Results of the IMO Video Meteor Network – September 2013

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September 2013 was a mediocre month. Whereas at first the perfect weather conditions of August continued, there were larger gaps in the observing statistics after the middle and in particular at the end of the month. 41 out of the 69 active video cameras managed to obtained observations in 20 or more nights, which is a good average. Compared to last year, the overall effective observing time reduced by 10% to 8,100 hours, but the number of meteors increased by 10% to over 36,000.

Highlight of the month was the unexpected outburst of the September epsilon Perseids (208 SPE) in the European evening hours of September 9. It was first mentioned by Japanese radio observers on the IMO-News mailing list, and only a short time later confirmed by video and visual observers from different European countries. The peak became soon visible in the MetRec flux viewer. However, different observers pointed out that the radiant position used by MetRec deviated clearly from the observed position.

Hence, the first analysis step was to determine the radiant position from all observations of September 9/10, 2013. 345 out of the 1302 meteors recorded in that night radiated from a narrow radiant at α=48.0° / δ=39.0° with a standard deviation of 1.2°. The velocity was determined to be v_{geo}=65 km/s. This radiant is just one degree off the position given in the IMO Meteor Shower Calendar, and fits also nicely to the values obtained in our recent meteor shower analysis for the September epsilon-Perseids (α=47.9° / δ=39.7° / v_{geo}=64.5 km/s at 167.2° solar longitude).

Based on these values, the shower assignment of the meteors was recomputed for all cameras. Indeed the SPE number almost doubled, because the previously used radiant position came from some old tables. The corrected flux density data were uploaded to the MetRec flux viewer. Based on 288 shower meteors, the activity profile in figure 1 was obtained.

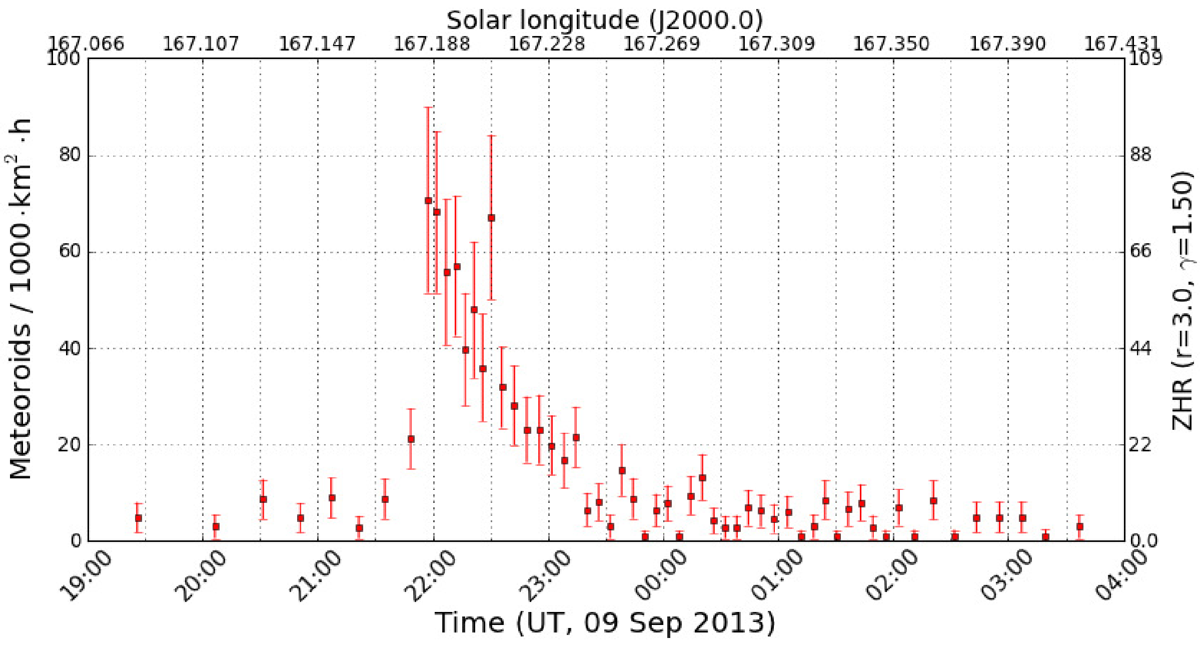

Figure 1: *Flux density profile of the September epsilon Perseids on September 9/10, 2013, calculated with a standard population index of 3.0. In reality the population index was much smaller, though.*

On the first glimpse, the short duration of the outburst is eye-catching. At 21:30 UT activity was still at the normal level. Half an hour later the outburst reached the peak, and after two hours the show was already over. As we recorded plenty of shower meteors is such a short period of time, we could calculate the activity profile at a high temporal resolution of 5 minutes just like for the Draconid outburst in 2011.

To determine the time of maximum, we tested different parameter sets. According to these tests, the peak occurred exactly at 22:00 UT ± 5 min at a solar longitude (SL) of 167.188°. That's later than the last known outburst of 2008, which was observed between SL 166.894° and 166.921°.

Remarkable is also, that the brief ascending branch contains almost no data points, whereas the longer descending branch is well represented. The reason is not a lack of observations before 22:00 UT, but rather that there were indeed almost no shower meteors recorded at that time. The epsilon September Perseids showed up literally instantaneously and declined a little slower.
To substantiate these qualitative statements with figures, we fitted a higher order polynomial to both the ascending and descending branch and determined to most important points in time. If the background activity is defined as 10 meteoroids per 1,000 km^2 and hour, the outburst started at 21:40 UT (SL 167.175°) and reached at 21:49 UT (SL 167.181°) half maximum. After the peak at 22:00 UT the activity had dropped to half value by 22:30 UT (SL 167.209°) and back to the background level at 23:30 UT (SL 167.249°). That yields a full width at half maximum (FWHM) of just 41 minutes or 0.028° in solar longitude – roughly half of the Draconids 2011 duration.

