network in 2012.

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	352	-	254	-	+48	-	36	-
IMO 2012	352	350-355	256	+0.8	+48.5	-0.0	36.8	-

Between end of February and mid-April there are a number of sub-radiants in Virgo which belong to the Antihelion complex. Over 2,000 meteors from our database could be assigned to these radiants. The scatter in the radiant parameters is typically quite large, but when the parameters are plotted over solar longitude (figure 1), roughly three distinct segments can be identified in the data.





**Figure 1:** Shower parameters for the radiants in the Virginitid complex plotted over the solar longitude: Right ascension (up left), declination (up right), velocity (down left) and relative activity (down right).

The first shower (red) lasts from late February until the first decade of March, where it typically reaches a rank of about five. There is no significant drift in right ascension or declination, and the velocity is higher than for typical Virginitid meteors.

The second segment (green) last from mid-March to mid-April. It is most of the time the strongest meteor source in the sky. The right ascension is growing steadily, while the declination drops from +5° to -15°. The velocity is constant.

Between the first and second segment, there is a transition phase, where the radiants have parameter values in-between segment one and two, and where the velocity is dropping by one km/s per day. This seems not plausible, which is why we omitted this transition phase.

Finally there is a third segment in the last March and first April decade (blue), which has typically a rank of three to four. Its drift in right ascension is similar to the second segment, but it is located more than ten degrees east. The declination is dropping as well, though at a small value that the second segment, and the velocity is 7..8 km/s higher.

Matching these segments with meteor shower entries from the MDC list, we come up with the following result: The first shower does not match to any of the list entries, particular due to the outstanding velocity (table 2).

The second segment fits both to the eta Virginids (11 EVI) and lambda Virginids (49 LVI). The eta Virginids mark the begin of the activity interval and the lambda Virginids the end, so obviously these showers are identical. (Tabelle 3).

The third segment (table 4) fits well to the kappa Virginids (509 KVI)

**Table 2:** Parameters of a possibly unknown meteor shower from the analysis of the IMO network in 2012.

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
IMO 2012	339	335-342	190	+0.2	+0	+0.1	45	-

**Table 3:** Parameters of the eta and lambda Virginids from the MDC Working List and the analysis of the IMO network in 2012.

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC/EVA	354	-	182.1	+1	+2.6	-0.37	31.3	-
MDC/LVA	20	-	210.7	-	-10.2	-	29.0	-
IMO 2012	7	352-23	196	+0.9	-5	-0.7	29	-

**Table 4:** Parameters of the kappa Virginids from the MDC Working List and the analysis of the IMO network in 2012.

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	6	-	208	+0.92	-8	-0.35	39	-
IMO 2012	9	358-18	210	+0.75	-10	-0.4	37	-0.1

Beyond the Virginid complex, there may be another unknown shower in in our database, active between March 7 and 10. Overall we assigned almost 150 meteors to that shower candidate. There is only little scatter in the parameters and the radiant reaches a rank of six to seven. Since the activity interval is so short, we will wait for an independent confirmation of this shower candidate before it is formally reported to the MDC.

A quick look at the SonotaCo network database showed no clear concentration of orbits at the expected positions of the two shower candidates.

**Table 5:** Parameters of a possibly unknown meteor shower from the analysis of the IMO network in 2012.

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
IMO 2012	347	346-349	233	+0.6	+43	+0.0	42	-

Finally we found traces of the zeta Serpentids (43 ZSE) in the March data, but the currently existing data set does not allow for an unequivocal identification of this shower.

