Results of the IMO Video Meteor Network – September 2016

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In 2016 we could repeatedly report about favourable observing conditions, but September was to top everything, as it dwarfed all the previous results.

But let's have a look at the plain figures. 79 video cameras contributed to the IMO video network in September 2016. 70 of these managed to observe in 20 or more nights, and still 49 in at least 25 nights. In every third September night, more than 70 cameras were active! If we forget about a short period of weakness in the middle of the month, we see that most of the increasing lengthy nights presented continuously starry skies. For this reason, we collected over 14,000 hours of effective observing time, which is a plus of about 1,700 hours to the previously best month (August 2015) and even 25% more than the previously best September. The hourly meteor rate was slightly above the long-term September average, so that also the overall meteor number reached a new all-time-high for September. More than 62,000 meteors in a single month is an output that we never reached in October or December. Only August 2011-2015 could cope with that yield, which is no surprise given the Perseids, which contribute substantially to the meteor activity over several weeks. And September? The meteor shower lists of MDC and IMO contain only a few minor showers in the Perseus / Aurigae region, which show variable activity and present no significant flux at all in many years.

Indeed, we received reports from American visual observers who pointed to increased rates of the September Perseids (SPE) in the three nights of September 8 to 10. However, if we compare the flux density profile of this shower with the previous years (figure 1), we see beside the 2013 outburst (which was omitted from the figure to not distort the graph) no significant variations. The 2016 rate is in fact a bit smaller than the long-term average.

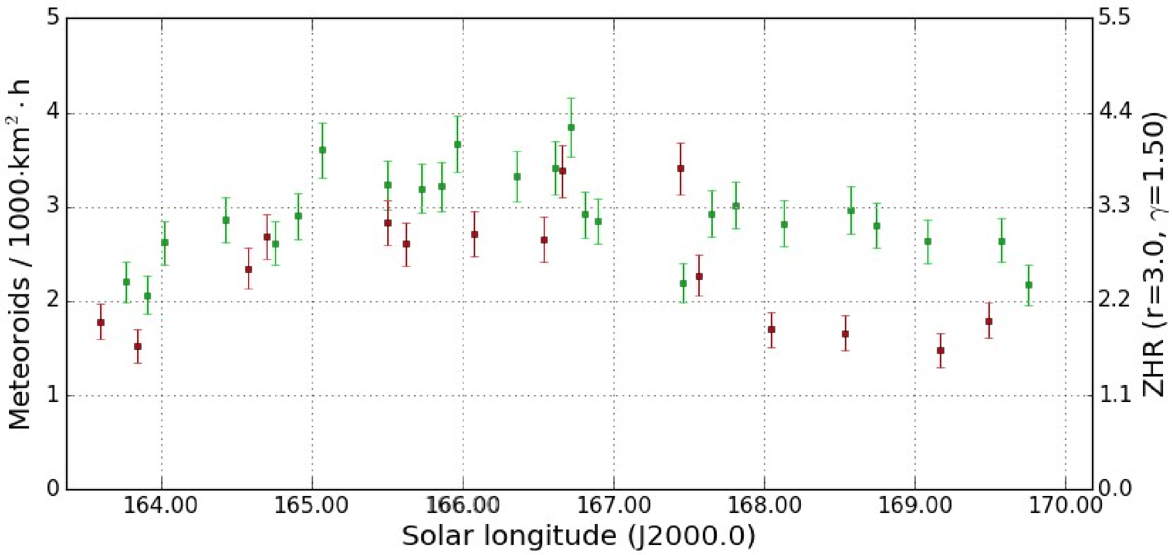

Figure 1: *Comparison of the flux density of the September Perseids 2016 (red) with the average of the years 2011-2015 (green, excluding 2013), derived from video data of the IMO Video Meteor Network.*

Before we continue to report on algorithms of video meteor observations, we first like to welcome a new Polish observer which found her way to the IMO network. After fixing initial software problems, Wala Wegrzyk has been providing the data from her Mintron camera PAV78 to our network since September.

In the monthly report of March 2016 we derived a formula, how the loss in limiting magnitude caused by the motion of meteors depends from their angular velocity and the point spread function, i.e. the focus of stars and meteors. We relied on the assumption that stars can be modelled by rotation-symmetric bi-variate Gaussians, whose only relevant parameter is the variance of the distribution. In the June report we presented, how the variance of the Gaussian can be estimated from video footage by plotting the cumulative brightness of pixels against their distance from the center of the object. For better statistics, all bright stars in the field of view are combined into a single distribution.

Today we want to present first practical results with the new methods.

After the algorithm to estimate the variance was implemented in the RefStars tool, we measured all cameras which were active in September. Normally we require low-noise average background images for that, which were not available. Alternatively, we selected for each camera a meteor image that contains many video frames and stars. The disadvantage of that approach is, that the images are more noisy than averaged images, because each pixel contains the maximum value over a number of video frames, not the mean. We shall check at a later point in time whether this is influencing the result in any systematic way.

While measuring the variance we found that the obtained cumulative distribution matches only sometimes to the expected distribution (e.g. for ICC9, figure 2, left). In many cases, the distribution has a kink in the upper part (e.g. in case of AVIS2, figure 2, right). Sometimes that kink has no impact on the variance estimate, but often the variance is getting smaller, when the distribution is fitted only up to the kink.

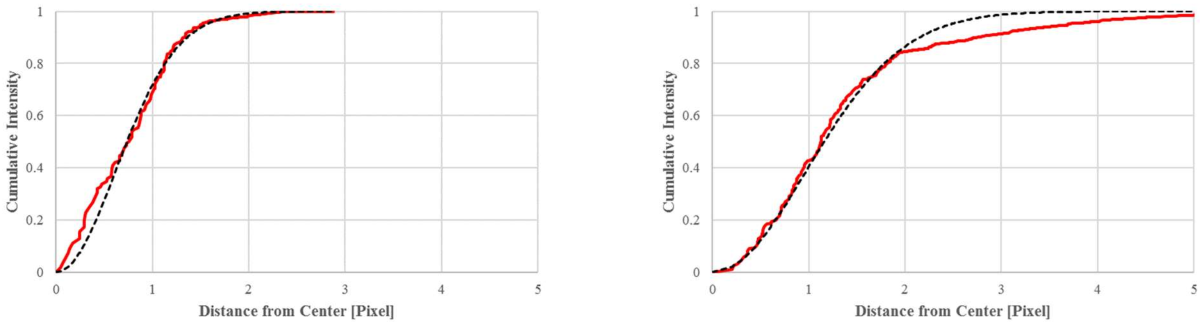

Figure 2: *Cumulative brightness distribution of the pixels of all bright stars in the field of view depending on their distance from the center of the object. Left we see the result for ICC9, right for AVIS2. The red solid line represented the measured distribution, the black dashed line the corresponding model.*

Taking the average over all cameras we obtain a mean variance of the bi-variate Gaussians of 0.61 without resp. 0.51 with the kink correction (figure 3). The star and meteor images are typically only a few pixels in size. In particular crisp and focussed images are provided by TEMPLAR2, TEMPLAR4 and LIC2 with variances below 0.2. Particularly large stellar images with variances beyond 1.0 are provided by LOOMECON, CAB1 and METKA.

