Results of the IMO Video Meteor Network – February 2014

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80 cameras contributed to the IMO network in February. As in the previous month, the weather was sympathetic to the more northern observers in Europe (Netherlands, Germany, Poland) and presented to them an unusually high number of clear nights. Observers in more southern countries like Spain, Italy, Slovenia or Hungary had to live with much fewer clear clear skies. 14 cameras managed to obtain observations in twenty or more nights, again more than half of them in Germany. Overall we recorded in those 28 February nights over 14,000 meteors in almost 7,000 hours of effective observing time. That's clearly more than in the previous year and only 10% below the outcome of the record-breaking year 2012.

Jörg Strunk started to operate his fifth camera named MINCAM6, another Mintron camera with 6 mm f/0.8 Computar lens. The fight for the pool position in the country statistics of the IMO network remains thrilling, as also the Hungarian observers have plans for further camera stations.

Since the meteor activity in February is not surprising, we will further analyse the new procedure for population index calculation from video observations at this point. So far, the analyses resulted in smaller r-values than expected, which is why the procedure was checked for possible error sources:

- Determination of meteor brightness: It is a known fact that the meteor brightness values calculated by MetRec show often larger errors. This has no impact to the new procedure, however, since the only thing that counts is the number of meteors recorded by a camera at a given limiting magnitude.

- Determination of limiting magnitude: Currently a number of video frames are averaged, to reduce the noise. A high-pass filter is applied to the mean image to extract point sources. Their position will be matched against a star catalog, and the limiting magnitude will be deduced from the number of identified stars. If some parameters are adjusted differently (e.g. the threshold to extract point sources), the calculated limiting magnitude will change systematically. That has an impact on the flux density, but not on the population index, since that is calculated from the ratio of cumulative meteor counts in successive magnitude classes. This ratio will remain the same if the limiting magnitude is changed by a constant value.

- Detection probability of meteors: Currently an idealized step function is used, according to which MetRec will detect 100% of all meteor up to the limiting magnitude, but no meteor beyond. In reality, the detection rate will decline slowly as the limiting magnitude is approached. The effect will be less dramatic than for visual observers, but it will be no step function. Also this effect has only an impact on the flux density, but not on the population index. The reason is, that we do not analyse intervalls of the same meteor brightness, but of the same limiting meteor magnitude of the camera. So a systematically lower detection probability has the same effect on all intervalls.

- Zenith exponent: Beside the population index, also the zenith exponent has a significant impact on the number of observed meteors – in particular for low radiant altitudes and slow meteor showers. An analysis has shown, though, that the zenith exponent impacts primarily the flux density, but not the determined population index.

- Programming errors: To check that the procedure is working properly, a real observation was taken (observing time, limiting magnitudes, effective collection areas of cameras) and the observed meteors were replaced by simulated meteors. During the simulation, each meteor resp. minute was characterized by three random numbers:

- One reflected the meteor brightness, whereby the overall distribution was chosen such that it matched a given population index.
- One simulated the direction in the sky, whereby cameras with twice as large field of view had a chance twice as high that the meteor appeared “inside” the field of view.
- One reflected the number of meteors per minute, based on a Poisson distribution.

A meteor was counted as „observed“ if it was inside the field of view and brighter than the limiting meteor magnitude of the camera.

The simulation was carried out for different r-values and it was checked, if the procedure obtained the predefined population indices. The result was encouraging – there were only minor systematic deviations such that the r-value was overestimated by 0.1 to 0.2. The root cause of this deviation is currently not clear, but it seems that the determined r-values are rather a little to big than to small.

A discussion at the AKM spring seminar revealed, that deviations between the visual r-values and those obtained from video observations would be possible, since both are based on different boundary conditions:

- Video observations are using the absolute meteor magnitude (i.e. normalized to 100 km altitude), visual observation the apparent magnitude.

- The observing direction (altitude, radiant distance) is accounted for in case of video observations, but not for visual observations.

- The loss in limiting magnitude from the meteor motion (fast meteors distribute their photons over more pixels) is accounted for in case video observations, but not for visual observations.

Thus, the recently obtained population indices match our expectations.

