Results of the IMO Video Meteor Network – April 2015

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The first few months of 2015 have already been promising, but the observing conditions still improved in April. With overall 86 active cameras we are slowly approaching one hundred video systems. Two third of these cameras managed to collect twenty and more observing nights, whereby there was no region that was given a particular advantage or disadvantage. In a number of nights there were more than 75 active cameras, and the all-time high was reached on April 10 with 79 video cameras.
Already for the third time in 2015 we could accumulate more than 10,000 hours of effective observing time in one month, which is 40% more than in the best April so far. With over 25,000 meteors, the output of the IMO network grew even by more than half compared to last April.

After a break of over three months, there was finally a meteor shower with ponderable activity again. The 2015 flux density profile of the Lyrids fits well to the data of the previous three years (figure 1). The ascent starts at about 30° solar longitude. The peak is reached slightly after 32° (in the evening hours UT of April 22, 2015), and at 34° solar longitude the activity has ceased. Hence, the descending activity branch is slightly shallower than the ascending branch. The flux density peaks almost constantly at 4 meteoroids per 1,000 km^2 and hour.

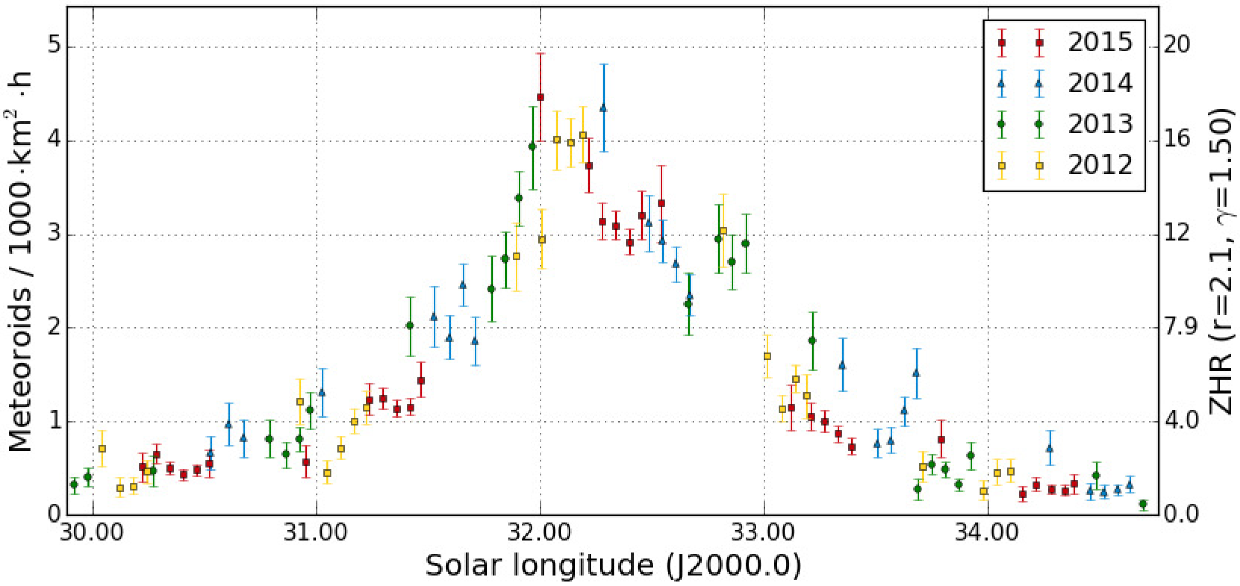

Figure 1: *Flux density profile of the Lyrids, obtained from video observations of the IMO network in April 2012-2015.*

Next we analysed the brightness distribution of the Lyrids. Figure 2 shows the population index profile of the sporadic meteors and Lyrids. The profile for the sporadic meteors is similar to the one of March – the r-value fluctuates between 2.5 and 3.0 with a few outliers. The population index of the Lyrids is 0.5 to 0.6 smaller all the time, i.e. there is a larger fraction of bright meteors. However the population is still higher than in the previous year when we found partly values below 2.0.

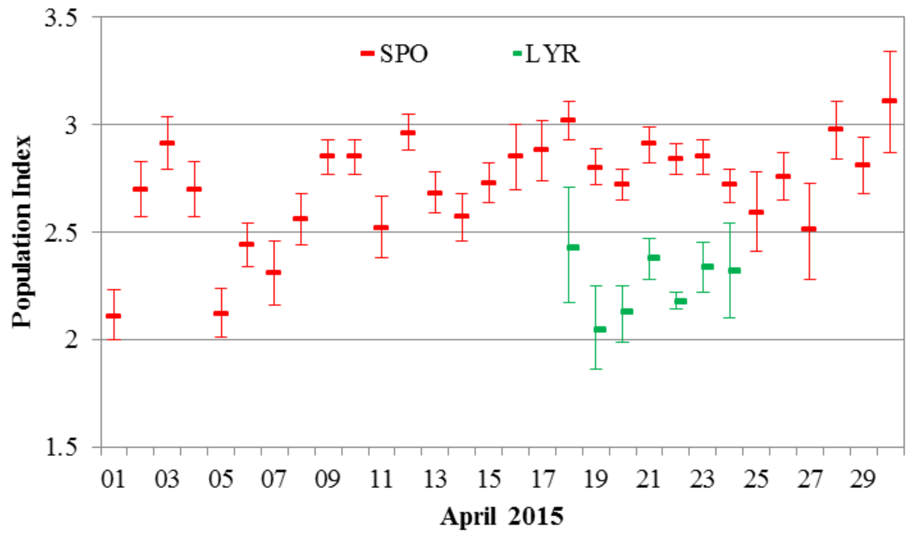

Figure 2: *Population index profile of the Lyrids and sporadic meteors in April 2015.*

Near the turn of the year 2014/2015 we had analysed, if the population index calculation can be improved by using extremely sensitive meteor cameras and thereby extending the limiting magnitude range. The result was that the benefit of these cameras is limited by their low yield on meteors. Still my camera ESCIMO2 started regular observation in April with a 25 mm f/0.85 Fujinon lens (field of view 14x11°, limiting magnitude >8 mag). The aim was not to throw the data into the big pool collected in the IMO network, but to use them primarily for the population index calculation.

The main idea was as follows: The effective collection area, i.e. how many square kilometer of atmosphere at what limiting magnitude a video camera is monitoring, is a prime ingredient in the calculation of flux densities and population indices. Among others, the effective collection area is calculation from the limiting magnitude of the camera, the altitude of the field of view, and the angular velocity of meteors. If there are systematic errors (e.g. by not properly accounting for the extinction near the horizon of by determining an average limiting magnitude over the full field of view), individual cameras may distort the overall result and cause scatter of the r-value. To minimize the impact of these systematic errors, ESCIMO2 was mounted exactly in parallel to MINCAM1 (field of view 43x32°, limiting magnitude 6 mag). Hence, both cameras have the same center of field of view, the same distance from the radiant resp. the same meteor angular velocity, the same boundary conditions regarding lunar distance, cloudiness, and more. Only the size of the field of view and the limiting magnitude differ, whereby the difference in limiting magnitude should be constant thanks to the identical observing direction. For this reason, an alternative method to calculate the population index can be applied, that was presented already at the last IMC to explain the principle of the population index calculation: The r-value can be derived directly from the meteor count ratio of both cameras!