At the descending branch we see a single outlier at 22:30 UT (SL 67.209°). However, depending on the parameter set this peak is sometimes really prominent and sometimes almost invisible, which is why its reality is questionable.

The absolute value of the peak flux density depends mainly on two parameters – the zenith exponent γ and the population index r. A zenith exponent of γ=1.0 yields a maximum of about 50 meteoroids per 1,000 km^2 and hour, at γ=2.0 it is already 90. The analysis presented by us on the 2012 IMC came up with zenith exponents between 1.5 and 2.0 for different showers. Hence, we obtain a peak value of 70 meteoroids per 1,000 km^2 and hour with a rather conservative value of γ=1.5 and the standard population index of r=3.0. Note that many observers reported that the outburst consisted mainly of bright meteors, so the population index must have been much smaller.

In our last monthly report we presented a method to determine the population index from data of different video cameras. That procedure was applied here for the first time. At first we selected cameras with mainly clear skies between 21:30 and 23:30 UT, because clouds may skew the limiting magnitude significantly. For this subset of cameras we determined the mean flux density of the September epsilon Perseids in the two hours period mentioned above depending on the population index. The result was plotted for all cameras in figure 2.

We now look for the population index r at which the flux density measures of all cameras agrees best, i.e. when the scatter of the individual value is lowest. Naturally, the standard deviation σ reduces automatically the smaller the mean μ becomes. For this reason we used a „relative standard deviation" σ/μ as criterion. Furthermore figure 2 is presented with a logarithmic scale so that the scatter in the data is also proportional to the mean. Three cameras that clearly deviated from the average value were regarded as outliers and removed from the analysis.

Subjectively, the set of curves seem to be densest at r-values slightly below 1.5. That fits to the "relative standard deviation" which was lowest at r=1.35. That population index is extremely small, but in the end it reflects the visual appearance and the results of individual cameras: Most September epsilon Perseids were recorded by systems like BILBO, MET38, NOA38 and SCO38, which have a large field of view but a poor limiting magnitude for this shower of 1 to 2 mag only. Cameras like AVIS2 and ICC9 with smaller fields of view and a higher SPE limiting magnitude around 5 mag, on the other hand, recorded almost no shower members. The percentage of bright meteors, which can be caught best with a wide angle camera, was over-proportionally high.

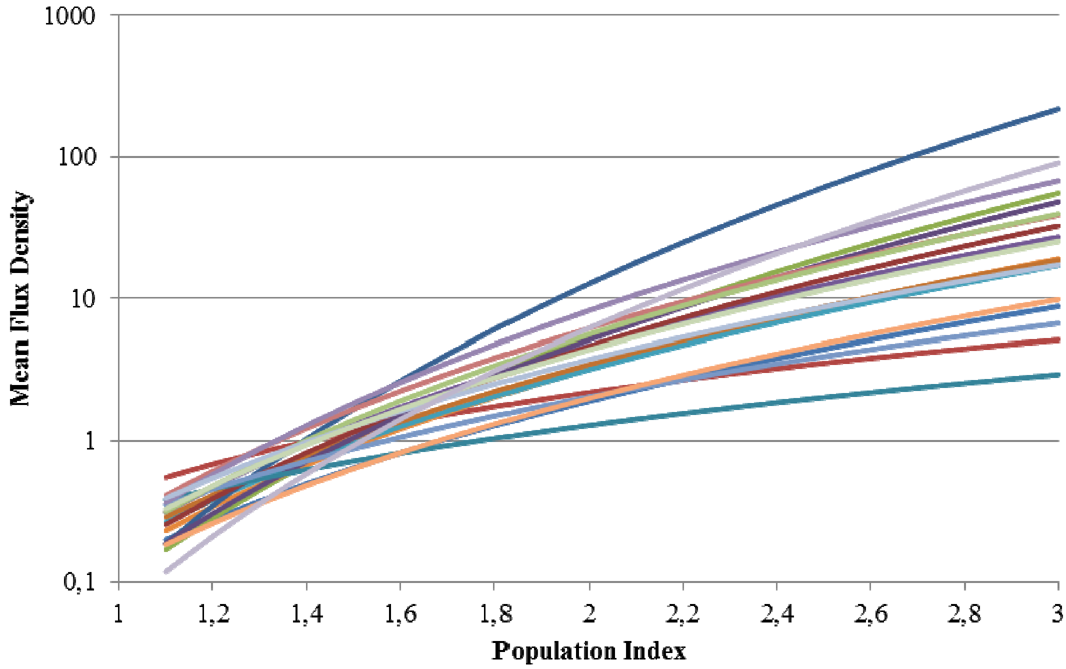

Figure 2: *Mean flux density of individual cameras between 21:30 and 23:30 UT depending on the chosen population index. The flux density is plotted logarithmic to represent the relative deviation of the measurements.*

At the assumed population index of r=1.35, the flux density reduces to less than 2% of the value at r=3.0. If this population index is correct, the above-mentioned peak flux density would melt down to almost negligible 1.3 Meteoroids per 1,000 km^2 and hour. We are curious, which r-value is derived from visual observations and how our new procedure for the determination of the population index performs under less exotic conditions.

