Results of the IMO Video Meteor Network – May 2013

Sirko Molau, Abenstalstr. 13b, 84072 Seysdorf *2013/07/25*

In this year, the weather feels no pity for the meteor observers: After we obtained much fewer observations in the first three months of this year compared to the first quarter of 2012, it seemed in April as if the weather would have returned to normal. But that turned out to be wrong, as in May it was catastrophic once more. Compared to 2012, the effective observing time reduced by more than a quarter to 4,500 hours, and the number of recorded meteors even by a third to about 9,300. Once more, we did not reach 10,000 meteors and we can only hope that similarly to February we still reach that target with a few late reports. Otherwise the series, which started in July 2010, would have ended now.
There were a few nights with up to fifty of the 69 active cameras in operation. In particular in the last decade of May, however, there are big gaps in the statistics. At least the distribution was relatively fair. Those 24 camera systems with twenty or more observing nights are scattered over all regions.

In May, the IMO network grew further east. Mikhail Maslow started observation with his camera NOWATEC (whereby NO does not stand for the opposite of yes but rather his home town) from Novosimbirsk in Russia. He operates a „standard setup“ with a Watec 902H2 camera and a 3.8 mm f/0.8 Computar lens. Of course, a single observer at this longitude cannot provide the same data quality as the dense camera network in central Europe, but the observations of Mikhail extend our data set (e.g. flux density profiles) significantly. Maybe Mikhail can even win further observers for our network in the years to come?

Highlight of May are the eta Aquariids. As always it is difficult to obtain an accurate activity profile of this shower, as most observations are obtained in central Europe, where there is only a small observing window of one or two hours combined with a low radiant altitude. Figure 1 presents the flux density profiles of the years 2011 to 2013, whereby each night is represented by a single data point. A higher temporal resolution is not sensible due to the short observing windows. There is good agreement in the ascending and descending branches, but this year the peak is by a factor of two to three higher than in the previous years. The absolute value depends significantly from the chosen zenith exponent γ due to the low radiant altitude. The peak flux density varies between almost 50 (γ=1.0) and almost 100 (γ=1.5).

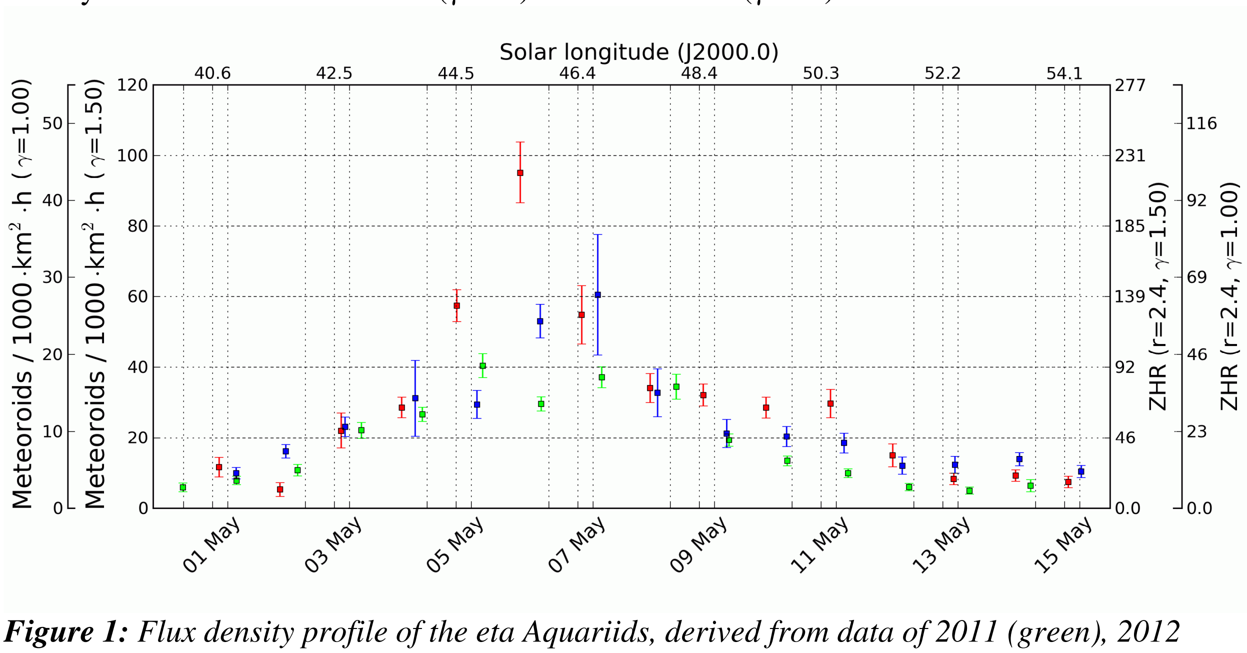

Figure 1: *Flux density profile of the eta Aquariids, derived from data of 2011 (green), 2012 (blue) and 2013 (red). Left and right of the graph are individual scales for zenith exponents of 1.0 and 1.5.*

Overall our data confirm the visual observing results: The IMO quick look analysis yielded a peak ZHR of 50 to 60 in 2011 and 60 to 70 in 2012. On May 6 of this year, however, a peak

ZHR of 135 was determined (at γ=1.0). The high activity comes as a surprise: In the past, some variations at a 12-years-scale were observed, but the next peak was only expected for 2014 to 2016 according to the IMO Meteor Shower Calendar. So it seems that the eta Aquariids are a bit early.

In the long-term analysis of spring 2012, the eta Aquariids (31 ETA) can be detected between April 29 and May 20. The IMO video meteor database contains a total of 3,800 shower members. The eta Aquariids have all the time a rank of one, which can be explained easily: If a shower can be detected at all with such a small observing window and low radiant altitude, it will be extremely upgraded by the observability function so that no other shower can compete. In fact, there are already radiants starting from April 24 and until June 3 at the expected position, but in these intervals the shower velocity deviates sometimes significantly, which is why they were omitted.
Table 1 lists our shower parameters for the eta Aquariids. They are in perfect agreement with the MDC list values.