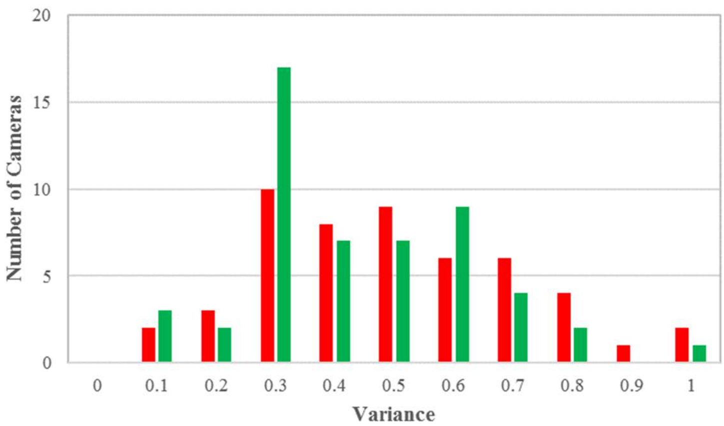

Figure 3: *Distribution of the variance of star images with (red) and without (green) considering the distribution beyond the kink.*

In addition we learned, that the variance cannot yet be calculated fully autonomously with RefStars, because it reacts sensitively on a number of errors sources:

- In selected cases we found, that the segmentation of stars did not work 100% error-free. Sometimes noisy background pixels were added to the star image. That increased the calculated variance significantly. In this analysis, we removed those stars manually from the list, but maybe such wrong segmentations are the root cause for the kink in the distributions (figure 2).
- Particularly bright stars, where the CCD chip is saturated and blooming, will also distort the estimate. The reason is that pixels at the object center are much brighter than the maximum possible value with 8-bit depth, so they should have a much bigger share in the lower part of the cumulative distribution.
- For about 25% of the cameras we could estimate no variance at all, because there were too few measurable stars in the field of view.
- In the presented analysis, we did not only look at the final estimate of the variance after measuring all bright stars in the field of view, but we also checked the interim results. Often the estimate stabilized the more stars were added, but in a few cases the variance decreased constantly the more fainter stars were added.

Maybe the estimate is getting more robust, when less noisy average images are used. Perhaps the algorithm can also be improved to not use the whole cumulative distribution but only the segment up to the kink.

But which impact does the calculated variance have on the meteor limiting magnitude and derived values like flux density and population index? Up to now, the loss of limiting magnitude depending on the angular velocity was identically modelled for all cameras. With the new model, the loss depends on the camera-specific variance. Figure 4 compares exemplary the dependency for a variance of 0.3 and 0.6. The deviation between both curves is quickly rising up to 40% (equivalent to 0.3 mag) and remains constant starting at a velocity of about 5 pixels per video frame.

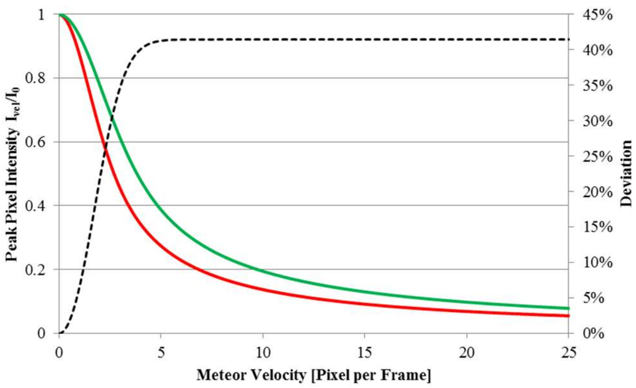

Figure 4: *Dependency of the intensity loss from the meteor velocity for an object with a variance of 0.3 (solid red line) resp. 0.6 (solid green line). The percental deviation between both curves is plotted against the secondary y-axis (dashed black line).*

May this difference explain the camera-specific perception coefficients that we introduced in the July 2015 report? To clarify that, we calculated the mean sporadic flux density over all of September for each cameras with the old and the new method. We see, that the scatter among the cameras is hardly changing (figure 5). With SRAKA and ICC9 we have to significant upper outliers, which have to be analysed in more detail.

The most important result is, however, that the loss in limiting magnitude by meteor motion is more than half a magnitude less than modelled before, which increases the calculated effective collection areas by a factor of two, and reduces the flux densities by the same amount. Thus, we cannot simply merge the data obtained by both methods, but rather have to update the whole data set with the new method first.

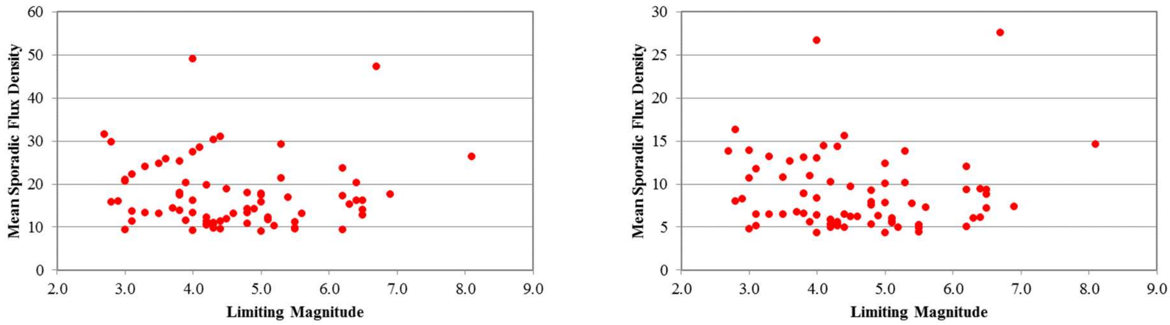

Figure 5: *Mean sporadic flux density in September obtained by the old method, where the dependency between meteor velocity and limiting magnitude loss was identical for all cameras (left), and by the new method, where it depends from the variance of star images (right). The x-axis represents the stellar limiting magnitude of the camera*

To take the camera-specific variance into account, we re-calculated the perception coefficients for all cameras (based on figure 5, right). Comparing the old and new values we see, that the perception coefficient has changed for some cameras. Otherwise all points of figure 6 would align along the diagonal.

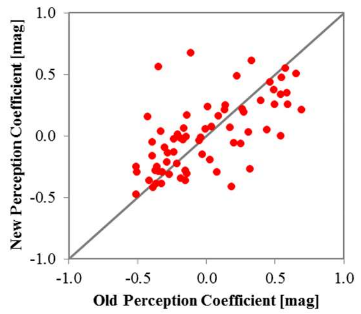

Figure 6: *Comparison of the perception coefficients according to the old and new procedure to correct for the meteor velocity.*

If we finally calculate the population index of sporadic meteors in all September nights and take the new perception coefficients into account, we see hardly any difference compared to the old method (figure 7). The reason is that all cameras gain more or less similarly in limiting magnitude, and deviations among the cameras are levelled out by the perception coefficient. Thus, the ratio of the meteor counts of individual cameras, which is the basis for the population index calculation, remains almost identical.

