Results of the IMO Video Meteor Network – November 2012

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The first half November was quite acceptable regarding the observing conditions. On November 5, for example, 57 out of the 71 cameras were in operation. In the second half of November, the weather became catastrophic though, and it left big holes in our observing statistics. The absolute lowlights were November 23 and 24: 21 hours of effective observing time with 65 meteors in a single night – fewer data have last been collected in March 2011. So it is no surprise, that there were no more than 18 cameras that collected twenty and more observing nights. In fact, without the Australian GOCAM1 there was no camera at all with 25 or more observing nights.
Overall, the effective observing time reduced from 8,800 hours in the previous to 6,600 hours in this year. Also the number of meteors dropped from almost 36,000 in 2011 to 27,000 in 2012. So we better put this month immediately on file.

After the big times for the Leonids are history and "normality" has returned, there is not really an attractive meteor shower in November. Figure 1 shows the flux density profile of the Leonids between November 10 and 22 (red squares). For comparison, the 2011 data are given as well (blue diamonds). Both profiles fit well to one another, only the peak at 236.5° solar longitude was not visible this year. Instead, there was a plateau of enhanced activity between 236 and 238.5° solar longitude.

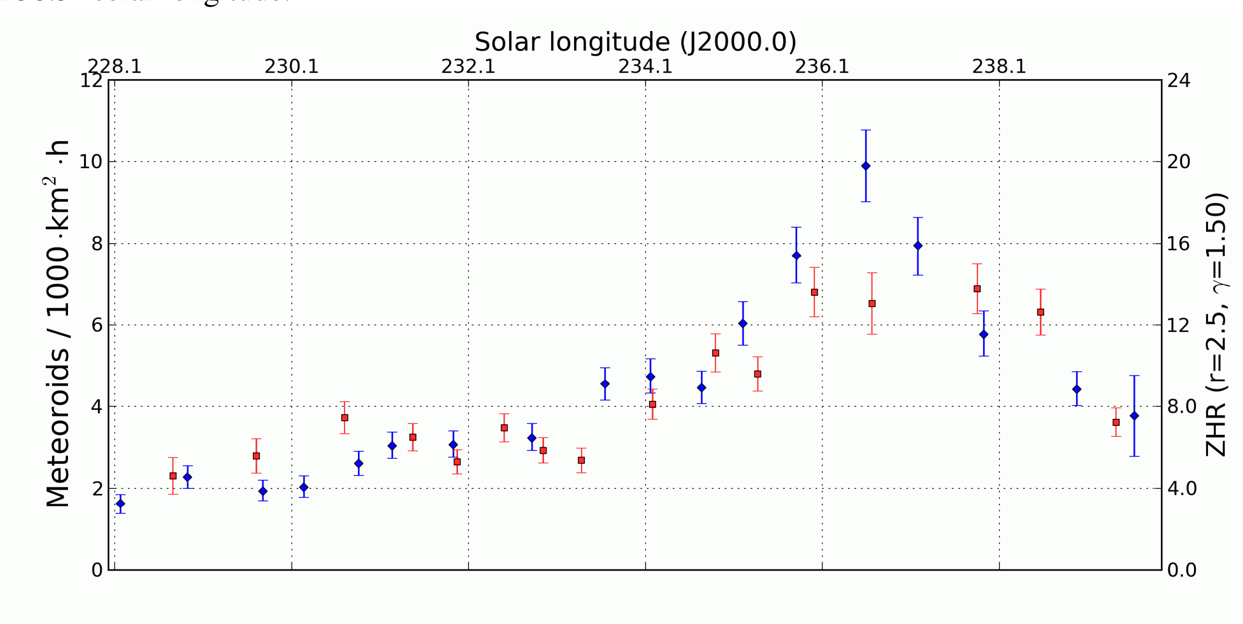

***Figure 1:** Flux density profile of the Leonids from data of the IMO network in 2011 (blue diamonds) and 2012 (red squares).*

In the 2012 meteor shower analysis, the Leonids (13 LEO) were detected between November 6 and 30. The radiants may be traceable a few days earlier and later, but at this time the parameters deviate more strongly from the average. In the given interval between 223 and 248° solar longitude, however, the scatter is low. As the Leonids are one of the most studied meteor showers of the last decade it's no surprise that there is excellent agreement between the MDC data and our meteor shower parameters derived from over 15,000 Leonids.

__Table 1:__ Parameters of the Leonids 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	235	-	153.5	+0.7	+22.1	-0.3	71.5	-
IMO 2012	236	223-248	154.3	+0.63	+21.5	-0.40	70.6	0

It has been quiet about the alpha Monocerotids (246 AMO) after their outburst in 1995 – and there are good reasons, because the shower is practically unnoticeable away from the outburst years. Also the 2012 flux density profile shows just a constant level little below one meteoroid per 1,000 km^2 and hour. Our 2012 meteor shower analysis shows between 240 and 245° solar longitude a handful of radiants with some similarity to the alpha Monocerotids, but there is big scatter in the radiant positions and an almost 10° displacement from the MDC position. Hence, this shower cannot be detected safely in our data.

There have been already some comments on the Taurid activity in our last report. Here we want to compare the flux density profile of both shower branches between September 25 and November 25.
Both in 2011 and 2012, the northern Taurids show low activity until the end of October, followed by enhanced rates until mid-November. There is good agreement between 2011 and 2012, only the activity rose about one week earlier in 2012. As will be described below, the northern Taurids cannot be safely detected before the last decade of October in our long-term analysis as well.