Table 1: *Parameters of the eta Aquariids 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	46.9	-	338.8	+0.8	-0.4	+0.4	66.9	-
IMO 2012	47	38-59	339.1	+0.64	-0.5	+0.33	67.4	+0.1

The eta Lyrids reach maximum activity between May 10 and 11 with a peak flux density of 2 meteoroids per 1,000 km^2 and hour (Figure 2).

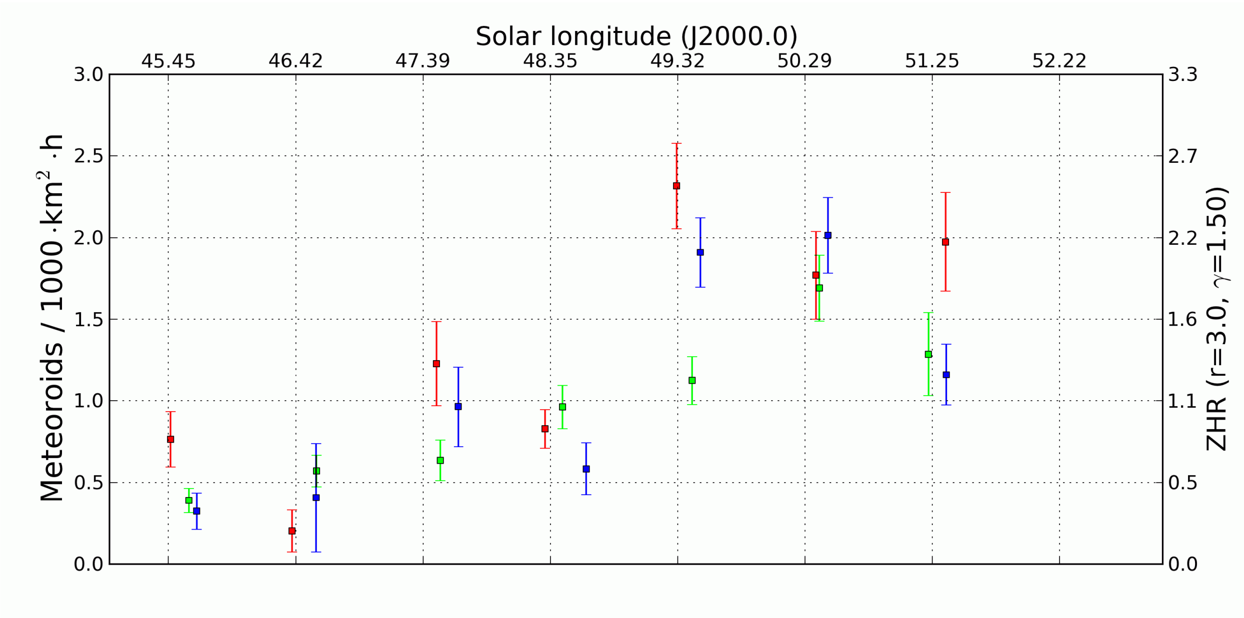

Figure 2: *Flux density profile of the eta Lyrids, derived from data of 2011 (green), 2012 (blue) and 2013 (red).*

In the long-term analysis, the eta Lyrids (145 ELY) can be found between May 7 and 13. There are an additional two intervals before and four thereafter with similar radiants, but these were not credited to the shower due to the larger scatter in parameters. Even without these, the eta Lyrid radiant shows quite some scatter even though it yields a rank of three in almost the full activity interval. The shower parameters which were obtained from about 800 meteors are summarized in table 2. In particular in declination there is a stronger deviation from the MDC list values.

Table 2: Parameters of the eta Lyrids 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	49.1	-	292.5	-	+39.7	-	46.7	-
IMO 2012	50	45-52	291.3	+0.15	+43.4	+0.0	44.0	-

The chi Capricornids (76 CCA) where discussed already in the monthly report of May 2012. Here we complete the list with two additional showers from May.

The southern May Ophiuchids (150 SOP) are an odd case. The shower can be detected safely between May 5 and June 6 with almost 1,600 shower meteors. Its rank is never larger than four, and even though it is the strongest source in the sky for an extended period of time, it is not possible to obtain sensible shower parameters. The day-to-day variation is reasonable, but there are times where the parameters are increasing and times where they are decreasing. The shower parameters can only be approximated by a set of four segments (figure 3).

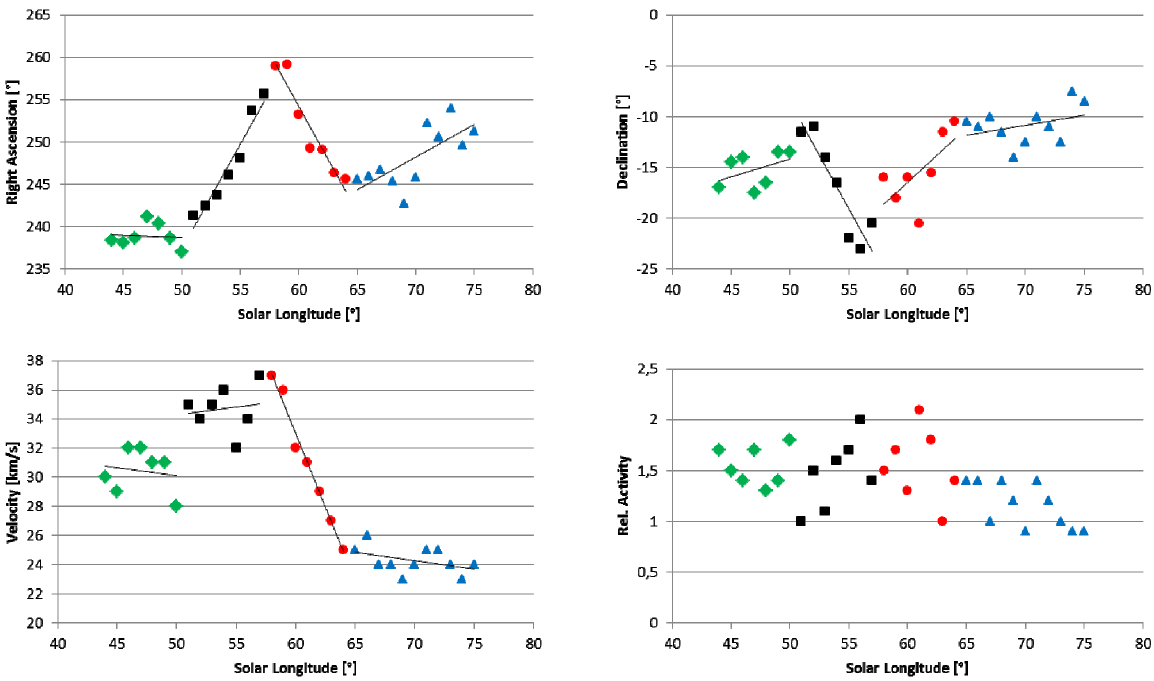

***Figure 3:** Shower parameters of the southern May Ophiuchids plotted over the solar longitude: Right ascension (up left), declination (up right), velocity (down left) and relative activity (down right).*