The new camera ESCIMO2 was installed just in time for the Lyrid maximum, and the night sky was almost completely clear at my site between April 18/19 and 24/25. As an example, figure 3 shows a Lyrid that was recorded by both cameras on April 24. The image was inverted for better contrast.

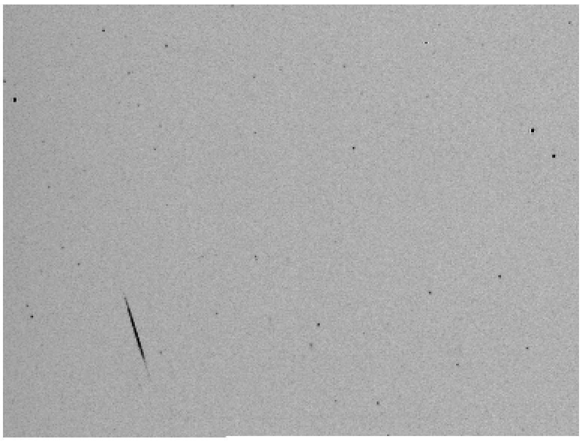 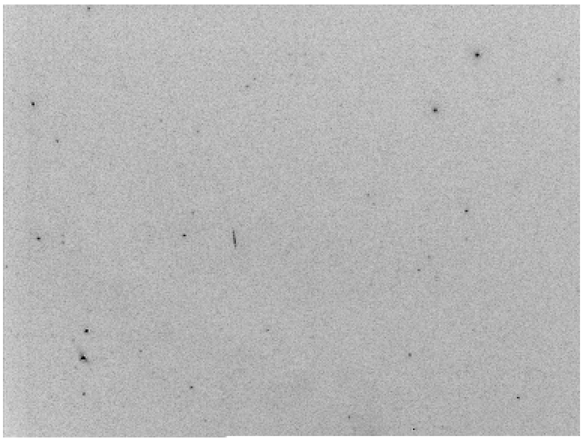

Figure 3: *Lyrid on April 24 at 01:21 UT, recorded by the cameras ESCIMO2 (left) and MINCAM1 (right) which are mounted in parallel.*

When configuring the new camera I run already into the first problem: The initial value of the "NoiseLevel" parameter has a significant impact on the limiting magnitude that is calculated for the camera.
What does that mean? To determine the limiting magnitude, an averaged background image is compared against a threshold: Pixels that are by the amount "NoiseLevel" brighter than their surroundings are segmented as stars and identified by the software. That threshold has to be adapted dynamically to the camera and observing conditions: The noisier the video image, the larger must be the threshold. If it is set to the right value, the majority of segmented objects can be identified and only a small remaining number are particularly noisy pixels. If the threshold is reduced, the number of identified stars is slowly increasing, since even fainter stars are recognized. At the same time, the number of unidentified "stars" (i.e. nosy pixels) is growing over-proportionally. If the threshold is increased, on the other hand, the number of identified stars will slowly reduce, but the number of noisy pixels will reduce much stronger. The automated adaption of the threshold is programmed such that a certain ratio between identified stars and noisy pixels is reached. Furthermore this ratio is depending on the star count. If only few stars are identified, a large fraction of noisy pixels is allowed. If there are hundreds of identified stars, the percentage of noisy pixels must become smaller.
It turned out, the over a certain range of thresholds the ratio of identified stars and noisy pixels remains approximately constant, i.e. that both the number of identified stars and noisy pixels increases or decreases by about the same amount when the threshold is adapted. Depending on the start value of the threshold, the algorithm in converging to another number of stars and thereby limiting magnitude. In the actual case, the difference was about half a magnitude, which has a significant impact on the calculated flux density and population index. We have to think again how the algorithm can be improved. Maybe it should not target for a certain ratio but rather for an absolute number of noisy pixels.

For further tests, both cameras were using the same start value for "NoiseLevel", and indeed the profiles of both cameras were similar. Figure 4 shows the development of the limiting magnitude on April 22/23 and 24/25. There where short breaks because of clouds in both nights, and we see two interesting effects: On the one hand, the drop in limiting magnitude lasts a little longer for MINCAM1 compared to ESCIMO2. That is understandable given the larger field of view where clouds enter earlier and remain longer. Even more interesting is the behavior of ESCIMO2 at dawn – under clear skies the limiting magnitude is increasing instead of decreasing. That must be caused by the electronics of the camera. It's a simple fact that more stars are identified for ESCIMO2 in morning twilight than under dark skies. It's also a fact that ESCIMO2 is on average 2.3 mags more sensitive than MINCAM1.

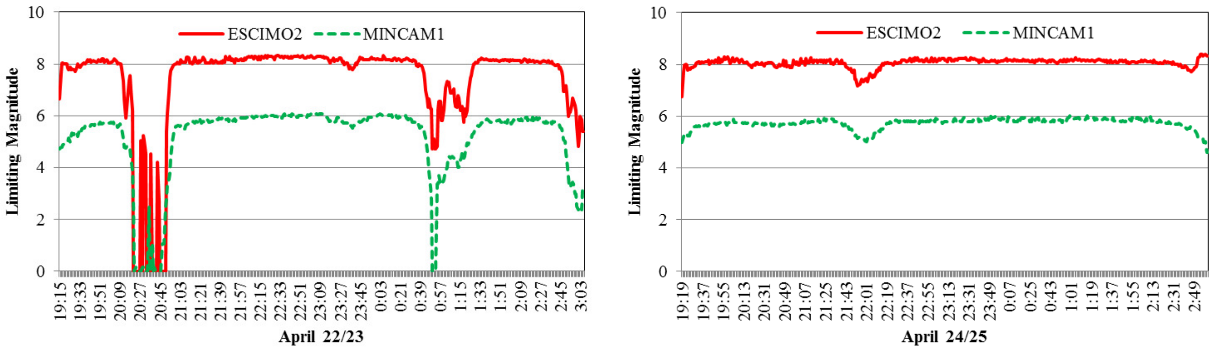

__Figure 4:__ Development of the limiting magnitude of ESCIMO2 and MINCAM1 on April 22/23 and 24/25, 2015.

Next it was calculated, how the effective collection area of the cameras (and thereby the number of expected Lyrids n_{Lyr}) depends on the population index r_{Lyr}. This dependency was calculated for different nights and we can see that the relation is indeed almost identical in all nights. So the assumption is correct, that from the population index alone we can derive the expected ratio of meteors of both cameras (figure 5 left). Now the function only needed to be inverted, and there you go: From the observed ratio of recorded meteors you can calculate the population index (figure 5 right). Well, that's not magic, because the population index is by definition the ratio of cumulative meteor counts under different meteor limiting magnitudes. Anyhow, an exponential function was fitted to the profile, so that we get for this particular pair of cameras the following formula:

$$r_{Lyr} = 7.7664 * (n_{Lyr, MINCAM1} / n_{Lyr, ESCIMO2})^{-0,841}$$

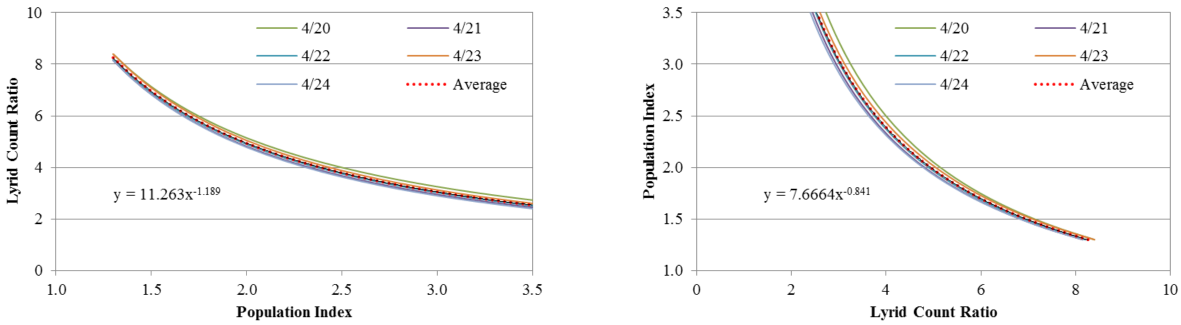

__Figure 5:__ Dependence of the ratio of the effective collection area (resp. the expected number of Lyrids) of ESCIMO2 and MINCAM1 from the population index (left). On the right side, the inverse function is shown.

Now only the number of meteors that both cameras had recorded per night needed to be plugged into the formula ... and ready was the disaster.

We obtained totally unbelievable r-values, which could be easily reconstructed: Figure 6 (left) gives the raw number of Lyrids recorded by MINCAM1 and ESCIMO2 per night. The graph of MINCAM1 shows the expected increase to up to 25 Lyrids in the peak night, followed by a decrease. ESCIMO2, on the other hand, recorded constantly between 0 and 2 Lyrids in every night. There is no sign whatsoever from the Lyrid peak!

And it's getting even worse: Figure 6 (right) gives the number of sporadic meteors in the same nights. Here the values of MINCAM1 is scattering as expected around a constant value, whereas ESCIMO2 shows an increase by almost a factor of two towards April 21/22, and a declining meteor count thereafter.

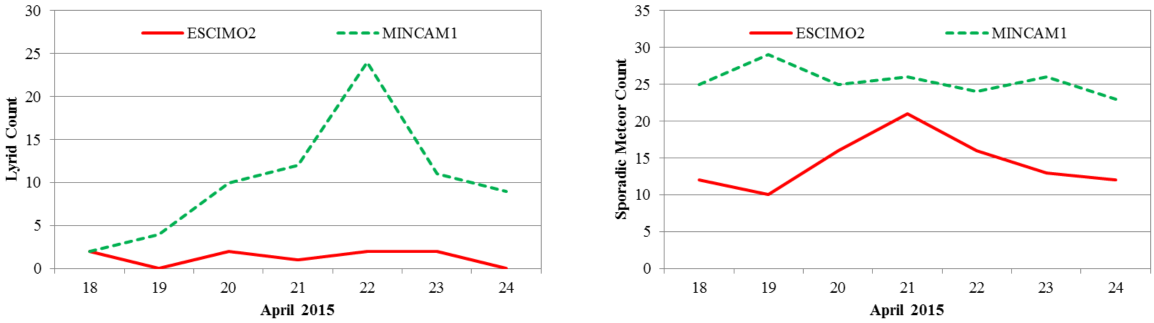

Figure 6: *Raw number of Lyrids and sporadic meteors, recorded by an ESCIMO2 and MINCAM1 in April 2015.*

Who would not think that there must be a problem with the meteor shower assignment procedure of ESCIMO2, but that's not the case: The meteor plot of the peak night (figure 7) shows that all but two backward prolongations of meteors recorded by ESCIMO2 clearly miss the Lyrid radiant.

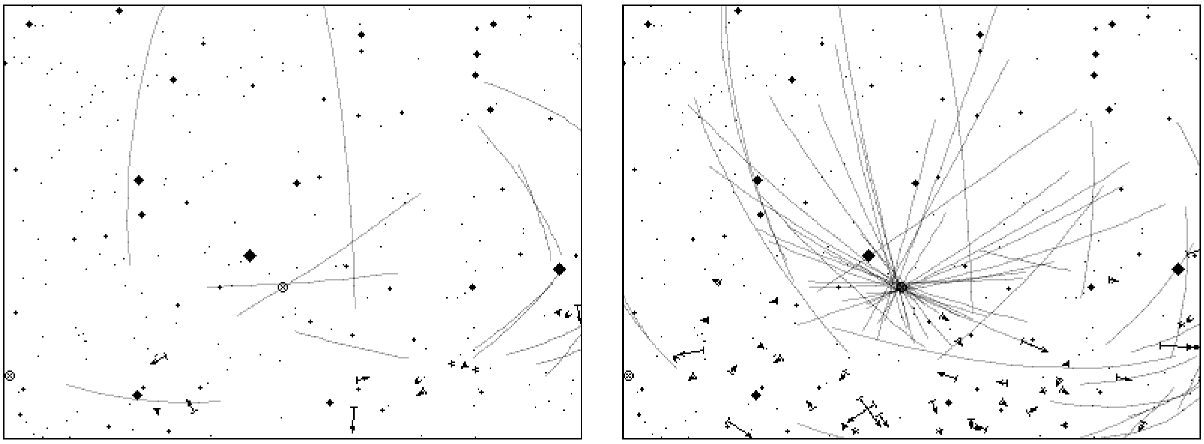

Figure 7: *Meteor backward prolongation plot of ESCIMO2 and MINCAM1 on April 22/23, 2015.*

We had expected a result of lower accuracy due to the low meteor count of ESCIMO2, since the accuracy is governed by the effective collection area of the camera. However, that the Lyrid peak cannot be seen at all in the meteor counts of ESCIMO2 was a big surprise.