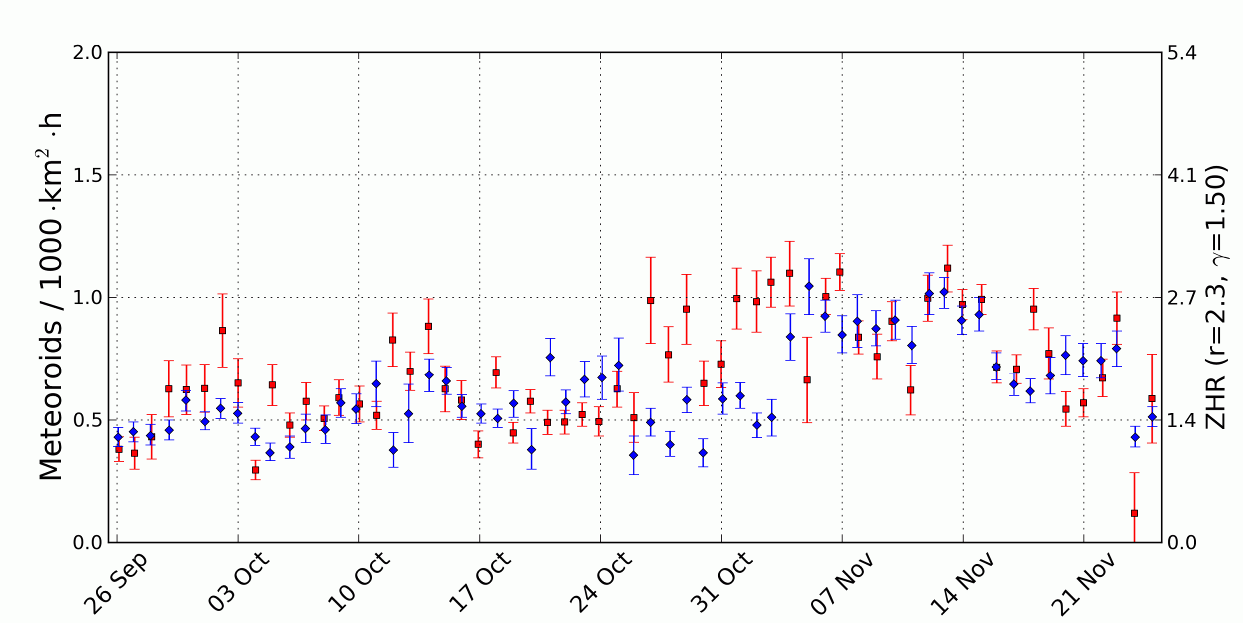

***Figure 2:** Flux density profile of the northern Taurids from data of the IMO network in 2011 (blue diamonds) and 2012 (red squares).*

There are much stronger deviations between the southern Taurid activity profiles of 2011 and 2012. In both years, the flux density raises first around October 10. Whereas activity in 2011 remained high until the Orionids and declined thereafter, we observed the decrease in this year already at October 17, only to raise once more at the end of October. Highest rates were measured on November 5 – at this time there was only a single outlier in the 2011 flux density profile.

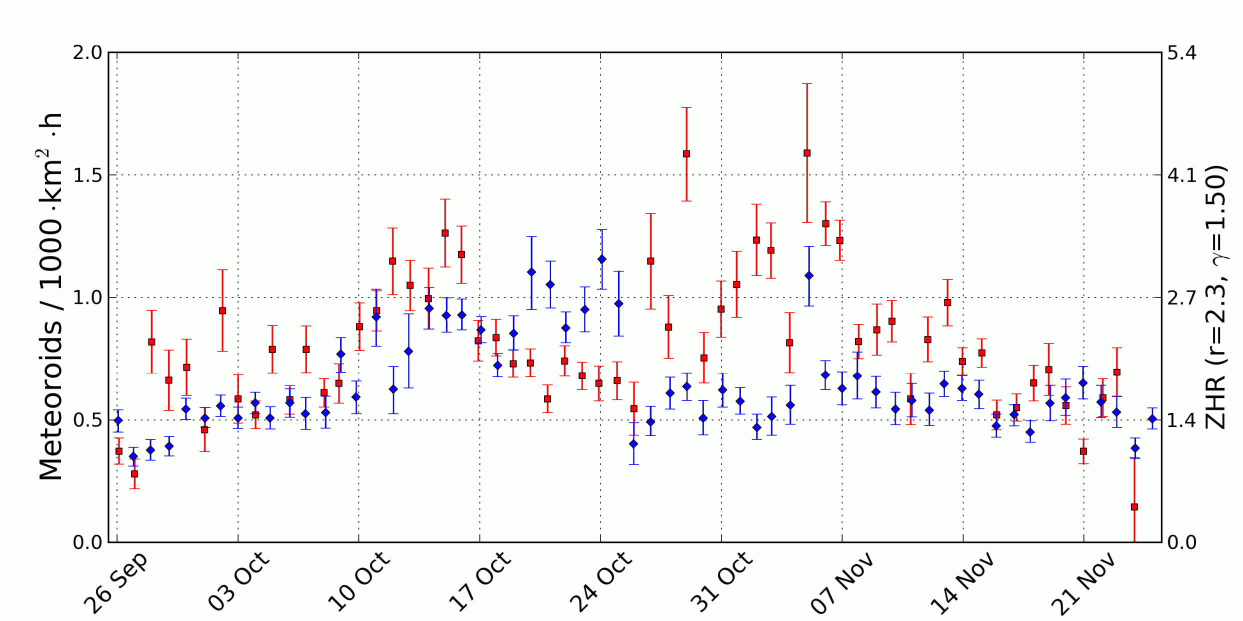

Figure 2: *Flux density profile of the southern Taurids from data of the IMO network in 2011 (blue diamonds) and 2012 (red squares).*

The Taurids become in particular interesting when looking at the 2012 meteor shower analysis. The northern Taurids (17 NTA) are detected between October 30 and December 5. Inspecting the preceding solar longitude intervals in more detail we find, that the radiant can also be detected a little earlier, but is then assigned to the sigma Arietids discussed last month. There seems to be a more or less smooth transition between the two showers, but at least the last few radiant positions of the shower declared as sigma Arietids clearly belong to the northern Taurids. So we can trace this shower between October 26 and December 5. The shower parameters, which were derived from almost 11,000 shower meteors, are summarized in table 2.

Table 2: *Parameters of the northern Taurids 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	224	-	56.8	+0.8	+21.2	+0.2	30.4	-
IMO 2012	229	212-252	58.4	+0.82	+22.4	+0.15	29.3	-0.10

Even more confusing is the case of the southern Taurids (2 STA), because they are not found at all in our 2012 meteor shower analysis! A more detailed inspection reveals, that the southern Taurids are indeed present with more than 20,000 shower members between September 22 and November 28, but they were declared by the software as southern October delta Arietids (28 SOA). We described this shower already in our September report, which is why we abstain from another detailed discussion this time. Table 3 listed once more the average shower parameters for the full activity interval. In addition, the shower is split into three segments to better describe the variable rate of change of certain parameters. The first segments ends at the primary peak at 201°, the second segment ends at a minor secondary peak at 227°, and the third segment lasts until the end of the activity interval at 246° solar longitude. For comparison, table 3 lists additionally the MDC values for the southern October delta Arietids and the southern Taurids.