A quick check reveals that the radiant is located only few degrees north of the nominal Antihelion position. The Antihelion source is presumably dominated by different sub-radiants at times, or the activity center inside this diffuse source is drifting. The MDC list value in table 3 originate from the 1996 IMO visual handbook. Later the shower was subsumed together with other shower of the IMO working list as Antihelion source. Table 3 separately lists the mean parameters of the four individual segments.

Table 3: *Parameters of the southern May Ophiuchids 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	57	-	258	-	-24	-	30.0	-
IMO 2012	47	44-50	238.9	-0.1	-15.2	+0.4	30.4	-
	54	51-57	247.3	+2.5	-16.9	-2.1	34.7	-
	61	58-64	251.7	-2.5	-15.4	+1.1	31.0	-
	70	65-75	248.2	+0.8	-10.8	+0.2	24.3	-

Between May 29 and June 1, the Antihelion radiant can be recognized once more – this time as Northern omega Scorpiids (66 NSC). It is the richest source in the sky during that time, but we cannot confirm the MDC shower for sure, because our position and velocity deviate strongly from the MDC values. For this reason we do not further pursue this shower.

The June mu Cassiopeiids (362 JMC), however, are safely detected in our database between May 31 and June 5 with 150 meteors. The rank of this shower is only somewhere between ten and twenty, but the activity profile shows a clear peak on June 2 and the scatter of parameters is acceptable. Table 4 compares our parameters with the MDC list values. Taking the difference in solar longitude into account, there is an amazing good agreement for such a minor source.

Table 4: *Parameters of the June mu Cassiopeiids 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	74	-	17.5	+0.91	+53.9	+0.28	45.0	-
IMO 2012	71	69-74	11	+2.8	+53	+0.5	43	-

At this point we have completed the latest meteor shower analysis, which was started in spring 2012 and documented in the recent monthly reports. A consolidated list of the identified showers will be prepared for the next IMC.

1. Observers

Code	Name	Place	Camera	FOV [^{o2}]	St.LM [mag]	Eff.CA [km^2]	Nights	Time [h]	Meteors
ARLRA	Arlt	Ludwigsfelde/DE	LUDWIG1 (0.8/8)	1488	4.8	726	8	34.2	30
BASLU	Bastiaens	Hove/BE	URANIA1 (0.8/3.8)*	4545	2.5	237	1	0.2	1
BERER	Berkó	Ludanyhalaszi/HU	HULUD1 (0.8/3.8)	5542	4.8	3847	14	75.3	243
			HULUD2 (0.95/4)	3398	3.8	671	12	69.4	92
			HULUD3 (0.95/4)	4357	3.8	876	11	68.5	70
BIRSZ	Biro	Agostyan/HU	HUAGO (0.75/4.5)	2427	4.4	1036	17	80.2	92
BOMMA	Bombardini	Faenza/IT	MARIO (1.2/4.0)	5794	3.3	739	13	50.6	119
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	15	57.3	73
			MBB4 (0.8/8)	1470	5.1	1208	15	62.0	66
BRIBE	Brinkmann	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	19	64.8	115
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	16	65.4	96
CASFL	Castellani	Monte Baldo/IT	BMH2 (1.5/4.5)*	4243	3.0	371	13	64.1	101
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	23	99.2	259
			C3P8 (0.8/3.8)	5455	4.2	1586	23	84.1	153
			STG38 (0.8/3.8)	5614	4.4	2007	23	108.3	339
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	16	26.5	200
GANKA	Gansel	Dingden/DE	DARO01 (1.4/3.6)	7141	3.1	652	10	44.4	42
GONRU	Goncalves	Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	21	135.1	353
			TEMPLAR2 (0.8/6)	2080	5.0	1508	22	153.9	315
			TEMPLAR3 (0.8/8)	1438	4.3	571	28	158.3	228
			TEMPLAR4 (0.8/3.8)	4475	3.0	442	23	149.4	331
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	19	74.6	139
			ORION3 (0.95/5)	2665	4.9	2069	17	51.4	87
			ORION4 (0.95/5)	2662	4.3	1043	20	52.6	115
IGAAN	Igaz	Baja/HU	HUBAJ (0.8/3.8)	5552	2.8	403	15	41.9	66
		Budapest/HU	HUPOL (1.2/4)	3790	3.3	475	13	67.7	35
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	22	99.1	100
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	9	38.5	120
		Kostanjevec/SI	METKA (0.8/12)*	715	6.4	640	4	24.1	82
		Ljubljana/SI	ORION1 (0.8/8)	1402	3.8	331	8	39.6	24
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	9	46.1	197
			STEFKA (0.8/3.8)	5471	2.8	379	7	28.9	60
KERST	Kerr	Glenlee/AU	GOCAM1 (0.8/3.8)	5189	4.6	2550	5	9.4	62
KISSZ	Kiss	Sulysap/HU	HUSUL (0.95/5)*	4295	3.0	355	18	85.1	43
LERAR	Leroy	Gretz/FR	SAPHIRA (1.2/6)	3260	3.4	301	11	16.7	32
MACMA	Maciejewski	Chelm/PL	PAV35 (1.2/4)	4383	2.5	253	21	88.4	107
			PAV36 (1.2/4)*	5732	2.2	227	22	96.1	163
			PAV43 (0.95/3.75)*	2544	2.7	176	19	93.6	72
MARGR	Maravelias	Lofoupoli/GR	LOOMECON (0.8/12)	738	6.3	2698	22	102.3	163
MASMI	Maslov	Novosimbirsk/RU	NOWATEC (0.8/3.8)	5574	3.6	773	5	9.7	26
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1230	6.9	6152	7	31.6	231
			MINCAM1 (0.8/8)	1477	4.9	1084	19	71.1	144
		Ketzür/DE	REMO1 (0.8/8)	1467	5.9	2837	23	90.1	359
			REMO2 (0.8/8)	1478	6.3	4467	24	95.7	313
			REMO3 (0.8/8)	1420	5.6	1967	22	82.7	92
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	2522	3.5	532	23	91.2	90
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	2944	3.5	358	9	8.4	50
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	13	56.1	153
PERZS	Perkó	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	23	90.3	266
PUCRC	Pucer	Nova vas nad Dra./SI	MOBCAM1 (0.75/6)	2398	5.3	2976	21	72.1	158
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	8	30.3	35
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	20	133.3	194
			RO2 (0.75/6)	2381	3.8	459	22	147.0	225
			SOFIA (0.8/12)	738	5.3	907	20	124.9	147
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4152	4.5	2052	11	12.2	55
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	19	77.2	156
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	563	6.2	1294	6	11.1	25
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	16	63.3	318
			NOA38 (0.8/3.8)	5609	4.2	1911	22	71.7	223
			SCO38 (0.8/3.8)	5598	4.8	3306	21	82.8	290
STORO	Štork	Kunzak/CZ	KUN1 (1.4/50)*	1913	5.4	2778	1	6.1	55
		Ondrejov/CZ	OND1 (1.4/50)*	2195	5.8	4595	3	10.1	124
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2362	4.6	1152	12	48.0	54
			MINCAM3 (0.8/12)	728	5.7	975	13	42.2	53
			MINCAM4 (1.0/2.6)	9791	2.7	552	14	41.5	57
			MINCAM5 (0.8/6)	2349	5.0	1896	15	49.6	90
TEPIS	Tepliczky	Budapest/HU	HUMOB (0.8/6)	2388	4.8	1607	24	80.9	187
TRIMI	Triglav	Velenje/SI	SRAKA (0.8/6)*	2222	4.0	546	14	15.4	99
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2337	5.5	3574	10	23.3	41
Sum							31	4477.2	9295