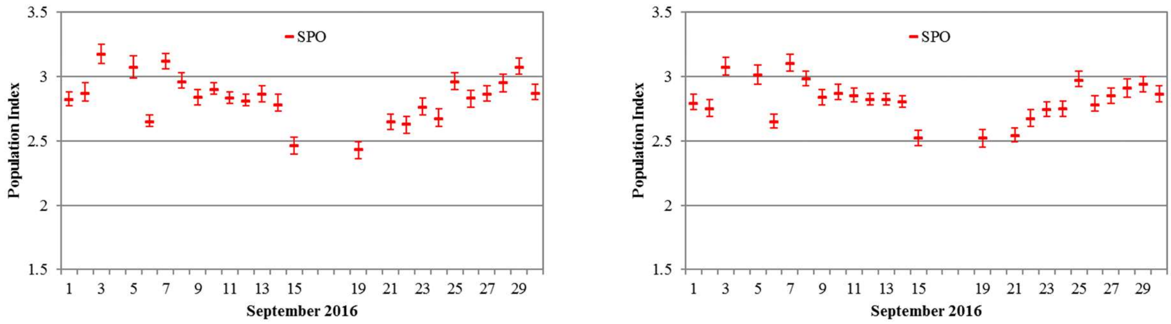

Figure 7: *Population index of sporadic meteors in September 2016, calculated by the old (left) and new(right) method to correct for the meteor velocity. Nights with less than 1,000 sporadic meteors were skipped in this analysis.*

Overall the improved model helps to register the observing conditions more precisely. It has a significant impact on the calculated flux density, but no impact on the population index or known systematic errors like the dependency of the r-value from the lunar phase.

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	27	194.6	1315
BERER	Berkó	Ludanyhalaszi/HU	HULUD1 (0.8/3.8)	5542	4.8	3847	9	68.9	313
BOMMA	Bombardini	Faenza/IT	MARIO (1.2/4.0)	5794	3.3	739	27	211.6	1080
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	27	166.6	509
BRIBE	Klemt	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	26	153.7	622
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	25	157.4	586
CARMA	Carli	Monte Baldo/IT	BMH2 (1.5/4.5)*	4243	3.0	371	24	156.5	423
CASFL	Castellani	Monte Baldo/IT	BMH1 (0.8/6)	2350	5.0	1611	25	186.5	645
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	30	218.3	914
			C3P8 (0.8/3.8)	5455	4.2	1586	29	194.1	649
			STG38 (0.8/3.8)	5614	4.4	2007	30	228.1	1530
DONJE	Donati	Faenza/IT	JENNI (1.2/4)	5886	3.9	1222	26	216.9	1314
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	24	176.3	609
FORKE	Förster	Carlsfeld/DE	AKM3 (0.75/6)	2375	5.1	2154	24	186.6	793
GONRU	Goncalves	Foz do Arelho/PT	FARELHO1 (1.0/2.6)	6328	2.8	469	14	102.8	109
		Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	30	259.1	1284
			TEMPLAR2 (0.8/6)	2080	5.0	1508	30	263.4	975
			TEMPLAR3 (0.8/8)	1438	4.3	571	29	241.4	416
			TEMPLAR4 (0.8/3.8)	4475	3.0	442	30	256.6	909
			TEMPLAR5 (0.75/6)	2312	5.0	2259	30	233.3	976
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	28	210.0	709
			ORION4 (0.95/5)	2662	4.3	1043	28	98.0	356
HERCA	Hergenrother	Tucson/US	SALSA3 (0.8/3.8)	2336	4.1	544	22	179.4	472
HINWO	Hinz	Schwarzenberg/DE	HINWO1 (0.75/6)	2291	5.1	1819	22	158.7	693
IGAAN	Igaz	Budapest/HU	HUPOL (1.2/4)	3790	3.3	475	19	149.1	118
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	29	200.6	358
			HUSOR2 (0.95/3.5)	2465	3.9	715	29	213.4	399
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	20	132.0	670
		Kostanjevec/SI	METKA (0.8/12)*	715	6.4	640	12	93.0	213
		Ljubljana/SI	ORION1 (0.8/8)	1399	3.8	268	24	170.7	646
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	21	152.0	1074
			STEFKA (0.8/3.8)	5471	2.8	379	20	136.8	432
KOSDE	Koschny	Izana Obs./ES	ICC7 (0.85/25)*	714	5.9	1464	20	170.0	1485
		La Palma / ES	ICC9 (0.85/25)*	683	6.7	2951	29	225.0	2405
		Izana Obs./ES	LIC1(2.8/50)*	2255	6.2	5670	29	261.3	2944
		La Palma / ES	LIC2 (3.2/50)*	2199	6.5	7512	28	261.3	3082
LOJTO	Łojek	Grabniak/PL	PAV57 (1.0/5)	1631	3.5	269	19	133.6	632
LOPAL	Lopes	Lisboa/PT	NASO1 (0.75/6)	2377	3.8	506	19	117.3	214
MACMA	Maciejewski	Chelm/PL	PAV35 (0.8/3.8)	5495	4.0	1584	25	172.3	1022
			PAV36 (0.8/3.8)*	5668	4.0	1573	28	192.9	997
			PAV43 (0.75/4.5)*	3132	3.1	319	26	165.2	501
			PAV60 (0.75/4.5)	2250	3.1	281	28	195.3	1055
MARGR	Maravelias	Lofoupoli/GR	LOOMECON (0.8/12)	738	6.3	2698	22	164.0	345
MARRU	Marques	Lisbon/PT	CAB1 (0.75/6)	2362	4.8	1517	30	261.9	987
			RAN1 (1.4/4.5)	4405	4.0	1241	29	237.4	675
MASMI	Maslov	Novosimbirsk/RU	NOWATEC (0.8/3.8)	5574	3.6	773	26	178.2	926
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1230	6.9	6152	25	207.1	2391
			ESCIMO2 (0.85/25)	155	8.1	3415	25	213.2	616
			MINCAM1 (0.8/8)	1477	4.9	1084	24	177.9	701
		Ketzür/DE	REMO1 (0.8/8)	1467	6.5	5491	29	208.2	1814
			REMO2 (0.8/8)	1478	6.4	4778	29	213.6	1455
			REMO3 (0.8/8)	1420	5.6	1967	28	206.1	880
			REMO4 (0.8/8)	1478	6.5	5358	28	219.0	1446
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	2522	3.5	532	27	213.1	395
MOSFA	Moschini	Rovereto/IT	ROVER (1.4/4.5)	3896	4.2	1292	22	23.7	142
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	23	124.4	208
PERZS	Perkó	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	20	160.9	853
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	13	51.0	165
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	27	217.1	404
			RO2 (0.75/6)	2381	3.8	459	18	169.0	420
			RO3 (0.8/12)	710	5.2	619	22	194.3	650
			SOFIA (0.8/12)	738	5.3	907	29	228.4	404
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4152	4.5	2052	13	86.7	128
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	27	154.0	644
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	563	6.2	1294	25	168.8	487
			KAYAK2 (0.8/12)	741	5.5	920	25	158.8	154
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	28	187.4	1117
			NOA38 (0.8/3.8)	5609	4.2	1911	29	191.4	817
			SCO38 (0.8/3.8)	5598	4.8	3306	29	202.1	1283
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2354	5.4	2751	24	155.3	922
			MINCAM3 (0.8/6)	2338	5.5	3590	28	169.6	669
			MINCAM4 (1.0/2.6)	9791	2.7	552	21	147.0	138
			MINCAM5 (0.8/6)	2349	5.0	1896	26	170.4	614
			MINCAM6 (0.8/6)	2395	5.1	2178	28	171.0	565
TEPIS	Tepliczky	Agostyan/HU	HUAGO (0.75/4.5)	2427	4.4	1036	28	222.0	388
			HUMOB (0.8/6)	2388	4.8	1607	28	212.1	722
TRIMI	Triglav	Velenje/SI	SRAKA (0.8/6)*	2222	4.0	546	23	100.3	280
WEGWA	Wegrzyk	Nieznaszyn/PL	PAV78 (0.8/6)	2286	4.0	778	21	144.9	599
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2337	5.5	3574	20	106.6	433
Sum							30	14077.5	62285