1. Observers

Code	Name	Place	Camera	FOV [°²]	St.LM [mag]	Eff.CA [km²]	Nights	Time [h]	Meteors
ARLRA	Arlt	Ludwigsfelde/DE	LUDWIG1 (0.8/8)	1488	4.8	726	6	50.7	52
BANPE	Bánfalvi	Zalaegerszeg/HU	HUVCSE01 (0.95/5)	2423	3.4	361	14	47.2	125
BASLU	Bastiaens	Hove/BE	URANIA1 (0.8/3.8)*	4545	2.5	237	7	33.2	45
BERER	Berkó	Ludanyhalaszi/HU	HULUD1 (0.8/3.8)	5542	4.8	3847	17	120.0	929
			HULUD2 (0.95/4)	3398	3.8	671	14	111.6	303
			HULUD3 (0.95/4)	4357	3.8	876	13	102.4	142
BOMMA	Bombardini	Faenza/IT	MARIO (1.2/4.0)	5794	3.3	739	29	174.2	1266
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	18	91.3	304
			MBB4 (0.8/8)	1470	5.1	1208	6	30.3	83
BRIBE	Klemt	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	21	111.6	451
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	20	90.6	444
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	27	178.0	706
			C3P8 (0.8/3.8)	5455	4.2	1586	25	163.4	556
			STG38 (0.8/3.8)	5614	4.4	2007	26	182.0	973
DONJE	Donati	Faenza/IT	JENNI (1.2/4)	5886	3.9	1222	28	220.2	1409
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	24	150.8	610
GONRU	Goncalves	Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	20	169.5	633
			TEMPLAR2 (0.8/6)	2080	5.0	1508	22	183.3	636
			TEMPLAR3 (0.8/8)	1438	4.3	571	26	182.7	512
			TEMPLAR4 (0.8/3.8)	4475	3.0	442	22	180.3	601
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	21	118.2	451
			ORION3 (0.95/5)	2665	4.9	2069	17	99.5	182
			ORION4 (0.95/5)	2662	4.3	1043	15	87.9	209
HINWO	Hinz	Schwarzenberg/DE	ACR (2.0/35)*	557	7.3	5002	13	75.5	449
IGAAN	Igaz	Baja/HU	HUBAJ (0.8/3.8)	5552	2.8	403	24	104.6	326
		Debrecen/HU	HUDEB (0.8/3.8)	5522	3.2	620	27	121.1	402
		Hodmezovasar./HU	HUHOD (0.8/3.8)	5502	3.4	764	21	128.6	338
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	24	157.6	387
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	15	66.3	287
		Kostanjevec/SI	METKA (0.8/12)*	715	6.4	640	3	19.1	68
		Ljubljana/SI	ORION1 (0.8/8)	1402	3.8	331	17	70.2	148
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	15	73.1	408
			STEFKA (0.8/3.8)	5471	2.8	379	18	83.0	275
KISSZ	Kiss	Sulysap/HU	HUSUL (0.95/5)*	4295	3.0	355	27	129.5	141
KOSDE	Koschny	Izana Obs./ES	ICC7 (0.85/25)*	714	5.9	1464	28	243.0	2439
		La Palma / ES	ICC9 (0.85/25)*	683	6.7	2951	23	164.7	1928
		Noordwijkerhout/NL	LIC4 (1.4/50)*	2027	6.0	4509	21	103.1	685
MACMA	Maciejewski	Chelm/PL	PAV35 (1.2/4)	4383	2.5	253	16	104.3	307
			PAV36 (1.2/4)*	5732	2.2	227	15	108.8	435
			PAV43 (0.95/3.75)*	2544	2.7	176	14	105.1	198
MARGR	Maravelias	Lofoupoli/GR	LOOMECON (0.8/12)	738	6.3	2698	20	168.3	514
MASMI	Maslov	Novosimbirsk/RU	NOWATEC (0.8/3.8)	5574	3.6	773	14	74.7	597
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1230	6.9	6152	20	101.4	1130
			MINCAM1 (0.8/8)	1477	4.9	1084	25	117.1	308
		Ketzür/DE	REMO1 (0.8/8)	1467	5.9	2837	24	145.0	1439
			REMO2 (0.8/8)	1478	6.3	4467	23	145.6	918
			REMO3 (0.8/8)	1420	5.6	1967	21	137.4	215
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	2522	3.5	532	23	136.4	327
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	2944	3.5	358	1	3.4	21
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	26	191.2	795
PERZS	Perkó	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	24	125.5	684
PUCRC	Pucer	Nova vas nad Dra./SI	MOBCAM1 (0.75/6)	2398	5.3	2976	17	80.3	398
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	15	90.3	234
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	23	159.5	381
			RO2 (0.75/6)	2381	3.8	459	23	184.6	398
			SOFIA (0.8/12)	738	5.3	907	22	164.3	267
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4152	4.5	2052	8	53.5	173
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	24	128.0	494
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	563	6.2	1294	17	65.8	121
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	25	147.2	998
			NOA38 (0.8/3.8)	5609	4.2	1911	23	128.3	729
			SCO38 (0.8/3.8)	5598	4.8	3306	27	154.8	1064
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2362	4.6	1152	17	93.5	397
			MINCAM3 (0.8/12)	2339	5.5	3590	20	95.6	577
			MINCAM4 (1.0/2.6)	9791	2.7	552	1	9.7	30
			MINCAM5 (0.8/6)	2349	5.0	1896	18	95.1	475
TEPIS	Tepliczky	Budapest/HU	HUMOB (0.8/6)	2388	4.8	1607	28	152.4	686
		Agostyan/HU	HUAGO (0.75/4.5)	2427	4.4	1036	25	158.8	520
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2337	5.5	3574	24	104.4	422
Sum							30	8148.6	36155