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)	1534	5.8	2467	22	160.1	406
BERER	Berkó	Ludanyhalaszi/HU	HULUD3 (0.95/4)	4357	3.8	876	4	41.8	40
BOMMA	Bombardini	Faenza/IT	MARIO (1.2/4.0)	5794	3.3	739	9	37.5	114
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	19	142.8	153
			MBB4 (0.8/8)	1470	5.1	1208	16	117.1	107
BRIBE	Klemt	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	20	135.9	219
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	19	112.9	163
CASFL	Castellani	Monte Baldo/IT	BMH1 (0.8/6)	2350	5.0	1611	11	30.3	136
			BMH2 (1.5/4.5)*	4243	3.0	371	13	82.7	136
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	16	76.7	163
			C3P8 (0.8/3.8)	5455	4.2	1586	13	86.9	122
			STG38 (0.8/3.8)	5614	4.4	2007	14	55.0	156
DONJE	Donati	Faenza/IT	JENNI (1.2/4)	5886	3.9	1222	16	94.5	263
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	9	60.0	103
GANKA	Gansel	Dingden/DE	DARO01 (1.4/3.6)	7141	3.1	652	18	113.4	122
GONRU	Goncalves	Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	10	66.2	92
			TEMPLAR2 (0.8/6)	2080	5.0	1508	15	89.0	133
			TEMPLAR3 (0.8/8)	1438	4.3	571	13	64.3	52
			TEMPLAR4 (0.8/3.8)	4475	3.0	442	14	68.0	109
			TEMPLAR5 (0.75/6)	2312	5.0	2259	20	81.8	113
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	13	70.1	117
			ORION3 (0.95/5)	2665	4.9	2069	8	36.5	45
			ORION4 (0.95/5)	2662	4.3	1043	7	6.0	37
HERCA	Hergenrother	Tucson/US	SALSA3 (1.2/4)*	2198	4.6	894	27	249.8	357
IGAAN	Igaz	Baja/HU	HUBAJ (0.8/3.8)	5552	2.8	403	6	18.5	39
		Debrecen/HU	HUDEB (0.8/3.8)	5522	3.2	620	11	71.9	86
		Hodmezovasar./HU	HUHOD (0.8/3.8)	5502	3.4	764	14	83.7	107
		Budapest/HU	HUPOL (1.2/4)	3790	3.3	475	8	52.8	19
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	14	74.1	107
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	5	16.7	28
		Kostanjevec/SI	METKA (0.8/12)*	715	6.4	640	1	9.3	15
		Ljubljana/SI	ORION1 (0.8/8)	1402	3.8	331	5	19.5	7
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	4	18.1	38
			STEFKA (0.8/3.8)	5471	2.8	379	5	14.7	23
KERST	Kerr	Glenlee/AU	GOCAM1 (0.8/3.8)	5189	4.6	2550	12	41.8	188
KISSZ	Kiss	Sulysap/HU	HUSUL (0.95/5)*	4295	3.0	355	11	63.9	26
KOSDE	Koschny	Izana Obs./ES	ICC7 (0.85/25)*	714	5.9	1464	24	186.3	991
		La Palma / ES	ICC9 (0.85/25)*	683	6.7	2951	23	183.6	1403
		Noordwijkerhout/NL	LIC4 (1.4/50)*	2027	6.0	4509	21	143.4	237
LOJTO	Łojek	Grabniak/PL	PAV57 (1.0/5)	1631	3.5	269	7	35.5	34
MACMA	Maciejewski	Chelm/PL	PAV35 (0.8/3.8)	5495	4.0	1584	19	111.9	206
			PAV36 (0.8/3.8)*	5668	4.0	1573	20	139.6	222
			PAV43 (0.75/4.5)*	3132	3.1	319	16	92.1	52
			PAV60 (0.75/4.5)	2250	3.1	281	18	104.3	130
MARGR	Maravelias	Lofoupoli/GR	LOOMECON (0.8/12)	738	6.3	2698	7	35.5	60
MASMI	Maslov	Novosimbirsk/RU	NOWATEC (0.8/3.8)	5574	3.6	773	15	90.1	163
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1230	6.9	6152	20	140.9	729
			MINCAM1 (0.8/8)	1477	4.9	1084	22	150.2	218
		Ketzür/DE	REMO1 (0.8/8)	1467	6.5	5491	24	142.6	643
			REMO2 (0.8/8)	1478	6.4	4778	23	164.5	496
			REMO3 (0.8/8)	1420	5.6	1967	16	127.2	88
			REMO4 (0.8/8)	1478	6.5	5358	24	171.1	611
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	2522	3.5	532	17	111.3	110
MOSFA	Moschini	Rovereto/IT	ROVER (1.4/4.5)	3896	4.2	1292	13	61.5	124
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	18	161.2	302
PERZS	Perkó	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	13	77.8	140
PUCRC	Pucer	Nova vas nad Dra./SI	MOBCAM1 (0.75/6)	2398	5.3	2976	9	37.2	53
QUIVI	Quinta	Azeitao(PT	AZEIT1 (1.2/6)	2354	-	-	8	69.8	37
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	17	127.7	123
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	15	87.5	82
			RO2 (0.75/6)	2381	3.8	459	16	86.1	99
			RO3 (0.8/12)	710	5.2	619	13	69.5	76
			SOFIA (0.8/12)	738	5.3	907	14	89.5	86
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4152	4.5	2052	5	15.0	23
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	24	152.7	321
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	563	6.2	1294	4	21.2	36
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	16	74.2	296
			NOA38 (0.8/3.8)	5609	4.2	1911	14	71.3	199
			SCO38 (0.8/3.8)	5598	4.8	3306	16	83.0	313
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2354	5.4	2751	18	128.1	312
			MINCAM3 (0.8/6)	2338	5.5	3590	18	126.5	236
			MINCAM4 (1.0/2.6)	9791	2.7	552	11	94.0	154
			MINCAM5 (0.8/6)	2349	5.0	1896	17	121.1	231
			MINCAM6 (0.8/6)	2395	5.1	2178	19	123.5	233
TEPIS	Tepliczky	Agostyan/HU	HUAGO (0.75/4.5)	2427	4.4	1036	17	135.2	175
		Budapest/HU	HUMOB (0.8/6)	2388	4.8	1607	19	139.3	221
TRIMI	Triglav	Velenje/SI	SRAKA (0.8/6)*	2222	4.0	546	10	28.3	69
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2337	5.5	3574	1	10.2	13
ZELZO	Zelko	Budapest/HU	HUVCSE03 (1.0/4.5)	2224	4.4	933	3	10.6	15
			HUVCSE04 (1.0/4.5)	1484	4.4	573	4	13.2	16
Sum							28	6909.6	14519