So there are two ways out: On the one hand we can wait for a larger shower like the Perseids, when ESCIMO2 hopefully records a sufficient number of meteors. On the other hand, error sources can further be eliminated by giving ESCIMO2 not a lens with the same f-stop and longer focal length, but with the same focal length and a slower f-stop than MINCAM1. Then the fields of view would be fully identical and there would be no need to calculate an effective collection area at all. The population index could instead be calculated directly from the difference in limiting magnitude *lm* and the ratio of meteor counts:

$$r_{Lyr} = (n_{Lyr,MINCAM1} / n_{Lyr,\,ESCIMO2})^{1/(lm_{ESCIMO2} - lm_{MINCAM1})}$$

So there is further room for experiments and improvements.

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	28	151.1	645
BANPE	Bánfalvi	Zalaegerszeg/HU	HUVCSE01 (0.95/5)	2423	3.4	361	16	12.4	76
BERER	Berkó	Ludanyhalaszi/HU	HULUD1 (0.8/3.8)	5542	4.8	3847	15	105.2	405
			HULUD3 (0.95/4)	4357	3.8	876	13	99.1	98
BOMMA	Bombardini	Faenza/IT	MARIO (1.2/4.0)	5794	3.3	739	22	147.6	463
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	23	144.4	180
BRIBE	Klemt	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	26	170.7	288
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	26	172.4	290
CASFL	Castellani	Monte Baldo/IT	BMH1 (0.8/6)	2350	5.0	1611	24	191.1	473
			BMH2 (1.5/4.5)*	4243	3.0	371	23	181.2	330
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	21	164.0	346
			C3P8 (0.8/3.8)	5455	4.2	1586	20	133.7	219
			STG38 (0.8/3.8)	5614	4.4	2007	21	174.3	691
DONJE	Donati	Faenza/IT	JENNI (1.2/4)	5886	3.9	1222	22	170.9	565
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	22	142.7	273
FORKE	Förster	Carlsfeld/DE	AKM3 (0.75/6)	2375	5.1	2154	22	137.6	325
GONRU	Goncalves	Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	26	162.2	344
			TEMPLAR2 (0.8/6)	2080	5.0	1508	25	141.7	269
			TEMPLAR3 (0.8/8)	1438	4.3	571	22	138.1	97
			TEMPLAR4 (0.8/3.8)	4475	3.0	442	24	137.4	268
			TEMPLAR5 (0.75/6)	2312	5.0	2259	26	124.5	218
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	24	130.0	330
			ORION3 (0.95/5)	2665	4.9	2069	12	54.2	60
			ORION4 (0.95/5)	2662	4.3	1043	17	55.8	118
HERCA	Hergenrother	Tucson/US	SALSA3 (0.8/3.8)	2336	4.1	544	28	227.4	392
HINWO	Hinz	Schwarzenberg/DE	HINWO1 (0.75/6)	2291	5.1	1819	22	145.1	371
IGAAN	Igaz	Debrecen/HU	HUDEB (0.8/3.8)	5522	3.2	620	23	141.6	203
		Hodmezovasar./HU	HUHOD (0.8/3.8)	5502	3.4	764	24	151.9	164
		Budapest/HU	HUPOL (1.2/4)	3790	3.3	475	18	120.2	49
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	27	179.3	167
			HUSOR2 (0.95/3.5)	2465	3.9	715	25	157.8	141
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	17	109.2	446
		Kostanjevec/SI	METKA (0.8/12)*	715	6.4	640	1	6.4	4
		Ljubljana/SI	ORION1 (0.8/8)	1402	3.8	331	24	135.4	136
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	17	109.7	600
			STEFKA (0.8/3.8)	5471	2.8	379	16	96.3	267
KISSZ	Kiss	Sulysap/HU	HUSUL (0.95/5)*	4295	3.0	355	26	161.4	106
KOSDE	Koschny	Izana Obs./ES	ICC7 (0.85/25)*	714	5.9	1464	24	156.9	935
		La Palma / ES	ICC9 (0.85/25)*	683	6.7	2951	25	181.1	1224
		Noordwijkerhout/NL	LIC4 (1.4/50)*	2027	6.0	4509	23	130.6	219
LOJTO	Łojek	Grabniak/PL	PAV57 (1.0/5)	1631	3.5	269	13	79.2	78
LOPAL	Lopes	Lisboa/PT	NASO1 (0.75/6)	2377	3.8	506	18	15.7	90
MACMA	Maciejewski	Chelm/PL	PAV35 (0.8/3.8)	5495	4.0	1584	22	88.0	322
			PAV36 (0.8/3.8)*	5668	4.0	1573	27	118.7	388
			PAV43 (0.75/4.5)*	3132	3.1	319	20	132.9	203
			PAV60 (0.75/4.5)	2250	3.1	281	24	94.2	395
MARGR	Maravelias	Lofoupoli/GR	LOOMECON (0.8/12)	738	6.3	2698	17	96.8	167
MARRU	Marques	Lisbon/PT	CAB1 (0.8/3.8)	5291	3.1	467	25	149.0	197
			RAN1 (1.4/4.5)	4405	4.0	1241	17	100.6	140
MASMI	Maslov	Novosimbirsk/RU	NOWATEC (0.8/3.8)	5574	3.6	773	10	44.8	105
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1230	6.9	6152	25	160.6	994
			ESCIMO2 (0.85/25)	155	8.1	3415	16	113.7	209
			MINCAM1 (0.8/8)	1477	4.9	1084	25	151.0	548
		Ketzür/DE	REMO1 (0.8/8)	1467	6.5	5491	26	160.3	742
			REMO2 (0.8/8)	1478	6.4	4778	28	164.0	684
			REMO3 (0.8/8)	1420	5.6	1967	10	57.9	127
			REMO4 (0.8/8)	1478	6.5	5358	29	169.7	771
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	2522	3.5	532	26	183.2	184
MOSFA	Moschini	Rovereto/IT	ROVER (1.4/4.5)	3896	4.2	1292	21	24.9	169
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	2944	3.5	358	21	160.4	196
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	24	144.4	183
PERZS	Perkó	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	23	167.7	348
PUCRC	Pucer	Nova vas nad Dra./SI	MOBCAM1 (0.75/6)	2398	5.3	2976	15	102.7	135
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	21	104.9	231
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	24	115.4	165
			RO2 (0.75/6)	2381	3.8	459	21	113.0	179
			RO3 (0.8/12)	710	5.2	619	20	121.1	247
			SOFIA (0.8/12)	738	5.3	907	22	87.2	115
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	22	127.0	257
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	563	6.2	1294	23	106.4	281
			KAYAK2 (0.8/12)	741	5.5	920	23	154.2	116
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	23	141.8	382
			NOA38 (0.8/3.8)	5609	4.2	1911	25	168.6	451
			SCO38 (0.8/3.8)	5598	4.8	3306	24	165.2	537
STORO	Stork	Ondrejov/CZ	OND1 (1.4/50)*	2195	5.8	4595	2	7.6	121
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2354	5.4	2751	24	144.2	270
			MINCAM3 (0.8/6)	2338	5.5	3590	25	135.4	245
			MINCAM4 (1.0/2.6)	9791	2.7	552	26	131.6	173
			MINCAM5 (0.8/6)	2349	5.0	1896	26	152.5	239
			MINCAM6 (0.8/6)	2395	5.1	2178	25	141.9	220
TEPIS	Tepliczky	Agostyan/HU	HUAGO (0.75/4.5)	2427	4.4	1036	24	181.7	202
			HUMOB (0.8/6)	2388	4.8	1607	28	133.7	388
TRIMI	Triglav	Velenje/SI	SRAKA (0.8/6)*	2222	4.0	546	22	85.6	165
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2337	5.5	3574	17	72.8	140
ZELZO	Zelko	Budapest/HU	HUVCSE03 (1.0/4.5)	2224	4.4	933	7	18.2	39
			HUVCSE04 (1.0/4.5)	1484	4.4	573	9	18.2	34
Sum							30	10761.2	25367