# 1. Observers

Code	Name	Place	Camera	FOV [ $^{\circ}$ ]	St.LM [mag]	Eff.CA [km $^2$ ]	Nights	Time [h]	Meteors
ARLRA	Arlt	Ludwigsfelde/DE	LUDWIG1 (0.8/8)	1488	4.8	726	9	70.8	57
BANPE	Bánfalvi	Zalaegerszeg/HU	HUVCS01 (0.95/5)	2423	3.4	361	10	81.0	96
BASLU	Bastiaens	Hove/BE	URANIA1 (0.8/3.8)*	4545	2.5	237	5	39.6	19
BERER	Berkó	Ludanyhalaszi/HU	HULUD1 (0.8/3.8)	5542	4.8	3847	9	64.8	224
			HULUD2 (0.95/4)	3398	3.8	671	8	61.7	70
			HULUD3 (0.95/4)	4357	3.8	876	8	63.5	78
BIRSZ	Biro	Agostyan/HU	HUAGO (0.75/4.5)	2427	4.4	1036	15	105.4	127
BOMMA	Bombardini	Faenza/IT	MARIO (1.2/4.0)	5794	3.3	739	9	19.4	144
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	11	69.5	91
			MBB4 (0.8/8)	1470	5.1	1208	16	98.9	89
BRIBE	Brinkmann	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	18	100.7	133
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	18	114.9	135
CASFL	Castellani	Monte Baldo/IT	BMH1 (0.8/6)	2350	5.0	1611	13	93.7	198
			BMH2 (1.5/4.5)*	4243	3.0	371	9	90.1	139
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	20	104.0	218
			C3P8 (0.8/3.8)	5455	4.2	1586	17	114.5	175
			STG38 (0.8/3.8)	5614	4.4	2007	23	133.1	297
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	9	71.9	129
GANKA	Gansel	Dingden/DE	DAR001 (1.4/3.6)	7141	3.1	652	4	25.3	13
GONRU	Goncalves	Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	9	58.7	148
			TEMPLAR2 (0.8/6)	2080	5.0	1508	15	89.8	174
			TEMPLAR3 (0.8/8)	1438	4.3	571	17	102.6	117
			TEMPLAR4 (0.8/3.8)	4475	3.0	442	14	73.3	147
GOVMI	Govedic	Sredisce ob Dr./SI	ORION3 (0.95/5)	2665	4.9	2069	13	85.2	115
			ORION4 (0.95/5)	2662	4.3	1043	14	103.1	132
IGAAN	Igaz	Baja/HU	HUBAJ (0.8/3.8)	5552	2.8	403	19	88.8	80
		Debrecen/HU	HUDEB (0.8/3.8)	5522	3.2	620	13	93.3	146
		Budapest/HU	HUPOL (1.2/4)	3790	3.3	475	9	74.8	30
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	12	75.5	73
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	10	78.9	232
		Ljubljana/SI	ORION1 (0.8/8)	1402	3.8	331	9	73.4	39
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	10	79.8	353
			STEFKA (0.8/3.8)	5471	2.8	379	9	76.5	189
KISSZ	Kiss	Sulysap/HU	HUSUL (0.95/5)*	4295	3.0	355	10	76.7	28
KOSDE	Koschny	Izana Obs./ES	ICC7 (0.85/25)*	714	5.9	1464	21	166.3	856
		Noordwijkerhout/NL	LIC4 (1.4/50)*	2027	6.0	4509	13	73.4	115
LERAR	Leroy	Gretz/FR	SAPHIRA (1.2/6)	3260	3.4	301	14	71.7	33
MACMA	Maciejewski	Chelm/PL	PAV35 (1.2/4)	4383	2.5	253	13	76.0	73
			PAV36 (1.2/4)*	5732	2.2	227	11	88.8	127
			PAV43 (0.95/3.75)*	2544	2.7	176	11	96.1	56
MARGR	Maravelias	Lofoupoli/GR	LOOMCON (0.8/12)	738	6.3	2698	20	89.3	142
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1230	6.9	6152	13	83.8	651
			MINCAM1 (0.8/8)	1477	4.9	1084	18	124.2	138
		Ketzür/DE	REMO1 (0.8/8)	1467	5.9	2837	21	154.1	570
			REMO2 (0.8/8)	1478	6.3	4467	21	149.4	488
			REMO3 (0.8/8)	1420	5.6	1967	18	146.0	107
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	2522	3.5	532	16	108.5	82
OCAFR	Ocana Gonzales	Madrid/ES	FOGCAM (1.4/7)	1890	3.9	109	17	105.2	84
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	2944	3.5	358	1	0.7	4
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	19	96.5	193
PERZS	Perkó	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	16	116.8	355
PUCRC	Pucer	Nova vas nad Dra./SI	MOBCAM1 (0.75/6)	2398	5.3	2976	15	105.9	198
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	8	76.0	93
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	12	50.0	77
			RO2 (0.75/6)	2381	3.8	459	11	52.2	71
			SOFIA (0.8/12)	738	5.3	907	11	56.0	58
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4152	4.5	2052	5	30.5	55
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	16	102.4	165
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	563	6.2	1294	4	20.7	39
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	13	74.4	247
			NOA38 (0.8/3.8)	5609	4.2	1911	11	75.4	226
			SCO38 (0.8/3.8)	5598	4.8	3306	11	70.7	234
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2362	4.6	1152	15	101.4	116
			MINCAM3 (0.8/12)	728	5.7	975	16	120.6	127
			MINCAM4 (1.0/2.6)	9791	2.7	552	1	8.0	5
			MINCAM5 (0.8/6)	2349	5.0	1896	17	118.1	170
TEPIS	Tepliczky	Budapest/HU	HUMOB (0.8/6)	2388	4.8	1607	11	84.6	162
TRIMI	Triglav	Velenje/SI	SRAKA (0.8/6)*	2222	4.0	546	15	17.9	114
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2337	5.5	3574	24	185.6	346
Sum							31	5850.4	11012