* active field of view smaller than video frame

2. Observing Times (h)

May	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	-	6.5	-	-	-	-	3.7	-	5.6	-	5.3	-
BASLU	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-
BERER	7.4	-	7.2	7.4	1.8	-	-	7.0	6.5	6.0	3.0	-	-	-	6.6
	7.6	-	6.1	6.9	-	-	-	6.6	6.5	5.9	3.1	-	-	-	6.7
	7.6	-	5.9	7.4	-	-	-	7.1	6.7	5.7	-	-	-	-	6.7
BIRSZ	6.8	2.0	4.8	5.4	-	-	5.1	7.0	6.9	-	-	1.1	4.1	6.6	6.4
BOMMA	-	7.5	5.9	2.6	-	-	-	6.2	-	-	2.2	-	6.0	6.1	-
BREMA	3.3	3.0	6.7	6.7	-	-	-	1.6	3.0	4.1	-	2.0	2.2	-	3.0
	2.0	3.9	6.7	6.2	6.6	4.6	-	1.7	3.1	3.3	-	-	-	-	2.8
BRIBE	1.8	3.3	6.7	6.2	5.4	3.2	3.3	1.5	0.8	4.1	-	-	3.6	1.6	-
	2.3	5.5	6.8	6.7	6.7	6.6	5.6	1.9	3.3	-	-	-	-	3.5	1.6
CASFL	-	3.1	5.7	7.7	-	3.2	-	4.3	-	-	5.2	6.2	7.2	2.7	-
CRIST	6.9	7.5	7.7	7.6	-	7.5	2.9	5.7	-	3.0	2.8	7.2	7.2	3.6	-
	7.7	5.5	6.6	6.9	1.2	7.2	2.8	6.7	-	1.6	1.3	7.3	2.0	1.5	-
	7.1	6.8	7.7	7.6	-	7.5	3.7	5.4	-	2.6	3.4	7.2	7.2	3.8	-
ELTMA	-	-	0.4	1.4	-	0.8	2.1	1.9	1.1	-	2.2	1.6	2.5	2.0	-
GANKA	1.1	6.9	6.7	5.6	6.3	4.6	-	-	-	-	-	-	-	-	3.3
GONRU	8.0	5.8	7.3	8.4	4.9	-	-	-	8.1	8.0	6.5	7.9	7.9	-	7.8
	8.4	6.8	8.0	8.4	4.9	-	-	-	8.1	8.0	6.5	8.0	7.9	-	8.0
	8.5	3.9	7.5	8.4	3.0	0.8	-	0.7	8.0	8.0	6.1	7.9	7.5	-	7.5
	8.4	4.4	7.5	8.3	3.5	-	-	-	8.1	8.0	6.5	8.0	7.9	-	7.9
GOVMI	-	-	7.6	-	-	0.2	4.4	5.9	7.2	-	0.4	1.1	0.8	7.0	4.9
	0.2	-	6.6	-	0.2	0.2	2.3	1.5	6.7	-	-	0.2	-	6.8	0.7
	-	-	7.4	0.2	-	0.2	1.7	1.1	7.0	-	-	0.3	0.5	6.9	1.5
IGAAN	6.2	-	3.2	6.7	-	-	0.9	0.2	0.5	-	-	3.8	2.4	3.2	6.6
	7.2	1.4	7.0	6.4	-	-	-	-	6.8	-	-	-	5.8	4.6	6.5
JONKA	6.4	1.3	7.2	7.1	0.4	-	2.6	6.9	6.3	3.6	-	-	5.5	3.6	6.8
KACJA	-	-	5.5	-	-	-	-	3.6	4.9	-	-	-	3.8	6.9	2.5
	-	-	4.6	-	-	-	-	-	-	-	-	-	-	6.0	-
	-	-	5.7	-	-	-	-	6.4	-	-	-	-	6.3	7.0	2.3
	-	-	5.9	-	-	-	-	3.6	5.7	-	-	-	6.6	7.2	4.0
	-	-	5.8	-	-	-	-	-	-	-	-	-	3.0	7.0	2.5
KERST	-	-	-	0.7	7.7	-	-	-	0.2	-	-	0.3	-	-	-
KISSZ	7.4	-	7.5	7.5	-	-	-	6.4	7.2	5.4	2.5	-	-	-	6.9
LERAR	-	-	-	-	2.4	0.4	1.2	-	3.9	-	-	-	-	-	-