* 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	6.1	4.1	6.1	3.3	6.8	7.7	7.8	8.0	8.0	8.3	8.5	8.4	8.5	8.2	8.0
BERER	-	8.4	-	-	-	-	8.6	8.2	7.0	8.1	9.4	9.3	6.1	-	3.8
BOMMA	7.7	9.1	9.2	0.4	9.4	1.5	5.3	8.8	9.7	7.8	9.7	9.7	9.8	9.6	8.3
BREMA	8.5	2.5	0.6	2.5	8.2	8.9	8.9	-	9.1	7.9	7.2	9.3	9.4	9.4	3.2
BRIBE	8.2	2.6	1.7	1.6	8.8	8.9	9.0	3.6	9.2	8.4	9.2	9.3	9.3	9.1	0.9
	8.4	2.3	5.0	-	8.7	8.8	8.7	3.7	8.8	7.7	8.5	9.3	9.3	8.2	0.7
CARMA	3.6	4.4	4.4	-	9.3	7.9	4.7	7.0	8.7	-	-	-	9.7	5.1	7.0
CASFL	5.7	6.8	9.2	-	9.5	9.5	5.6	7.8	9.1	3.9	-	-	10.0	6.5	7.2
CRIST	9.0	9.1	7.9	0.9	9.2	6.4	9.3	8.9	8.7	8.3	8.1	9.6	9.6	0.7	0.2
	9.0	9.1	5.7	0.4	8.5	7.3	9.3	3.8	8.3	7.8	7.6	9.6	9.7	-	2.2
	9.0	9.1	8.6	1.7	9.2	7.8	9.3	8.9	8.9	8.9	7.9	9.6	9.6	0.4	0.9
DONJE	8.6	-	9.4	1.6	9.6	1.9	6.3	9.2	9.7	8.4	9.8	9.9	10.0	9.8	9.1
ELTMA	3.3	8.6	7.6	-	8.2	-	9.5	8.7	9.3	4.1	7.5	8.7	8.7	7.1	-
FORKE	8.4	5.6	8.2	-	-	8.6	9.1	8.4	9.1	8.3	9.1	9.4	8.7	9.5	8.2
GONRU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.4	9.4	9.5	9.5	9.6	9.5	4.5	9.7	9.5	8.1	9.6	1.9	8.5	3.4	8.5
	9.5	9.6	9.6	9.6	9.7	9.7	4.4	9.8	9.9	7.8	9.6	1.5	8.5	4.4	8.4
	9.1	9.4	9.4	9.5	9.5	9.5	4.1	9.5	9.7	7.3	8.7	1.3	8.8	-	8.4
	9.5	9.5	9.5	9.4	9.7	9.7	4.0	9.8	9.3	7.1	9.6	1.5	8.0	3.8	7.8
	9.1	9.3	9.3	9.4	9.4	9.4	4.3	9.5	9.8	6.6	8.4	0.8	8.2	1.1	6.7
GOVMI	8.8	8.9	8.9	-	1.2	3.9	6.3	9.1	9.1	6.8	6.8	9.2	7.9	9.3	8.1
	2.3	2.7	2.7	-	0.5	1.1	1.9	3.4	3.4	1.6	1.9	2.8	1.2	1.5	3.0
HERCA	3.0	5.7	8.9	-	-	-	-	-	-	-	7.8	10.4	9.9	8.9	9.5
HINWO	7.5	3.2	7.0	-	-	5.7	-	9.2	7.7	9.1	6.4	7.9	6.4	7.9	6.3
IGAAN	8.6	-	8.4	-	2.6	8.3	9.1	7.3	9.1	9.0	9.1	8.6	-	8.0	-
JONKA	9.0	9.0	9.0	1.8	4.0	8.1	9.1	9.4	8.9	5.0	7.3	5.3	9.3	9.2	9.8
	3.7	9.0	9.1	1.4	3.8	8.7	9.3	9.4	4.9	8.2	8.6	8.1	9.2	8.4	9.8
KACJA	3.6	9.0	6.8	-	-	-	-	7.6	6.8	-	9.3	5.5	8.8	4.4	-
	-	6.5	7.8	-	-	-	-	-	6.1	6.6	-	-	6.2	5.2	-
	-	8.9	8.3	-	6.1	2.7	7.4	4.8	9.6	5.1	6.9	8.7	10.0	7.3	1.2
	3.2	9.1	7.9	-	1.6	-	-	7.6	6.9	-	9.6	5.6	9.7	4.8	-
	3.6	9.0	6.5	-	-	-	-	7.7	7.0	-	9.4	5.6	8.7	4.6	-
KOSDE	7.8	6.6	9.4	-	-	-	-	-	8.9	9.6	7.6	1.7	9.4	-	-
	9.3	9.4	9.4	9.4	9.5	9.5	9.5	9.6	9.6	9.6	9.1	8.2	7.2	6.2	3.6
	8.6	7.2	9.9	9.9	8.6	9.2	8.6	8.7	9.2	9.3	8.4	2.7	9.6	9.1	9.0
	9.4	9.4	9.5	9.5	9.5	9.5	9.6	9.6	9.6	9.7	9.2	8.2	7.2	6.3	4.8
LOPAL	6.0	5.7	8.3	-	-	7.2	9.3	8.3	7.5	8.3	9.7	4.8	8.5	8.6	-
LOTJO	1.3	6.6	-	-	3.2	4.8	1.6	-	0.8	1.6	4.4	-	7.5	-	-
MACMA	8.6	8.1	8.4	5.1	0.3	9.0	9.1	9.1	9.2	9.3	9.3	9.4	9.5	9.6	9.6
	8.7	7.7	7.6	4.2	-	9.0	9.1	9.1	9.2	9.3	9.4	9.4	9.5	9.6	9.7