* active field of view smaller than video frame

2. Observing Times (h)

September	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BANPE	4.4	-	6.1	0.2	0.9	5.3	6.5	1.5	-	-	-	-	-	-	3.5
BASLU	-	-	-	4.1	6.2	-	-	-	-	-	-	3.9	-	2.7	-
BERER	8.3	-	8.2	8.3	8.6	8.9	8.7	8.4	-	3.1	6.8	-	-	-	-
	8.3	-	8.2	8	8.6	8.9	8.7	8.4	-	-	6	-	-	-	-
	-	-	8.3	8.2	8.6	8.9	8.7	8.6	-	-	6.4	-	-	-	-
BOMMA	2.5	6.6	5.9	6	5.7	5.5	4.5	0.3	7.6	4.9	-	5.1	4.4	6.1	1.8
BREMA	-	5.1	1.2	6.5	8.8	5.3	-	-	-	-	4.9	6.1	-	1.2	0.2
	-	5.3	1.3	8.7	8.8	5	-	-	-	-	1.2	-	-	-	-
BRIBE	0.4	6	6.6	8.8	8.9	6	-	-	-	0.5	2.7	1.8	-	0.3	-
	1.1	3	8.5	8.7	8.8	7	-	-	0.3	-	-	0.2	-	-	-
CRIST	7.7	9	9.1	9.1	8.9	9.2	3.4	2.3	9.3	5.8	4.9	9.6	9.6	2.3	0.9
	8.8	9	9.1	9.2	9.2	9.2	1.3	1.2	3.4	3.6	4.9	8.7	8.1	-	4
	5.2	9	9.1	9.1	9	9.2	3.4	2.5	9.4	5.6	6.7	9.5	9.6	3.1	1.2
DINJE	-	9.4	9.3	9.4	9.4	9.4	9.2	0.5	7.2	6.2	0.2	9.5	9.5	10.1	4
ELTMA	-	9	9.1	9.5	9.5	8.7	7.7	0.2	6.9	4	7.7	7	8.9	4.3	-
GONRU	9.3	9.5	9.4	-	-	9.5	-	9.7	8.2	9.6	9.8	9.5	9.6	8.8	6.1
	9.4	9.5	9.5	1.3	5.5	9.6	-	9.7	8.6	9.6	9.9	10	9.8	8.9	7
	9.3	9.3	9.4	2.2	-	9.2	9.5	9.7	6.7	9.7	9.8	9.7	9.9	4.7	7
	9.4	9.5	9.5	0.5	5.6	8.7	-	9.7	7.8	9.6	9.9	10	9.7	7.7	6.8
GOVMI	3.5	2.1	4.8	3.4	7.6	6.1	8.5	6.7	-	-	-	6.2	1.8	6.8	5.6
	2.6	-	-	-	7.8	8.3	8.6	5.4	-	-	-	6.6	-	5.4	4.4
	2.4	-	3.2	2	7.5	8.3	8	4.4	-	-	-	6.8	-	6.5	4.2
HINWO	-	-	-	7.4	7.8	7.8	6.3	-	5	5.3	-	-	0.4	-	-
IGAAN	5.2	0.5	6.8	8.8	9.1	9.1	9.1	3.7	0.3	-	-	2	3.5	3.8	0.5
	2.7	2.3	8.6	7.3	9.1	9.2	9.3	9.4	0.5	4.5	4.2	4.5	8	-	0.5
	6.3	3.3	-	6.7	7.4	7.1	8	7.9	3	-	3.1	-	-	6	3.8
JONKA	8.7	2.5	9.1	8.9	9.2	9.3	9.3	8.4	-	-	3.8	-	5	7.6	4.8
KACJA	1.1	6.5	-	-	-	-	5.2	-	-	-	0.8	3.2	5.1	6.1	4.2
	-	-	-	-	-	-	6.4	-	-	-	-	-	-	-	-
	0.7	2.4	5.3	2.2	2.1	6.1	7.7	-	-	-	-	2.8	4.8	5.5	4
	1.8	5.6	-	-	-	-	5.3	-	-	-	0.8	4.5	7.3	6.6	4.4
	1.4	7.4	8.3	-	1.8	6.2	5.4	-	-	-	0.9	3.1	6.5	6	4.2
KISSZ	8.8	1.1	6.4	9	8.2	9.3	9.3	7.8	0.6	0.3	3.6	0.6	5.8	5.3	3.3
KOSDE	9.4	9.5	9.5	9.5	9.5	9.6	9.6	9.6	-	-	5.7	8.8	5.6	9.8	8.3