Table 3: *Parameters of the southern October delta Arietids and the southern Taurids from the MDC Working List. They are compared with radiant parameters from the analysis of the IMO network data in 2012. Given are the mean parameters over the full activity interval, and the values for three individual segments.*

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC/SOA	199	-	33.1	-	+10.6	-	27.9	-
MDC/STA	224	-	54.2	+0.7	+14.2	+0.2	30.1	-
IMO 2012	**201**	**179-246**	**35.7**	**+0.74**	**+8.8**	**+0.18**	**29.1**	**-0.09**
	190	179-201	28.8	+0.84	+6.3	+0.33	29.7	-0.05
	215	202-227	47.0	+0.77	+12.3	+0.17	28.6	-0.08
	237	228-246	61.8	+0.55	+14.5	+0.01	25.4	-0.23

Now it becomes clear why the meteors were assigned to the wrong shower: Extrapolating the radiant position of the Taurids backwards by 25° solar longitude yields almost exactly the radiant position of the Arietids. The deviation in velocity between both showers is in the range of the error bars resp. the scatter from a diffuse ecliptical shower.
Hence, the southern October delta Arietids are in fact only an early segment of the southern Taurids (figure 4). When checking carefully the MDC entry for the Arietids we find indeed a comment: „part of STA"

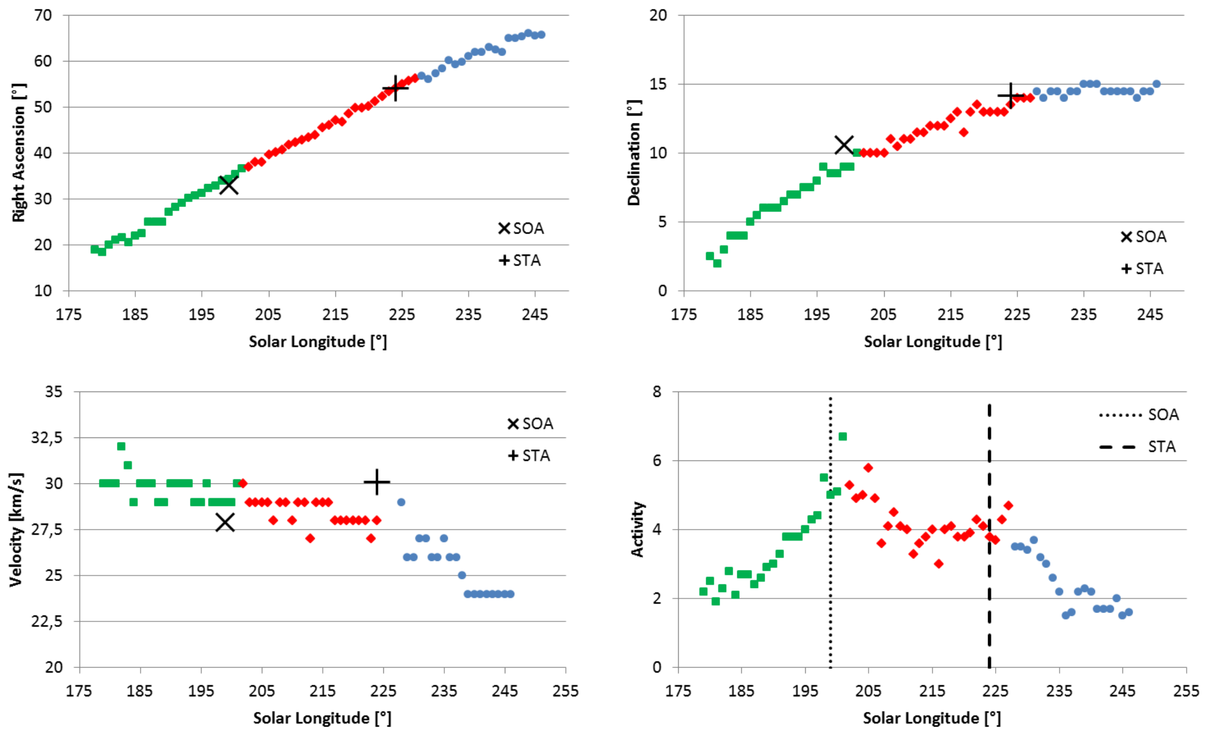

Figure 4: *Shower parameters of the southern Taurids in the activity interval from 179 to 246° solar longitude: Right ascension (up left), declination (up right), velocity (down left) and activity (down right). The three segments of activity are marked with different colors. The MDC list values for the southern October delta Arietids and the southern Taurids are shown as well.*

Beyond these, our 2012 meteor shower analysis confirmed three further showers in November. Unknown meteor showers were not detected, though.

Close to the limit is the detection of the November iota Draconids (392 NID). This shower is recognized with more than 1,800 shower members from November 12 till the end of the month. It shows significant scatter in all parameters. Towards the end of November, however, it reaches a rank of four to five, which hints on a relatively strong source. The agreement with the MDC list data is only mediocre (table 4).

Table 4: *Parameters of the November iota Draconids 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	241	-	200.0	-	+64.5	-	44.4	-
IMO 2012	239	229-249	189.6	+0.8	+69.3	-0.5	42.9	-

Much better is the situation with the November Orionids (250 NOO). In our analysis, this shower exhibits only little scatter – and a massive jump in declination at 254° solar longitude. A detailed analysis reveals that there are once more two consecutive, very similar showers whose activity intervals overlap by only two degrees in solar longitude. Looking at the right ascension or velocity, you get a flat progression without any discontinuity. In declination, however, there is this sudden jump by seven degrees at the given solar longitude, and also the activity profile shows two well-separated peaks.

The first shower lasts from November 14 till December 7. Highest activity is reached at November 28. In the last few days of November, this shower is the strongest source in the sky. The shower parameters, which were derived from about 3,500 shower members, are given in table 5. They are in excellent agreement with the MDC values for the November Orionids.

Table 5: *Parameters of the November Orionids 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	245	-	90.6	+1.0	+15.7	0.0	45.1	-
IMO 2012	246	231-255	90.6	+0.75	+15.5	-0.04	45.1	-0.19

The second, slightly weaker shower, lasts from December 6 till December 21 with peak activity at December 9 and a maximum rank of four to five. The parameters for this shower (table 6) were obtained from well above 2,000 shower meteors. They fit perfectly to the December Monocerotids (19 MON) as can be seen from a comparison with the MDC data.

Table 6: *Parameters of the December Monocerotids 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	261	-	102.4	+0.8	+8.1	-0.1	43.5	-
IMO 2012	257	254-269	100.1	+0.64	+8.3	-0.13	42.0	-0.15

Last but not least, also the activity interval of the sigma Hydrids (16 HYD) starts in November. We can detect them between November 25 and December 21 with more than 5,000 members in our database. In early December, the sigma Hydrids are the strongest source in the sky. The

shower has a prominent activity profile with a main peak at December 6 and a secondary peak of roughly half the activity on December 16. Interestingly, the values given in the MDC list refer to the solar longitude of the secondary peak.
The radiant position shows almost no scatter, but there is some deviation in the meteor shower velocity. Still there is good agreement with the MDC list values if the difference in solar longitude is taken into account (table 7).

Table 7: *Parameters of the sigma Hydrids 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	265	-	131.9	+0.72	+0.2	-0.21	59.1	-
IMO 2012	254	242-269	124.0	+0.81	+2.7	-0.19	61.7	-0.06

Beside these shower, we find also some traces of other showers like the chi Taurids (388 CTA), omicron Eridanids (338 OER) and November nu Arietids (249 NAR). In all cases, the quality of the shower parameters is too low to declare a safe detection based on our current database.