\* 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
ARLRA	10.8	4.2	11.0	3.7	10.5	5.7	-	-	-	-	-	-	8.9	-	10.0
BANPE	-	-	10.7	11.1	-	-	8.7	7.2	-	-	5.4	-	-	-	8.3
BASLU	-	-	-	11.0	5.0	-	-	-	-	-	-	-	4.8	-	-
BERER	5.5	11.1	9.2	11.1	7.6	-	-	-	-	-	9.8	-	-	-	-
	5.5	11.2	8.7	11.1	7.5	-	-	-	-	-	9.9	-	-	-	-
	5.7	11.2	8.8	11.1	7.8	-	-	-	-	-	10.7	-	-	-	-
BIRSZ	6.3	11.0	10.0	10.9	5.9	-	6.7	5.5	-	2.4	9.2	-	-	-	6.6
BOMMA	-	2.2	3.6	1.5	-	-	-	-	-	-	-	-	-	-	2.9
BREMA	-	-	-	11.0	6.5	-	-	-	-	-	-	10.5	5.3	8.2	-
	-	-	7.3	10.9	5.3	2.7	-	-	-	-	-	7.9	6.8	4.6	-
BRIBE	-	-	7.2	11.1	7.8	3.1	-	-	-	-	-	7.5	7.9	7.8	0.2
	-	-	9.9	11.0	10.3	-	-	-	-	-	-	7.4	3.5	9.8	1.3
CASFL	3.1	11.3	11.3	11.1	-	-	-	-	-	6.0	-	-	-	10.5	10.7
	10.4	10.5	11.1	11.0	-	-	-	-	-	-	-	-	-	10.5	10.4
CRIST	-	11.0	11.0	10.1	-	-	-	1.4	1.3	7.2	5.9	2.6	2.8	6.5	10.3
	2.9	11.0	11.0	10.5	-	-	-	-	5.7	2.2	6.2	-	6.3	8.3	10.4
	2.7	10.8	11.0	10.9	-	-	-	1.1	9.0	7.7	6.7	4.2	3.9	8.5	10.3
ELTMA	9.1	9.6	11.3	11.0	-	-	-	-	-	2.3	-	-	-	-	-
GANKA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GONRU	-	-	-	-	-	-	-	-	-	-	-	5.4	9.8	10.2	-
	9.7	0.2	-	-	-	-	2.6	-	4.7	5.8	-	6.1	9.8	9.1	-
	9.8	-	0.2	-	-	-	0.5	3.5	5.1	4.8	-	9.0	10.7	9.5	-
	9.3	-	-	-	-	-	0.6	-	-	3.7	-	5.3	9.9	8.0	-
GOVMI	0.7	11.2	11.1	11.0	-	-	5.3	3.7	-	3.3	9.3	-	-	-	5.0
	0.2	11.1	10.8	10.8	-	-	6.8	8.9	-	1.2	9.0	-	-	-	8.8
IGAAN	4.2	10.8	-	4.1	5.2	-	5.4	4.6	-	-	9.4	1.8	0.8	-	6.3
	2.2	8.3	11.1	11.0	10.3	-	-	0.4	-	-	8.5	4.9	-	-	-
	-	10.7	10.8	10.6	5.9	-	-	-	-	-	7.5	-	-	-	-
JONKA	2.0	11.1	11.0	11.1	5.5	-	1.9	-	-	-	7.0	-	-	-	2.4
KACJA	5.1	11.1	11.0	10.9	-	-	-	4.6	-	-	-	-	-	-	9.2
	4.7	10.3	11.0	10.5	-	-	-	-	-	-	-	-	-	-	10.3
	5.2	11.2	11.2	11.1	-	-	-	4.9	-	-	-	-	-	-	9.2
	5.0	11.2	11.1	11.1	-	-	-	4.6	-	-	-	-	-	-	9.3
KISSZ	4.9	11.2	11.1	11.1	-	-	-	-	-	2.3	7.8	-	-	-	-
KOSDE	-	6.3	-	-	-	9.9	7.6	-	5.8	10.3	10.5	10.1	7.0	-	4.7
	-	-	5.4	4.4	7.8	0.8	-	-	-	-	-	7.5	5.2	4.0	-