	9.7	-	-	-	9.8	9.8	9.8	-	9.9	9.9	1.8	9.1	9.9	9	8
	2.7	4.8	2.4	8.2	8.2	-	-	1.1	0.7	3.3	-	6.6	-	4.5	1.7
MACMA	6.4	0.8	8.5	8.6	6.4	9.2	9.3	9.2	-	9.3	-	0.5	9.1	2.5	-
	7.1	0.6	8.1	8.7	5.6	9.2	9.1	9.2	-	9.2	-	0.8	9	9.1	-
	7.1	1	8.3	9.1	5.1	9.2	9.4	7	-	9.5	-	-	9.2	8.6	-
MARGR	5.6	7.4	9.6	9.6	9.6	9.6	9.6	9.6	9.7	9.7	9.7	9.7	9.7	9.8	9.8
MASMI	-	-	-	-	2.1	6.2	7.9	7.8	0.7	-	-	0.1	8.9	5.9	-
MOLSI	2.7	2.2	8.2	8.3	8.3	7.3	5.9	-	6.1	4.7	0.5	-	4	-	-
	4.1	1.2	8.9	9	9.1	7.9	6.9	-	6.2	5.4	1.3	-	4	-	2.6
	4	-	1.4	8.6	8.6	8.7	8.7	-	7.5	6	4.2	1.3	9.3	-	-
	3.7	-	-	8.7	8.8	8.8	8.8	-	7.7	5.9	4.2	1.9	9.3	1.2	-
	2.8	-	-	8.5	8.8	8.9	8.8	-	7.5	5.1	4.2	0.2	9.4	-	-
MORJO	8	3.5	9	9	5.7	9.3	9.3	8.7	2.5	1.6	0.6	1.4	4.8	6.5	4.4
OCHPA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	6.4	-	7.6	8.8	7.8	8.3	4.8	5.7	8	2.9	7.2	6.7	6.4	-	4.7
PERZS	3.7	2.2	7.9	4.3	6.3	9.3	9.4	7.2	0.3	-	-	8.4	1.6	8.9	6.1
PUCRC	0.7	8.4	8.6	-	8.4	8.7	6.6	-	-	-	5.4	3.4	7.4	-	2.5
ROTEC	-	-	-	-	-	-	-	-	7.5	8.8	-	1.1	4.1	2	0.4
SARAN	9.5	8.6	8.2	6.5	7.4	7.4	9.7	9.3	8.5	8.9	7.7	9.5	9.1	10	7.2
	9.1	8	7.5	7.5	9.1	8	9.3	9	8.1	8.9	9	9	8.9	9.5	9.4
	-	8.6	9.2	7.8	8.6	8.8	9.6	9.2	8.6	9.2	9.3	9.3	7.5	7.9	6.3
SCALE	-	8.4	9	7.9	9	7.7	4.3	-	4.6	2.6	-	-	-	-	-
SCHHA	2.2	7.2	7.4	8.4	8.8	4.8	-	2	0.2	0.3	-	0.9	-	2.8	-
SLAST	1.8	2.1	6	3.2	4.1	6.4	6	3.4	-	-	-	1.1	1.3	5.3	6.1
STOEN	-	8.7	9	9.1	8.8	7.7	7.2	0.5	7.4	3.1	8.9	6.1	8.9	6.5	3.5
	-	8.5	8.8	9	8.9	7.8	7	0.2	7.6	3.2	9	6.1	8.9	6.2	3.7
	-	8.7	8.9	8.9	8.3	6.8	7.8	0.6	7.7	3	9	6.2	8.4	5.5	4.5
STRJO	-	-	0.9	7.4	8.2	8.3	2.4	-	3.5	-	-	-	2.6	-	-
	-	0.6	0.9	7.7	8.2	8.2	0.9	-	2.7	-	0.2	-	1.6	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	1.4	8.2	8.2	8.4	-	-	2.9	0.2	0.2	-	1.6	-	-
TEPIS	7.2	0.4	8.7	8.2	7.4	8.8	8.8	8	6.6	2.2	0.9	3	1.8	5.2	5.1
	7.6	-	8.8	8.5	8.9	9	9.1	9.1	7.6	2.1	2	2.7	0.9	4.7	4.1
YRJIL	6.1	4.6	7	7.1	5.7	6.7	7.6	5.5	2.5	2.2	2	6.3	6.1	7.4	1.9
Sum	256.9	258.9	390	407.8	456.3	485.1	401.6	258.3	237.6	219.5	212	261.1	326.6	274.6	186.7

