Results of the IMO Video Meteor Network – November 2014

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November started with two perfect nights that seamlessly continued the nice observing conditions of the previous months, but then the situation worsened soon. The observing statistics show more and more gaps and towards the end of the month almost no one enjoyed clear skies anymore. Whereas 69 out of 84 cameras were active on November 1, it was just 15 cameras on November 29 and 30. Only Carl Hergenrother of Tucson experienced excellent observing conditions all month long and did not have to pause a single night. Beside his camera SALSA3, only seven other cameras obtained twenty or more observing nights, which underlines how poor the weather was. Observers is south eastern Europe were particularly affected. Overall we observed just about 25,000 meteors in 6,600 hours of effective observing time, which is less than in the three years before.

In November, Stane Slavec started to operate a second camera KAYAK2, after his first camera KAYAK1 became nearly blind after many years of operation. KAYAK2 is a Mintron camera with 12 mm f/0.8 Panasonic lens.

Near the millennium, the Leonids made November the most attractive month for meteor observers, but the last unmissable rates happened a long time ago. In 2014, the shower presented a similar flux density as in the years before with roughly 8 meteoroids per 1,000 km^2 and hour at best (figure 1). Only in 2013 rates were a bit higher by tendency. A clear peak cannot be found in the 2014 data set – the activity level remained constantly high (or low) for several days.

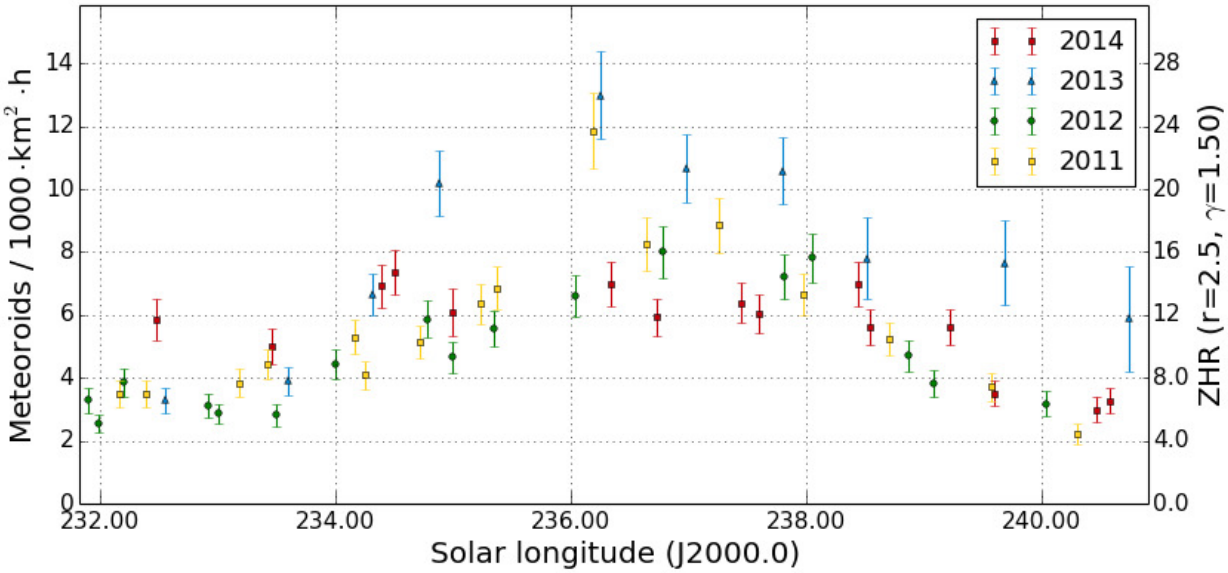

Figure 1: *Activity profile of the Leonids, derived from data of the IMO Video Meteor Network 2011-2014.*

Also the population index yielded no surprises (figure 2). The r-value of the Leonids was clearly lower than that of the sporadic meteors, and the sporadic population index was smaller than the expected "default value" of 3.0. In addition it was confirmed again, that the convergence of flux density vs. population index graphs is much better for minor showers with smaller meteor counts, and also the population index profile shows fewer fluctuations than in case of major showers.

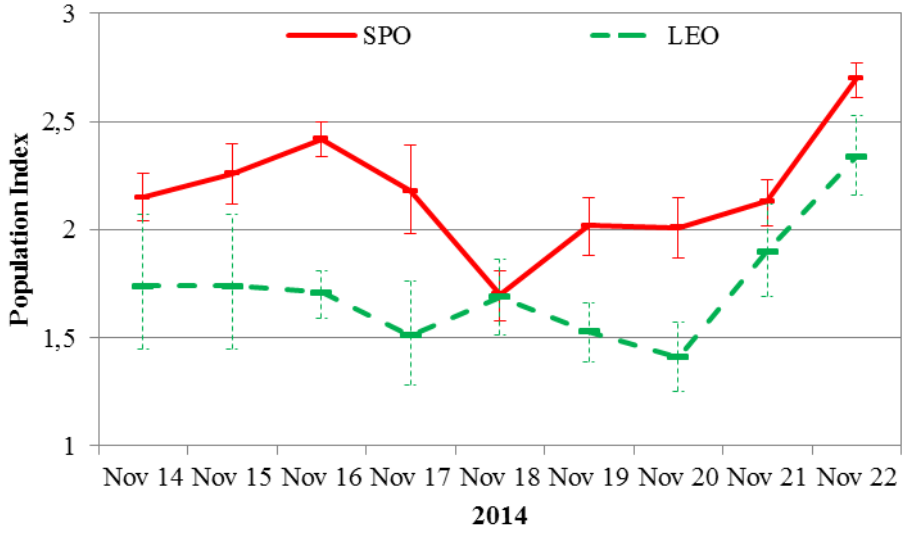

Figure 2: *Comparison of the population index of Leonids and of sporadic meteors in November 2014.*

When analyzing the November data, there was yet another topic in focus, which is completely unrelated to meteors. For the first time we could support the observers of variable stars!