1. Observers

Code	Name	Place	Camera	FOV [^{o}^{2}]	St.LM [mag]	Eff.CA [km^2]	Nights	Time [h]	Meteors
ARLRA	Arlt	Ludwigsfelde/DE	LUDWIG1 (0.8/8)	1488	4.8	726	4	26.3	39
BERER	Berko	Ludanyhalaszi/HU	HULUD1 (0.95/3)	2256	4.8	1540	16	91.8	890
			HULUD2 (0.75/6)	4860	3.9	1103	14	93.9	274
			HULUD3 (0.75/6)	4661	3.9	1052	13	90.1	238
BIRSZ	Biro	Agostyan/HU	HUAGO (0.75/4.5)	2427	4.4	1036	20	134.1	405
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	21	118.0	356
			MBB4 (0.8/8)	1470	5.1	1208	20	124.8	349
BRIBE	Brinkmann	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	21	131.4	396
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	20	99.9	350
CASFL	Castellani	Monte Baldo/IT	BMH2 (1.5/4.5)*	4243	3.0	371	19	124.4	504
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	16	132.8	582
			C3P8 (0.8/3.8)	5455	4.2	1586	19	147.4	567
			STG38 (0.8/3.8)	5614	4.4	2007	7	28.5	106
CSISZ	Csizmadia	Zalaegerszeg/HU	HUVCSE01 (0.95/5)	2423	3.4	361	14	72.5	186
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	16	145.8	726
GONRU	Goncalves	Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	19	160.9	658
			TEMPLAR2 (0.8/6)	2080	5.0	1508	19	176.7	710
			TEMPLAR3 (0.8/8)	1438	4.3	571	20	170.0	625
			TEMPLAR4 (0.8/3.8)	4475	3.0	442	20	162.7	577
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	19	95.0	330
			ORION3 (0.95/5)	2665	4.9	2069	15	55.0	179
			ORION4 (0.95/5)	2662	4.3	1043	15	73.8	152
HINWO	Hinz	Brannenburg/DE	ACR (2.0/35)*	557	7.4	4954	12	53.8	527
IGAAN	Igaz	Baja/HU	HUBAJ (0.8/3.8)	5552	2.8	403	23	93.4	180
		Debrecen/HU	HUDEB (0.8/3.8)	5522	3.2	620	23	132.1	529
		Hodmezovasar./HU	HUHOD (0.8/3.8)	5502	3.4	764	23	126.6	337
		Budapest/HU	HUPOL (1.2/4)	3790	3.3	475	9	38.5	43
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	20	96.4	252
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	1	9.7	21
		Kostanjevec/SI	METKA (0.8/12)*	715	6.4	640	1	4.2	9
		Ljubljana/SI	ORION1 (0.8/8)	1402	3.8	331	9	30.5	22
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	7	47.5	395
			STEFKA (0.8/3.8)	5471	2.8	379	2	8.1	27
KERST	Kerr	Glenlee/AU	GOCAM1 (0.8/3.8)	5189	4.6	2550	28	147.6	850
KISSZ	Kiss	Sulysap/HU	HUSUL (0.95/5)*	4295	3.0	355	22	73.1	117
KOSDE	Koschny	Izana Obs./ES	ICC7 (0.85/25)*	714	5.9	1464	9	78.9	768
		Noordwijkerhout/NL	LIC4 (1.4/50)*	2027	6.0	4509	10	62.0	167
LERAR	Leroy	Gretz/FR	SAPHIRA (1.2/6)	3260	3.4	301	9	41.3	40
MACMA	Maciejewski	Chelm/PL	PAV35 (1.2/4)	4383	2.5	253	16	64.2	124
			PAV36 (1.2/4)*	5732	2.2	227	19	72.2	217
			PAV43 (0.95/3.75)*	2544	2.7	176	16	72.2	114
MARGR	Maravelias	Lofoupoli/GR	LOOMECON (0.8/12)	738	6.3	2698	18	93.3	305
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1230	6.9	6152	3	12.3	204
			MINCAM1 (0.8/8)	1477	4.9	1084	14	60.9	139
		Ketzür/DE	REMO1 (0.8/8)	1467	5.9	2837	17	118.5	1098
			REMO2 (0.8/8)	1478	6.3	4467	17	128.6	977
			REMO3 (0.8/8)	1420	5.6	1967	18	122.5	294
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	2522	3.5	532	19	107.1	220
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	2944	3.5	358	12	27.5	168
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	24	97.2	482
PERZS	Perko	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	13	54.7	340
PUCRC	Pucer	Nova vas nad Dra./SI	MOBCAM1 (0.75/6)	2398	5.3	2976	19	146.3	687
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	10	75.5	209
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	23	171.9	483
			RO2 (0.75/6)	2381	3.8	459	21	182.2	595
			SOFIA (0.8/12)	738	5.3	907	22	167.2	407
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4152	4.5	2052	17	114.3	365
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	19	113.0	417
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	18	146.2	1110
			NOA38 (0.8/3.8)	5609	4.2	1911	19	157.7	863
			SCO38 (0.8/3.8)	5598	4.8	3306	20	152.5	1117
STORO	Stork	Kunzak/CZ	KUN1 (1.4/50)*	1913	5.4	2778	2	15.4	189
		Ondrejov/CZ	OND1 (1.4/50)*	2195	5.8	4595	2	24.5	637
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2362	4.6	1152	17	102.7	229
			MINCAM3 (0.8/12)	728	5.7	975	17	113.9	287
			MINCAM4 (1.0/2.6)	9791	2.7	552	13	58.2	79
			MINCAM5 (0.8/6)	2349	5.0	1896	19	108.8	345
TEPIS	Tepliczky	Budapest/HU	HUMOB (0.8/6)	2388	4.8	1607	18	133.3	521
TRIMI	Triglav	Velenje/SI	SRAKA (0.8/6)*	2222	4.0	546	13	22.6	163
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2337	5.5	3574	7	30.6	117
ZELZO	Zelko	Budapest/HU	HUVCSE03 (1.0/4.5)	2224	4.4	933	5	26.8	67
Sum							30	6594.3	27052