	6.5	4.4	1.8	3.0	-	8.3	9.0	9.0	9.1	9.2	9.3	9.2	9.4	9.5	9.5
	8.6	8.0	7.7	4.2	-	9.0	9.1	9.1	9.2	9.3	9.3	9.4	9.5	9.5	9.6
MARGR	9.0	8.7	9.0	-	-	-	-	-	-	-	8.3	8.9	8.9	7.8	5.2
MARRU	8.9	9.0	9.0	9.1	9.0	9.7	7.5	9.8	9.8	10.0	9.8	0.4	9.2	7.8	9.7
	9.4	9.4	9.3	9.4	4.8	9.1	2.9	7.5	4.1	6.4	9.2	-	6.9	7.4	8.6
MASMI	-	7.7	6.6	6.0	3.8	4.9	5.7	6.1	1.1	7.7	6.6	7.6	1.9	8.2	8.5
MOLSI	7.3	8.3	7.9	0.6	-	5.3	8.5	8.7	8.7	8.8	8.8	8.9	8.9	9.0	5.5
	8.4	8.7	7.7	0.6	-	3.7	8.8	8.9	9.2	9.2	9.3	7.1	9.4	9.5	6.7
	6.6	8.1	6.4	0.6	-	-	7.6	8.0	8.0	7.0	6.9	6.8	8.2	7.3	1.9
	6.7	2.1	5.0	3.2	6.7	8.5	8.6	8.6	8.7	8.8	8.9	9.0	9.1	9.0	9.0
	6.7	2.8	5.3	3.5	6.6	8.6	8.8	8.8	8.8	9.0	9.0	9.0	9.1	9.1	8.9
	7.0	2.6	5.1	3.3	6.6	7.8	8.9	5.4	8.5	9.2	9.2	9.3	9.3	9.4	9.4
	6.9	2.2	5.3	3.4	6.0	8.9	9.0	9.0	9.0	9.2	9.2	9.3	9.4	9.5	9.4
MORJO	9.0	9.0	9.0	3.3	7.0	7.2	9.2	9.4	9.4	-	7.7	9.6	8.5	9.2	9.3
MOSFA	0.5	0.2	0.2	-	1.8	2.6	0.7	1.2	1.9	1.1	0.6	1.2	1.1	0.8	1.1
OTTMI	9.0	2.8	9.5	5.8	3.4	-	2.4	0.4	6.5	-	9.9	5.1	-	8.2	4.9
PERZS	-	-	6.9	-	6.1	0.5	7.9	9.4	-	7.3	7.3	9.6	7.3	7.1	6.7
ROTEC	1.3	1.6	2.2	-	2.1	-	-	-	-	-	-	8.9	0.6	9.1	0.7
SARAN	8.3	9.6	9.8	8.4	9.7	9.1	3.7	7.7	5.4	9.3	9.9	-	-	4.9	5.3
	8.4	9.4	9.7	9.7	9.7	-	-	-	-	-	-	-	-	-	8.6
	8.3	9.2	9.4	9.7	9.6	-	-	-	-	-	-	-	1.1	-	8.8
	8.3	9.1	9.1	7.2	3.0	7.6	3.8	7.4	4.6	6.3	4.1	-	6.9	4.9	7.0
SCALE	2.2	7.3	4.9	-	7.5	5.5	8.4	6.4	-	-	-	-	-	-	-
SCHHA	8.6	2.7	2.1	2.0	8.7	5.5	7.2	4.6	8.3	7.4	8.6	9.2	7.3	8.8	1.5
SLAST	1.9	8.7	8.3	-	4.9	2.4	7.4	9.1	9.1	5.9	8.9	7.8	9.2	3.8	4.3
	1.5	2.2	3.3	-	5.2	3.1	8.1	8.7	4.5	7.6	8.3	8.4	8.7	8.3	4.9
STOEN	2.4	7.9	6.8	-	7.8	8.2	9.6	9.3	9.3	3.1	9.6	9.8	9.8	8.2	6.1
	2.1	7.0	7.0	-	7.6	8.8	9.5	8.9	9.1	3.5	9.7	9.8	9.8	8.3	6.8
	3.8	7.0	9.4	-	7.1	8.7	9.6	9.4	8.8	5.0	9.6	9.8	10.0	9.2	7.2
STRJO	8.4	-	-	1.8	8.6	8.9	9.0	6.4	8.5	6.0	9.2	8.8	-	9.4	1.8
	6.4	1.5	2.3	1.0	8.7	8.7	8.8	6.4	8.9	6.3	9.0	9.1	9.3	9.2	2.9
	7.1	0.5	2.2	0.8	8.8	8.9	9.0	6.0	9.1	8.7	9.3	-	9.3	9.4	-
	4.5	1.4	3.1	1.3	8.8	8.7	8.8	6.4	8.9	7.6	9.0	9.3	9.2	9.4	3.6
	7.9	1.0	1.7	1.2	8.7	8.7	8.9	6.2	9.1	5.0	9.2	9.3	9.3	9.3	4.0
TEPIS	8.8	8.7	7.6	-	3.9	7.6	9.1	9.2	9.2	8.0	9.4	9.4	8.4	9.5	9.6
	8.8	8.8	5.8	-	4.7	5.7	9.1	4.9	9.2	9.2	9.4	9.4	7.7	9.5	8.9
TRIMI	2.8	9.1	6.3	-	-	3.8	4.3	7.3	6.4	2.6	3.1	4.4	5.0	-	2.7
WEGWA	-	-	-	-	-	6.0	9.0	9.1	8.2	7.8	7.5	7.5	8.2	9.5	8.7
YRJIL	1.2	6.9	-	1.2	6.9	-	4.3	5.9	1.6	3.1	1.7	7.9	8.3	6.8	8.1
Sum	478.6	484.2	507.4	201.4	408.0	449.7	494.8	531.8	565.5	477.5	583.4	500.4	590.3	511.0	419.3