LERAR	-	1.0	11.2	11.0	-	-	5.5	4.3	4.3	-	-	-	0.5	10.5	5.6
MACMA	-	-	7.9	8.4	11.0	7.3	-	-	-	-	-	-	-	-	-
	-	-	8.5	8.2	11.2	6.9	-	-	-	-	-	-	-	-	-
	-	-	8.9	7.7	11.4	7.5	-	-	-	-	-	-	-	-	4.8
MARGR	5.9	5.4	1.9	4.8	8.1	-	4.9	3.4	9.3	9.1	5.3	5.5	0.5	-	4.7
MOLSI	-	10.0	10.3	10.3	10.3	1.5	-	5.3	0.6	4.0	-	-	-	1.6	9.6
	-	11.2	11.1	11.1	11.0	1.5	6.5	5.4	-	4.1	10.7	-	1.7	6.8	10.4
	11.2	5.5	11.1	11.0	11.0	10.9	-	-	-	-	-	-	9.6	5.4	10.3
	11.2	5.5	11.1	11.0	10.9	9.8	-	-	-	-	-	4.4	9.7	4.2	10.3
	11.3	4.6	10.4	11.1	11.0	9.5	-	-	-	-	1.2	4.7	9.6	5.9	10.3
MORJO	3.9	11.2	10.6	11.0	6.5	-	3.2	5.7	-	1.8	10.7	2.8	-	-	3.8
OCAFR	8.0	-	-	-	-	-	4.7	-	-	5.0	7.8	7.5	10.6	8.8	-
OCHPA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7
OTTMI	6.6	8.9	6.8	-	-	-	9.1	-	-	-	-	0.8	1.2	2.6	-
PERZS	2.9	10.9	11.1	11.0	3.9	-	7.6	10.0	-	7.4	9.8	2.5	-	-	-
PUCRC	11.2	11.1	11.1	11.0	-	-	-	-	-	3.8	0.5	4.5	-	-	9.3
ROTEC	9.3	3.5	11.0	11.0	11.0	10.1	-	-	-	-	-	-	10.5	-	-
SARAN	5.9	-	-	-	-	-	-	-	-	1.0	0.9	-	-	10.4	4.1
	6.6	-	-	-	-	-	-	2.3	2.4	2.7	-	-	-	5.6	-
	5.4	-	-	-	-	-	-	-	1.8	1.8	-	-	8.8	5.6	-
SCALE	1.1	9.1	9.3	10.2	-	-	-	-	-	-	-	-	-	-	-
SCHHA	-	-	7.6	11.1	4.1	3.3	-	-	-	-	-	4.4	6.6	10.3	-
SLAST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.5
STOEN	7.1	11.3	11.2	11.2	-	-	-	-	-	-	1.6	-	-	0.3	1.5
	8.6	11.4	11.3	11.3	-	-	-	-	-	-	2.4	-	-	-	2.0
	-	11.3	11.2	11.3	-	-	-	-	-	2.3	-	-	-	0.9	2.4
STRJO	-	-	7.4	10.6	10.5	5.6	-	-	-	-	-	8.1	6.0	10.0	-
	4.6	-	7.5	9.6	10.6	7.1	-	-	-	-	-	8.7	7.2	9.9	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.5	-	7.5	10.6	10.6	5.6	-	-	-	-	-	8.4	6.4	10.0	-
TEPIS	-	5.3	9.5	10.3	4.4	-	7.6	6.8	-	-	9.0	-	-	-	5.0
TRIMI	0.2	2.1	2.6	2.6	-	-	0.3	1.4	-	1.3	0.3	0.3	-	-	1.6
YRJIL	10.5	-	10.7	-	-	6.8	10.4	10.0	10.2	8.1	9.3	-	9.6	7.5	9.0
Sum	260.0	379.1	507.7	535.2	266.4	115.6	105.9	105.0	61.2	115.5	197.4	152.8	212.3	225.5	257.4