* active field of view smaller than video frame

2. Observing Times (h)

February	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	0.9	-	12.4	11.2	8.1	-	5.3	2.4	11.1	-	7.4	4.6	-	1.5	-
BERER	-	-	12.3	12.2	-	-	-	-	-	-	-	-	-	10.0	-
BOMMA	-	-	-	-	-	9.7	2.0	-	4.8	-	1.0	11.1	3.1	1.5	2.5
BREMA	10.6	12.8	6.7	8.7	5.5	-	6.5	3.3	7.3	-	3.0	2.5	-	-	-
	8.1	12.6	-	11.4	4.0	-	7.6	-	7.5	2.1	-	-	6.5	0.6	-
BRIBE	4.3	12.8	4.8	11.7	4.9	-	7.4	4.2	7.7	-	2.2	1.6	6.8	-	1.9
	4.1	12.7	1.2	10.6	3.4	-	8.1	1.2	5.9	-	-	2.9	3.5	-	-
CASFL	-	-	-	-	0.2	2.1	2.3	-	1.8	-	-	-	-	0.6	-
	-	-	-	-	0.5	6.8	3.6	-	6.4	-	10.0	-	-	3.6	-
CRIST	-	-	-	0.7	-	1.0	2.2	0.7	-	1.6	8.1	4.5	3.5	-	-
	-	-	-	-	-	3.3	4.7	-	-	1.5	10.8	-	9.0	-	-
	-	-	-	0.2	-	-	-	0.4	-	-	0.3	3.8	4.4	0.5	-
DINJE	-	-	-	-	-	10.5	3.1	0.8	5.6	-	-	-	-	3.0	4.2
ELTMA	-	-	-	-	-	7.4	-	-	1.6	-	-	7.5	-	-	-
GANKA	10.8	10.4	6.9	-	7.1	0.5	5.8	-	3.8	1.4	1.9	-	7.2	-	-
GONRU	2.7	2.2	-	-	-	-	-	-	-	-	2.9	-	-	-	6.2
	6.7	1.3	-	-	-	6.4	-	5.3	-	-	2.4	-	-	-	11.6
	5.1	3.8	0.4	-	-	5.2	-	-	-	-	-	-	-	-	11.6
	4.8	0.9	-	-	-	4.3	-	2.5	-	0.8	4.7	-	-	-	9.6
	4.6	4.2	0.5	2.1	-	4.8	0.2	5.6	4.3	-	-	0.2	-	-	10.3
GOVMI	-	-	-	-	-	4.5	1.2	0.6	6.2	1.9	-	7.2	-	3.2	-
	-	-	-	-	-	3.4	1.4	-	2.9	-	-	-	-	2.5	-
	-	-	-	-	-	0.5	0.2	-	-	-	-	-	-	0.8	-
HERCA	-	7.0	3.8	10.0	2.5	10.5	3.0	11.9	10.8	10.8	11.9	11.9	11.2	11.7	11.4
IGAAN	-	5.7	9.2	0.5	0.3	-	-	0.6	2.2	-	-	-	-	-	-
	4.8	8.4	11.7	12.3	-	-	1.0	2.0	-	2.7	-	-	2.7	-	-
	-	7.9	8.3	8.1	-	-	-	2.8	3.1	-	-	6.6	4.1	7.6	8.4
	-	9.8	-	9.0	-	-	-	-	3.5	-	-	-	-	11.6	7.0
JONKA	-	5.9	12.6	8.2	-	-	-	0.7	3.8	-	-	1.7	2.1	11.0	6.7
KACJA	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	2.5	-	-	-	-	6.0	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	3.5	-
	-	-	-	-	-	-	-	-	-	-	-	0.4	-	0.7	-
KERST	-	5.4	3.7	8.0	5.8	1.2	4.9	-	0.2	2.6	2.8	2.8	2.3	2.1	-
KISSZ	-	9.9	0.3	11.5	-	-	-	-	-	-	-	-	5.1	12.1	5.1
KOSDE	11.2	10.8	9.9	8.2	7.1	7.1	7.6	1.8	2.2	7.5	5.8	7.5	7.0	4.3	-
	10.4	10.4	10.4	10.4	10.3	10.3	9.3	1.1	7.8	6.8	6.3	5.2	4.7	-	-
	10.0	10.3	6.8	9.8	5.0	-	5.4	3.0	8.8	1.9	7.4	-	7.5	-	5.0
LOJTO	-	-	4.6	0.6	-	-	-	8.9	-	-	-	-	-	-	-