September	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	-	6.9	-	5.2	-	7.0	6.2	7.6	8.5	8.9	8.1	8.5	8.5	4.1	7.3
BERER	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BOMMA	3.3	0.7	2.6	8.6	-	-	-	7.7	10.6	10.6	10.7	10.7	10.7	10.0	9.4
BREMA	4.3	1.3	0.5	7.1	-	10.0	8.4	8.4	10.2	6.3	7.0	2.7	-	2.5	2.3
BRIBE	-	-	0.2	-	-	4.1	7.3	9.2	10.2	2.8	6.7	6.4	4.5	0.2	2.3
	2.3	-	-	-	0.2	9.8	6.8	10.0	10.1	2.3	0.5	6.9	8.8	-	1.6
CARMA	-	0.2	1.9	7.3	0.3	-	9.6	6.3	10.3	10.4	0.7	9.1	9.7	10.5	8.4
CASFL	-	0.6	1.9	7.3	2.0	-	10.4	8.2	10.6	10.7	3.1	10.0	10.8	10.7	9.4
CRIST	3.9	1.8	8.2	9.7	7.5	5.0	8.2	9.3	10.2	10.3	8.2	10.4	10.4	4.8	4.5
	4.0	2.2	8.2	9.7	5.5	6.7	6.2	8.9	9.7	10.3	3.1	10.2	10.0	0.3	0.8
	3.3	2.6	8.4	9.9	8.3	7.9	8.7	9.0	10.2	10.3	9.0	10.4	10.3	4.8	5.2
DONJE	4.2	1.6	3.8	9.9	-	-	-	9.2	10.6	10.6	10.7	10.7	10.7	10.8	10.8
ELTMA	-	-	-	4.7	1.8	3.2	6.9	8.6	10.6	10.4	6.3	8.6	9.9	7.7	6.3
FORKE	-	-	-	-	7.7	5.3	4.8	9.4	9.8	8.7	1.4	9.7	8.1	8.1	3.0
GONRU	10.0	7.0	6.9	-	0.5	7.7	8.1	4.6	3.1	10.0	7.9	10.2	10.6	10.6	5.6
	9.9	8.7	10.0	7.1	8.1	10.1	10.2	10.4	6.3	10.3	10.0	10.5	10.5	10.6	5.8
	10.2	10.1	10.2	7.2	8.2	10.2	10.3	10.3	6.2	10.6	10.1	10.7	10.7	10.8	5.6
	9.9	8.9	10.1	6.6	5.3	10.1	10.4	10.3	4.3	4.1	10.4	10.4	10.5	10.5	5.4
	10.1	8.4	10.1	7.3	8.9	10.2	10.3	10.3	5.9	9.2	10.1	10.7	10.7	10.8	5.4
	8.9	6.2	10.0	4.0	5.5	10.0	10.2	10.2	4.6	6.1	10.3	10.5	10.4	10.5	4.6
GOVMI	-	4.2	0.7	3.3	5.7	7.7	10.1	9.1	10.2	10.2	7.0	9.7	7.0	10.4	10.4
	0.5	1.1	0.2	0.3	1.3	6.8	9.9	8.3	4.8	10.0	5.5	-	3.9	10.3	5.1
HERCA	10.3	10.6	10.6	10.5	-	5.2	10.4	9.0	9.5	10.2	5.0	6.2	6.3	1.1	10.4
HINWO	-	-	-	-	-	7.1	3.5	10.2	7.8	9.9	4.3	10.5	10.2	9.3	1.6
IGAAN	-	-	-	-	-	2.8	8.8	8.7	8.9	6.2	-	-	7.1	10.1	8.4
JONKA	4.5	8.5	0.6	-	4.0	1.3	10.2	2.8	4.8	6.5	5.4	10.5	8.6	10.2	8.5
	4.0	7.8	1.9	-	4.0	2.4	10.2	7.9	9.4	7.2	7.4	10.5	9.4	10.6	9.1
KACJA	-	-	-	1.6	-	6.1	5.3	5.5	7.8	9.7	3.0	7.1	9.1	7.5	7.5
	-	-	-	-	-	9.1	-	8.7	8.5	8.2	-	-	-	10.3	9.8
	-	-	-	3.5	-	9.5	6.7	6.6	9.5	6.2	7.4	7.8	10.5	9.2	6.8
	-	-	-	1.4	-	8.9	7.1	7.2	10.4	10.3	4.1	8.8	10.5	10.2	7.1
	-	-	-	0.9	-	8.6	5.2	6.4	10.0	9.6	3.5	8.0	7.7	7.2	7.6
KOSDE	-	8.4	3.2	-	-	10.0	9.9	10.0	10.0	10.1	7.3	10.1	9.6	10.2	10.2
	3.0	3.1	4.5	4.5	4.5	5.7	6.0	7.0	8.0	9.0	10.1	10.1	-	10.2	10.2
	10.0	9.4	7.3	8.5	-	10.3	10.2	10.0	10.2	9.9	8.0	10.0	10.0	9.7	9.8
	9.8	9.9	9.9	9.9	-	10.0	10.0	10.0	10.1	10.1	10.1	10.1	-	10.2	10.2
LOPAL	1.5	-	-	-	-	-	-	0.8	9.2	10.4	-	10.2	-	7.3	2.0
LOTJO	-	-	-	-	-	1.9	10.5	10.6	4.9	8.0	10.7	10.6	10.8	10.8	6.7
MACMA	7.4	-	-	6.0	3.5	5.0	1.9	2.3	1.5	-	-	5.0	-	10.2	5.9
	9.0	0.3	1.8	6.5	4.1	5.0	0.7	1.9	9.0	6.3	-	10.0	0.6	9.9	6.3
	8.8	-	1.3	5.2	4.1	4.7	0.7	0.9	1.6	6.2	-	10.0	-	8.9	5.6
	9.3	0.7	1.8	7.0	4.3	4.8	1.0	2.1	8.9	7.0	0.3	9.9	-	10.0	6.7
MARGR	4.2	5.9	6.0	1.8	8.8	9.0	3.6	9.0	6.2	9.0	8.4	8.9	8.7	8.7	-
MARRU	10.0	9.0	10.2	3.9	9.5	10.3	10.2	10.3	5.1	6.9	10.4	10.3	10.3	10.4	6.4
	8.2	8.9	8.6	10.2	10.2	9.7	10.4	10.4	3.0	7.5	10.3	10.7	10.7	10.6	3.6
MASMI	7.6	8.3	6.3	7.9	5.4	-	-	8.8	8.0	9.7	-	9.8	9.1	8.4	6.5
MOLSI	-	-	-	-	6.2	9.4	9.3	9.6	9.6	9.7	8.8	9.8	9.7	9.9	9.9
	-	-	-	-	6.5	9.8	10.0	10.0	10.1	10.2	9.7	10.3	10.0	9.3	10.1
	-	-	-	-	1.4	7.3	9.1	9.8	9.8	9.8	9.3	9.1	9.7	10.1	9.1
	0.2	6.2	-	9.1	2.2	5.5	8.0	9.4	9.7	9.9	7.2	9.7	8.1	3.1	8.0
	0.4	7.2	-	9.3	1.3	5.7	8.3	9.3	10.0	10.0	7.9	9.9	8.9	3.3	8.1
	-	7.5	-	9.6	2.7	5.5	8.3	9.9	7.3	10.2	6.3	8.7	8.6	3.0	7.5
	-	8.0	-	9.6	2.6	6.8	9.0	9.8	10.2	10.2	7.4	10.2	8.3	2.9	8.3
MORJO	5.0	7.5	0.2	-	2.2	3.3	10.2	10.2	10.4	7.0	10.5	10.4	8.7	10.7	-
MOSFA	-	-	0.2	1.6	0.2	-	2.4	-	-	2.0	-	0.6	1.0	-	0.7
OTTMI	1.6	10.2	10.2	0.4	7.3	-	-	0.5	1.0	1.2	10.6	-	8.1	5.4	-
PERZS	-	-	-	-	9.2	8.0	9.2	7.4	10.1	9.6	-	-	10.5	10.6	10.2
ROTEC	-	-	-	0.7	-	-	-	-	-	-	-	7.4	3.3	4.3	8.8
SARAN	6.4	7.4	-	7.6	4.1	9.1	10.3	10.6	5.9	7.8	10.6	10.7	7.6	10.8	7.1
	10.2	10.3	10.2	10.4	9.9	10.0	-	-	4.9	-	10.1	10.6	10.2	10.2	6.5
	10.1	9.5	8.5	9.6	9.4	10.2	9.9	9.8	6.5	7.4	9.8	10.4	10.2	9.8	7.1
	8.8	9.0	8.8	9.7	10.3	9.8	10.4	10.4	5.7	6.8	10.6	10.7	10.7	10.9	6.5
SCALE	-	-	-	-	-	-	-	-	-	10.4	3.6	7.7	10.5	7.0	5.3
SCHHA	4.7	-	0.9	3.2	0.6	5.2	3.3	9.6	8.5	5.0	6.3	7.3	6.9	-	-
SLAST	-	-	-	4.0	-	8.6	5.0	5.4	9.1	9.4	6.6	9.4	8.4	8.7	2.5
	-	1.8	-	4.4	-	8.0	7.0	5.3	8.8	8.8	6.9	8.8	8.1	8.1	-
STOEN	1.5	0.3	2.5	5.0	0.2	1.4	10.3	7.4	9.8	9.2	5.7	-	10.6	7.3	8.3
	0.7	0.7	3.3	5.7	0.2	1.4	10.4	5.8	9.7	9.0	5.9	4.9	10.6	6.8	8.4
	0.9	0.9	4.1	6.9	0.2	2.2	10.4	6.4	10.3	9.2	5.4	4.8	10.7	7.2	7.9
STRJO	1.7	0.9	2.1	-	4.0	10.0	-	9.4	9.1	5.3	10.3	9.6	1.6	-	4.5
	1.9	1.3	4.9	-	2.7	9.2	3.1	9.9	10.1	4.0	9.6	9.6	1.2	-	3.6
	3.2	-	4.5	-	-	9.9	4.5	10.0	10.1	5.4	10.3	-	-	-	-
	1.5	-	3.3	-	3.5	9.8	3.5	9.7	10.1	5.3	10.2	9.6	-	-	3.9
	2.5	2.0	2.4	-	2.9	9.8	3.4	9.9	10.2	3.1	10.3	9.3	1.6	-	4.1
TEPIS	4.5	3.4	6.7	-	3.9	4.2	10.0	10.1	10.1	8.1	9.5	10.3	3.4	10.4	9.0
	4.0	-	5.1	0.2	4.4	3.1	8.9	9.6	10.1	8.6	9.7	10.3	6.1	10.4	10.5
TRIMI	-	-	-	3.5	-	4.3	2.5	3.5	5.0	6.6	2.2	5.6	5.8	1.6	1.9
WEGWA	4.6	-	-	4.4	3.5	5.5	10.0	-	3.6	9.5	0.9	9.7	-	8.0	3.7
YRJIL	-	-	8.4	8.9	9.0	0.4	3.3	-	-	-	3.1	-	-	-	9.6
Sum	266.8	257.4	254.2	328.3	249.8	472.6	515.5	581.1	605.1	605.9	497.8	637.5	555.0	570.0	477.2