What happened? Alpha Comae Berenices (α COM), the 4.3 mag primary star in the constellation of Coma Berenices is a known double-star that presents an occultation every 25.8 year. The event was predicted to happen around January 25, 2015, and several variable star observers started their observing campaign in December 2014. However, after a numeric error was detected and fixed it turned out that the occultation had already occurred in late fall 2014, when the star slowly escaped morning twilight. The most probable point in time was now November 20, 2014. The occultation was expected to last 1 to 2 days with a brightness dip of less than one magnitude. The hope of the variable star observers was that maybe all-sky meteor recordings might show the star, which is why they contacted meteor observers.

The initiative was not fruitless: It turned out that several video cameras of the IMO network observed the respective region of sky in the November early morning hours, and that they were sensitive enough to detect the star. Now we only had to search for relevant meteor images, whereby our photometry was clearly inferior to the accuracy that variable star observers typically obtain. One reason is that meteor sum images are not averaged over several video frames (which would decrease the noise level) but they are rather made of the maximum of all video frames. Still, they should be sufficient to decide whether or not an occultation has taken place by comparing α COM with nearby reference stars.

We could even go one step further: To determine the limiting magnitude, MetRec detects and measures every minute all stars in the field of view and writes their data (position, pixel sum) into a new reference file. These reference files are only used when the observer decides to re-calibrate the camera position every few weeks or months. Still we had decided once to keep all these files, which was now our selling point. Even though the file format is not particularly well-suited for photometry of single stars (e.g. neither the name of the star nor the exact time are stored, since the primary use case is the calibration of the field of view), we can still extract all relevant data. We determined the declination and catalog brightness of the reference stars given by the variable star observers, which allowed us to find these stars among the several thousand entries in the reference file. Further, the time of measurement could be derived based on the time when the observation was started, and the difference of the given and the true right ascension of the star. So we could extract all single measures of α COM and the reference stars script-based from all the reference files. Figure 3 shows exemplary the (log) pixel sum plot for α COM and three reference stars taken from data of MINCAM1 in the morning of November 21, 2014. Since these are raw data, the result is affected by drifting Cirrus clouds and other side effects.

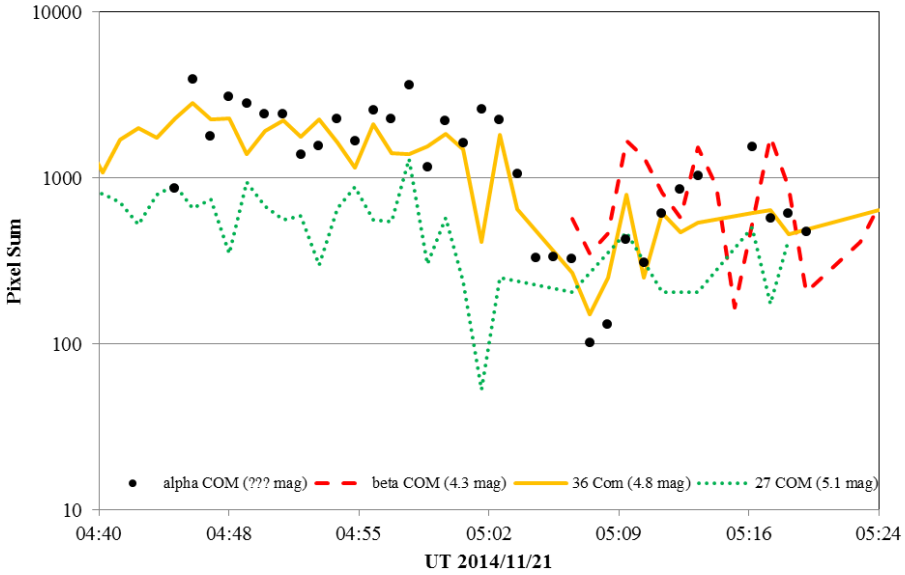

Figure 3: *Brightness (log pixel sum) of alpha Comae Berenices and three reference stars on the morning of November 21, 2014. The data were extracted from the MINCAM1 reference file.*

In total we obtained 1,200 individual measurements for α COM in November, and the same order of magnitude for other reference stars. Particularly successful were the cameras AKM3, BMH1, HERMINE, MINCAM5, RO3 and TEMPLAR5. We submitted all data to the variable star observers. Even though the final result is still pending, this is already a fine example for cooperation between amateur astronomers of different disciplines.