MACMA	1.4	-	-	4.8	6.2	3.3	5.6	6.7	5.1	5.1	5.9	1.2	3.2	-	0.6
	1.6	-	-	4.8	6.4	2.5	5.9	6.1	5.9	6.3	6.1	1.4	3.3	-	-
	1.8	-	-	4.7	7.1	5.8	4.9	6.8	6.2	6.0	6.2	1.1	-	-	-
MARGR	-	-	-	-	-	-	-	5.8	5.1	5.4	7.4	7.3	5.0	7.1	6.1
MASMI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLSI	-	-	-	-	6.5	-	-	6.3	-	-	-	3.6	-	5.6	4.3
	-	-	3.7	3.8	7.2	-	0.6	6.6	-	4.9	4.5	3.8	2.1	5.8	4.7
	4.9	-	6.6	6.6	6.5	1.6	2.4	6.1	-	6.0	5.5	5.9	1.0	5.8	3.4
	5.5	-	6.6	6.5	6.5	2.2	2.7	6.0	0.8	6.2	5.8	6.0	1.5	5.8	3.8
	4.6	-	6.6	6.6	6.5	1.9	1.9	5.7	0.7	6.0	5.8	6.0	1.3	5.9	2.4
MORJO	7.1	2.0	1.0	7.5	1.0	-	-	7.0	7.2	5.6	-	2.0	6.9	4.0	6.7
OCHPA	-	-	-	-	-	0.2	1.0	0.9	-	-	1.3	1.9	0.3	1.6	-
OTTMI	2.0	-	-	-	6.9	-	7.7	-	-	6.5	6.4	6.9	6.5	2.6	1.1
PERZS	2.9	2.6	7.6	-	0.5	0.5	5.9	7.0	7.3	0.7	-	-	3.8	7.1	5.9
PUCRC	-	-	5.4	6.4	-	1.0	1.7	7.5	6.9	-	-	-	4.9	7.1	0.3
ROTEC	-	-	-	-	-	-	-	-	-	-	-	5.8	-	5.3	5.2
SARAN	-	8.6	8.4	8.1	3.6	-	-	-	8.3	8.3	8.1	8.2	5.5	-	6.2
	-	8.4	8.3	8.3	4.1	-	-	-	8.1	8.1	7.0	8.0	6.4	-	6.4
	-	7.9	8.1	8.2	4.8	-	-	-	8.0	7.9	7.6	7.9	-	-	6.4
SCALE	-	-	-	-	-	-	1.3	0.9	0.5	-	0.5	-	1.2	0.8	-
SCHHA	0.8	3.7	6.3	6.9	6.7	4.1	5.3	1.2	4.0	6.2	-	-	3.8	2.3	0.3
SLAST	-	-	-	-	-	-	-	-	2.9	-	-	-	0.7	5.9	-
STOEN	-	-	0.8	4.8	-	-	4.4	7.6	1.6	-	6.9	3.8	7.4	5.2	-
	-	0.3	1.1	6.1	-	0.7	5.0	7.6	2.4	-	6.3	4.3	7.3	5.8	-
	-	0.6	1.3	6.3	-	0.8	5.5	7.6	3.7	-	7.4	4.0	7.4	5.7	-
STORO	-	-	-	-	-	-	-	6.1	-	-	-	-	-	-	-
	-	-	-	-	2.3	-	1.9	5.9	-	-	-	-	-	-	-
STRJO	-	-	6.2	5.6	5.9	5.9	1.3	-	-	-	-	-	3.3	4.0	2.0
	1.0	-	6.2	4.8	5.7	5.9	1.2	2.2	2.7	-	-	-	-	4.0	0.5
	0.9	-	6.2	5.5	5.9	5.9	1.4	2.0	2.0	1.3	-	-	-	3.5	0.9
	1.5	-	6.2	5.5	5.8	5.9	1.4	2.1	2.4	-	-	-	2.9	3.7	-
TEPIS	7.4	2.0	5.1	6.4	0.8	0.4	4.0	6.0	4.4	-	-	2.3	3.8	6.5	5.9
TRIMI	0.2	-	1.5	0.6	-	-	-	1.4	1.7	-	-	-	1.0	1.8	0.3
YRJIL	3.9	3.9	-	2.7	-	2.6	2.9	2.7	-	0.8	1.2	-	-	0.7	1.9
Sum	169.8	118.6	299.1	285.9	168.4	98.2	114.7	232.7	224.5	172.3	151.6	167.1	198.4	216.5	188.8