September	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	-	6.9	-	-	-	-	-	-	-	-	7.1	6.4	9.6	10.3	10.4
BANPE	-	-	-	3.6	0.3	1.7	2.1	-	8.9	2.2	-	-	-	-	-
BASLU	-	-	-	-	-	-	-	-	-	-	7.7	-	-	6.7	1.9
BERER	-	-	-	9.1	-	7.2	1.7	-	1.1	-	9.7	9.3	9.5	3.1	-
	-	-	-	9.3	-	7.5	-	-	-	-	9.7	8.4	9.2	2.4	-
	-	-	-	8.3	-	6.7	1.6	-	-	-	9.8	8.7	9.6	-	-
BOMMA	2.7	8.1	9.7	10.1	6.8	9.6	10.1	10.2	10.5	9.9	6.1	10.3	0.2	0.3	2.7
BREMA	6.2	-	-	-	2.8	-	1.9	2.8	2.1	-	7.1	10.3	8.3	10.5	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRIBE	8	-	5.4	-	4.5	2.6	2.1	-	2.8	-	8.9	10.4	10.4	10.4	4.1
	4.8	-	1.1	-	0.6	2.3	0.2	0.2	4.4	1	9	9	10	10.4	-
CRIST	1.5	4.9	4.6	10	10	10.1	10.1	10.2	7.1	0.9	0.2	-	-	-	7.3
	2.4	5.5	7.7	10	9.7	10.1	10.1	8.4	1.5	-	-	-	0.2	-	8.1
	2.2	5.8	7.5	9.9	10	10.1	10.1	10.2	7.3	-	0.2	-	-	-	7.1
DINJE	4.1	8.5	10.2	10.3	8.3	9.7	10.2	10.3	10.5	10.6	8.5	10.6	-	2.2	2.9
ELTMA	-	4.1	3.3	4.9	2	2.9	9	9.2	7.1	7.5	-	1.1	-	-	7.2
GONRU	0.8	9.6	7.1	9.9	10.2	6.7	10.2	-	6	-	-	-	-	-	-
	3.2	9.5	7	10	10.3	8.2	10.4	-	6.4	-	-	-	-	-	-
	3.1	9.9	5.5	10	10.1	9.4	10.2	0.6	6.2	-	0.2	0.4	1	-	-
	3.2	9.7	6.6	10	10.3	9.5	10.4	-	6.2	-	-	-	-	-	-
GOVMI	-	5.9	-	2.9	4.5	1.5	9.5	10.1	9	9.8	1.9	-	-	-	-
	-	0.3	-	2.1	5.8	1.3	10	10.1	9	9.6	2.2	-	-	-	-
	-	-	-	-	4.7	0.9	10	10	9	-	-	-	-	-	-
HINWO	-	-	0.1	-	-	1	-	-	-	-	-	8.9	9	9	7.5
IGAAN	0.7	4.5	0.2	2.7	0.7	4.6	3.9	7.8	8.9	4.9	3.3	-	-	-	-
	1.9	-	-	4.5	0.7	1.2	2.2	1.1	2	1.2	4.4	10.4	7.1	0.9	3.4
	3.5	8.6	-	9.1	1.4	7.3	4.9	9.6	6.9	8.5	6.2	-	-	-	-
JONKA	-	5.6	-	8.5	2.8	9.5	2	4.6	10.2	5.9	9.1	7.7	3.9	-	1.2
KACJA	-	1.8	-	-	6.9	-	7.5	9.6	2.1	3.5	2.7	-	-	-	-
	-	-	-	-	3.3	-	-	9.4	-	-	-	-	-	-	-
	-	1	-	-	3.8	3.4	7.9	6	4.5	-	-	-	-	-	-
	-	2.1	-	-	6.8	-	8.6	10	2.8	3.6	2.9	-	-	-	-
	-	2	-	-	5.7	-	6.5	8.3	2.8	3.8	2.7	-	-	-	-
KISSZ	-	0.4	0.2	8.9	2.9	-	1	7.5	7.3	5	9.1	5.5	0.7	-	1.6
KOSDE	7.7	9.9	3	8.6	7.7	8.9	9.5	10	8.7	7.5	10.1	7.7	9.7	9.5	10.1
	2.4	6	5	-	-	3	3.9	4	5	-	4.4	7.5	8	9.1	9.7
	4.2	-	3.8	-	3.1	-	-	4.2	-	1.6	4.5	9.2	9.1	9.6	9.6
MACMA	-	-	-	-	7.6	7.2	-	-	-	-	-	-	-	3	6.7
	-	-	-	-	9.5	7.3	-	-	-	-	-	-	-	-	6.3
	-	-	-	-	9.2	7.1	-	-	-	-	-	-	-	-	5.3
MARGR	4.8	7.1	-	-	-	-	1.5	-	-	6.3	-	-	9.9	-	-
MASMI	-	4.2	-	-	-	-	1.8	-	9.3	2.6	6.9	-	-	-	10.3
MOLSI	-	-	-	-	-	5.8	3.5	3.1	9.5	5.5	-	2.5	1.5	4.8	7
	-	0.2	2	0.2	1	7	3.9	3	10.3	5.3	-	9.1	2.5	1.6	4.4
	3.4	6.4	4.9	-	0.2	3.7	2.6	0.4	6.6	-	10	7.3	10.3	10.4	10.5
	3.3	6.3	4.5	-	0.2	3.9	3.6	-	6.3	-	9.9	7.2	10.4	10.5	10.5
	2	6.2	4.6	1.2	-	-	3.7	-	6.7	-	10.2	7.1	10.4	10.5	10.6
MORJO	-	8.1	-	7.8	-	-	-	7.7	9.3	7.9	7.2	3.4	-	-	0.7
OCHPA	-	-	-	-	-	-	-	-	-	3.4	-	-	-	-	-
OTTMI	9	-	1.5	-	9.5	8.3	10.2	9.6	8.3	9.7	8.3	9.6	7.8	8.1	6
PERZS	-	7.1	0.3	1.4	1	3	4	10.2	9.9	9.8	2.5	-	-	-	0.7
PUCRC	-	3.6	-	0.4	2.9	1.4	6.4	-	2.4	3.1	-	-	-	-	-
ROTEC	1.3	5.9	1.7	-	-	-	-	-	7.2	-	9.5	9.5	10.4	10.4	10.5
SARAN	4.1	8.1	4	3.7	-	1.5	5.7	0.6	-	4.3	-	-	-	-	-
	8.3	10.1	6.5	7.3	-	5.1	9	1.5	-	6.5	-	-	-	-	-
	3.5	8.3	6.9	7.3	-	3.7	8.9	0.7	-	5.1	-	-	-	-	-
SCALE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SCHHA	7.1	-	2.1	-	7.5	2.8	2.7	3.8	8.8	3.5	9.6	10.3	10.3	10.5	4
SLAST	-	-	-	-	-	-	1.6	5.5	3.6	4.6	3.7	-	-	-	-
STOEN	3.2	4.4	3.2	3.9	1.8	-	8.6	8.8	2	9	-	2	-	-	4.9
	3.1	5	3.1	4.5	1.8	-	-	-	5.2	5.9	0.3	-	-	-	4.5
	3.7	6.2	3.4	5.8	2.7	1.8	9	9	2.4	9.6	0.2	2.5	-	-	4.2
STRJO	8.2	-	1.4	-	-	-	2.7	3.8	1.4	-	9.5	3.3	9.9	10	10
	8.1	-	2.5	-	-	-	0.6	3.3	0.5	0.4	9.3	9.9	10	10	10
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.7
	8.5	-	1.7	-	-	-	1	2.9	0.6	-	9.4	9.9	10	9.9	10.1
TEPIS	-	5.5	0.3	7.9	1.2	9.2	0.7	1.8	10.1	5.8	6.9	9.8	6.5	-	4.4
	-	5.8	1.2	8.1	-	9.7	-	3.6	10	6.1	7.6	9.4	7.5	-	4.7
YRJIL	3.2	3.6	-	-	-	0.4	1.1	1.4	3.5	5.2	-	6.6	0.7	-	-
Sum	147.4	242.7	143.8	232.2	212.8	245.8	290.6	265.1	310.2	216.6	268.7	261.2	233.6	194.1	250.8