MACMA	7.1	6.1	12.9	12.6	12.2	5.6	2.1	2.8	0.7	5.3	-	-	2.4	-	3.0
	7.3	8.7	12.7	12.6	12.6	7.7	3.1	3.3	4.9	7.5	-	-	2.3	-	6.8
	5.9	-	8.9	8.6	12.4	6.8	-	1.8	4.3	5.9	-	-	3.2	-	-
	6.1	4.1	12.5	12.2	11.7	4.8	2.9	2.9	2.6	7.8	-	-	-	-	-
MARGR	-	-	-	-	-	-	1.0	10.1	9.1	-	7.8	-	-	-	-
MASMI	-	-	-	-	6.8	12.4	8.8	8.2	6.7	3.5	3.5	3.8	6.2	-	5.8
MOLSI	-	-	-	-	-	10.0	5.8	0.2	11.4	-	11.4	6.4	3.2	3.1	1.4
	6.7	-	1.6	-	2.0	10.3	5.1	-	12.3	-	11.9	7.6	4.3	3.8	1.8
	3.9	-	12.8	11.2	5.4	3.1	5.3	2.7	9.0	-	3.8	4.0	-	-	0.5
	4.7	-	12.5	11.8	8.3	4.5	5.4	4.6	11.1	-	4.1	5.1	-	1.3	-
	4.3	-	-	10.8	-	-	4.6	4.5	10.8	-	6.2	6.1	-	-	-
	4.9	-	12.6	11.8	8.3	4.3	5.1	4.7	10.0	-	6.5	5.6	-	-	0.7
MORJO	-	9.9	12.5	10.0	-	-	-	3.6	4.3	-	-	2.2	4.9	11.8	9.4
MOSFA	-	-	-	-	-	6.3	-	-	2.2	-	3.9	6.4	1.9	1.0	-
OTTMI	-	10.7	7.8	-	11.5	9.8	-	-	11.7	10.3	7.4	3.0	6.8	10.5	-
PERZS	-	-	-	-	-	4.7	1.8	1.4	7.3	-	-	7.5	-	4.2	3.1
PUCRC	-	-	-	-	-	-	-	-	3.3	-	-	4.7	-	-	-
QUIVI	-	-	-	-	-	-	-	-	-	-	4.2	-	-	-	8.6
ROTEC	-	-	-	12.0	5.8	-	-	2.4	10.7	-	4.7	5.2	-	-	-
SARAN	8.3	1.5	-	-	-	7.0	-	1.6	-	-	-	-	-	-	6.3
	7.0	1.1	-	-	-	6.6	-	3.6	-	-	2.6	-	-	-	8.3
	6.5	1.2	-	-	-	7.7	-	-	-	-	2.6	-	-	-	6.7
	8.5	1.6	-	-	-	8.2	-	2.7	-	-	-	-	-	-	7.4
SCALE	-	-	-	-	-	-	-	-	4.6	-	2.1	6.0	1.2	-	1.1
SCHHA	6.1	12.7	4.1	9.0	6.3	-	7.5	5.1	6.0	-	4.0	2.7	8.3	0.5	2.2
SLAST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STOEN	-	-	-	-	-	10.9	1.1	-	1.1	-	4.1	7.0	3.4	1.7	-
	-	-	-	-	-	10.3	1.7	-	2.3	-	-	5.9	2.7	2.0	-
	-	-	-	-	-	11.3	1.7	-	2.8	-	4.6	7.0	4.3	3.5	-
STRJO	-	12.4	4.6	12.1	5.0	-	4.3	3.5	7.9	-	-	2.0	0.5	-	-
	-	12.2	0.8	12.2	4.3	-	4.6	4.5	8.1	-	-	1.9	0.6	-	-
	-	12.2	-	12.1	4.2	-	-	-	-	-	-	-	-	-	-
	-	12.3	0.8	12.2	4.5	-	4.1	3.7	8.0	-	-	1.7	-	-	-
	-	12.4	0.8	12.2	4.5	-	3.9	3.9	8.1	0.2	-	1.0	0.4	-	-
TEPIS	-	9.2	12.4	12.3	5.2	-	-	4.2	2.7	-	-	9.2	-	11.9	11.0
	-	10.9	12.4	9.3	4.9	8.9	-	3.4	3.6	-	-	7.8	3.2	11.9	9.2
TRIMI	-	-	-	-	-	1.2	-	-	2.4	-	-	2.0	-	2.5	-
YRJIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZELZO	-	-	5.5	-	-	-	-	-	-	-	-	-	2.9	-	-
	-	-	5.6	-	-	-	-	-	-	-	-	-	3.2	-	-
Sum	186.4	304.4	280.3	370.4	200.6	261.9	172.7	149.2	311.8	82.1	184.3	203.8	156.6	170.9	194.8