* active field of view smaller than video frame

2. Observing Times (h)

November	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	-	-	-	-	-	-	-	-	-	8.2	2.1	-
BERER	-	5.9	-	-	9.5	12.3	5.4	-	11.6	3.1	6.6	-	10.1	7.0	4.6
	-	6.2	-	-	9.7	12.4	5.9	-	11.2	4.0	7.1	-	10.1	7.0	6.6
	-	6.2	-	-	9.2	12.4	5.5	-	11.2	2.8	6.2	-	9.9	7.0	6.4
BIRSZ	3.6	11.6	11.8	-	8.0	10.0	1.0	3.6	12.5	6.6	0.7	-	9.2	6.1	3.7
BREMA	2.3	5.6	9.9	1.0	8.5	-	-	-	0.7	2.5	1.8	5.1	-	12.3	-
	5.1	8.4	11.7	1.0	8.8	-	-	-	0.8	2.5	1.9	4.6	-	9.2	-
BRIBE	6.0	7.5	6.3	2.5	8.7	-	-	-	1.8	0.4	4.3	8.5	1.1	10.6	-
	2.6	4.6	6.3	2.5	2.5	-	-	0.2	2.2	-	3.5	11.8	9.8	-	-
CASFL	-	5.3	-	-	10.1	8.8	11.2	5.5	0.3	-	1.5	6.8	6.0	8.5	9.1
CRIST	5.5	0.8	-	-	9.7	10.0	10.3	2.2	-	-	7.2	9.4	12.5	12.6	12.6
	2.0	-	-	-	9.8	11.5	12.3	1.3	-	-	10.6	9.2	10.6	12.5	12.6
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CSISZ	-	9.0	9.1	0.5	1.7	6.6	4.1	6.1	12.6	3.8	2.9	-	-	2.0	-
ELTMA	10.0	6.6	-	-	12.4	8.2	11.6	11.3	3.7	-	-	-	9.3	12.4	9.9
GONRU	-	-	-	10.3	9.6	8.9	-	6.4	3.4	3.0	12.0	12.2	10.9	8.2	-
	-	-	-	10.6	9.5	8.8	-	6.4	2.9	9.3	12.0	12.2	12.4	8.0	-
	1.3	-	-	-	7.6	9.7	-	11.5	-	8.5	12.3	12.2	-	-	4.7
	-	-	-	6.0	5.8	9.0	-	6.4	2.4	7.8	12.0	12.2	12.4	7.7	-
GOVMI	6.5	6.2	5.7	0.4	5.1	4.5	5.0	5.8	11.5	7.1	4.5	-	2.1	4.1	-
	4.6	2.8	4.4	-	1.7	0.6	4.3	3.0	8.5	3.5	2.2	-	1.4	2.1	-
	8.6	3.2	9.6	1.2	1.4	-	4.8	4.6	8.2	6.4	3.3	-	1.9	0.7	-
HINWO	-	1.4	1.9	-	-	0.8	9.1	1.2	7.0	3.1	-	-	0.1	6.0	8.0
IGAAN	1.5	1.6	4.0	0.7	3.3	0.2	3.7	3.7	6.7	8.5	8.0	-	3.7	5.8	1.8
	0.2	-	7.3	2.2	3.2	4.2	7.8	1.7	10.0	6.1	8.0	-	6.9	8.1	10.7
	3.1	7.4	9.3	2.0	5.2	5.4	5.1	3.9	5.0	10.2	10.2	-	7.4	1.3	6.9
	6.7	2.1	1.0	-	6.1	7.3	4.3	-	5.1	2.4	-	-	-	-	-
JONKA	0.5	9.1	7.1	-	7.2	5.3	1.8	3.4	11.2	6.5	5.0	-	5.9	3.5	-
KACJA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	4.2	-	-	-	-	-	-	-	-	-	-	-	-
	-	2.6	-	-	2.7	1.2	5.7	4.0	3.8	-	-	-	-	1.1	-
	-	-	0.3	-	2.9	6.2	10.7	6.5	9.8	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KERST	7.4	7.0	0.5	7.7	8.1	7.6	7.9	6.7	5.7	-	4.2	3.7	6.7	5.3	6.4
KISSZ	1.1	5.9	1.1	-	3.5	5.0	5.5	5.8	6.0	1.9	6.0	-	4.1	-	4.1
KOSDE	-	-	-	-	-	5.0	-	-	-	-	10.5	-	10.5	4.8	11.5
	3.0	5.8	5.2	-	-	-	-	-	-	-	-	-	-	11.6	-
LERAR	-	-	-	-	-	-	-	11.3	-	1.8	1.0	-	11.5	-	-
MACMA	-	2.7	9.6	1.7	4.7	4.4	-	-	-	6.6	6.4	2.0	8.8	-	6.2
	-	3.2	10.5	2.6	4.7	4.1	0.3	-	0.8	8.7	8.2	2.5	8.7	-	6.2
	-	3.7	10.3	2.3	5.1	3.7	-	-	-	7.0	7.4	2.7	9.2	-	6.2
MARGR	-	2.6	7.3	7.2	4.9	5.7	6.4	-	10.6	4.4	5.6	3.7	4.4	4.5	3.6
MOLSI	-	-	-	-	-	4.1	4.7	3.5	-	-	-	-	-	-	-
	1.8	-	6.8	-	5.1	8.7	5.5	1.9	8.3	2.9	-	1.4	4.3	4.6	-
	4.6	5.3	6.2	1.2	4.7	0.8	-	1.7	6.4	2.8	6.0	9.0	13.2	12.1	-
	5.6	6.5	6.9	-	5.2	-	-	2.7	7.5	4.2	8.0	9.5	13.1	12.6	-
	5.9	6.5	7.6	1.3	5.0	1.3	-	2.2	6.6	3.1	6.3	9.3	8.2	12.1	-
MORJO	-	-	-	1.5	9.4	8.9	3.8	7.7	9.7	12.3	7.2	-	5.0	1.0	-
OCHPA	-	-	-	-	0.3	2.4	5.0	2.5	-	-	0.5	1.8	0.2	1.2	4.2
OTTMI	6.2	0.9	0.2	2.8	5.5	-	-	3.6	0.2	0.2	2.7	8.0	3.5	9.6	4.4
PERZS	-	-	-	1.5	6.4	7.0	2.7	7.2	10.4	-	1.3	-	3.9	2.7	-
PUCRC	6.2	11.3	-	-	10.3	6.3	4.9	-	6.1	1.7	-	1.0	11.8	11.8	11.8
ROTEC	4.7	3.2	-	-	-	-	-	-	3.1	-	3.7	7.9	13.1	12.6	-
SARAN	8.3	-	-	11.5	6.1	9.8	-	10.5	6.3	2.0	12.2	12.2	12.2	9.3	3.5
	10.2	-	-	11.1	7.2	10.1	-	10.5	6.4	-	12.2	12.2	12.2	10.1	-
	-	-	-	10.6	5.3	9.8	-	9.7	6.5	1.5	8.8	9.8	12.1	9.0	3.6
SCALE	8.6	-	-	-	9.8	7.5	12.0	4.5	0.4	-	-	-	9.7	12.0	11.0
SCHHA	7.1	8.6	8.0	1.7	9.7	-	0.3	-	2.0	2.4	6.3	6.1	3.1	-	-
STOEN	4.8	5.0	-	-	11.6	10.9	12.7	5.9	1.2	-	-	3.0	7.2	11.9	13.0
	6.4	6.9	0.6	-	11.8	10.8	12.7	7.7	2.0	-	-	3.3	7.6	12.1	13.0
	6.3	6.3	0.2	-	12.3	11.2	12.7	5.9	1.3	-	-	3.2	7.8	11.6	12.7
STORO	-	-	-	-	-	-	-	-	-	-	-	-	6.5	8.9	-
	-	-	-	-	-	-	-	-	-	-	-	-	12.1	12.4	-
STRJO	5.2	1.4	2.9	3.0	6.2	-	-	-	1.4	0.4	5.8	12.4	-	11.7	-
	8.6	2.0	8.1	3.2	5.1	-	-	-	1.7	-	5.9	12.4	-	12.0	-
	2.1	-	0.2	2.5	2.1	-	-	-	1.3	-	2.4	12.0	-	2.4	-
	6.2	0.5	7.1	2.4	6.1	-	-	-	1.9	0.5	5.8	12.4	-	11.9	-
TEPIS	-	11.6	11.6	-	8.5	10.5	1.2	4.1	12.5	7.9	3.2	-	9.8	6.8	-
TRIMI	2.0	0.8	-	-	3.4	2.3	2.7	1.6	1.4	-	0.2	-	-	0.8	-
YRJIL	-	-	0.7	-	-	-	-	11.5	6.3	-	-	0.3	6.7	-	1.5
ZELZO	-	-	-	-	4.9	-	-	-	9.8	-	3.9	-	5.1	3.1	-
Sum	192.4	221.8	221.5	116.7	372.9	322.2	230.6	227.4	307.9	180.4	295.5	266.0	414.2	418.4	220.5