* active field of view smaller than video frame

2. Observing Times (h)

April	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	3.9	3.9	7.2	7.6	3.1	7.4	1.1	5.0	7.3	7.4	2.5	5.4	7.4	2.5	6.7
BANPE	-	-	1.1	-	1.7	0.1	0.2	-	1.0	0.8	0.8	-	-	0.3	-
BERER	-	-	8.6	-	-	-	-	2.2	8.6	8.8	-	-	-	-	8.1
	-	-	7.4	-	-	-	-	-	8.6	8.9	-	-	-	-	7.6
BOMMA	9.7	7.7	-	-	8.9	1.3	7.3	8.7	8.6	7.9	8.9	6.5	7.9	7.7	8.6
BREMA	-	1.6	4.5	8.9	1.5	8.8	-	6.7	8.6	-	8.4	-	8.3	5.4	4.8
BRIBE	-	3.1	-	8.6	1.7	8.8	1.6	8.7	8.6	8.3	8.4	1.3	7.6	8.3	8.2
	-	1.2	-	8.3	4.2	-	8.1	8.8	8.7	8.6	5.9	5.7	7.1	8.3	8.3
CASFL	9.7	9.7	0.8	-	9.5	9.4	9.4	9.3	9.3	9.3	9.2	9.1	5.1	9.0	9.0
	9.5	9.5	-	-	9.3	9.2	9.2	9.1	9.1	8.4	9.0	9.0	3.1	8.8	8.7
CRIST	7.0	9.4	-	-	3.5	9.2	9.1	9.1	9.0	8.7	8.9	8.8	8.0	8.7	8.7
	8.9	8.9	-	0.2	3.8	9.2	9.1	9.1	9.1	5.7	8.9	8.9	7.9	-	1.0
	9.5	9.4	-	-	5.2	9.2	9.1	9.1	9.0	9.0	8.9	8.8	8.8	8.7	8.7
DINJE	9.6	7.6	-	-	9.2	3.6	9.4	9.3	9.3	9.1	9.1	9.1	8.6	8.9	9.1
ELTMA	9.4	-	-	-	8.8	1.0	9.1	8.3	8.9	6.7	6.4	8.9	5.6	8.6	8.7
FORKE	-	-	6.6	3.5	4.1	6.4	-	-	8.5	8.3	2.2	7.6	8.2	6.9	8.1
GONRU	9.6	8.1	5.0	7.6	4.1	1.2	-	-	1.8	8.8	9.3	8.8	7.5	-	8.6
	9.8	8.2	4.3	6.6	2.6	1.3	0.2	-	-	4.0	-	9.1	7.2	-	8.8
	9.6	7.3	5.3	9.5	5.5	-	0.3	-	-	8.7	9.3	9.1	6.8	-	5.1
	9.4	6.8	2.6	8.0	5.1	-	-	-	0.7	8.1	9.3	8.8	6.6	-	7.7
	8.5	3.5	3.7	4.9	1.1	0.8	0.2	-	1.3	8.4	9.4	8.9	6.6	-	4.7
GOVMI	-	6.4	4.9	-	9.1	6.5	2.3	5.0	5.9	8.8	0.6	7.8	0.7	6.9	8.5
	-	-	3.5	-	-	6.3	-	3.9	5.9	8.7	2.6	2.5	-	4.6	5.7
	-	-	4.0	-	-	5.6	1.3	1.7	4.0	7.8	2.2	7.8	-	3.9	0.8
HERCA	7.8	10.1	6.6	4.8	4.2	5.6	9.7	6.0	9.7	10.0	9.1	-	9.6	9.1	9.1
HINWO	-	-	8.8	2.3	4.6	6.3	3.2	-	8.5	8.4	-	8.0	8.4	7.4	8.3
IGAAN	-	4.3	6.4	-	9.2	1.0	2.7	-	9.0	8.9	8.3	8.8	2.6	7.8	6.5
	5.6	4.4	4.3	1.7	7.8	-	7.1	5.0	7.8	7.8	5.5	7.3	-	6.3	6.4
	-	8.1	8.7	3.3	-	-	4.4	6.2	8.6	8.4	-	8.4	3.5	-	-
JONKA	5.4	8.3	9.3	2.1	4.1	5.1	7.3	8.8	9.0	9.0	4.6	8.8	2.2	2.3	8.3
	5.6	-	9.4	0.2	4.1	3.7	6.4	8.6	9.0	9.0	4.6	8.8	1.8	2.1	7.9
KACJA	4.7	6.2	1.7	-	-	-	-	5.4	8.9	8.9	-	7.2	-	5.6	8.7
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.4	6.3	3.5	-	9.2	2.1	2.3	8.1	8.7	8.5	-	8.2	2.9	3.1	8.6
	4.7	6.1	1.3	-	-	-	-	5.4	9.0	9.1	-	7.3	-	5.4	8.8
	4.7	5.7	0.9	-	-	-	-	5.5	9.0	9.0	-	7.4	-	4.3	8.7
KISSZ	5.7	9.0	9.3	2.2	4.1	6.0	3.8	2.2	9.3	7.2	3.9	8.0	2.4	2.0	8.8
KOSDE	-	-	-	-	-	3.4	8.4	8.2	7.0	6.2	-	8.7	6.4	4.0	8.6
	-	5.2	4.7	5.2	5.2	3.0	-	5.8	6.2	6.5	7.5	8.0	-	-	-
	-	-	-	8.1	3.0	7.8	2.9	6.5	5.9	7.0	7.8	1.8	5.5	7.6	5.0
LOJTO	-	-	-	-	-	-	-	5.5	7.9	6.4	5.1	-	-	-	7.5
LOPAL	1.1	0.2	0.7	0.7	-	0.2	-	-	-	0.5	1.0	1.7	-	-	0.8