May	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ARLRA	-	-	-	2.7	5.3	-	-	2.8	-	-	-	2.3	-	-	-	-
BASLU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BERER	-	-	6.5	-	3.9	5.7	-	-	-	1.1	-	-	-	-	-	5.2
	-	-	6.6	-	3.8	5.6	-	-	-	-	-	-	-	-	-	4.0
	-	-	6.6	-	3.6	6.1	-	-	-	-	-	-	-	-	-	5.1
BIRSZ	-	1.8	6.4	1.3	6.0	-	-	-	-	-	-	2.6	5.9	-	-	-
BOMMA	2.8	-	0.9	-	-	5.8	-	1.4	-	-	-	-	1.5	1.7	-	-
BREMA	-	-	5.5	-	-	-	4.7	5.4	3.6	-	-	2.5	-	-	-	-
	-	-	5.5	-	-	-	4.1	5.3	-	-	-	3.2	3.0	-	-	-
BRIBE	-	-	5.5	0.5	2.0	-	-	4.3	5.1	-	-	2.8	3.1	-	-	-
	-	-	5.8	0.2	-	-	-	-	5.0	-	-	3.4	0.5	-	-	-
CASFL	-	6.3	-	3.7	5.1	-	-	-	-	3.7	-	-	-	-	-	-
CRIST	-	0.9	-	0.3	3.6	5.5	0.5	0.3	1.2	4.0	6.6	-	-	0.2	6.5	-
	-	-	-	0.2	0.2	5.0	1.4	0.5	-	4.0	5.0	-	-	0.2	6.5	2.8
	-	2.0	-	-	2.8	6.7	1.8	0.5	1.6	5.9	6.6	-	-	0.6	6.5	3.3
ELTMA	-	1.8	-	1.9	2.1	2.7	-	-	-	-	1.6	0.4	-	-	-	-
GANKA	-	-	5.8	-	-	-	-	-	2.4	-	-	-	1.7	-	-	-
GONRU	-	-	-	5.4	7.7	0.7	3.6	4.6	7.5	5.0	-	-	5.3	-	7.2	7.5
	-	6.4	-	7.8	7.7	4.7	4.3	7.6	7.5	4.8	-	-	5.4	-	7.2	7.5
	1.1	4.7	5.7	7.7	6.3	4.5	-	7.4	7.3	4.6	5.6	0.8	6.5	4.1	6.9	7.3
	-	4.9	-	7.8	6.6	3.8	4.4	7.7	7.6	4.8	3.2	-	5.4	-	7.2	7.5
GOVMI	2.8	1.4	6.7	6.1	3.3	6.4	2.2	-	0.2	-	-	-	6.0	-	-	-
	-	4.5	6.7	1.6	0.7	6.3	1.5	-	-	-	-	-	4.7	-	-	-
	1.0	4.1	4.8	4.5	2.6	2.3	0.9	-	-	-	-	0.4	5.0	-	0.2	-
IGAAN	-	-	3.3	0.7	2.4	-	1.0	-	-	-	-	-	0.8	-	-	-
	-	0.2	6.3	-	5.0	-	4.4	-	-	-	-	-	6.1	-	-	-
JONKA	-	-	6.7	0.8	5.9	3.7	4.5	-	1.6	-	5.4	1.2	6.3	-	-	5.3
KACJA	-	-	6.7	2.0	-	-	-	-	-	-	-	-	2.6	-	-	-
	-	-	7.0	-	-	6.5	-	-	-	-	-	-	-	-	-	-
	-	2.3	6.6	-	-	-	-	-	-	-	-	-	3.0	-	-	-
	-	-	7.0	2.8	-	-	-	-	-	-	-	-	3.3	-	-	-
	-	-	6.9	1.3	-	-	-	-	-	-	-	-	2.4	-	-	-
KERST	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
KISSZ	-	1.4	6.7	0.9	6.0	1.9	3.4	-	-	-	3.4	2.6	3.1	-	-	4.9
LERAR	-	0.3	-	-	-	-	-	1.5	-	0.3	1.6	0.3	1.0	-	-	3.8
MACMA	6.3	6.2	6.2	5.8	4.5	4.6	0.5	-	-	-	-	-	4.2	1.0	-	-
	6.3	6.2	6.1	5.7	5.4	5.5	0.5	-	-	1.4	1.4	-	4.6	2.7	-	-
	6.3	6.1	6.2	6.0	5.3	5.7	0.6	-	-	-	-	-	4.7	2.1	-	-
MARGR	3.9	0.9	-	4.7	2.7	5.1	-	0.8	2.0	5.7	7.0	5.7	2.6	3.7	7.0	1.3
MASMI	0.2	2.8	3.7	-	1.1	1.9	-	-	-	-	-	-	-	-	-	-
MOLSI	2.4	-	-	-	-	-	-	-	-	-	-	-	2.9	-	-	-
	1.4	-	3.1	6.4	2.0	-	-	-	0.9	1.4	-	4.8	3.4	-	-	-
	1.6	2.6	2.8	3.8	4.7	2.9	4.3	-	-	-	-	2.8	0.5	1.8	-	-
	2.5	2.6	3.5	3.9	4.7	2.9	3.8	1.9	-	-	-	2.7	-	1.3	-	-
	1.0	1.3	-	3.4	4.8	2.7	4.2	1.6	-	-	-	-	-	1.8	-	-
MORJO	2.1	3.1	6.7	0.6	5.9	-	2.5	0.3	-	1.3	5.4	-	2.2	-	-	3.1
OCHPA	-	0.8	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	0.5	1.5	1.6	-	-	-	-	-	-	-	-	-	-	5.9	-	-
PERZS	2.5	-	6.5	6.2	5.4	4.7	1.5	-	-	1.3	2.2	-	6.1	0.9	1.2	-
PUCRC	0.6	3.7	3.4	3.9	4.8	6.0	4.5	1.6	0.5	-	0.6	1.0	0.3	-	-	-
ROTEC	1.4	-	-	3.6	4.9	2.6	-	-	-	-	-	-	-	1.5	-	-
SARAN	-	2.9	4.7	-	5.6	4.4	-	7.3	7.1	5.2	-	-	7.7	-	7.7	7.4
	-	4.0	4.8	3.0	7.4	6.7	4.2	7.2	7.6	6.9	-	-	7.5	-	7.4	7.2
	-	4.0	5.6	1.5	6.0	6.0	-	5.7	3.1	5.0	-	-	7.3	-	7.2	6.7
SCALE	-	0.7	-	0.6	-	0.6	1.3	-	-	-	3.8	-	-	-	-	-
SCHHA	-	-	5.6	-	4.7	-	-	4.7	4.6	-	0.8	5.2	-	-	-	-
SLAST	-	0.6	0.7	-	-	-	-	-	-	-	-	0.3	-	-	-	-
STOEN	-	6.4	0.3	5.0	6.1	1.8	-	-	-	-	-	-	-	1.0	-	0.2
	-	3.8	0.3	5.8	6.0	1.7	1.1	-	1.0	0.5	1.6	1.6	-	1.4	-	-
	-	6.5	-	5.9	6.9	2.8	1.5	-	1.2	0.6	3.7	1.5	-	1.9	-	-
STORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STRJO	-	-	4.0	-	-	-	-	-	3.2	-	-	4.2	2.4	-	-	-
	-	-	3.8	2.8	-	-	-	-	-	-	-	1.4	-	-	-	-
	-	-	2.7	-	-	-	-	-	3.0	-	-	-	0.3	-	-	-
	-	-	4.0	2.8	-	-	-	0.4	2.7	-	-	2.3	-	-	-	-
TEPIS	0.6	2.7	6.1	0.8	3.2	3.1	0.9	-	-	-	1.7	-	5.8	0.8	-	0.2
TRIMI	-	1.1	1.4	1.1	-	1.5	-	-	-	-	-	0.5	1.3	-	-	-
YRJIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum	47.3	113.5	230.5	143.9	194.7	157.1	74.1	80.8	87.5	67.5	67.2	56.5	146.4	34.6	78.7	90.3