February	16	17	18	19	20	21	22	23	24	25	26	27	28
ARLRA	9.3	8.1	-	0.6	7.5	8.5	6.2	11.4	11.4	9.5	8.3	3.3	11.1
BERER	-	-	-	-	7.3	-	-	-	-	-	-	-	-
BOMMA	1.8	-	-	-	-	-	-	-	-	-	-	-	-
BREMA	7.9	7.7	-	1.2	-	11.2	10.3	9.9	11.5	4.7	11.5	-	-
	6.1	0.4	-	-	-	10.3	9.7	10.1	9.6	-	10.5	-	-
BRIBE	7.9	7.1	-	-	-	11.3	10.2	11.7	5.3	-	10.3	1.8	-
	2.5	8.1	-	-	-	8.2	9.7	10.6	8.5	-	7.0	1.3	3.4
CASFL	-	0.6	-	-	2.6	-	4.4	5.6	7.6	-	-	2.5	-
	-	10.7	-	-	5.8	-	10.5	11.5	11.4	0.5	-	1.4	-
CRIST	-	6.0	-	1.7	8.7	1.2	9.2	11.2	11.1	-	-	5.3	-
	-	7.9	-	2.0	7.9	4.9	10.3	11.2	11.2	-	-	2.2	-
	-	1.9	-	0.3	7.2	1.4	11.0	11.4	11.4	-	-	0.8	-
DINJE	5.6	6.0	-	-	-	1.8	6.1	9.8	11.3	7.1	4.3	9.4	5.9
ELTMA	-	6.6	-	-	-	-	5.0	11.0	11.0	4.9	-	5.0	-
GANKA	7.1	-	-	-	-	11.4	6.0	11.7	8.2	2.3	9.2	-	1.7
GONRU	8.1	-	7.2	-	-	7.9	10.9	-	-	10.9	-	7.2	-
	8.6	1.8	6.9	1.1	-	8.7	10.0	-	-	10.7	-	7.2	0.3
	8.5	3.4	6.7	-	5.0	-	-	1.8	-	6.6	-	5.6	0.6
	7.1	0.8	5.2	-	-	6.7	8.3	-	-	7.6	-	4.7	-
	6.8	1.2	6.1	0.9	2.9	7.2	7.1	1.1	-	6.8	-	4.9	-
GOVMI	-	1.0	-	-	-	-	-	-	10.8	11.3	7.3	3.7	11.2
	-	-	-	-	-	-	-	0.4	10.6	-	5.3	-	10.0
	-	0.3	-	-	-	-	-	-	1.1	-	-	1.6	1.5
HERCA	6.1	9.0	11.7	10.4	11.6	11.6	8.3	6.0	7.4	10.3	6.5	11.1	11.4
IGAAN	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	8.0	-	-	7.0	-	-	11.3	-	-
	4.7	-	-	-	-	-	-	-	-	7.8	6.4	0.3	7.6
	-	-	-	-	5.6	-	-	-	2.7	3.6	-	-	-
JONKA	-	5.4	-	-	-	-	-	3.0	2.3	5.4	-	-	5.3
KACJA	-	-	-	-	-	-	-	0.6	-	7.1	2.5	3.7	-
	-	-	-	-	-	-	-	-	-	9.3	-	-	-
	-	-	-	-	-	0.9	-	-	4.7	-	-	5.4	-
	-	-	-	-	-	-	-	-	-	7.4	3.5	3.7	-
	-	-	-	-	-	-	-	-	-	4.3	4.3	5.0	-
KERST	-	-	-	-	-	-	-	-	-	-	-	-	-
KISSZ	-	7.3	-	-	-	-	-	3.9	2.4	5.7	-	0.6	-
KOSDE	-	-	-	10.2	10.8	10.1	8.3	2.3	9.7	10.2	9.3	6.8	10.6
	-	-	-	4.7	6.2	7.0	8.0	3.9	10.0	10.1	10.1	10.1	10.1
	9.5	-	-	3.3	-	7.3	9.6	3.2	9.5	4.5	9.5	6.1	-
LOJTO	-	-	-	-	1.9	0.9	-	9.5	-	9.1	-	-	-
MACMA	1.5	7.3	3.1	1.0	11.8	-	-	-	11.6	-	-	-	2.8
	2.8	8.3	5.8	2.2	11.9	-	-	0.8	11.7	-	-	6.6	-