1. Observers

Code	Name	Place	Camera	FOV [°²]	St.LM [mag]	Eff.CA [km²]	Nights	Time [h]	Meteors
ARLRA	Arlt	Ludwigsfelde/DE	LUDWIG2 (0.8/8)	1475	6.2	3779	15	85.2	561
BANPE	Bánfalvi	Zalaegerszeg/HU	HUVCSE01 (0.95/5)	2423	3.4	361	12	49.9	153
BERER	Berkó	Ludanyhalaszi/HU	HULUD1 (0.8/3.8)	5542	4.8	3847	7	50.8	161
			HULUD3 (0.95/4)	4357	3.8	876	7	39.9	49
BOMMA	Bombardini	Faenza/IT	MARIO (1.2/4.0)	5794	3.3	739	15	90.3	508
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	17	107.6	218
			MBB4 (0.8/8)	1470	5.1	1208	19	108.0	240
BRIBE	Klemt	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	20	115.4	382
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	12	46.3	168
CASFL	Castellani	Monte Baldo/IT	BMH1 (0.8/6)	2350	5.0	1611	13	104.6	457
			BMH2 (1.5/4.5)*	4243	3.0	371	10	80.7	335
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	14	91.7	521
			C3P8 (0.8/3.8)	5455	4.2	1586	16	90.9	401
			STG38 (0.8/3.8)	5614	4.4	2007	15	67.5	327
CSISZ	Csizmadia	Baja/HU	HUVCSE02 (0.95/5)	1606	3.8	390	20	81.0	232
DONJE	Donati	Faenza/IT	JENNI (1.2/4)	5886	3.9	1222	16	108.3	678
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	2	17.6	64
FORKE	Förster	Carlsfeld/DE	AKM3 (0.75/6)	2375	5.1	2154	9	76.5	333
GONRU	Goncalves	Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	18	105.4	428
			TEMPLAR2 (0.8/6)	2080	5.0	1508	16	111.9	382
			TEMPLAR3 (0.8/8)	1438	4.3	571	21	123.4	203
			TEMPLAR4 (0.8/3.8)	4475	3.0	442	18	119.9	386
			TEMPLAR5 (0.75/6)	2312	5.0	2259	24	119.7	421
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	15	68.6	309
			ORION3 (0.95/5)	2665	4.9	2069	3	28.8	49
			ORION4 (0.95/5)	2662	4.3	1043	16	72.5	136
HERCA	Hergenrother	Tucson/US	SALSA3 (0.8/3.8)	2336	4.1	544	30	328.1	943
HINWO	Hinz	Schwarzenberg/DE	HINWO1 (0.75/6)	2291	5.1	1819	22	168.2	778
IGAAN	Igaz	Baja/HU	HUBAJ (0.8/3.8)	5552	2.8	403	16	80.3	149
		Debrecen/HU	HUDEB (0.8/3.8)	5522	3.2	620	12	64.9	124
		Hodmezovasar./HU	HUHOD (0.8/3.8)	5502	3.4	764	19	81.9	218
		Budapest/HU	HUPOL (1.2/4)	3790	3.3	475	7	39.4	39
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	16	83.0	144
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	6	23.7	50
		Kostanjevec/SI	METKA (0.8/12)*	715	6.4	640	1	8.3	49
		Ljubljana/SI	ORION1 (0.8/8)	1402	3.8	331	8	14.7	21
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	7	29.1	129
			STEFKA (0.8/3.8)	5471	2.8	379	6	15.1	25
KISSZ	Kiss	Sulysap/HU	HUSUL (0.95/5)*	4295	3.0	355	12	22.8	30
KOSDE	Koschny	Izana Obs./ES	ICC9 (0.85/25)*	683	6.7	2951	1	4.8	97
		Noordwijkerhout/NL	LIC4 (1.4/50)*	2027	6.0	4509	17	87.8	285
LOJTO	Łojek	Grabniak/PL	PAV57 (1.0/5)	1631	3.5	269	5	53.5	76
MACMA	Maciejewski	Chelm/PL	PAV35 (0.8/3.8)	5495	4.0	1584	9	62.8	189
			PAV36 (0.8/3.8)*	5668	4.0	1573	11	91.4	418
			PAV43 (0.75/4.5)*	3132	3.1	319	12	78.4	367
			PAV60 (0.75/4.5)	2250	3.1	281	11	89.9	548
MARGR	Maravelias	Lofoupoli/GR	LOOMECON (0.8/12)	738	6.3	2698	19	123.2	241
MARRU	Marques	Lisbon/PT	RAN1 (1.4/4.5)	4405	4.0	1241	14	53.3	220
MASMI	Maslov	Novosimbirsk/RU	NOWATEC (0.8/3.8)	5574	3.6	773	9	68.8	432
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1230	6.9	6152	16	102.3	735
			ESCIMO (0.6/130)*	21	10.0	3507	2	18.9	15
			MINCAM1 (0.8/8)	1477	4.9	1084	16	89.1	434
		Ketzür/DE	REMO1 (0.8/8)	1467	6.5	5491	18	107.6	742
			REMO2 (0.8/8)	1478	6.4	4778	15	105.3	600
			REMO3 (0.8/8)	1420	5.6	1967	2	15.7	114
			REMO4 (0.8/8)	1478	6.5	5358	17	112.3	721
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	2522	3.5	532	16	102.5	172
MOSFA	Moschini	Rovereto/IT	ROVER (1.4/4.5)	3896	4.2	1292	1	0.3	2
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	2944	3.5	358	7	44.3	130
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	18	96.2	201
PERZS	Perkó	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	18	110.5	574
PUCRC	Pucer	Nova vas nad Dra./SI	MOBCAM1 (0.75/6)	2398	5.3	2976	12	62.0	286
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	12	78.6	151
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	10	55.7	93
			RO2 (0.75/6)	2381	3.8	459	17	98.9	292
			RO3 (0.8/12)	710	5.2	619	16	104.0	452
			SOFIA (0.8/12)	738	5.3	907	17	77.3	173
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	22	109.1	409
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	563	6.2	1294	5	15.1	17
			KAYAK2 (0.8/12)	741	5.5	920	3	9.3	10
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	18	128.7	969
			NOA38 (0.8/3.8)	5609	4.2	1911	18	131.5	845
			SCO38 (0.8/3.8)	5598	4.8	3306	19	128.3	929
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2354	5.4	2751	19	122.0	361
			MINCAM3 (0.8/6)	2338	5.5	3590	19	122.8	415
			MINCAM4 (1.0/2.6)	9791	2.7	552	22	131.9	375
			MINCAM5 (0.8/6)	2349	5.0	1896	19	124.4	356
			MINCAM6 (0.8/6)	2395	5.1	2178	19	116.7	299
TEPIS	Tepliczky	Agostyan/HU	HUAGO (0.75/4.5)	2427	4.4	1036	19	78.7	282
			HUMOB (0.8/6)	2388	4.8	1607	17	99.9	272
TRIMI	Triglav	Velenje/SI	SRAKA (0.8/6)*	2222	4.0	546	9	30.2	84
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2337	5.5	3574	2	4.7	5
ZELZO	Zelko	Budapest/HU	HUVCSE03 (1.0/4.5)	2224	4.4	933	3	19.6	56
			HUVCSE04 (1.0/4.5)	1484	4.4	573	1	7.6	23
Sum							30	6597.8	25268