3. Results (Meteors)

September	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	39	13	38	15	51	70	79	72	44	50	57	70	62	77	46
BERER	-	33	-	-	-	-	48	40	26	37	28	58	16	-	27
BOMMA	32	43	30	2	51	7	13	53	46	32	33	48	36	33	46
BREMA	26	9	1	3	24	38	36	-	34	19	34	23	26	24	3
BRIBE	22	10	4	4	45	47	56	6	42	17	46	42	32	29	2
	23	3	6	-	42	58	51	5	30	11	40	46	26	30	3
CARMA	9	6	6	-	32	43	12	20	25	-	-	-	19	9	20
CASFL	20	11	19	-	47	52	30	32	40	3	-	-	31	14	26
CRIST	45	39	29	2	47	46	44	28	28	28	30	44	50	2	1
	30	45	11	1	35	40	21	15	25	19	23	24	31	-	6
	90	74	54	6	85	77	69	58	54	38	44	72	72	1	3
DONJE	53	-	51	1	78	7	19	60	69	31	35	64	64	43	58
ELTMA	8	19	16	-	30	-	34	47	39	16	17	25	29	17	-
FORKE	32	14	38	-	-	56	53	52	50	32	41	54	37	42	26
GONRU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	50	44	50	33	38	53	39	60	56	46	40	2	49	9	47
	29	37	26	29	20	39	25	57	37	36	42	2	43	14	36
	17	13	10	11	10	16	16	17	13	24	10	1	18	-	13
	21	25	27	18	26	38	22	48	38	32	50	2	32	16	21
	33	30	30	25	25	31	31	48	50	54	35	2	42	5	26
GOVMI	33	39	28	-	5	12	20	35	46	21	20	30	20	24	27
	16	22	19	-	3	7	13	22	24	10	15	19	8	10	20
HERCA	5	20	28	-	-	-	-	-	-	-	25	28	13	22	22
HINWO	26	10	33	-	-	44	-	40	29	36	33	33	32	32	22
IGAAN	9	-	6	-	2	7	8	8	6	6	10	4	-	5	-
JONKA	23	17	17	1	5	13	18	16	26	10	10	10	11	15	11
	9	24	15	3	4	16	23	24	12	20	12	18	7	19	13
KACJA	21	55	21	-	-	-	-	60	71	-	52	37	55	20	-
	-	17	11	-	-	-	-	-	16	11	-	-	16	12	-
	-	28	16	-	18	18	41	20	47	14	30	47	45	20	1
	22	70	35	-	8	-	-	92	72	-	54	70	78	29	-
	9	43	16	-	-	-	-	46	36	-	29	35	26	10	-
KOSDE	61	45	83	-	-	-	-	-	85	87	68	23	99	-	-
	109	102	103	108	103	101	94	106	108	112	109	72	96	86	63
	92	78	114	116	136	153	113	138	86	151	90	46	106	66	46
	116	120	127	121	128	127	130	113	145	126	106	97	95	79	58
LOPAL	35	23	18	-	-	39	49	39	37	19	42	25	47	48	-
LOTJO	4	2	-	-	7	4	3	-	2	1	15	-	4	-	-
MACMA	73	41	23	19	1	60	72	51	57	64	56	43	77	53	76
	57	27	17	16	-	58	56	47	61	54	50	41	59	50	54
	32	18	6	7	-	25	29	19	29	31	27	21	39	29	32
	52	37	17	20	-	52	38	52	60	47	66	60	67	65	56
MARGR	25	18	23	-	-	-	-	-	-	-	16	10	19	7	8
MARRU	34	35	19	24	27	35	39	50	44	48	44	2	33	18	29
	26	21	19	19	16	23	7	8	7	12	40	-	28	19	19
MASMI	-	45	41	63	30	32	34	42	2	30	36	40	5	38	40
MOLSI	95	61	119	8	-	93	83	128	134	115	102	116	114	94	18
	25	18	20	3	-	21	22	20	38	39	29	26	23	25	2
	33	26	30	2	-	-	31	48	53	17	25	19	39	32	9
	65	3	30	28	65	120	107	96	49	73	100	83	89	113	73
	51	4	19	22	48	96	87	83	55	79	63	87	65	67	65
	33	4	14	23	36	40	60	27	37	47	51	43	49	56	57
	63	3	22	22	49	112	93	63	47	93	67	72	76	88	53
MORJO	19	17	14	1	15	7	27	19	31	-	13	15	10	16	18
MOSFA	3	1	1	-	13	14	5	7	9	6	5	7	8	5	7
OTTMI	14	7	19	11	4	-	8	2	21	-	11	4	-	12	3
PERZS	-	-	51	-	25	2	56	60	-	40	36	62	24	45	39
ROTEC	4	5	14	-	21	-	-	-	-	-	-	33	4	26	3
SARAN	14	10	13	6	14	14	15	17	9	21	19	-	-	6	8
	21	20	15	14	16	-	-	-	-	-	-	-	-	-	24
	22	20	12	17	10	-	-	-	-	-	-	-	2	-	43
	12	6	9	11	9	10	8	5	10	12	10	-	13	8	13
SCALE	7	7	3	-	18	14	12	13	-	-	-	-	-	-	-
SCHHA	37	12	3	7	43	23	32	13	53	22	43	40	29	25	7
SLAST	3	26	20	-	8	11	18	32	31	15	29	19	14	4	4
	2	3	4	-	4	7	6	12	5	4	9	10	7	4	2
STOEN	23	30	33	-	78	77	66	73	57	22	35	57	44	21	48
	21	13	27	-	69	68	39	39	46	17	27	40	38	19	31
	43	19	42	-	84	93	53	71	55	28	45	53	57	40	54
STRJO	23	-	-	4	75	81	80	20	64	7	67	71	-	40	2
	24	3	6	3	30	49	33	17	36	19	52	33	33	37	4
	7	2	1	1	17	12	10	1	10	3	14	-	4	5	-
	10	2	3	6	27	36	27	6	35	13	41	32	58	25	3
	16	4	3	2	39	36	48	13	35	4	36	32	30	19	7
TEPIS	22	15	6	-	1	9	27	24	19	4	16	21	10	20	18
	42	21	14	-	9	15	44	14	28	25	29	36	22	32	36
TRIMI	13	16	6	-	-	5	15	19	23	5	7	11	13	-	10
WEGWA	-	-	-	-	-	19	39	42	33	32	32	28	32	53	32
YRJIL	2	35	-	3	33	-	22	27	8	11	7	33	29	22	29
Sum	2237	1838	1874	861	2039	2628	2658	2757	2885	2208	2680	2473	2736	2100	1729