March	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ARLRA	6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BANPE	8.8	-	-	9.2	-	8.4	3.2	-	-	-	-	-	-	-	-	-
BASLU	-	-	-	-	-	9.3	-	-	-	-	9.5	-	-	-	-	-
BERER	2.6	-	-	-	-	-	6.8	1.1	-	-	-	-	-	-	-	-
	1.5	-	-	-	-	-	6.3	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	6.8	1.4	-	-	-	-	-	-	-	-
BIRSZ	10.2	-	0.2	7.1	-	-	7.0	6.4	-	-	-	-	-	-	-	-
BOMMA	1.9	-	2.4	3.4	-	0.3	1.2	-	-	-	-	-	-	-	-	-
BREMA	1.1	-	-	-	-	1.9	1.5	-	-	-	8.4	7.4	-	-	-	7.7
	0.4	-	-	-	-	5.6	-	7.6	3.8	8.7	9.4	9.1	-	1.9	-	6.9
BRIBE	1.9	1.4	-	-	-	6.4	1.8	-	4.0	6.6	9.6	5.3	-	4.4	-	6.7
	1.3	2.8	9.4	4.7	-	9.8	-	1.4	-	6.2	9.6	4.8	-	3.6	-	8.1
CASFL	2.6	-	-	10.6	4.0	-	6.7	-	-	-	-	0.8	-	-	-	5.0
	-	-	-	10.3	-	10.1	5.8	-	-	-	-	-	-	-	-	-
CRIST	-	-	7.4	2.6	6.3	10.0	1.4	-	-	-	1.7	0.2	-	-	1.1	3.2
	-	-	9.6	0.3	9.5	6.6	-	-	-	2.4	4.8	-	-	-	6.8	-
	1.5	-	8.8	5.2	6.3	10.0	2.5	-	-	0.3	3.4	0.2	-	-	5.5	2.6
ELTMA	3.9	-	-	9.4	-	8.0	7.3	-	-	-	-	-	-	-	-	-
GANKA	-	-	-	-	-	5.8	-	-	2.6	8.5	8.4	-	-	-	-	-
GONRU	-	10.3	-	6.1	10.2	-	2.0	2.3	-	-	-	2.4	-	-	-	-
	-	10.3	5.3	6.4	10.1	-	2.8	4.0	-	-	-	2.9	-	-	-	-
	-	10.3	7.9	9.3	8.1	1.6	3.1	3.2	-	-	-	-	-	-	-	6.0
	-	10.0	5.0	5.7	8.2	1.6	0.3	2.7	-	-	-	3.0	-	-	-	-
GOVMI	6.3	-	-	10.2	-	5.8	2.3	-	-	-	-	-	-	-	-	-
	8.7	-	-	10.2	-	7.6	3.2	-	-	-	-	5.8	-	-	-	-
IGAAN	3.7	5.9	3.2	5.6	-	1.4	9.8	-	-	-	-	-	1.3	-	0.9	4.4
	-	-	-	9.3	3.3	-	9.6	9.8	4.6	-	-	-	-	-	-	-
	9.2	-	-	7.8	-	-	9.6	2.7	-	-	-	-	-	-	-	-
JONKA	10.2	-	-	4.8	-	-	8.4	-	-	-	-	-	-	-	-	0.1
KACJA	2.4	-	-	5.5	-	9.3	9.8	-	-	-	-	-	-	-	-	-
	-	-	-	6.8	-	10.1	8.0	-	-	-	-	1.7	-	-	-	-
	2.3	-	-	5.5	-	9.4	9.8	-	-	-	-	-	-	-	-	-
	-	-	-	4.7	-	9.5	10.0	-	-	-	-	-	-	-	-	-
KISSZ	8.0	-	-	9.3	-	-	5.4	-	-	-	-	-	-	-	-	5.6
KOSDE	6.3	7.0	-	5.8	5.3	6.7	-	-	9.6	8.8	-	6.3	10.0	10.0	10.0	8.3