	2.5	9.0	3.4	-	11.8	-	-	0.8	3.9	-	-	-	2.9
	2.3	4.6	3.5	1.0	7.0	0.4	-	-	11.4	-	-	6.5	-
MARGR	-	-	-	-	-	1.7	2.5	3.3	-	-	-	-	-
MASMI	10.7	-	-	-	-	1.1	-	-	9.5	1.0	-	2.1	-
MOLSI	-	9.7	4.4	2.4	8.9	4.0	8.0	11.0	10.9	10.9	7.1	-	10.7
	-	9.6	-	1.1	9.3	1.4	6.7	11.6	11.6	11.5	6.0	2.7	11.3
	10.2	7.0	0.2	0.4	9.0	7.6	3.0	11.6	11.6	6.3	0.3	4.2	9.5
	9.9	7.7	-	1.2	8.9	9.0	4.2	11.7	11.6	7.8	2.0	5.8	11.3
	11.8	7.9	-	2.5	9.0	8.4	-	11.7	10.2	7.1	-	-	11.3
	11.2	8.0	1.2	2.4	9.0	9.4	4.6	11.7	11.6	7.8	2.6	5.7	11.4
MORJO	0.8	0.9	-	-	4.6	-	-	5.5	-	11.5	2.9	6.1	10.4
MOSFA	-	2.5	-	-	1.1	-	11.8	11.8	11.7	-	0.7	0.2	-
OTTMI	-	7.9	8.7	-	-	9.0	8.8	10.9	-	8.9	8.3	9.2	-
PERZS	-	1.8	-	-	-	-	-	-	11.3	9.5	11.0	3.0	11.2
PUCRC	-	2.2	-	-	-	2.9	0.2	4.0	7.2	6.6	-	6.1	-
QUIVI	9.5	6.2	10.3	-	-	10.0	10.6	-	-	10.4	-	-	-
ROTEC	9.7	6.2	-	-	7.9	7.6	2.8	11.7	11.6	11.5	4.2	3.5	10.2
SARAN	5.0	9.5	6.7	-	1.7	9.3	10.4	3.4	-	8.3	1.8	6.7	-
	5.3	10.2	5.6	-	1.2	8.6	10.3	2.4	-	7.0	1.0	5.3	-
	3.2	9.7	4.3	-	-	6.9	10.2	2.9	-	6.9	0.7	-	-
	5.3	10.8	6.4	-	1.6	8.6	10.4	4.1	-	7.4	-	6.5	-
SCALE	-	-	-	-	-	-	-	-	-	-	-	-	-
SCHHA	5.7	4.9	-	1.8	0.2	11.7	11.3	11.5	11.5	-	11.5	4.8	3.3
SLAST	-	-	-	-	-	-	-	-	7.8	5.0	3.8	4.6	-
STOEN	0.3	6.8	-	-	-	-	6.2	11.5	11.6	5.2	1.6	1.4	0.3
	-	10.1	-	-	-	-	6.0	11.5	11.7	3.9	1.4	1.6	0.2
	0.2	10.0	-	-	-	-	6.3	11.7	11.7	4.7	1.5	1.5	0.2
STRJO	6.9	9.5	-	-	-	10.9	8.5	11.3	11.2	3.9	8.9	-	4.7
	8.4	9.2	-	-	-	11.1	8.1	11.2	11.2	4.6	8.4	-	5.1
	6.1	9.3	-	-	-	9.0	7.8	10.9	11.1	-	8.1	-	3.2
	6.3	9.6	-	-	-	11.1	8.1	11.2	11.2	3.5	8.1	-	4.7
	7.6	9.5	-	-	-	11.1	8.6	11.3	11.2	3.8	9.3	-	3.7
TEPIS	-	5.3	-	-	7.2	-	-	7.5	9.6	11.0	2.6	5.5	8.4
	-	3.8	-	-	6.6	-	-	6.1	8.2	10.5	3.4	6.0	9.2
TRIMI	-	-	-	-	-	0.2	-	-	5.3	2.3	5.1	5.0	2.3
YRJIL	-	-	-	-	-	-	-	-	-	10.2	-	-	-
ZELZO	-	-	-	-	-	-	-	-	-	-	-	-	2.2
	-	-	-	-	-	-	-	1.2	-	-	-	-	3.2
Sum	250.8	336.3	107.4	52.4	227.7	309.5	354.5	427.6	491.4	386.7	259.4	231.3	244.4