November	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	-	-	-	-	-	-	4.5	-	-	11.5	-	-	-	-	-
BERER	8.7	-	-	2.5	-	-	-	-	-	0.9	-	0.5	2.3	0.8	-
	8.8	-	-	2.3	-	-	-	-	-	-	-	-	1.9	0.7	-
	9.0	-	-	-	-	-	-	-	-	0.8	-	-	3.5	-	-
BIRSZ	5.7	6.4	-	9.5	6.1	-	-	-	-	-	10.1	-	3.3	-	4.6
BREMA	12.0	-	8.5	4.7	13.1	4.1	9.9	0.6	-	6.4	0.2	-	4.1	4.7	-
	12.0	-	11.4	5.1	12.9	4.1	8.8	-	-	6.4	-	0.6	4.4	5.1	-
BRIBE	13.3	-	3.5	12.4	13.2	3.9	11.1	0.2	0.4	12.9	-	-	-	-	2.8
	13.1	-	0.9	7.2	-	3.2	7.8	-	0.5	12.6	0.2	-	-	0.8	7.6
CASFL	10.8	10.5	2.9	6.2	6.9	5.7	-	1.5	6.8	-	-	-	-	-	-
CRIST	-	11.8	7.0	-	12.7	6.0	2.5	-	-	-	-	-	-	-	-
	12.3	12.6	6.4	1.4	12.7	3.1	4.1	0.3	-	-	-	-	-	2.1	-
	9.3	0.3	4.3	0.4	12.1	0.3	1.8	-	-	-	-	-	-	-	-
CSISZ	-	1.0	-	-	-	-	-	-	-	-	11.1	-	2.0	-	-
ELTMA	11.6	8.3	-	-	12.9	9.4	-	5.4	-	-	-	-	2.8	-	-
GONRU	-	10.7	12.0	9.0	-	10.0	4.9	-	-	-	10.4	-	7.9	2.3	8.8
	-	10.7	10.4	8.0	-	12.0	7.6	-	-	-	12.4	7.8	11.9	3.8	-
	0.9	11.1	10.9	9.1	2.9	12.5	8.3	-	-	-	12.6	8.7	11.0	2.9	11.3
	-	10.3	10.5	6.9	-	7.9	7.2	-	-	-	5.1	7.1	11.8	3.9	10.3
GOVMI	-	5.1	-	-	-	0.3	-	-	9.0	-	9.5	-	2.2	-	0.4
	-	3.9	-	-	-	-	-	-	4.8	-	7.2	-	-	-	-
	-	4.9	-	-	-	-	-	-	5.5	-	9.5	-	-	-	-
HINWO	5.6	9.6	-	-	-	-	-	-	-	-	-	-	-	-	-
IGAAN	3.3	8.8	9.9	2.1	-	3.8	-	-	-	1.1	9.0	0.3	-	-	1.9
	7.6	8.3	7.3	8.2	9.2	3.3	-	-	-	5.8	-	-	0.7	4.9	0.4
	0.7	10.2	10.2	8.9	-	0.8	-	-	6.7	2.3	3.6	0.8	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.5
JONKA	5.2	3.7	0.5	9.7	-	-	-	-	-	-	5.1	1.7	0.8	-	3.2
KACJA	-	9.7	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	7.9	-	-	-	-	-	-	-	-	-	-	1.5	-	-
	-	11.1	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	6.8	-	-	-	-	-	-	1.3	-	-	-	-	-	-
KERST	7.0	4.8	6.8	2.7	0.7	4.3	3.7	3.7	-	4.7	6.3	3.1	3.2	5.2	6.5
KISSZ	7.1	4.1	-	1.9	-	-	-	-	0.5	0.3	2.8	0.8	0.8	2.4	2.4
KOSDE	-	1.7	11.7	11.7	11.5	-	-	-	-	-	-	-	-	-	-
	9.0	-	9.1	-	-	5.4	-	-	-	3.3	-	-	4.6	5.0	-
LERAR	1.6	0.3	-	-	-	7.7	5.0	1.1	-	-	-	-	-	-	-
MACMA	-	-	4.5	-	1.0	-	-	-	-	2.1	1.3	-	1.1	1.1	-
	-	-	4.5	-	0.7	-	-	-	-	1.8	1.1	1.0	1.0	1.6	-
	-	-	4.5	-	1.2	-	-	-	-	2.8	1.4	-	2.6	2.1	-
MARGR	3.5	-	8.7	5.8	-	4.1	-	-	-	-	-	-	-	-	0.3
MOLSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	6.3	-	-	-	-	-	1.0	-	-	-	-	-	2.3
	-	-	-	-	-	9.0	13.5	-	-	13.6	-	-	-	-	8.4
	-	-	2.0	-	-	9.6	13.5	-	-	13.2	0.2	-	-	-	8.3
	-	-	1.8	-	-	9.0	13.6	-	-	13.7	-	-	-	-	9.0
MORJO	-	-	2.6	12.7	-	2.7	-	-	4.6	-	8.7	2.2	1.8	1.6	3.7
OCHPA	4.4	3.4	1.6	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	10.1	8.1	-	-	-	10.0	3.2	1.6	2.7	-	6.7	1.1	4.3	0.6	1.0
PERZS	-	2.2	-	2.0	-	-	-	-	-	-	5.7	-	1.7	-	-
PUCRC	11.8	8.1	-	6.9	9.9	11.1	-	-	-	-	6.5	-	5.4	-	3.4
ROTEC	-	-	-	-	-	1.5	12.4	-	-	13.3	-	-	-	-	-
SARAN	0.3	3.3	10.5	2.3	-	12.4	4.9	-	-	-	7.9	6.2	9.5	1.8	8.9
	0.3	3.4	10.6	2.8	-	12.4	8.3	-	-	-	10.7	7.0	11.1	3.2	10.2
	0.7	4.4	10.4	2.5	-	12.0	8.1	-	-	-	10.4	7.1	11.8	3.1	10.0
SCALE	11.8	-	1.1	4.6	12.3	6.9	-	0.9	-	-	0.9	-	-	0.3	-
SCHHA	13.1	-	1.6	11.8	7.9	3.6	6.8	-	1.2	11.7	-	-	-	-	-
STOEN	13.0	12.3	4.0	8.7	13.2	7.4	-	0.4	-	-	-	-	-	-	-
	13.0	12.4	5.4	7.9	13.2	7.8	-	3.1	-	-	-	-	-	-	-
	12.9	12.4	4.3	8.9	12.9	7.3	-	1.9	-	-	-	-	-	0.4	-
STORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STRJO	9.4	-	-	12.7	4.4	0.7	12.9	-	-	8.7	-	-	-	-	3.5
	9.4	-	0.8	12.8	4.7	2.8	13.1	-	-	8.5	-	-	-	-	2.8
	9.4	-	-	12.8	3.6	0.6	-	-	-	6.8	-	-	-	-	-
	9.4	-	0.9	12.9	4.7	2.2	13.1	-	-	6.9	-	2.0	-	-	1.9
TEPIS	3.0	7.2	-	10.6	6.4	-	-	-	-	-	9.7	-	3.8	-	4.9
TRIMI	-	5.2	-	-	-	1.0	-	0.3	0.9	-	-	-	-	-	-
YRJIL	-	-	-	3.6	-	-	-	-	-	-	-	-	-	-	-
ZELZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum	310.1	277.0	230.3	272.2	223.0	241.9	210.6	21.0	45.9	172.1	186.3	58.0	134.8	60.4	142.3