3. Results (Meteors)

September	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BANPE	10	-	15	1	1	15	23	1	-	-	-	-	-	-	7
BASLU	-	-	-	5	11	-	-	-	-	-	-	4	-	1	-
BERER	72	-	76	78	91	71	110	61	-	2	35	-	-	-	-
	31	-	18	23	30	30	37	21	-	-	17	-	-	-	-
	-	-	17	13	16	15	15	12	-	-	13	-	-	-	-
BOMMA	20	67	67	62	50	57	36	2	89	47	-	48	44	56	18
BREMA	-	16	2	24	30	8	-	-	-	-	11	19	-	5	1
	-	16	1	22	28	12	-	-	-	-	4	-	-	-	-
BRIBE	1	25	22	45	40	16	-	-	-	2	4	1	-	1	-
	8	19	41	46	42	25	-	-	1	-	-	1	-	-	-
CRIST	32	40	44	44	42	61	8	18	40	14	12	47	52	6	2
	18	38	35	35	38	44	7	5	1	9	21	29	27	-	16
	23	75	49	75	57	75	4	20	43	22	30	44	66	8	2
DONJE	-	86	74	77	59	74	40	3	71	51	1	68	60	70	14
ELTMA	-	43	43	40	50	39	18	2	34	23	32	34	25	14	-
GONRU	29	50	36	-	-	28	-	48	42	44	54	47	51	9	22
	37	42	24	2	27	35	-	48	30	30	37	35	39	17	27
	24	19	32	3	-	28	33	30	18	29	33	36	38	10	13
	44	38	33	1	22	29	-	46	30	39	37	32	36	15	18
GOVMI	3	8	16	5	31	37	34	13	-	-	-	21	1	41	29
	4	-	-	-	17	16	23	4	-	-	-	11	-	10	12
	4	-	9	9	13	23	13	3	-	-	-	32	-	20	14
HINWO	-	-	-	36	46	50	27	-	26	26	-	-	1	-	-
IGAAN	14	1	19	22	20	26	30	10	3	-	-	5	5	20	3
	14	4	31	21	26	37	50	48	2	5	10	16	15	-	1
	22	3	-	18	20	23	29	18	12	-	6	-	-	23	13
JONKA	26	2	22	29	14	31	27	14	-	-	5	-	8	29	10
KACJA	4	29	-	-	-	-	11	-	-	-	1	17	14	37	44
	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-
	1	4	11	8	1	22	18	-	-	-	-	4	6	9	20
	8	41	-	-	-	-	32	-	-	-	4	12	31	58	52
	3	43	32	-	6	26	11	-	-	-	4	6	20	18	21
KOSDE	6	1	8	10	9	9	12	10	1	1	2	1	4	7	6
	79	64	75	64	52	70	101	78	-	-	29	52	42	82	90
	136	-	-	-	124	130	130	-	129	119	9	91	130	125	108
KISSZ	9	32	6	51	59	-	-	4	2	17	-	22	-	26	8
MACMA	14	2	32	21	12	32	35	42	-	18	-	1	18	5	-
	24	2	39	38	21	40	48	48	-	46	-	1	32	29	-
	13	1	17	17	6	23	18	13	-	25	-	-	14	7	-
MARGR	26	33	33	35	31	26	27	25	30	25	27	30	27	28	22
MASMI	-	-	-	-	8	53	73	89	5	-	-	71	55	20	-
MOLSI	33	14	161	178	164	106	62	-	63	69	3	-	31	-	-
	8	2	32	38	39	18	23	-	16	16	1	-	4	-	6
	19	-	5	94	103	104	103	-	83	75	27	3	91	-	-
	10	-	-	49	70	73	48	-	61	34	14	4	64	3	-
	5	-	-	17	17	12	15	-	16	5	3	1	10	-	-
MORJO	16	1	19	20	14	26	30	19	5	1	1	5	12	27	5
OCHPA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTTMI	22	-	35	34	26	30	7	19	38	17	33	48	49	-	13
PERZS	6	5	51	16	34	60	88	21	3	-	-	42	4	63	38
PUCRC	3	29	51	-	43	56	28	-	-	-	28	10	20	-	26
ROTEC	-	-	-	-	-	-	-	-	23	25	-	5	9	1	1
SARAN	16	15	20	18	7	17	22	25	30	15	19	28	21	24	17
	30	16	17	19	14	20	25	27	21	20	22	16	24	18	16
	-	10	18	17	5	17	14	18	16	15	8	23	14	9	16
SCALE	-	25	24	23	23	29	13	-	27	9	-	-	-	-	-
SCHHA	13	35	23	43	40	9	-	6	2	1	-	1	-	7	-
SLAST	3	7	17	6	5	17	7	1	-	-	-	7	4	8	16
STOEN	-	71	57	60	64	79	28	4	52	23	72	61	59	33	23
	-	53	44	53	54	60	21	1	58	20	81	48	44	20	18
	-	75	61	51	55	54	31	3	72	21	78	56	58	18	34
STRJO	-	-	7	40	35	39	3	-	10	-	-	-	2	-	-
	-	4	6	37	64	30	1	-	3	-	1	-	3	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	9	29	39	31	-	-	10	2	1	-	5	-	-
TEPIS	17	2	59	40	25	47	42	22	42	3	2	21	7	28	28
	21	-	30	26	31	30	43	29	35	1	2	17	1	22	12
YRJIL	20	14	42	38	20	36	32	12	7	6	8	18	34	36	2
Sum	1001	1222	1767	1926	2141	2336	1775	943	1302	972	842	1252	1431	1123	864