	-	-	5.1	-	-	9.2	-	-	-	2.5	8.9	8.6	-	-	-	4.0
LERAR	0.3	9.7	2.5	-	2.2	3.1	-	-	-	-	-	-	-	-	-	-
MACMA	10.3	9.6	0.9	-	5.6	-	1.6	5.7	5.7	-	-	0.5	1.5	-	-	-
	10.1	9.8	-	-	8.8	-	2.4	9.7	9.3	-	-	-	3.9	-	-	-
	10.5	10.3	-	-	9.3	-	-	10.1	9.7	-	-	-	5.9	-	-	-
MARGR	6.5	-	6.0	4.5	1.1	-	-	-	-	-	-	0.2	0.8	-	-	1.4
MOLSI	9.4	-	-	7.2	-	3.7	-	-	-	-	-	-	-	-	-	-
	6.7	-	-	10.2	1.1	4.8	-	-	-	-	-	3.0	-	-	-	6.9
	9.6	-	-	1.1	-	8.8	3.7	9.7	9.5	9.4	7.7	-	2.2	1.0	0.8	4.6
	8.8	-	-	0.6	-	8.8	3.6	9.6	9.5	9.5	4.3	-	1.4	0.5	-	4.7
	8.9	-	-	-	-	8.6	3.5	9.7	9.6	9.5	6.6	-	-	-	-	-
MORJO	9.7	3.4	-	10.1	-	-	9.3	-	-	-	-	-	-	-	-	4.8
OCAFR	-	6.9	9.3	3.7	7.4	3.6	3.2	-	7.2	0.9	-	-	-	7.5	-	3.1
OCHPA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	1.9	2.0	2.3	6.1	7.0	8.0	4.4	-	-	-	-	9.0	3.8	6.0	2.0	8.0
PERZS	-	1.8	3.1	10.0	-	10.2	10.0	-	-	-	-	4.6	-	-	-	-
PUCRC	6.1	-	-	10.0	-	7.3	10.0	0.2	-	-	6.3	3.5	-	-	-	-
ROTEC	-	-	-	-	-	-	-	9.6	-	-	-	-	-	-	-	-
SARAN	-	9.2	4.5	7.1	3.7	-	0.2	1.8	-	-	-	1.2	-	-	-	-
	-	9.4	5.7	7.6	6.2	-	0.8	-	-	-	-	2.9	-	-	-	-
	-	9.0	5.1	6.7	6.8	-	0.6	4.4	-	-	-	-	-	-	-	-
SCALE	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SCHHA	-	1.8	9.5	3.5	-	8.0	-	-	-	4.7	9.9	6.4	-	-	3.8	7.4
SLAST	-	-	-	7.0	-	1.8	2.4	-	-	-	-	-	-	-	-	-
STOEN	0.4	-	3.0	10.3	-	9.5	6.1	-	-	-	-	0.9	-	-	-	-
	0.4	-	2.6	8.8	-	10.4	6.2	-	-	-	-	-	-	-	-	-
	0.7	-	4.0	10.2	-	8.0	8.4	-	-	-	-	-	-	-	-	-
STRJO	-	-	-	-	-	2.6	0.9	7.8	0.4	6.5	9.1	7.8	-	-	-	8.1
	3.3	-	-	-	-	2.7	-	9.3	9.2	8.0	9.1	9.1	-	-	-	4.7
	-	-	-	-	-	-	-	-	-	-	8.0	-	-	-	-	-
	4.2	-	-	-	-	2.8	0.7	8.2	8.3	6.8	8.0	8.4	-	-	-	8.1
TEPIS	10.2	-	-	6.7	-	-	9.8	-	-	-	-	-	-	-	-	-
TRIMI	0.7	-	0.2	2.3	-	1.5	0.5	-	-	-	-	-	-	-	-	-
YRJIL	9.6	9.2	-	-	9.2	7.8	1.8	3.3	3.7	2.9	7.4	8.4	7.7	7.1	-	5.4
Sum	229.9	150.1	123.0	309.5	139.7	286.4	242.5	141.7	106.7	102.2	150.1	124.4	38.5	42.0	30.9	135.8