* 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	-	-	3.4	-	-	1.9	2.4	6.9	0.7	5.9	5.4	-	-	-	6.1
BANPE	5.6	3.7	6.9	6.1	2.0	-	-	-	1.3	5.9	-	-	-	-	-
BERER	-	-	9.2	11.9	6.3	-	-	-	-	1.8	-	-	10.3	6.9	-
	-	-	8.9	11.9	0.8	-	-	-	-	2.0	-	-	9.7	2.2	-
BOMMA	12.2	-	7.5	-	0.5	-	-	0.5	1.6	-	5.4	-	3.5	10.2	8.2
BREMA	5.1	3.6	-	-	-	7.1	8.2	5.2	-	12.1	2.0	7.9	1.4	-	-
	3.7	3.3	-	-	-	8.1	8.0	5.4	-	12.0	4.5	6.3	2.3	-	-
BRIBE	9.0	4.4	-	-	-	0.9	6.6	7.9	2.4	12.9	0.2	0.2	5.8	0.2	-
	9.4	4.0	-	-	3.0	2.1	3.5	6.4	-	8.1	2.8	2.5	1.1	-	-
CASFL	12.3	12.5	-	-	-	-	2.7	-	-	-	-	-	3.0	-	-
	12.2	12.3	-	-	-	-	2.2	-	-	-	-	-	-	-	-
CRIST	11.3	6.6	1.1	-	-	-	9.2	6.7	-	-	-	-	7.6	-	6.3
	11.9	1.3	1.4	-	0.3	4.6	12.3	6.3	-	-	-	2.6	7.0	-	4.9
	12.0	7.9	0.2	-	-	0.2	0.3	3.4	0.5	-	-	-	2.4	-	2.7
CSISZ	7.7	5.2	5.3	10.3	0.9	0.7	0.8	-	1.4	6.9	-	3.7	-	5.6	7.0
DINJE	11.9	11.9	10.5	-	0.2	-	-	1.2	0.4	-	5.2	-	4.3	10.5	8.2
ELTMA	12.0	5.6	-	-	-	-	-	-	-	-	-	-	-	-	-
FORKE	12.2	11.7	9.1	-	-	-	-	12.4	5.3	2.7	8.5	5.1	-	-	-
GONRU	11.8	5.2	-	-	2.2	-	0.9	-	5.1	-	5.5	0.2	-	5.6	8.5
	12.0	3.7	-	12.0	-	-	1.2	-	4.7	-	6.1	-	-	5.6	8.1
	12.0	1.8	-	12.0	9.4	-	0.9	7.6	5.0	-	4.6	-	-	4.2	5.1
	12.0	3.9	-	11.9	9.9	-	1.1	-	4.6	-	5.8	-	-	6.2	8.5
	11.4	1.6	2.6	8.9	7.9	-	1.8	5.6	4.0	0.4	4.1	-	-	3.9	5.3
GOVMI	11.8	8.7	11.6	11.4	1.1	-	-	-	2.3	4.0	0.2	-	-	0.7	-
	11.6	7.2	10.0	-	-	-	-	-	-	-	-	-	-	-	-
	5.7	7.3	11.2	11.3	1.3	-	-	-	4.7	8.9	0.9	-	-	0.4	-
HERCA	8.5	0.9	11.1	11.9	9.6	11.9	12.1	10.4	11.5	11.9	11.5	10.2	10.9	12.3	8.0
HINWO	12.4	8.2	8.0	1.7	-	-	2.6	12.8	6.0	2.6	11.1	5.6	-	1.2	7.7
IGAAN	7.7	5.4	3.5	12.2	-	-	-	-	-	6.2	-	4.5	2.3	5.4	8.3
	-	-	-	-	-	-	-	-	3.5	11.1	1.2	3.3	0.9	7.1	3.8
	5.0	6.8	7.2	7.3	-	-	1.5	1.0	5.1	7.0	3.3	6.3	1.6	7.4	6.4
	-	-	-	11.4	-	-	-	-	-	-	-	1.9	0.9	6.9	-
JONKA	-	12.4	12.4	12.5	3.2	0.2	-	-	-	3.1	4.5	-	-	7.6	3.6
KACJA	9.8	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-
	8.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.2	-	1.6	1.5	-	-	-	-	-	-	-	-	-	-	-
	10.2	0.7	0.6	-	-	-	-	-	-	-	-	-	-	-	-
	7.0	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-
KISSZ	0.2	1.0	3.0	3.3	-	-	-	1.0	-	-	0.9	3.1	0.2	0.8	-
KOSDE	-	-	-	-	4.8	-	-	-	-	-	-	-	-	-	-
	6.7	-	-	4.8	1.2	4.6	8.7	-	1.5	12.3	8.7	9.4	4.2	-	2.1
LOJTO	-	11.3	10.1	10.0	12.3	-	-	-	-	-	9.8	-	-	-	-