September	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	-	29	-	23	-	51	13	41	46	85	63	71	52	14	44
BERER	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BOMMA	25	3	9	69	-	-	-	52	57	59	60	60	68	50	63
BREMA	14	2	1	25	-	25	26	28	42	23	13	4	-	2	4
BRIBE	-	-	1	-	-	25	25	31	61	8	23	22	13	1	8
	4	-	-	-	1	29	16	30	58	6	4	27	33	-	4
CARMA	-	1	9	21	2	-	15	13	33	34	2	32	28	16	16
CASFL	-	2	4	28	1	-	42	14	35	45	5	36	49	32	27
CRIST	20	6	27	30	29	15	33	44	45	40	29	63	48	13	9
	20	15	29	35	28	27	11	26	34	27	13	22	31	2	3
	38	14	43	51	47	26	46	55	86	79	37	84	90	18	19
DONJE	22	4	6	85	-	-	-	65	73	67	75	73	82	57	72
ELTMA	-	-	-	19	6	16	42	26	33	42	22	25	34	17	30
FORKE	-	-	-	-	16	12	7	57	46	41	2	44	18	19	4
GONRU	11	12	5	-	1	8	6	2	3	5	7	11	13	17	8
	37	31	42	23	30	36	56	63	23	30	74	69	64	57	33
	31	26	31	19	20	37	45	52	18	14	35	60	57	41	17
	20	13	15	7	4	18	18	17	8	3	24	28	24	18	10
	24	39	42	17	27	51	47	35	10	13	47	49	32	49	11
	29	31	40	3	9	37	50	49	16	12	47	60	57	52	17
GOVMI	-	14	3	10	31	22	38	14	46	28	16	28	21	38	40
	3	6	1	2	8	10	22	5	13	22	11	-	8	23	14
HERCA	32	42	25	23	-	8	26	25	30	25	8	18	15	3	29
HINWO	-	-	-	-	-	22	7	54	43	57	6	53	32	46	3
IGAAN	-	-	-	-	-	2	6	11	5	8	-	-	5	8	2
JONKA	10	15	5	-	2	8	12	6	12	12	10	15	18	22	8
	9	7	3	-	3	7	25	12	17	11	14	26	9	22	15
KACJA	-	-	-	9	-	20	29	13	36	44	13	34	29	22	29
	-	-	-	-	-	28	-	8	27	17	-	-	-	19	31
	-	-	-	10	-	25	28	37	49	24	28	37	33	18	12
	-	-	-	12	-	73	43	33	85	69	31	64	62	48	24
	-	-	-	5	-	18	9	18	33	27	10	29	15	8	10
KOSDE	-	42	26	-	-	91	74	81	96	79	58	82	102	99	104
	39	38	39	39	27	38	40	49	71	83	105	112	-	122	131
	45	53	13	78	-	109	102	142	117	106	75	147	133	151	142
	50	63	51	75	-	69	123	128	107	139	158	148	-	145	138
LOPAL	2	-	-	-	-	-	-	1	52	49	-	56	-	50	1
LOTJO	-	-	-	-	-	13	24	18	8	6	29	24	19	22	9
MACMA	27	-	-	21	31	35	8	9	10	-	-	41	-	44	30
	23	2	1	23	34	23	3	7	64	29	-	58	1	61	21
	28	-	2	13	13	22	3	2	13	7	-	24	-	21	9
	38	2	8	36	41	22	3	8	56	28	2	51	-	52	19
MARGR	6	8	4	1	23	34	6	23	12	15	26	25	12	24	-
MARRU	31	42	43	21	23	33	47	39	9	17	49	51	38	37	26
	23	28	27	25	32	25	34	32	15	6	32	41	27	35	29
MASMI	30	30	31	29	24	-	-	43	40	50	-	51	45	38	37
MOLSI	-	-	-	-	25	116	90	119	128	143	95	51	74	190	80
	-	-	-	-	6	35	28	25	35	44	22	12	16	50	32
	-	-	-	-	2	30	28	24	64	41	23	23	29	53	20
	1	65	-	103	22	49	31	32	59	110	37	95	44	7	65
	1	43	-	62	6	19	18	41	65	97	39	84	39	5	45
	-	24	-	45	10	7	23	38	13	43	13	35	22	8	22
	-	29	-	65	19	19	25	46	61	70	30	87	29	6	37
MORJO	8	10	1	-	2	5	13	15	27	16	22	17	15	22	-
MOSFA	-	-	1	10	1	-	14	-	-	11	-	4	6	-	4
OTTMI	8	10	17	1	3	-	-	3	7	5	21	-	12	5	-
PERZS	-	-	-	-	40	33	38	19	51	44	-	-	43	89	56
ROTEC	-	-	-	4	-	-	-	-	-	-	-	18	11	4	18
SARAN	14	7	-	7	11	20	24	32	6	8	22	26	15	26	20
	24	38	23	21	26	23	-	-	6	-	37	38	21	37	16
	38	27	30	49	33	47	38	37	16	15	40	45	42	45	22
	15	10	14	13	21	13	26	28	7	5	21	27	26	18	24
SCALE	-	-	-	-	-	-	-	-	-	14	5	6	18	4	7
SCHHA	23	-	2	9	1	15	5	36	39	24	40	33	28	-	-
SLAST	-	-	-	10	-	29	17	7	35	41	11	55	21	23	4
	-	3	-	3	-	13	6	7	4	10	4	14	6	5	-
STOEN	14	2	12	22	1	11	89	39	59	55	35	-	42	28	44
	4	4	13	21	1	10	65	14	35	35	28	20	42	13	18
	8	7	19	41	1	25	74	35	76	61	44	40	57	20	38
STRJO	5	4	7	-	14	53	-	67	78	18	69	47	2	-	24
	5	5	34	-	4	37	17	41	41	10	43	40	2	-	11
	1	-	4	-	-	13	4	7	8	3	11	-	-	-	-
	2	-	15	-	10	42	8	52	55	13	51	30	-	-	12
	10	7	14	-	2	33	8	37	33	4	45	34	3	-	11
TEPIS	4	3	11	-	2	13	20	21	16	17	17	19	3	19	11
	16	-	23	1	11	13	39	40	24	30	35	34	16	47	26
TRIMI	-	-	-	8	-	13	7	8	11	18	8	27	16	9	12
WEGWA	17	-	-	21	33	24	57	-	11	26	4	26	-	21	17
YRJIL	-	-	37	38	34	1	12	-	-	-	11	-	-	-	39
Sum	909	918	863	1441	854	1931	2034	2388	2863	2622	2146	3042	2117	2407	2047