MACMA	-	-	-	0.6	1.0	3.3	-	2.8	-	-	1.1	0.7	1.4	-	1.4
	0.7	-	0.2	1.5	0.9	2.7	-	3.5	8.6	8.3	6.1	6.5	8.3	-	6.3
	-	-	-	4.0	-	-	-	4.6	8.9	8.8	7.2	8.5	8.1	-	7.0
	-	-	-	1.5	1.3	-	-	1.6	7.8	8.2	1.9	0.9	2.2	-	2.4
MARGR	6.8	2.6	3.6	-	-	6.6	-	-	2.8	0.4	-	3.5	-	-	-
MARRU	9.7	2.7	7.2	5.8	1.3	-	0.2	-	-	8.3	9.4	9.3	4.2	4.1	3.9
	7.8	-	-	-	-	-	-	-	3.7	8.2	8.7	8.9	1.7	-	8.8
MASMI	4.8	0.8	0.2	4.8	7.5	8.0	5.3	3.1	6.5	-	3.8	-	-	-	-
MOLSI	1.2	4.6	-	4.3	4.9	7.8	8.4	8.3	8.2	7.9	4.3	8.0	4.1	7.9	7.8
	-	-	-	-	-	-	-	-	5.9	7.8	-	8.4	2.8	8.4	8.3
	-	4.6	-	2.5	4.3	7.4	7.4	8.4	8.5	7.8	3.1	8.4	2.2	8.3	8.2
	-	-	8.6	8.4	3.8	8.5	-	6.6	8.3	8.2	4.7	4.4	8.0	2.6	5.7
	3.7	5.0	7.6	8.5	2.5	8.3	-	6.1	8.3	8.2	4.5	4.4	8.1	3.2	5.7
	4.1	5.9	9.0	8.9	5.8	8.7	0.3	7.0	7.0	1.2	-	-	-	-	-
	3.9	4.6	9.0	8.8	4.2	8.8	0.4	6.6	8.5	8.5	4.8	4.4	8.2	2.7	5.7
MORJO	6.9	7.2	7.1	2.3	6.6	-	8.7	8.8	9.1	9.0	6.1	8.9	-	6.0	8.7
MOSFA	1.7	1.0	0.3	-	1.2	1.2	2.2	0.7	0.6	0.6	1.1	0.7	0.2	0.5	1.0
OCHPA	9.5	9.6	2.1	-	9.5	9.5	9.0	7.4	8.9	8.0	6.7	9.1	4.9	8.9	8.5
OTTMI	4.6	3.5	1.0	4.0	9.3	-	-	-	0.2	9.3	6.1	-	7.9	5.2	4.8
PERZS	9.0	6.5	6.5	-	8.3	4.0	-	3.3	9.1	9.0	4.3	8.9	-	8.8	8.7
PUCRC	9.3	5.9	2.5	-	9.2	6.4	8.8	9.1	9.0	9.0	8.6	8.9	3.4	-	4.9
ROTEC	-	-	2.4	3.6	0.3	-	-	-	-	6.8	1.6	7.9	8.2	1.6	3.4
SARAN	6.4	0.7	5.0	1.1	2.9	-	-	-	2.4	7.6	9.3	9.4	2.5	-	9.3
	8.7	-	6.9	3.0	3.2	0.9	-	-	-	6.9	9.2	9.3	-	-	8.9
	9.7	2.9	7.1	-	3.3	0.2	-	-	-	7.2	8.9	9.0	-	-	8.5
	2.2	-	3.8	1.7	1.3	-	-	-	-	7.6	9.1	9.1	1.7	-	1.0
SCHHA	-	-	-	4.7	-	8.4	-	6.7	4.1	7.3	5.4	3.0	-	6.1	7.2
SLAST	9.2	6.5	4.9	-	-	-	0.6	1.3	1.6	1.3	0.7	8.6	1.5	2.4	6.7
	9.1	6.6	-	-	8.6	1.4	7.7	9.0	8.8	8.9	6.1	8.6	3.2	6.8	8.7
STOEN	6.6	6.6	-	-	9.4	5.4	9.4	8.6	9.2	7.3	7.9	8.1	-	8.8	8.9
	9.8	9.7	-	-	9.3	6.4	9.4	9.3	9.2	9.1	7.7	9.1	4.8	8.8	8.9
	9.8	-	-	-	9.5	7.2	9.5	9.3	9.2	8.7	8.8	9.1	4.6	8.8	9.0
STORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STRJO	-	-	-	3.7	1.8	8.8	-	8.6	8.3	8.4	7.2	2.7	8.3	5.6	6.1
	-	1.0	6.4	7.1	2.2	8.8	-	2.0	8.3	8.2	7.4	-	7.9	5.6	4.7
	-	0.9	5.7	1.2	-	8.8	-	8.4	8.4	8.3	7.4	2.9	8.3	5.6	6.3
	-	-	5.3	4.3	1.9	8.8	-	8.7	8.0	8.4	7.6	2.7	8.3	5.6	6.3
	-	1.4	5.1	4.7	2.2	8.8	-	8.7	8.6	8.2	-	-	7.8	5.3	6.2
TEPIS	-	6.9	5.9	-	9.0	7.3	-	8.6	8.8	8.7	6.1	8.6	7.0	8.0	7.6
	2.7	8.7	4.3	3.0	8.5	5.6	0.4	3.3	4.3	4.9	1.1	2.1	1.8	1.7	2.1
TRIMI	-	-	-	-	2.5	4.9	2.4	4.5	1.5	1.7	2.9	3.8	-	4.6	4.8
YRJIL	-	-	-	-	7.5	-	5.9	7.1	4.9	4.5	4.1	-	5.4	-	-
ZELZO	-	-	-	-	-	-	0.3	-	-	-	-	2.8	-	-	-
	-	-	-	-	-	-	1.1	-	-	-	-	0.3	-	-	-
Sum	336.7	302.6	272.8	208.3	322.5	332.4	242.6	393.2	520.8	586.7	408.6	490.2	331.3	326.4	508.6