3. Results (Meteors)

November	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	-	-	-	-	-	-	-	-	-	11	3	-
BERER	-	50	-	-	147	156	76	-	83	15	34	-	110	88	13
	-	14	-	-	32	58	22	-	28	13	9	-	33	23	9
	-	8	-	-	30	35	35	-	22	5	6	-	27	29	12
BIRSZ	13	50	20	-	33	43	3	7	59	6	1	-	22	8	5
BREMA	4	13	38	4	21	-	-	-	5	11	3	4	-	37	-
	7	35	40	2	21	-	-	-	1	6	3	11	-	36	-
BRIBE	10	24	17	2	20	-	-	-	3	1	6	19	7	42	-
	5	15	17	5	14	-	-	1	4	-	5	42	60	-	-
CASFL	-	14	-	-	33	50	46	30	1	-	4	22	16	26	42
CRIST	46	2	-	-	32	39	46	7	-	-	20	46	60	75	79
	10	-	-	-	21	54	51	7	-	-	44	45	45	54	43
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CSISZ	-	37	27	1	1	30	16	9	28	4	2	-	-	5	-
ELTMA	42	32	-	-	50	83	72	24	4	-	-	-	65	78	60
GONRU	-	-	-	21	29	45	-	22	7	4	71	80	67	48	-
	-	-	-	39	29	36	-	17	7	37	43	59	56	43	-
	5	-	-	-	36	30	-	35	-	39	61	47	-	-	29
	-	-	-	20	27	40	-	6	3	28	51	48	62	44	-
GOVMI	32	40	25	2	36	30	41	16	30	11	3	-	8	10	-
	40	21	18	-	11	4	11	5	12	9	3	-	9	7	-
	29	7	18	3	3	-	14	11	9	13	3	-	6	4	-
HINWO	-	2	7	-	-	5	119	12	32	12	-	-	1	95	71
IGAAN	5	1	9	3	9	1	17	7	16	8	12	-	11	12	2
	1	-	17	5	22	30	50	3	19	23	34	-	27	42	51
	5	22	39	6	21	27	14	4	15	18	27	-	17	1	13
	3	1	1	-	6	17	4	-	4	2	-	-	-	-	-
JONKA	2	20	11	-	35	23	3	4	35	9	5	-	19	6	-
KACJA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-
	-	3	-	-	2	1	3	2	3	-	-	-	-	4	-
	-	-	1	-	21	65	107	26	48	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KERST	35	30	3	37	48	29	33	29	16	-	29	42	48	29	44
KISSZ	2	13	1	-	12	13	11	1	5	3	6	-	8	-	3
KOSDE	-	-	-	-	-	68	-	-	-	-	103	-	82	67	68
	6	20	26	-	-	-	-	-	-	-	-	-	-	30	-
LERAR	-	-	-	-	-	-	-	6	-	3	2	-	13	-	-
MACMA	-	11	17	1	18	11	-	-	-	6	7	6	21	-	6
	-	13	36	4	34	12	1	-	1	16	17	7	29	-	9
	-	6	16	2	12	4	-	-	-	10	7	5	12	-	7
MARGR	-	2	28	27	17	29	22	-	44	13	7	6	7	11	7
MOLSI	-	-	-	-	-	94	86	24	-	-	-	-	-	-	-
	3	-	18	-	14	32	25	3	9	4	-	7	4	1	-
	40	72	43	1	21	3	-	10	38	20	67	133	165	90	-
	29	55	40	-	38	-	-	16	32	25	63	123	133	103	-
	18	20	18	1	7	2	-	6	13	4	20	26	29	26	-
MORJO	-	-	-	3	34	32	15	6	29	11	12	-	12	2	-
OCHPA	-	-	-	-	2	16	31	18	-	-	3	11	1	7	22
OTTMI	39	2	2	27	25	-	-	28	1	1	19	43	7	25	4
PERZS	-	-	-	5	50	51	23	25	55	-	6	-	36	20	-
PUCRC	23	58	-	-	25	55	46	-	5	4	-	4	62	64	70
ROTEC	5	2	-	-	-	-	-	-	6	-	7	37	47	37	-
SARAN	11	-	-	36	23	20	-	19	19	7	31	36	47	30	4
	43	-	-	45	27	36	-	36	23	-	48	45	40	29	-
	-	-	-	38	12	20	-	19	14	8	25	29	35	24	7
SCALE	29	-	-	-	23	43	53	14	2	-	-	-	41	27	12
SCHHA	13	42	28	4	32	-	2	-	4	3	16	11	17	-	-
STOEN	20	26	-	-	101	112	113	31	3	-	-	18	78	87	119
	12	18	2	-	79	93	96	29	3	-	-	13	51	50	105
	30	27	1	-	111	133	119	43	6	-	-	14	81	94	119
STORO	-	-	-	-	-	-	-	-	-	-	-	-	84	105	-
	-	-	-	-	-	-	-	-	-	-	-	-	286	351	-
STRJO	6	3	6	5	9	-	-	-	3	1	6	34	-	25	-
	18	4	11	8	2	-	-	-	2	-	8	39	-	34	-
	2	-	1	4	1	-	-	-	2	-	1	17	-	4	-
	12	2	18	10	11	-	-	-	6	1	8	50	-	37	-
TEPIS	-	64	35	-	48	50	7	9	57	18	7	-	29	21	-
TRIMI	16	6	-	-	24	15	16	11	8	-	1	-	-	7	-
YRJIL	-	-	4	-	-	-	-	57	20	-	-	4	20	-	7
ZELZO	-	-	-	-	14	-	-	-	29	-	4	-	12	8	-
Sum	671	907	668	371	1616	1875	1449	695	933	432	980	1183	2276	2265	1042