3. Results (Meteors)

February	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	3	-	47	35	16	-	15	13	37	-	22	2	-	1	-
BERER	-	-	14	14	-	-	-	-	-	-	-	-	-	10	-
BOMMA	-	-	-	-	-	37	10	-	3	-	3	26	16	10	3
BREMA	13	20	9	9	1	-	7	1	15	-	3	1	-	-	-
	9	15	-	11	1	-	4	-	5	1	-	-	7	1	-
BRIBE	6	18	3	23	6	-	13	11	22	-	2	1	10	-	2
	3	16	2	12	2	-	13	2	12	-	-	8	2	-	-
CASFL	-	-	-	-	1	8	11	-	10	-	-	-	-	4	-
	-	-	-	-	1	7	9	-	3	-	32	-	-	4	-
CRIST	-	-	-	2	-	2	8	3	-	4	19	9	14	-	-
	-	-	-	-	-	2	11	-	-	5	15	-	8	-	-
	-	-	-	1	-	-	-	2	-	-	2	8	27	1	-
DINJE	-	-	-	-	-	41	11	2	8	-	-	-	-	10	1
ELTMA	-	-	-	-	-	14	-	-	3	-	-	8	-	-	-
GANKA	15	8	16	-	5	1	8	-	4	2	6	-	3	-	-
GONRU	3	5	-	-	-	-	-	-	-	-	1	-	-	-	6
	3	2	-	-	-	12	-	8	-	-	5	-	-	-	16
	2	3	1	-	-	3	-	-	-	-	-	-	-	-	18
	11	2	-	-	-	9	-	2	-	2	4	-	-	-	10
	2	3	1	8	-	7	1	6	6	-	-	1	-	-	16
GOVMI	-	-	-	-	-	5	1	2	1	6	-	2	-	10	-
	-	-	-	-	-	6	2	-	1	-	-	-	-	1	-
	-	-	-	-	-	3	1	-	-	-	-	-	-	5	-
HERCA	-	11	7	19	5	12	7	13	16	27	10	17	11	15	22
IGAAN	-	8	18	2	1	-	-	2	8	-	-	-	-	-	-
	3	18	15	11	-	-	1	6	-	1	-	-	2	-	-
	-	4	14	14	-	-	-	2	8	-	-	6	1	20	13
	-	3	-	2	-	-	-	-	2	-	-	-	-	6	3
JONKA	-	4	14	16	-	-	-	2	12	-	-	3	2	18	9
KACJA	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-
	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-
KERST	-	14	20	35	11	5	4	-	1	22	21	21	16	18	-
KISSZ	-	4	1	2	-	-	-	-	-	-	-	-	2	7	3
KOSDE	49	38	71	55	53	52	40	7	20	28	35	29	37	21	-
	71	62	85	84	104	74	69	18	68	65	70	75	59	-	-
	20	24	14	15	7	-	3	2	13	5	11	-	8	-	8
LOJTO	-	-	11	3	-	-	-	1	-	-	-	-	-	-	-
MACMA	11	13	29	20	27	17	1	6	1	9	-	-	7	-	2
	10	6	28	34	24	18	4	6	1	14	-	-	4	-	4
	3	-	4	2	5	5	-	1	1	6	-	-	3	-	-
	7	9	16	19	16	7	2	2	5	9	-	-	-	-	-
MARGR	-	-	-	-	-	-	2	21	18	-	13	-	-	-	-
MASMI	-	-	-	-	14	27	5	15	18	12	3	3	3	-	11
MOLSI	-	-	-	-	-	48	57	1	97	-	55	9	12	8	2
	5	-	2	-	2	14	15	-	17	-	24	9	15	8	1
	6	-	58	68	21	3	26	19	38	-	12	8	-	-	3
	9	-	62	53	22	2	24	24	35	-	13	8	-	1	-
	4	-	-	14	-	-	7	2	8	-	3	4	-	-	-
	7	-	54	50	29	5	27	27	41	-	10	9	-	-	3
MORJO	-	5	12	17	-	-	-	2	15	-	-	1	4	18	11
MOSFA	-	-	-	-	-	15	-	-	6	-	11	9	9	1	-
OTTMI	-	27	11	-	25	30	-	-	19	15	8	7	8	15	-
PERZS	-	-	-	-	-	1	2	1	22	-	-	20	-	11	5
PUCRC	-	-	-	-	-	-	-	-	4	-	-	9	-	-	-
QUIVI	-	-	-	-	-	-	-	-	-	-	3	-	-	-	6
ROTEC	-	-	-	20	2	-	-	4	13	-	3	3	-	-	-
SARAN	8	3	-	-	-	7	-	2	-	-	-	-	-	-	10
	9	2	-	-	-	7	-	4	-	-	2	-	-	-	6
	9	2	-	-	-	9	-	-	-	-	3	-	-	-	6
	7	1	-	-	-	4	-	1	-	-	-	-	-	-	8
SCALE	-	-	-	-	-	-	-	-	4	-	9	4	3	-	3
SCHHA	22	36	11	20	10	-	8	7	11	-	16	10	24	2	2
SLAST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STOEN	-	-	-	-	-	41	3	-	3	-	33	7	24	8	-
	-	-	-	-	-	22	7	-	4	-	-	5	13	7	-
	-	-	-	-	-	49	9	-	6	-	33	8	25	17	-
STRJO	-	28	3	41	8	-	17	13	36	-	-	3	1	-	-
	-	26	2	30	5	-	16	10	21	-	-	3	2	-	-
	-	18	-	20	6	-	-	-	-	-	-	-	-	-	-
	-	24	1	29	4	-	7	7	27	-	-	4	-	-	-
	-	24	3	24	8	-	15	8	21	1	-	3	1	-	-
TEPIS	-	20	21	15	5	-	-	2	7	-	-	18	-	23	12
	-	17	27	22	5	11	-	1	5	-	-	17	4	19	19
TRIMI	-	-	-	-	-	1	-	-	8	-	-	3	-	2	-
YRJIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZELZO	-	-	11	-	-	-	-	-	-	-	-	-	1	-	-
	-	-	8	-	-	-	-	-	-	-	-	-	1	-	-
Sum	330	543	726	871	452	643	503	291	791	234	515	402	389	320	244