3. Results (Meteors)

May	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	-	9	-	-	-	-	2	-	4	-	4	-
BASLU	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
BERER	16	-	19	33	1	-	-	30	30	24	5	-	-	-	28
	8	-	6	15	-	-	-	12	10	9	2	-	-	-	13
	4	-	5	9	-	-	-	6	9	5	-	-	-	-	5
BIRSZ	5	3	3	3	-	-	6	4	7	-	-	1	3	6	6
BOMMA	-	9	16	15	-	-	-	10	-	-	1	-	12	23	-
BREMA	2	3	8	11	-	-	-	1	5	9	-	1	1	-	3
	2	5	9	5	8	6	-	3	6	2	-	-	-	-	2
BRIBE	3	7	7	9	20	10	10	1	4	6	-	-	4	3	-
	4	4	6	13	12	14	9	1	3	-	-	-	-	5	3
CASFL	-	6	12	8	-	6	-	8	-	-	8	8	8	4	-
CRIST	8	10	17	21	-	33	15	18	-	13	3	23	21	3	-
	5	3	5	14	15	16	13	17	-	5	2	15	1	1	-
	14	14	18	27	-	34	19	25	-	9	8	29	27	7	-
ELTMA	-	-	4	12	-	6	15	15	7	-	19	11	18	18	-
GANKA	1	2	4	5	12	7	-	-	-	-	-	-	-	-	3
GONRU	29	22	19	21	14	-	-	-	20	29	9	17	25	-	14
	15	9	22	26	18	-	-	-	27	20	6	13	14	-	12
	12	7	13	17	8	1	-	1	22	19	6	5	9	-	8
	14	11	28	29	15	-	-	-	21	27	7	19	12	-	12
GOVMI	-	-	8	-	-	1	6	9	20	-	1	2	4	15	1
	1	-	5	-	1	1	6	3	14	-	-	1	-	11	1
	-	-	8	1	-	1	6	2	15	-	-	1	1	11	3
IGAAN	5	-	6	13	-	-	2	1	1	-	-	1	7	4	9
	2	1	3	5	-	-	-	-	4	-	-	-	2	1	3
JONKA	5	2	5	13	1	-	2	6	7	2	-	-	3	3	16
KACJA	-	-	14	-	-	-	-	20	19	-	-	-	10	24	2
	-	-	17	-	-	-	-	-	-	-	-	-	-	19	-
	-	-	2	-	-	-	-	6	-	-	-	-	2	5	2
	-	-	28	-	-	-	-	30	23	-	-	-	23	38	4
	-	-	10	-	-	-	-	-	-	-	-	-	10	20	2
KERST	-	-	-	4	49	-	-	-	1	-	-	2	-	-	-
KISSZ	1	-	4	9	-	-	-	3	5	2	2	-	-	-	2
LERAR	-	-	-	-	8	1	5	-	4	-	-	-	-	-	-
MACMA	1	-	-	13	12	8	10	7	1	8	2	2	1	-	1
	1	-	-	12	15	4	6	14	7	14	11	1	1	-	-
	1	-	-	6	12	8	1	4	3	4	4	1	-	-	-
MARGR	-	-	-	-	-	-	-	11	4	7	20	13	8	9	15
MASMI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLSI	-	-	-	-	66	-	-	37	-	-	-	22	-	47	36
	-	-	8	1	20	-	2	12	-	7	12	7	6	13	6
	23	-	32	26	43	2	7	14	-	19	34	18	2	26	11
	14	-	27	23	29	1	8	16	1	25	22	17	4	22	12
	4	-	6	8	8	2	1	5	3	6	7	4	2	7	3
MORJO	4	1	5	10	2	-	-	5	9	5	-	2	1	2	9
OCHPA	-	-	-	-	-	1	5	6	-	-	8	12	2	9	-
OTTMI	14	-	-	-	22	-	16	-	-	8	16	17	15	10	9
PERZS	1	1	16	-	3	1	20	34	32	1	-	-	4	26	10
PUCRC	-	-	7	6	-	5	6	25	19	-	-	-	19	15	1
ROTEC	-	-	-	-	-	-	-	-	-	-	-	8	-	7	4
SARAN	-	10	13	16	7	-	-	-	13	20	12	5	5	-	7
	-	11	17	22	13	-	-	-	18	18	14	14	4	-	10
	-	14	21	10	9	-	-	-	15	13	10	4	-	-	5
SCALE	-	-	-	-	-	-	9	6	3	-	4	-	8	5	-
SCHHA	2	2	8	22	25	10	6	2	13	19	-	-	3	4	2
SLAST	-	-	-	-	-	-	-	-	6	-	-	-	5	6	-
STOEN	-	-	3	17	-	-	24	27	6	-	42	23	41	21	-
	-	1	3	15	-	4	21	24	4	-	24	26	16	16	-
	-	2	6	12	-	5	34	25	5	-	28	25	22	13	-
STORO	-	-	-	-	-	-	-	55	-	-	-	-	-	-	-
	-	-	-	-	36	-	11	77	-	-	-	-	-	-	-
STRJO	-	-	6	5	14	11	2	-	-	-	-	-	2	5	1
	1	-	5	7	5	7	6	5	1	-	-	-	-	4	1
	1	-	8	8	7	10	4	5	1	1	-	-	-	2	1
	1	-	8	8	15	16	5	6	3	-	-	-	3	10	-
TEPIS	8	4	11	11	5	2	4	18	16	-	-	2	3	14	16
TRIMI	1	-	11	3	-	-	-	9	10	-	-	-	6	11	2
YRJIL	7	7	-	5	-	5	2	5	-	1	6	-	-	1	2
Sum	240	171	552	604	559	239	325	686	477	359	355	376	400	530	318