November	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	-	-	-	-	-	-	4	-	-	21	-	-	-	-	-
BERER	87	-	-	17	-	-	-	-	-	2	-	1	6	5	-
	25	-	-	5	-	-	-	-	-	-	-	-	1	2	-
	21	-	-	-	-	-	-	-	-	3	-	-	5	-	-
BIRSZ	20	20	-	38	10	-	-	-	-	-	20	-	6	-	21
BREMA	30	-	33	18	43	15	16	2	-	19	1	-	19	20	-
	36	-	36	13	39	10	13	-	-	18	-	2	9	11	-
BRIBE	49	-	10	47	48	14	24	1	1	48	-	-	-	-	3
	52	-	4	17	-	21	16	-	2	56	1	-	-	1	12
CASFL	55	34	11	31	39	14	-	7	29	-	-	-	-	-	-
CRIST	-	33	12	-	64	11	10	-	-	-	-	-	-	-	-
	54	30	17	14	48	4	21	1	-	-	-	-	-	4	-
	18	2	8	3	64	2	9	-	-	-	-	-	-	-	-
CSISZ	-	1	-	-	-	-	-	-	-	-	19	-	6	-	-
ELTMA	70	22	-	-	75	33	-	4	-	-	-	-	12	-	-
GONRU	-	59	36	30	-	45	5	-	-	-	36	-	26	3	24
	-	54	32	29	-	59	11	-	-	-	50	41	64	4	-
	1	50	34	25	13	42	21	-	-	-	40	24	32	5	56
	-	44	35	23	-	26	5	-	-	-	9	26	29	8	43
GOVMI	-	5	-	-	-	1	-	-	9	-	23	-	5	-	3
	-	4	-	-	-	-	-	-	7	-	18	-	-	-	-
	-	10	-	-	-	-	-	-	9	-	13	-	-	-	-
HINWO	78	93	-	-	-	-	-	-	-	-	-	-	-	-	-
IGAAN	4	18	13	1	-	5	-	-	-	4	14	2	-	-	6
	22	19	25	41	44	2	-	-	-	16	-	-	4	30	2
	3	44	20	27	-	1	-	-	7	2	2	2	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
JONKA	19	11	2	24	-	-	-	-	-	-	11	2	2	-	9
KACJA	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	2	-	-	-	-	-	-	-	-	-	-	2	-	-
	-	127	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	26	-	-	-	-	-	-	1	-	-	-	-	-	-
KERST	41	26	24	19	4	25	17	23	-	22	50	26	23	37	61
KISSZ	6	6	-	6	-	-	-	-	1	2	3	3	2	2	8
KOSDE	-	21	132	116	111	-	-	-	-	-	-	-	-	-	-
	23	-	23	-	-	14	-	-	-	3	-	-	12	10	-
LERAR	3	1	-	-	-	4	2	6	-	-	-	-	-	-	-
MACMA	-	-	1	-	3	-	-	-	-	6	2	-	5	3	-
	-	-	5	-	5	-	-	-	-	7	3	1	5	12	-
	-	-	5	-	6	-	-	-	-	9	4	-	7	2	-
MARGR	4	-	41	16	-	22	-	-	-	-	-	-	-	-	2
MOLSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	12	-	-	-	-	-	1	-	-	-	-	-	6
	-	-	-	-	-	53	158	-	-	145	-	-	-	-	39
	-	-	7	-	-	36	113	-	-	125	1	-	-	-	38
	-	-	1	-	-	11	44	-	-	31	-	-	-	-	17
MORJO	-	-	2	16	-	11	-	-	3	-	17	3	2	2	8
OCHPA	24	23	10	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	45	38	-	-	-	51	7	8	15	-	43	13	32	1	6
PERZS	-	1	-	9	-	-	-	-	-	-	51	-	8	-	-
PUCRC	71	25	-	44	36	38	-	-	-	-	14	-	24	-	19
ROTEC	-	-	-	-	-	2	31	-	-	35	-	-	-	-	-
SARAN	1	5	19	5	-	43	14	-	-	-	14	29	35	5	30
	1	3	33	10	-	36	14	-	-	-	20	25	28	5	48
	1	7	22	10	-	39	6	-	-	-	20	15	29	3	24
SCALE	38	-	3	28	29	16	-	2	-	-	3	-	-	2	-
SCHHA	65	-	2	55	15	30	15	-	5	58	-	-	-	-	-
STOEN	114	59	10	74	127	16	-	2	-	-	-	-	-	-	-
	75	52	10	53	92	27	-	3	-	-	-	-	-	-	-
	93	75	7	51	93	14	-	4	-	-	-	-	-	2	-
STORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STRJO	31	-	-	34	4	4	25	-	-	28	-	-	-	-	5
	33	-	1	48	3	5	35	-	-	33	-	-	-	-	3
	11	-	-	22	2	3	-	-	-	9	-	-	-	-	-
	52	-	9	54	5	7	39	-	-	18	-	5	-	-	1
TEPIS	18	15	-	49	12	-	-	-	-	-	24	-	15	-	43
TRIMI	-	43	-	-	-	6	-	2	8	-	-	-	-	-	-
YRJIL	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-
ZELZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum	1394	1129	707	1127	1034	818	675	65	98	720	526	220	455	179	542