April	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	7.3	5.4	7.0	6.9	6.7	5.6	6.7	6.6	6.5	-	4.6	-	5.2	3.5	0.7
BANPE	-	-	0.7	0.2	-	1.7	1.8	0.5	-	-	1.2	0.2	-	0.1	-
BERER	-	-	8.1	7.7	5.3	7.9	8.0	7.6	7.9	7.9	7.6	-	-	0.9	-
	-	-	8.1	7.3	5.4	8.0	7.9	7.1	7.9	7.5	7.4	-	-	-	-
BOMMA	0.8	2.7	-	7.2	7.0	6.5	8.1	8.3	5.6	1.7	-	-	-	-	-
BREMA	-	8.0	7.0	7.8	7.8	5.7	4.8	7.5	2.9	4.2	-	7.2	7.1	-	6.9
BRIBE	7.8	8.1	8.0	7.9	7.8	6.5	7.7	7.6	1.4	-	-	7.2	7.3	3.2	7.0
	6.5	8.0	8.1	7.8	7.8	7.7	7.7	7.6	2.9	2.8	-	5.4	7.4	3.9	5.6
CASFL	-	8.1	5.4	8.7	8.6	8.6	8.5	8.3	4.9	4.6	-	-	7.6	-	-
	-	8.1	5.4	8.5	8.5	8.4	8.3	7.8	3.9	2.5	-	-	7.9	-	-
CRIST	-	2.0	-	8.2	8.4	8.4	6.6	8.2	7.5	-	-	-	6.6	-	-
	-	-	-	8.1	8.4	7.4	1.4	4.0	6.0	-	-	-	7.7	-	-
	-	3.2	-	8.4	8.4	8.4	8.3	8.2	8.0	-	-	-	8.0	-	-
DINJE	-	4.0	0.9	8.8	8.8	8.7	8.6	8.5	8.5	2.2	-	-	-	-	-
ELTMA	-	3.2	5.2	8.2	8.5	8.3	8.4	2.3	7.5	-	-	-	-	0.5	0.2
FORKE	-	3.0	7.9	7.6	7.2	7.6	2.7	7.4	7.4	-	6.7	-	4.9	4.8	-
GONRU	3.0	9.0	8.6	9.0	7.9	4.5	8.3	4.1	2.1	-	4.4	5.9	8.3	4.1	2.6
	3.0	9.0	8.7	9.1	7.8	4.7	8.8	3.8	2.3	-	4.9	4.1	7.3	3.8	2.3
	2.1	7.1	5.8	8.9	7.7	4.5	7.4	-	-	-	4.5	3.9	7.4	2.3	-
	1.6	7.4	7.8	9.1	8.0	2.8	7.6	1.8	-	-	3.9	3.7	6.5	3.2	0.9
	1.9	7.2	7.0	9.1	7.5	3.6	7.6	1.0	-	-	3.7	3.7	6.8	2.6	0.8
GOVMI	4.4	-	8.0	7.1	4.0	6.5	4.5	2.0	6.5	1.3	7.7	-	-	4.6	-
	3.5	-	1.5	-	-	-	-	-	5.5	-	-	-	-	-	-
	3.7	-	4.4	-	-	2.0	2.8	0.8	1.4	-	1.6	-	-	-	-
HERCA	9.5	1.5	9.4	9.6	9.3	8.5	7.5	9.3	8.3	8.9	-	7.9	9.1	8.4	8.8
HINWO	-	5.5	7.9	7.7	8.0	7.9	3.2	7.8	7.6	-	5.2	-	5.0	5.1	-
IGAAN	-	-	8.4	1.2	3.6	5.0	8.2	8.1	7.7	8.0	7.0	-	-	7.6	1.3
	2.0	-	6.6	7.8	6.7	7.6	7.7	7.7	6.2	7.6	7.6	-	-	7.4	-
	-	-	8.1	-	6.5	7.9	7.8	7.7	-	-	7.5	4.8	-	7.3	3.0
JONKA	-	-	8.5	7.4	8.3	8.2	8.2	7.7	8.1	7.9	8.0	3.4	-	6.1	2.9
	-	-	8.4	7.2	6.8	7.8	8.0	6.4	7.3	7.9	8.0	3.0	-	5.8	-
KACJA	2.3	-	-	6.2	8.2	7.3	8.3	-	8.1	-	-	-	-	6.6	4.9
	-	-	-	-	-	-	-	-	-	-	6.4	-	-	-	-
	3.1	-	2.0	8.4	2.4	8.0	8.2	-	7.1	4.2	-	-	1.1	5.3	4.7
	2.4	-	-	6.3	8.2	7.3	8.3	-	8.3	-	-	-	-	6.8	5.0
	2.0	-	-	6.3	8.3	-	7.6	-	7.7	-	-	-	-	5.2	4.0
KISSZ	-	-	8.8	8.4	8.2	8.0	7.8	7.2	8.3	7.4	8.3	1.9	-	-	3.2
KOSDE	8.7	8.7	5.8	8.9	7.9	8.5	7.2	5.2	5.3	5.4	3.9	6.2	6.4	3.3	4.6
	9.4	9.5	9.4	9.4	6.8	9.3	9.3	9.3	9.2	5.0	9.2	7.3	7.6	7.1	6.0
	-	7.4	7.3	7.2	7.2	7.0	-	6.9	-	1.7	1.6	6.0	6.1	3.3	-
LOJTO	8.0	-	-	-	7.4	2.8	7.2	7.0	6.0	4.5	-	3.9	-	-	-
LOPAL	-	0.5	1.9	1.3	1.2	0.2	2.0	-	-	-	-	0.5	0.7	0.5	-
MACMA	5.2	4.8	2.5	-	3.9	6.3	7.7	7.6	4.1	7.5	4.4	7.4	3.1	7.3	3.9
	8.2	5.6	1.1	0.3	3.8	5.3	7.5	7.6	2.9	4.1	1.2	7.2	0.8	7.3	2.2
	8.3	6.8	3.1	-	4.0	6.5	7.7	7.7	6.2	7.1	-	7.5	3.7	7.2	-
	3.8	2.6	0.6	0.2	2.6	4.2	7.7	7.7	5.0	7.2	3.1	7.4	2.8	7.3	4.2
MARGR	-	-	9.3	-	7.9	7.3	6.6	9.2	1.2	5.6	-	-	8.0	8.3	7.1
MARRU	3.5	9.1	9.0	9.0	8.9	5.5	8.9	-	1.6	-	5.4	4.8	8.1	3.9	5.2
	-	5.1	-	6.5	8.2	-	7.5	1.0	-	-	5.2	3.4	6.5	4.7	4.7
MASMI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLSI	-	3.5	7.6	7.6	7.5	7.4	7.4	7.3	7.2	-	6.5	-	6.0	4.9	-
	-	-	7.1	6.9	6.8	7.6	7.4	7.8	7.7	-	7.6	-	6.7	6.5	-
	0.9	2.4	8.0	7.7	6.7	7.5	7.1	7.6	7.4	-	7.4	-	6.3	0.9	-
	7.8	6.0	7.6	7.5	7.5	4.5	7.4	7.3	7.2	1.2	5.3	-	6.5	5.9	0.8
	7.7	6.0	7.7	7.6	7.5	4.5	7.4	7.3	7.2	1.2	5.1	0.3	5.4	5.0	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.9	6.5	7.9	7.8	7.7	4.6	7.6	7.5	7.4	0.8	4.2	-	5.5	4.8	0.4
MORJO	5.2	-	8.5	8.3	8.4	7.6	8.3	-	8.2	6.7	8.1	4.8	1.1	7.9	4.7
MOSFA	-	0.3	1.5	-	1.4	3.1	3.3	2.1	0.2	-	-	-	-	-	-
OCHPA	-	-	7.5	8.7	7.8	6.9	6.1	4.3	-	-	-	-	7.5	-	-
OTTMI	6.6	6.9	5.7	-	6.4	4.5	7.5	7.5	-	7.3	8.1	7.7	7.0	7.2	6.1
PERZS	8.3	-	8.5	8.5	7.0	8.4	6.3	5.9	8.2	-	8.1	-	-	7.6	4.5
PUCRC	-	-	-	-	-	-	-	-	-	-	-	-	-	3.6	4.1
ROTEC	8.0	4.2	6.7	5.8	7.7	7.6	7.6	6.0	6.7	-	2.2	-	3.2	3.4	-
SARAN	2.1	3.6	4.7	8.8	9.2	1.9	9.0	1.0	-	-	4.3	2.6	5.0	3.5	3.1
	2.0	4.3	3.8	9.2	8.8	0.9	7.9	-	-	-	4.2	4.4	4.2	2.9	3.4
	3.0	4.8	5.9	8.9	8.5	1.5	8.5	-	-	-	-	6.0	7.1	4.8	5.3
	1.5	3.7	2.0	8.8	9.0	1.8	7.4	0.5	-	-	3.7	1.7	4.9	3.3	1.4
SCHHA	4.9	6.1	7.7	6.2	6.8	7.3	6.8	6.8	-	1.6	-	6.0	7.0	0.3	6.6
SLAST	4.3	-	1.5	8.6	8.4	8.3	8.1	-	3.5	4.9	-	-	2.2	5.6	5.7
	4.0	-	-	8.5	8.5	8.4	8.1	-	3.1	7.2	-	-	1.6	5.7	5.6
STOEN	0.5	3.5	6.6	8.7	4.1	7.4	6.5	1.0	5.8	-	-	-	-	1.3	0.2
	0.4	3.7	7.4	8.6	8.5	8.3	8.3	1.4	7.4	-	-	-	0.2	2.1	0.8
	1.8	4.2	7.3	8.8	8.7	8.5	8.6	0.9	7.4	1.3	-	-	-	3.0	1.2
STORO	-	-	-	-	-	6.1	1.5	-	-	-	-	-	-	-	-
STRJO	-	5.4	5.9	7.8	7.7	4.1	7.6	7.5	4.5	3.1	-	6.0	5.9	4.2	5.0
	-	5.3	5.5	3.1	5.2	3.0	7.2	5.6	5.4	2.8	-	5.6	6.9	4.8	5.4
	0.5	4.6	5.1	7.6	7.4	4.6	7.2	7.2	5.2	0.3	-	1.2	6.0	2.0	0.5
	1.3	5.1	5.6	7.6	7.7	3.7	7.6	7.5	4.7	3.1	-	6.5	6.7	3.9	5.6
	1.9	4.7	5.5	7.6	7.8	4.2	6.8	7.5	4.2	2.3	-	6.5	6.2	4.3	5.4
TEPIS	4.8	-	8.2	8.1	7.2	7.9	8.0	7.9	7.8	6.6	7.7	7.5	-	7.5	-
	0.6	-	7.7	2.2	7.7	7.8	7.8	7.8	7.7	7.2	7.1	7.3	-	5.3	3.0
TRIMI	3.2	-	2.3	6.1	8.0	8.4	7.4	0.7	3.7	3.6	1.8	-	-	4.0	2.8
YRJIL	-	3.6	3.1	5.5	2.0	-	3.3	5.0	4.9	0.9	-	-	1.0	-	4.1
ZELZO	-	-	1.5	-	-	2.9	-	2.0	3.2	-	5.5	-	-	-	-
	-	-	3.4	0.7	-	5.5	-	1.4	0.3	-	5.1	0.4	-	-	-
Sum	211.2	269.0	426.7	508.7	535.4	477.1	549.6	394.4	379.0	196.8	252.2	198.4	295.1	295.5	188.4