February	16	17	18	19	20	21	22	23	24	25	26	27	28
ARLRA	20	19	-	3	15	18	20	37	37	10	3	6	27
BERER	-	-	-	-	2	-	-	-	-	-	-	-	-
BOMMA	6	-	-	-	-	-	-	-	-	-	-	-	-
BREMA	1	1	-	2	-	10	18	14	9	2	17	-	-
	4	1	-	-	-	11	6	4	11	-	16	-	-
BRIBE	8	1	-	-	-	15	15	25	14	-	21	3	-
	5	2	-	-	-	13	27	16	6	-	19	1	2
CASFL	-	4	-	-	14	-	21	33	27	-	-	3	-
	-	11	-	-	9	-	18	15	20	3	-	4	-
CRIST	-	9	-	3	10	2	10	30	28	-	-	10	-
	-	8	-	5	9	7	19	13	16	-	-	4	-
	-	2	-	2	5	1	26	40	38	-	-	1	-
DINJE	11	7	-	-	-	1	20	39	45	22	16	20	9
ELTMA	-	8	-	-	-	-	8	24	20	11	-	7	-
GANKA	7	-	-	-	-	13	6	10	9	2	6	-	1
GONRU	7	-	10	-	-	17	22	-	-	15	-	6	-
	11	1	11	2	-	9	28	-	-	16	-	8	1
	7	2	2	-	3	-	-	3	-	4	-	3	1
	9	3	7	-	-	15	23	-	-	10	-	2	-
	13	4	3	2	6	7	16	3	-	5	-	3	-
GOVMI	-	2	-	-	-	-	-	-	20	16	10	11	31
	-	-	-	-	-	-	-	1	13	-	3	-	18
	-	2	-	-	-	-	-	-	7	-	-	10	9
HERCA	11	11	18	13	18	12	18	17	7	6	12	13	9
IGAAN	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	5	-	-	6	-	-	18	-	-
	6	-	-	-	-	-	-	-	-	7	6	1	5
	-	-	-	-	1	-	-	-	1	1	-	-	-
JONKA	-	5	-	-	-	-	-	5	1	5	-	-	11
KACJA	-	-	-	-	-	-	-	1	-	8	3	9	-
	-	-	-	-	-	-	-	-	-	15	-	-	-
	-	-	-	-	-	1	-	-	2	-	-	1	-
	-	-	-	-	-	-	-	-	-	13	8	9	-
	-	-	-	-	-	-	-	-	-	8	5	8	-
KERST	-	-	-	-	-	-	-	-	-	-	-	-	-
KISSZ	-	1	-	-	-	-	-	2	1	2	-	1	-
KOSDE	-	-	-	48	55	56	30	22	52	44	39	55	55
	-	-	-	20	28	30	48	35	74	63	74	59	68
	7	-	-	9	-	16	17	3	23	5	21	6	-
LOJTO	-	-	-	-	7	2	-	9	-	1	-	-	-
MACMA	6	13	4	4	19	-	-	-	16	-	-	-	1
	10	14	3	2	18	-	-	1	16	-	-	5	-
	4	5	2	-	8	-	-	1	1	-	-	-	1
	6	5	4	4	7	2	-	-	9	-	-	1	-
MARGR	-	-	-	-	-	3	2	1	-	-	-	-	-
MASMI	19	-	-	-	-	3	-	-	24	1	-	5	-
MOLSI	-	34	2	2	43	6	24	90	101	65	9	-	64
	-	9	-	1	12	1	8	23	19	14	4	1	14
	35	50	1	3	38	51	19	68	59	11	2	14	30
	24	19	-	3	22	29	17	47	41	3	2	7	29
	4	6	-	2	6	7	-	8	5	2	-	-	6
	38	34	1	5	31	43	20	64	51	9	4	11	38
MORJO	1	1	-	-	1	-	-	4	-	2	1	2	13
MOSFA	-	4	-	-	6	-	19	19	22	-	2	1	-
OTTMI	-	12	26	-	-	16	5	22	-	14	32	10	-
PERZS	-	4	-	-	-	-	-	-	20	11	6	6	31
PUCRC	-	4	-	-	-	1	1	13	8	7	-	6	-
QUIVI	12	2	2	-	-	5	1	-	-	6	-	-	-
ROTEC	4	2	-	-	9	8	4	19	9	9	2	3	9
SARAN	4	6	4	-	4	8	14	3	-	3	3	3	-
	4	12	5	-	2	14	10	3	-	12	3	4	-
	2	17	6	-	-	9	6	2	-	4	1	-	-
	5	7	4	-	6	12	13	8	-	3	-	7	-
SCALE	-	-	-	-	-	-	-	-	-	-	-	-	-
SCHHA	12	5	-	4	1	23	13	21	19	-	29	7	8
SLAST	-	-	-	-	-	-	-	-	21	7	2	6	-
STOEN	1	21	-	-	-	-	36	47	38	16	9	7	2
	-	20	-	-	-	-	29	35	40	6	8	2	1
	1	24	-	-	-	-	38	34	43	16	7	2	1
STRJO	15	8	-	-	-	22	25	36	18	9	22	-	7
	13	11	-	-	-	22	21	12	14	6	17	-	5
	12	8	-	-	-	17	17	19	12	-	22	-	3
	11	8	-	-	-	17	27	25	14	3	13	-	10
	13	14	-	-	-	25	20	13	10	6	20	-	4
TEPIS	-	9	-	-	2	-	-	6	6	9	2	4	14
	-	4	-	-	8	-	-	3	6	17	7	5	24
TRIMI	-	-	-	-	-	1	-	-	19	7	11	11	6
YRJIL	-	-	-	-	-	-	-	-	-	13	-	-	-
ZELZO	-	-	-	-	-	-	-	-	-	-	-	-	3
	-	-	-	-	-	-	-	1	-	-	-	-	6
Sum	389	496	115	139	430	601	805	1055	1142	585	537	394	577