### 3. Results (Meteors)

March	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	9	1	9	7	9	2	-	-	-	-	-	-	10	-	7
BANPE	-	-	10	18	-	-	6	10	-	-	3	-	-	-	13
BASLU	-	-	-	8	2	-	-	-	-	-	-	-	1	-	-
BERER	21	52	20	52	15	-	-	-	-	-	52	-	-	-	-
	5	15	6	17	5	-	-	-	-	-	17	-	-	-	-
	6	23	7	20	3	-	-	-	-	-	11	-	-	-	-
BIRSZ	10	15	16	20	2	-	13	3	-	4	9	-	-	-	7
BOMMA	-	15	29	14	-	-	-	-	-	-	-	-	-	-	21
BREMA	-	-	-	13	2	-	-	-	-	-	-	20	5	16	-
	-	-	10	10	3	2	-	-	-	-	-	8	2	7	-
BRIBE	-	-	22	24	1	2	-	-	-	-	-	17	4	17	1
	-	-	18	27	7	-	-	-	-	-	-	6	1	14	1
CASFL	6	28	26	42	-	-	-	-	-	11	-	-	-	18	22
	12	24	12	20	-	-	-	-	-	-	-	-	-	16	15
CRIST	-	35	21	19	-	-	-	2	2	8	10	4	3	17	26
	8	21	22	10	-	-	-	-	9	4	8	-	9	16	8
	5	40	35	34	-	-	-	1	11	13	4	4	4	13	25
ELTMA	12	19	20	28	-	-	-	-	-	4	-	-	-	-	-
GANKA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GONRU	-	-	-	-	-	-	-	-	-	-	-	23	25	19	-
	13	1	-	-	-	-	4	-	10	9	-	13	24	9	-
	11	-	1	-	-	-	2	5	9	7	-	12	20	10	-
	18	-	-	-	-	-	1	-	-	11	-	14	21	9	-
GOVMI	2	15	22	11	-	-	7	8	-	2	7	-	-	-	7
	1	14	22	14	-	-	7	9	-	1	4	-	-	-	7
IGAAN	4	7	-	10	4	-	3	5	-	-	8	1	1	-	5
	2	19	18	23	7	-	-	2	-	-	18	5	-	-	-
	-	2	5	8	1	-	-	-	-	-	1	-	-	-	-
JONKA	2	21	6	14	4	-	3	-	-	-	5	-	-	-	1
KACJA	9	33	40	32	-	-	-	8	-	-	-	-	-	-	26
	1	5	6	5	-	-	-	-	-	-	-	-	-	-	7
	12	46	72	65	-	-	-	6	-	-	-	-	-	-	47
	6	32	41	27	-	-	-	7	-	-	-	-	-	-	28
KISSZ	1	4	3	4	-	-	-	-	-	1	1	-	-	-	-
KOSDE	-	12	-	-	-	53	29	-	16	60	62	52	31	-	4
	-	-	16	11	16	3	-	-	-	-	-	21	5	4	-
LERAR	-	1	1	2	-	-	1	1	4	-	-	-	1	9	1
MACMA	-	-	18	8	10	4	-	-	-	-	-	-	-	-	-
	-	-	20	23	15	11	-	-	-	-	-	-	-	-	-
	-	-	9	4	11	4	-	-	-	-	-	-	-	-	1
MARGR	18	5	1	8	13	-	5	1	17	8	5	5	1	-	10
MOLSI	-	67	96	113	113	11	-	19	5	14	-	-	-	5	101
	-	21	20	22	10	1	8	2	-	3	-	-	3	3	15
	54	11	51	48	65	24	-	-	-	-	-	-	29	17	55
	35	7	39	57	46	25	-	-	-	-	-	9	42	13	39
	7	3	6	12	13	5	-	-	-	1	1	9	1	1	8
MORJO	3	18	6	11	1	-	2	3	-	2	6	2	-	-	1
OCAFR	6	-	-	-	-	-	1	-	-	4	7	8	14	9	-
OCHPA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
OTTMI	14	18	2	-	-	-	14	-	-	-	-	5	4	7	-
PERZS	16	34	32	35	5	-	20	41	-	25	30	3	-	-	-
PUCRC	24	14	37	36	-	-	-	-	-	4	2	7	-	-	10
ROTEC	13	1	19	14	15	8	-	-	-	-	-	-	16	-	-
SARAN	5	-	-	-	-	-	-	-	2	3	-	-	22	8	-
	8	-	-	-	-	-	-	2	2	6	-	-	-	9	-
	2	-	-	-	-	-	-	-	1	2	-	-	10	7	-
SCALE	1	16	16	19	-	-	-	-	-	-	-	-	-	-	-
SCHHA	-	-	19	30	5	2	-	-	-	-	-	22	8	13	-
SLAST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20
STOEN	14	31	32	53	-	-	-	-	-	5	-	-	-	2	4
	7	35	32	50	-	-	-	-	-	3	-	-	-	-	2
	-	32	39	37	-	-	-	-	-	9	-	-	-	3	11
STRJO	-	-	10	26	6	1	-	-	-	-	-	10	6	11	-
	6	-	12	19	7	2	-	-	-	-	-	8	9	16	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	-	17	28	6	6	-	-	-	-	-	17	2	21	-
TEPIS	-	25	22	24	6	-	18	10	-	-	16	-	-	-	8
TRIMI	1	12	19	18	-	-	2	9	-	8	2	2	-	-	11
YRJIL	22	-	22	-	-	17	18	16	17	12	12	-	17	17	22
Sum	436	850	1132	1304	428	183	164	170	105	243	301	299	359	356	601