MACMA	-	-	-	12.6	12.0	1.2	-	-	-	10.9	7.0	-	-	-	-
	4.3	6.0	12.7	12.8	12.8	2.5	-	-	-	13.0	7.2	-	-	-	-
	2.6	7.6	12.6	12.3	12.4	2.8	0.2	0.8	-	10.8	7.1	-	-	-	-
	4.4	7.9	12.6	12.6	12.7	3.7	-	-	-	12.9	7.1	-	-	-	-
MARGR	-	0.6	-	7.6	4.0	5.1	3.9	6.8	6.8	-	-	-	6.6	7.2	6.1
MARRU	2.3	1.2	-	4.0	4.2	-	-	1.1	2.2	-	-	-	-	3.9	-
MASMI	-	7.2	11.7	12.3	-	-	-	-	-	-	-	-	-	-	1.4
MOLSI	11.8	11.8	10.9	5.0	-	0.7	5.2	4.0	-	-	8.3	-	-	-	0.3
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.6	11.8	10.8	4.6	-	0.2	4.0	3.8	-	-	4.7	-	-	-	0.2
	11.0	5.4	3.2	0.2	-	4.1	3.8	12.2	-	6.4	5.3	-	-	-	3.0
	11.6	4.9	2.3	-	-	4.0	4.0	10.8	-	4.3	5.6	-	-	-	3.0
	9.1	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-
	11.6	6.1	2.4	-	-	4.0	4.8	11.9	-	6.7	5.2	-	-	-	2.7
MORJO	9.0	10.5	8.1	11.0	2.7	-	0.7	2.1	3.0	8.5	2.3	4.3	-	10.0	6.4
MOSFA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OCHPA	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	4.5	6.0	-	-	-	0.2	-	-	-	0.2	-	0.6	0.3	7.8	-
PERZS	12.2	8.4	8.9	9.6	0.2	-	0.2	-	5.0	8.4	1.7	-	-	-	-
PUCRC	2.9	5.0	11.9	6.0	-	-	-	-	1.1	1.0	1.0	-	8.8	0.8	-
ROTEC	12.4	6.1	2.2	-	-	-	-	11.9	-	3.1	4.1	-	-	-	-
SARAN	7.7	4.3	-	5.6	-	-	-	3.7	2.8	-	-	-	-	6.2	6.2
	8.5	5.2	-	6.9	6.5	-	-	5.3	3.6	-	-	0.2	-	6.2	4.8
	8.6	6.5	-	7.3	6.8	-	-	6.2	2.9	-	-	-	-	6.7	5.8
	6.3	3.7	-	3.6	-	-	-	3.9	3.4	-	-	-	-	5.8	4.8
SCHHA	5.2	2.3	-	0.5	3.4	7.8	8.5	6.8	-	10.1	-	2.4	6.2	-	0.2
SLAST	6.9	2.4	1.0	-	-	-	-	-	-	-	-	-	-	-	-
	6.9	-	-	1.8	-	-	-	-	-	0.6	-	-	-	-	-
STOEN	12.2	10.6	5.0	-	-	-	-	-	0.3	-	0.3	-	3.6	4.4	6.5
	12.1	12.1	6.4	0.2	-	-	-	-	0.3	-	0.6	-	2.7	5.5	6.4
	12.2	12.0	7.1	0.2	-	-	-	-	1.0	-	0.3	-	2.7	4.7	-
STRJO	7.7	4.8	-	-	-	7.0	5.4	9.6	5.1	13.0	3.2	0.9	7.5	3.0	-
	8.1	5.0	-	-	-	5.3	6.6	12.0	5.0	9.1	4.0	0.8	7.8	4.3	-
	8.1	4.8	0.2	-	-	7.4	6.2	10.6	5.1	13.0	2.6	1.2	7.5	3.7	-
	8.7	5.0	-	-	-	5.7	5.0	8.6	4.3	12.9	3.8	-	7.6	4.0	-
	7.8	4.5	-	-	-	7.8	6.0	10.9	5.3	12.7	2.6	-	7.6	2.2	-
TEPIS	6.1	7.9	7.8	7.8	0.8	-	-	-	6.7	7.5	1.1	3.8	-	6.4	4.1
	8.1	12.2	12.2	12.3	-	-	-	-	-	8.9	2.6	0.8	-	3.6	6.3
TRIMI	5.6	-	1.0	1.9	-	-	-	-	-	-	-	-	-	-	0.4
YRJIL	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZELZO	-	-	5.1	4.7	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum	597.9	396.5	313.2	347.7	155.4	111.8	151.5	243.7	135.5	311.8	199.9	87.8	148.3	207.3	187.4