September	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	-	4	-	-	-	-	-	-	-	-	5	7	11	11	14
BANPE	-	-	-	14	2	2	5	-	24	5	-	-	-	-	-
BASLU	-	-	-	-	-	-	-	-	-	-	10	-	-	12	2
BERER	-	-	-	75	-	38	2	-	3	-	107	43	60	5	-
	-	-	-	25	-	4	-	-	-	-	34	16	16	1	-
	-	-	-	10	-	4	1	-	-	-	15	5	6	-	-
BOMMA	21	51	53	50	21	53	56	72	55	54	32	53	1	3	28
BREMA	23	-	-	-	5	-	4	3	2	-	21	51	41	38	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRIBE	30	-	21	-	12	3	2	-	7	-	33	58	61	46	21
	23	-	5	-	6	14	1	1	25	5	29	45	49	58	-
CRIST	10	15	18	37	27	30	35	28	20	3	1	-	-	-	20
	9	23	17	41	27	29	36	20	6	-	-	-	1	-	24
	10	26	26	60	42	41	57	55	38	-	1	-	-	-	24
DONJE	20	69	83	46	32	52	59	71	57	63	36	44	-	1	28
ELTMA	-	28	18	30	6	11	29	24	9	28	-	6	-	-	24
GONRU	5	14	11	33	33	30	32	-	15	-	-	-	-	-	-
	3	29	18	40	31	37	35	-	13	-	-	-	-	-	-
	3	32	5	40	29	22	24	1	7	-	1	1	1	-	-
	6	27	14	26	38	37	22	-	11	-	-	-	-	-	-
GOVMI	-	6	-	19	13	2	28	78	32	30	4	-	-	-	-
	-	2	-	6	5	1	20	26	15	9	1	-	-	-	-
	-	-	-	-	12	3	15	28	11	-	-	-	-	-	-
HINWO	-	-	1	-	-	1	-	-	-	-	-	56	64	62	53
IGAAN	1	5	1	13	5	22	4	30	35	12	20	-	-	-	-
	4	-	-	18	3	3	2	4	4	1	13	35	32	1	2
	8	28	-	18	2	24	3	25	14	18	11	-	-	-	-
JONKA	-	20	-	21	10	18	2	4	31	14	20	15	11	-	4
KACJA	-	7	-	-	40	-	41	30	5	5	2	-	-	-	-
	-	-	-	-	9	-	-	50	-	-	-	-	-	-	-
	-	1	-	-	6	12	15	7	3	-	-	-	-	-	-
	-	12	-	-	31	-	49	61	2	11	4	-	-	-	-
	-	6	-	-	30	-	30	14	2	1	2	-	-	-	-
KISSZ	-	1	1	8	3	-	2	7	9	5	8	5	2	-	3
KOSDE	83	133	34	81	98	88	137	140	123	91	130	100	93	114	116
	14	115	81	-	-	12	29	32	43	-	16	64	69	106	116
	9	-	5	-	6	-	-	16	-	5	39	96	82	114	77
MACMA	-	-	-	-	14	16	-	-	-	-	-	-	-	19	26
	-	-	-	-	24	24	-	-	-	-	-	-	-	-	19
	-	-	-	-	12	13	-	-	-	-	-	-	-	-	19
MARGR	18	22	-	-	-	-	10	-	-	22	-	-	17	-	-
MASMI	-	33	-	-	-	-	14	-	58	3	39	-	-	-	76
MOLSI	-	-	-	-	-	16	8	7	87	32	-	9	2	29	56
	-	1	6	1	2	27	3	4	27	8	-	15	2	1	8
	36	42	49	-	1	3	9	9	52	-	75	80	141	118	117
	28	20	17	-	1	8	8	-	27	-	60	72	76	89	82
	2	7	4	2	-	-	1	-	4	-	7	14	23	18	32
MORJO	-	19	-	22	-	-	-	11	24	17	21	10	-	-	2
OCHPA	-	-	-	-	-	-	-	-	-	21	-	-	-	-	-
OTTMI	23	-	5	-	27	36	33	37	40	46	39	46	21	39	32
PERZS	-	70	2	7	2	4	18	41	43	54	6	-	-	-	6
PUCRC	-	28	-	3	10	3	37	-	7	16	-	-	-	-	-
ROTEC	2	6	1	-	-	-	-	-	13	-	21	34	32	31	30
SARAN	12	16	10	12	-	4	17	3	-	13	-	-	-	-	-
	8	19	7	17	-	8	13	3	-	18	-	-	-	-	-
	9	8	16	8	-	2	10	1	-	13	-	-	-	-	-
SCALE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SCHHA	29	-	7	-	31	5	3	6	20	8	43	42	46	51	23
SLAST	-	-	-	-	-	-	11	3	4	4	1	-	-	-	-
STOEN	21	33	36	41	5	-	42	42	4	32	-	11	-	-	45
	11	23	23	19	6	-	-	-	11	25	2	-	-	-	34
	32	62	31	47	14	11	62	47	9	43	1	6	-	-	32
STRJO	36	-	5	-	-	-	5	10	4	-	46	21	45	50	39
	62	-	14	-	-	-	3	21	1	3	65	58	64	64	73
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30
	56	-	7	-	-	-	1	13	3	-	56	50	58	55	50
TEPIS	-	35	1	35	3	40	1	15	50	7	37	38	20	-	19
	-	22	5	24	-	32	-	10	34	13	22	21	20	-	17
YRJIL	6	10	-	-	-	3	3	5	14	14	-	41	1	-	-
Sum	673	1130	658	949	736	848	1089	1115	1157	772	1136	1268	1168	1136	1423