March	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ARLRA	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BANPE	8	-	-	14	-	13	1	-	-	-	-	-	-	-	-	-
BASLU	-	-	-	-	-	6	-	-	-	-	2	-	-	-	-	-
BERER	2	-	-	-	-	-	9	1	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	5	3	-	-	-	-	-	-	-	-
BIRSZ	13	-	1	11	-	-	2	1	-	-	-	-	-	-	-	-
BOMMA	13	-	18	24	-	2	8	-	-	-	-	-	-	-	-	-
BREMA	2	-	-	-	-	2	1	-	-	-	9	10	-	-	-	11
	1	-	-	-	-	3	-	13	2	6	13	2	-	1	-	6
BRIBE	5	2	-	-	-	3	3	-	2	3	8	5	-	1	-	13
	1	8	10	4	-	9	-	1	-	6	6	3	-	2	-	11
CASFL	3	-	-	18	13	-	3	-	-	-	-	1	-	-	-	7
	-	-	-	20	-	14	6	-	-	-	-	-	-	-	-	-
CRIST	-	-	20	3	14	23	3	-	-	-	1	1	-	-	4	2
	-	-	19	2	19	7	-	-	-	3	3	-	-	-	7	-
	1	-	26	7	16	29	9	-	-	1	3	1	-	-	14	1
ELTMA	3	-	-	22	-	17	4	-	-	-	-	-	-	-	-	-
GANKA	-	-	-	-	-	2	-	-	1	3	7	-	-	-	-	-
GONRU	-	34	-	25	17	-	1	1	-	-	-	3	-	-	-	-
	-	28	12	19	20	-	6	5	-	-	-	1	-	-	-	-
	-	12	4	7	8	1	3	3	-	-	-	-	-	-	-	2
	-	24	8	24	8	1	2	4	-	-	-	2	-	-	-	-
GOVMI	6	-	-	12	-	11	5	-	-	-	-	-	-	-	-	-
	8	-	-	15	-	16	4	-	-	-	-	10	-	-	-	-
IGAAN	1	1	4	9	-	2	10	-	-	-	-	-	1	-	1	3
	-	-	-	19	1	-	14	15	3	-	-	-	-	-	-	-
	3	-	-	5	-	-	4	1	-	-	-	-	-	-	-	-
JONKA	5	-	-	4	-	-	3	-	-	-	-	-	-	-	-	5
KACJA	3	-	-	21	-	43	17	-	-	-	-	-	-	-	-	-
	-	-	-	4	-	6	2	-	-	-	-	3	-	-	-	-
	1	-	-	30	-	44	30	-	-	-	-	-	-	-	-	-
	-	-	-	10	-	30	8	-	-	-	-	-	-	-	-	-
KISSZ	2	-	-	7	-	-	2	-	-	-	-	-	-	-	-	3
KOSDE	48	39	-	45	52	38	-	-	41	33	-	24	53	38	68	58
	-	-	3	-	-	7	-	-	-	4	8	9	-	-	-	8
LERAR	1	7	2	-	1	1	-	-	-	-	-	-	-	-	-	-
MACMA	11	4	1	-	2	-	1	5	4	-	-	1	4	-	-	-
	15	17	-	-	3	-	3	6	9	-	-	-	5	-	-	-
	8	7	-	-	4	-	-	3	3	-	-	-	2	-	-	-
MARGR	3	-	6	17	3	-	-	-	-	-	-	1	6	-	-	9
MOLSI	26	-	-	73	-	8	-	-	-	-	-	-	-	-	-	-
	7	-	-	12	1	4	-	-	-	-	-	5	-	-	-	1
	14	-	-	1	-	40	20	55	32	29	12	-	3	1	1	8
	17	-	-	4	-	31	16	34	28	28	4	-	1	1	-	12
	6	-	-	-	-	5	3	8	6	10	3	-	-	-	-	-
MORJO	9	2	-	7	-	-	8	-	-	-	-	-	-	-	-	1
OCAFR	-	3	11	2	3	4	3	-	3	1	-	-	-	3	-	2
OCHPA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	6	2	5	21	13	18	11	-	-	-	-	16	6	12	3	16
PERZS	-	4	6	39	-	38	17	-	-	-	-	10	-	-	-	-
PUCRC	3	-	-	26	-	14	8	1	-	-	6	6	-	-	-	-
ROTEC	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-
SARAN	-	12	4	8	8	-	1	3	-	-	-	1	-	-	-	-
	-	19	4	15	1	-	2	-	-	-	-	3	-	-	-	-
	-	14	2	7	3	-	1	9	-	-	-	-	-	-	-	-
SCALE	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SCHHA	-	2	10	5	-	10	-	-	-	6	14	6	-	-	1	12
SLAST	-	-	-	9	-	8	2	-	-	-	-	-	-	-	-	-
STOEN	2	-	20	25	-	40	17	-	-	-	-	2	-	-	-	-
	2	-	12	28	-	36	19	-	-	-	-	-	-	-	-	-
	4	-	15	31	-	36	17	-	-	-	-	-	-	-	-	-
STRJO	-	-	-	-	-	3	1	10	1	5	6	6	-	-	-	14
	4	-	-	-	-	2	-	9	10	5	10	5	-	-	-	3
	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-
	8	-	-	-	-	6	1	14	8	6	12	3	-	-	-	11
TEPIS	16	-	-	5	-	-	12	-	-	-	-	-	-	-	-	-
TRIMI	4	-	1	13	-	9	3	-	-	-	-	-	-	-	-	-
YRJIL	21	14	-	-	14	10	4	2	17	7	11	13	19	15	-	7
Sum	323	255	224	729	224	652	339	214	170	156	143	153	100	74	99	226