November	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	10.2	-	-	-	1.1	-	9.0	10.6	11.3	1.1	9.2	-	-	-	-
BANPE	-	-	0.2	5.6	1.2	4.3	7.1	-	-	-	-	-	-	-	-
BERER	-	-	-	-	4.4	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	4.4	-	-	-	-	-	-	-	-	-	-
BOMMA	6.7	3.6	3.2	11.3	10.8	-	-	-	5.1	-	-	-	-	-	-
BREMA	0.3	-	-	-	4.9	7.0	2.4	-	9.8	12.8	-	4.2	13.6	-	-
	1.5	1.5	-	-	4.8	5.6	1.6	1.7	10.3	10.4	-	4.1	12.9	-	-
BRIBE	-	-	-	-	0.2	12.7	4.9	1.9	11.9	13.1	0.2	6.3	13.7	-	-
	2.5	-	-	-	-	-	-	-	-	-	-	-	0.9	-	-
CASFL	3.7	-	13.1	7.5	-	10.3	13.2	13.1	8.8	-	-	0.8	-	3.6	-
	-	-	-	6.4	-	10.2	12.8	13.0	8.6	-	-	0.5	-	2.5	-
CRIST	8.6	1.5	12.5	12.7	3.4	-	-	4.0	0.2	-	-	-	-	-	-
	3.2	2.6	12.7	12.5	1.6	-	-	5.7	-	-	-	-	-	-	-
	9.8	1.0	10.4	12.7	3.7	-	-	0.3	-	-	-	-	-	-	-
CSISZ	0.8	-	3.5	5.3	8.6	-	1.3	-	0.4	0.9	4.7	-	-	-	-
DINJE	6.7	3.8	2.9	10.8	12.9	-	-	-	6.9	-	-	-	-	-	-
ELTMA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FORKE	9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GONRU	0.3	5.3	-	-	6.1	8.9	-	7.9	3.2	5.7	-	-	10.7	-	12.3
	-	5.1	-	-	6.1	8.2	-	7.3	2.6	5.9	-	-	10.5	-	12.8
	-	5.8	-	2.3	8.1	8.4	-	3.7	1.2	4.1	0.2	-	12.7	2.7	11.6
	0.4	2.9	-	-	6.2	8.5	-	6.7	2.8	5.2	-	-	10.7	-	12.6
	0.6	5.7	-	2.5	7.5	7.7	-	5.1	0.6	3.7	-	0.6	12.6	3.9	11.7
GOVMI	0.5	-	0.7	-	2.3	3.6	8.6	-	1.1	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0.5	-	1.2	5.4	2.9	2.9	7.5	-	0.4	-	-	-	-	-	-
HERCA	8.8	10.7	12.2	12.3	12.3	11.1	10.2	12.4	12.3	12.5	12.3	12.1	12.0	12.5	11.7
HINWO	11.0	-	-	-	-	8.5	13.3	9.2	6.6	13.4	9.0	-	8.6	4.9	3.8
IGAAN	1.8	-	3.1	7.5	4.7	-	-	1.3	-	1.0	5.4	-	-	-	-
	-	-	8.7	1.1	5.5	-	-	10.6	8.1	-	-	-	-	-	-
	-	1.1	4.5	2.4	-	-	-	4.0	3.6	0.4	-	-	-	-	-
	-	-	-	4.7	11.4	-	2.2	-	-	-	-	-	-	-	-
JONKA	-	-	3.0	2.5	13.1	2.0	2.0	0.2	-	0.7	-	-	-	-	-
KACJA	1.7	-	1.2	3.4	-	-	7.2	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.2	-	0.7	0.7	-	0.6	2.2	-	-	-	-	-	-	-	-
	2.1	-	1.9	5.3	-	-	8.3	-	-	-	-	-	-	-	-
	1.4	-	1.0	1.4	-	-	4.0	-	-	-	-	-	-	-	-
KISSZ	-	-	1.7	2.7	4.9	-	-	-	-	-	-	-	-	-	-
KOSDE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	2.6	1.8	-	2.1	7.5	8.1	-	-	1.5	-	-
LOJTO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MACMA	-	-	-	-	-	-	-	0.3	8.5	-	-	9.7	0.6	-	-
	-	-	-	-	-	-	-	0.7	9.2	-	-	10.2	-	-	-
	-	-	-	-	-	-	-	0.3	8.9	-	-	-	-	-	-
	-	-	-	-	-	-	-	0.7	5.1	-	-	10.2	-	-	-
MARGR	10.6	10.8	10.8	3.1	8.1	9.7	3.7	-	-	-	-	-	10.0	1.7	-
MARRU	-	-	-	-	-	6.2	5.4	3.3	5.4	4.9	-	-	-	0.8	8.4
MASMI	-	12.2	-	-	-	-	-	-	1.6	-	-	8.6	11.0	2.8	-
MOLSI	12.4	1.1	-	0.7	5.9	7.7	12.1	-	-	-	-	4.4	-	-	-
	6.7	-	-	-	-	-	12.2	-	-	-	-	-	-	-	-
	12.0	-	-	0.6	4.4	4.8	11.8	-	-	0.5	-	4.3	-	-	-
	10.0	-	-	-	0.8	-	8.2	10.9	11.1	2.3	9.5	-	-	-	0.2
	10.7	-	-	-	-	-	8.7	10.9	11.5	3.3	9.7	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11.4	-	-	-	0.5	-	9.0	11.0	11.5	3.0	9.9	0.6	-	-	-
MORJO	-	-	3.7	9.8	10.4	-	-	-	-	-	-	-	-	-	-
MOSFA	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	-
OCHPA	0.4	-	3.5	4.8	7.1	9.2	8.7	-	-	-	-	-	-	-	-
OTTMI	10.8	8.2	2.6	10.4	7.9	-	-	-	1.1	9.1	2.9	-	9.3	9.7	4.6
PERZS	-	-	2.5	6.1	7.3	12.4	13.1	1.4	4.5	4.9	3.7	-	-	-	-
PUCRC	-	-	5.2	12.6	-	-	-	-	5.7	-	-	-	-	-	-
ROTEC	5.6	-	-	-	-	-	-	10.0	10.8	-	9.6	0.9	-	-	1.9
SARAN	-	6.3	-	-	5.5	7.4	-	-	-	-	-	-	-	-	-
	-	5.5	-	-	5.5	7.4	-	4.2	6.8	7.1	3.6	-	-	-	11.6
	-	5.8	-	-	6.6	7.4	-	-	9.1	7.8	4.0	-	-	1.2	11.3
	0.2	5.7	-	-	4.2	5.1	-	3.6	7.3	7.8	2.2	-	-	0.5	9.2
SCHHA	0.7	1.1	-	3.3	11.1	11.6	2.4	-	13.0	5.6	0.2	4.5	2.2	-	-
SLAST	-	-	0.8	-	-	-	4.0	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STOEN	6.6	-	9.1	11.9	11.7	12.8	13.2	13.0	7.0	-	-	-	0.3	0.2	-
	7.1	-	9.5	11.0	11.8	12.7	13.1	13.1	6.7	-	-	-	0.2	-	-
	7.9	-	9.7	12.1	11.6	12.3	13.3	13.1	6.6	0.2	-	-	0.6	0.7	-
STRJO	1.6	3.8	-	-	-	-	5.9	5.2	12.2	8.7	-	9.6	7.8	-	-
	1.4	4.6	-	-	-	-	7.1	2.8	11.2	11.0	-	9.9	6.8	-	-
	2.1	4.5	-	-	-	6.3	6.8	5.5	12.1	7.0	0.5	9.5	7.2	-	-
	1.3	3.6	-	-	-	-	7.1	4.8	12.4	11.1	0.3	9.4	8.8	-	-
	1.6	3.4	-	-	-	-	4.6	4.6	11.8	8.8	0.6	8.4	5.5	-	-
TEPIS	0.9	0.7	1.0	0.2	6.7	4.9	0.9	-	-	3.4	-	-	-	-	-
	4.2	1.4	3.6	2.2	12.2	3.8	-	-	-	4.6	0.9	-	-	-	-
TRIMI	-	-	6.6	11.5	1.2	0.7	1.3	-	-	-	-	-	-	-	-
YRJIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.3
ZELZO	-	-	-	-	9.8	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	7.6	-	-	-	-	-	-	-	-	-	-
Sum	221.0	129.3	167.0	239.3	313.6	264.7	290.4	240.2	334.4	210.1	98.6	128.8	190.7	48.0	126.0