May	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ARLRA	-	-	-	3	6	-	-	1	-	-	-	1	-	-	-	-
BASLU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BERER	-	-	21	-	5	11	-	-	-	1	-	-	-	-	-	19
	-	-	11	-	2	2	-	-	-	-	-	-	-	-	-	2
	-	-	10	-	6	4	-	-	-	-	-	-	-	-	-	7
BIRSZ	-	4	17	1	11	-	-	-	-	-	-	2	10	-	-	-
BOMMA	5	-	1	-	-	12	-	6	-	-	-	-	5	4	-	-
BREMA	-	-	4	-	-	-	10	6	2	-	-	7	-	-	-	-
	-	-	4	-	-	-	3	5	-	-	-	3	3	-	-	-
BRIBE	-	-	9	1	1	-	-	7	7	-	-	2	4	-	-	-
	-	-	11	1	-	-	-	-	6	-	-	3	1	-	-	-
CASFL	-	15	-	7	4	-	-	-	-	7	-	-	-	-	-	-
CRIST	-	2	-	1	8	20	2	2	1	6	11	-	-	1	20	-
	-	-	-	1	1	8	1	2	-	6	3	-	-	1	12	6
	-	6	-	-	3	22	4	2	1	11	20	-	-	1	31	7
ELTMA	-	14	-	15	12	21	-	-	-	-	10	3	-	-	-	-
GANKA	-	-	6	-	-	-	-	-	1	-	-	-	1	-	-	-
GONRU	-	-	-	27	14	3	7	5	19	14	-	-	14	-	12	19
	-	16	-	7	13	10	4	14	7	10	-	-	15	-	14	23
	1	8	5	18	4	5	-	8	5	5	6	1	8	2	9	15
	-	9	-	14	6	14	7	14	9	8	8	-	15	-	19	13
GOVMI	4	4	13	20	5	12	4	-	1	-	-	-	9	-	-	-
	-	6	13	3	2	10	2	-	-	-	-	-	7	-	-	-
	2	8	8	8	10	13	3	-	-	-	-	2	11	-	1	-
IGAAN	-	-	8	3	3	-	1	-	-	-	-	-	2	-	-	-
	-	1	2	-	6	-	1	-	-	-	-	-	4	-	-	-
JONKA	-	-	11	1	4	2	1	-	1	-	3	1	3	-	-	8
KACJA	-	-	18	3	-	-	-	-	-	-	-	-	10	-	-	-
	-	-	21	-	-	25	-	-	-	-	-	-	-	-	-	-
	-	1	4	-	-	-	-	-	-	-	-	-	2	-	-	-
	-	-	34	5	-	-	-	-	-	-	-	-	12	-	-	-
	-	-	14	1	-	-	-	-	-	-	-	-	3	-	-	-
KERST	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-
KISSZ	-	1	5	1	2	1	1	-	-	-	1	1	1	-	-	1
LERAR	-	1	-	-	-	-	-	2	-	1	3	1	3	-	-	3
MACMA	2	7	7	10	3	2	1	-	-	-	-	-	8	1	-	-
	12	16	8	9	11	9	2	-	-	1	1	-	7	1	-	-
	2	3	2	3	5	6	1	-	-	-	-	-	5	1	-	-
MARGR	4	1	-	2	4	8	-	1	1	10	15	10	3	3	8	6
MASMI	1	10	9	-	3	3	-	-	-	-	-	-	-	-	-	-
MOLSI	5	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-
	2	-	2	19	3	-	-	-	1	2	-	12	9	-	-	-
	1	6	4	8	39	8	22	-	-	-	-	8	1	5	-	-
	3	3	5	16	28	8	18	1	-	-	-	5	-	5	-	-
	1	3	-	3	9	3	5	1	-	-	-	-	-	1	-	-
MORJO	5	2	10	1	4	-	2	1	-	1	3	-	2	-	-	4
OCHPA	-	5	-	2	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	4	8	10	-	-	-	-	-	-	-	-	-	-	4	-	-
PERZS	6	-	27	21	16	12	2	-	-	1	4	-	23	4	1	-
PUCRC	2	14	3	5	5	8	8	2	2	-	2	3	1	-	-	-
ROTEC	1	-	-	2	9	3	-	-	-	-	-	-	-	1	-	-
SARAN	-	5	7	-	9	12	-	13	11	5	-	-	8	-	9	7
	-	6	3	5	10	7	6	11	10	4	-	-	6	-	9	7
	-	3	8	2	1	2	-	3	2	2	-	-	8	-	7	8
SCALE	-	5	-	4	-	3	1	-	-	-	7	-	-	-	-	-
SCHHA	-	-	13	-	4	-	-	8	8	-	1	4	-	-	-	-
SLAST	-	3	3	-	-	-	-	-	-	-	-	2	-	-	-	-
STOEN	-	35	2	36	28	6	-	-	-	-	-	-	-	6	-	1
	-	10	1	29	8	3	6	-	1	3	4	1	-	3	-	-
	-	35	-	24	16	10	5	-	3	2	10	1	-	7	-	-
STORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STRJO	-	-	3	-	-	-	-	-	1	-	-	3	1	-	-	-
	-	-	6	4	-	-	-	-	-	-	-	1	-	-	-	-
	-	-	5	-	-	-	-	-	3	-	-	-	1	-	-	-
	-	-	7	2	-	-	-	2	2	-	-	2	-	-	-	-
TEPIS	2	4	12	3	12	16	5	-	-	-	2	-	15	1	-	1
TRIMI	-	8	8	7	-	11	-	-	-	-	-	4	8	-	-	-
YRJIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum	65	288	421	358	355	335	135	117	105	100	114	83	267	52	152	157