3. Results (Meteors)

November	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	21	-	-	22	22	38	1	39	12	-	-	-	18
BANPE	18	6	22	28	7	-	-	-	5	18	-	-	-	-	-
BERER	-	-	30	72	11	-	-	-	-	2	-	-	25	13	-
	-	-	9	18	1	-	-	-	-	2	-	-	9	6	-
BOMMA	57	-	66	-	4	-	-	1	6	-	15	-	29	53	73
BREMA	7	6	-	-	-	23	6	5	-	32	5	7	3	-	-
	3	2	-	-	-	17	14	9	-	29	17	11	4	-	-
BRIBE	24	7	-	-	-	5	20	20	2	56	1	1	7	1	-
	39	14	-	-	23	4	8	20	-	24	12	9	1	-	-
CASFL	68	44	-	-	-	-	19	-	-	-	-	-	15	-	-
	47	51	-	-	-	-	7	-	-	-	-	-	-	-	-
CRIST	72	51	5	-	-	-	31	43	-	-	-	-	34	-	50
	48	8	3	-	2	18	53	27	-	-	-	24	37	-	28
	76	71	1	-	-	1	1	18	1	-	-	-	5	-	12
CSISZ	24	17	14	34	1	1	2	-	2	20	-	6	-	22	20
DINJE	85	87	63	-	2	-	-	9	2	-	8	-	23	60	76
ELTMA	55	9	-	-	-	-	-	-	-	-	-	-	-	-	-
FORKE	68	25	45	-	-	-	-	49	21	13	39	5	-	-	-
GONRU	60	19	-	-	17	-	5	-	24	-	11	1	-	33	20
	41	5	-	51	-	-	1	-	11	-	19	-	-	27	20
	24	1	-	21	7	-	1	13	11	-	4	-	-	5	4
	47	10	-	36	23	-	3	-	17	-	14	-	-	28	21
	45	3	24	47	16	-	2	17	18	2	6	-	-	20	7
GOVMI	57	24	37	63	5	-	-	-	23	31	1	-	-	5	-
	28	6	15	-	-	-	-	-	-	-	-	-	-	-	-
	15	5	26	24	5	-	-	-	8	9	6	-	-	1	-
HERCA	19	4	37	48	28	36	34	29	29	34	33	31	35	36	26
HINWO	77	20	45	5	-	-	9	51	20	9	64	11	-	4	22
IGAAN	5	3	5	35	-	-	-	-	-	10	-	5	7	13	7
	-	-	-	-	-	-	-	-	3	18	4	9	2	7	2
	8	22	15	16	-	-	7	2	12	31	6	11	2	20	14
	-	-	-	7	-	-	-	-	-	-	-	1	1	4	-
JONKA	-	13	11	24	5	1	-	-	-	4	3	-	-	14	2
KACJA	31	-	2	-	-	-	-	-	-	-	-	-	-	-	-
	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	-	4	6	-	-	-	-	-	-	-	-	-	-	-
	77	4	3	-	-	-	-	-	-	-	-	-	-	-	-
	15	-	2	-	-	-	-	-	-	-	-	-	-	-	-
KISSZ	1	2	5	5	-	-	-	1	-	-	1	3	1	2	-
KOSDE	-	-	-	-	97	-	-	-	-	-	-	-	-	-	-
	43	-	-	5	4	9	14	-	4	42	24	37	10	-	3
LOJTO	-	14	22	19	13	-	-	-	-	-	8	-	-	-	-
MACMA	-	-	-	48	33	2	-	-	-	47	13	-	-	-	-
	18	33	87	69	60	7	-	-	-	66	16	-	-	-	-
	6	31	65	59	64	15	1	1	-	76	26	-	-	-	-
	32	39	98	84	95	16	-	-	-	86	23	-	-	-	-
MARGR	-	1	-	18	3	9	2	12	6	-	-	-	12	19	17
MARRU	12	7	-	15	10	-	-	8	6	-	-	-	-	25	-
MASMI	-	55	94	82	-	-	-	-	-	-	-	-	-	-	1
MOLSI	42	108	138	32	-	3	18	25	-	-	20	-	-	-	4
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28	62	94	20	-	1	19	12	-	-	6	-	-	-	1
	104	28	7	1	-	57	29	80	-	36	4	-	-	-	7
	104	12	7	-	-	38	27	64	-	18	5	-	-	-	6
	85	29	-	-	-	-	-	-	-	-	-	-	-	-	-
	95	25	6	-	-	18	25	71	-	29	11	-	-	-	10
MORJO	9	16	12	25	1	-	2	7	10	18	4	4	-	12	9
MOSFA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OCHPA	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	13	11	-	-	-	1	-	-	-	1	-	3	1	21	-
PERZS	79	18	42	84	1	-	1	-	9	50	4	-	-	-	-
PUCRC	9	34	48	21	-	-	-	-	6	6	6	-	49	3	-
ROTEC	32	9	1	-	-	-	-	25	-	10	3	-	-	-	-
SARAN	15	8	-	6	-	-	-	4	2	-	-	-	-	21	13
	21	18	-	13	32	-	-	20	12	-	-	2	-	29	11
	35	17	-	34	42	-	-	32	8	-	-	-	-	40	18
	25	8	-	13	-	-	-	10	4	-	-	-	-	16	9
SCHHA	16	21	-	3	18	40	34	29	-	24	-	6	12	-	1
SLAST	5	2	1	-	-	-	-	-	-	-	-	-	-	-	-
	5	-	-	2	-	-	-	-	-	3	-	-	-	-	-
STOEN	103	50	30	-	-	-	-	-	2	-	1	-	32	22	101
	78	38	23	1	-	-	-	-	2	-	4	-	24	27	89
	112	51	41	1	-	-	-	-	6	-	2	-	32	25	-
STRJO	30	3	-	-	-	32	22	30	14	40	7	2	27	7	-
	44	6	-	-	-	28	35	40	14	23	10	2	40	8	-
	32	5	1	-	-	23	29	29	13	40	7	2	27	6	-
	45	1	-	-	-	32	24	19	8	53	7	-	24	2	-
	26	3	-	-	-	22	20	23	17	26	4	-	23	3	-
TEPIS	19	27	29	37	1	-	-	-	25	27	3	8	-	40	7
	20	34	35	41	-	-	-	-	-	30	3	3	-	3	6
TRIMI	13	-	2	4	-	-	-	-	-	-	-	-	-	-	2
YRJIL	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZELZO	-	-	9	17	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum	2697	1363	1402	1294	631	481	547	893	384	1134	502	204	553	703	737

November	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	84	-	-	-	3	-	91	36	91	6	77	-	-	-	-
BANPE	-	-	1	22	6	6	14	-	-	-	-	-	-	-	-
BERER	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-
BOMMA	65	28	23	18	62	-	-	-	8	-	-	-	-	-	-
BREMA	2	-	-	-	18	16	5	-	23	19	-	8	33	-	-
	4	1	-	-	16	9	1	5	33	22	-	20	23	-	-
BRIBE	-	-	-	-	1	41	8	1	63	44	1	19	60	-	-
	12	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CASFL	8	-	59	44	-	60	49	41	45	-	-	2	-	3	-
	-	-	-	31	-	55	55	38	44	-	-	3	-	4	-
CRIST	25	10	95	88	3	-	-	13	1	-	-	-	-	-	-
	16	11	61	50	2	-	-	13	-	-	-	-	-	-	-
	21	1	29	80	8	-	-	2	-	-	-	-	-	-	-
CSISZ	3	-	7	21	19	-	1	-	1	2	15	-	-	-	-
DINJE	68	25	24	27	96	-	-	-	23	-	-	-	-	-	-
ELTMA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FORKE	68	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GONRU	1	10	-	-	33	33	-	30	4	14	-	-	58	-	55
	-	7	-	-	32	38	-	19	3	13	-	-	38	-	57
	-	5	-	1	18	20	-	5	2	3	1	-	26	1	30
	2	9	-	-	25	36	-	17	3	12	-	-	30	-	53
	1	5	-	9	29	34	-	18	1	2	-	1	36	16	62
GOVMI	3	-	4	-	2	22	24	-	8	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1	-	1	18	1	5	10	-	1	-	-	-	-	-	-
HERCA	29	39	38	33	38	23	30	30	30	38	30	21	34	36	35
HINWO	62	-	-	-	-	63	97	45	32	77	28	-	24	9	4
IGAAN	8	-	2	26	8	-	-	4	-	1	10	-	-	-	-
	-	-	19	3	8	-	-	38	11	-	-	-	-	-	-
	-	2	21	5	-	-	-	19	3	2	-	-	-	-	-
	-	-	-	6	16	-	4	-	-	-	-	-	-	-	-
JONKA	-	-	3	13	39	4	6	1	-	1	-	-	-	-	-
KACJA	1	-	1	3	-	-	12	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1	-	1	1	-	2	1	-	-	-	-	-	-	-	-
	1	-	4	16	-	-	24	-	-	-	-	-	-	-	-
	1	-	1	2	-	-	4	-	-	-	-	-	-	-	-
KISSZ	-	-	1	7	1	-	-	-	-	-	-	-	-	-	-
KOSDE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	16	4	-	12	32	20	-	-	6	-	-
LOJTO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MACMA	-	-	-	-	-	-	-	2	13	-	-	30	1	-	-
	-	-	-	-	-	-	-	5	27	-	-	30	-	-	-
	-	-	-	-	-	-	-	2	21	-	-	-	-	-	-
	-	-	-	-	-	-	-	6	21	-	-	48	-	-	-
MARGR	29	38	23	2	17	17	5	-	-	-	-	-	10	1	-
MARRU	-	-	-	-	-	16	28	21	15	8	-	-	-	6	43
MASMI	-	68	-	-	-	-	-	-	4	-	-	51	58	19	-
MOLSI	114	1	-	7	50	32	128	-	-	-	-	13	-	-	-
	7	-	-	-	-	-	8	-	-	-	-	-	-	-	-
	68	-	-	2	29	12	69	-	-	2	-	9	-	-	-
	117	-	-	-	2	-	68	29	92	11	69	-	-	-	1
	80	-	-	-	-	-	62	21	74	11	71	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	130	-	-	-	1	-	63	26	92	18	99	2	-	-	-
MORJO	-	-	5	25	13	-	-	-	-	-	-	-	-	-	-
MOSFA	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
OCHPA	2	-	6	9	18	25	26	-	-	-	-	-	-	-	-
OTTMI	17	13	1	24	22	-	-	-	2	11	6	-	30	15	9
PERZS	-	-	14	38	51	61	92	1	6	19	4	-	-	-	-
PUCRC	-	-	12	68	-	-	-	-	24	-	-	-	-	-	-
ROTEC	21	-	-	-	-	-	-	12	18	-	18	1	-	-	1
SARAN	-	9	-	-	7	8	-	-	-	-	-	-	-	-	-
	-	13	-	-	16	13	-	19	12	15	6	-	-	-	40
	-	13	-	-	39	24	-	-	29	24	12	-	-	4	81
	1	10	-	-	9	1	-	7	15	4	8	-	-	3	30
SCHHA	3	3	-	7	44	43	4	-	65	14	1	18	3	-	-
SLAST	-	-	7	-	-	-	2	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STOEN	72	-	85	81	112	99	83	61	32	-	-	-	2	1	-
	68	-	77	75	97	96	62	56	27	-	-	-	1	-	-
	63	-	101	86	103	107	80	76	36	1	-	-	4	2	-
STRJO	8	3	-	-	-	-	12	3	60	13	-	33	15	-	-
	11	9	-	-	-	-	13	2	64	19	-	40	7	-	-
	14	8	-	-	-	24	13	7	41	14	2	27	11	-	-
	2	2	-	-	-	-	19	5	44	27	1	26	15	-	-
	7	6	-	-	-	-	9	6	52	20	4	21	7	-	-
TEPIS	2	3	3	1	29	12	2	-	-	7	-	-	-	-	-
	4	2	5	6	55	15	-	-	-	9	1	-	-	-	-
TRIMI	-	-	27	27	3	4	2	-	-	-	-	-	-	-	-
YRJIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
ZELZO	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	23	-	-	-	-	-	-	-	-	-	-
Sum	1327	354	761	982	1282	1080	1286	754	1348	523	464	423	534	122	503