3. Results (Meteors)

April	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	7	4	20	24	12	23	1	19	25	27	3	15	43	7	22
BANPE	-	-	4	-	5	1	2	-	6	5	4	-	-	2	-
BERER	-	-	24	-	-	-	-	1	21	24	-	-	-	-	27
	-	-	2	-	-	-	-	-	8	10	-	-	-	-	6
BOMMA	29	12	-	-	28	3	14	29	21	29	17	18	15	14	25
BREMA	-	1	1	6	3	7	-	10	3	-	11	-	11	5	3
BRIBE	-	1	-	11	1	17	3	6	11	13	17	4	9	15	10
	-	1	-	14	5	-	5	7	12	11	8	8	6	15	17
CASFL	23	20	1	-	22	26	22	21	26	19	12	19	8	17	21
	17	18	-	-	14	15	10	15	19	12	12	13	1	11	14
CRIST	14	19	-	-	4	14	8	13	17	14	9	21	11	7	15
	15	15	-	1	9	9	24	12	10	9	9	5	9	-	2
	28	31	-	-	10	26	42	34	36	35	37	43	25	25	28
DINJE	29	12	-	-	24	5	22	30	37	25	19	25	30	28	27
ELTMA	13	-	-	-	14	7	15	13	8	5	7	9	3	7	14
FORKE	-	-	14	2	4	11	-	-	17	22	4	15	14	17	17
GONRU	17	8	12	15	5	2	-	-	4	23	28	33	9	-	10
	21	9	12	10	3	2	1	-	-	5	-	16	9	-	10
	8	5	6	7	2	-	1	-	-	5	10	4	2	-	1
	13	3	11	10	7	-	-	-	2	12	20	20	4	-	15
	10	3	14	9	1	3	1	-	2	10	24	8	9	-	1
GOVMI	-	20	8	-	18	9	3	8	10	11	1	26	1	8	20
	-	-	3	-	-	9	-	5	3	6	1	10	-	5	4
	-	-	3	-	-	6	3	2	3	11	1	8	-	4	5
HERCA	15	24	6	7	9	8	15	13	7	11	13	-	17	12	11
HINWO	-	-	18	4	8	17	2	-	17	19	-	14	20	19	21
IGAAN	-	5	8	-	11	3	3	-	10	6	4	5	3	8	8
	1	8	3	2	4	-	6	5	6	7	7	6	-	3	7
	-	1	3	3	-	-	2	2	4	1	-	3	1	-	-
JONKA	1	11	8	2	6	3	5	6	9	6	3	7	3	2	6
	5	-	4	1	6	3	1	5	10	9	6	4	2	1	9
KACJA	22	18	3	-	-	-	-	23	24	23	-	31	-	16	36
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12	8	2	-	3	4	1	1	2	11	-	7	5	5	6
	35	30	1	-	-	-	-	26	31	21	-	51	-	19	52
	13	16	1	-	-	-	-	8	23	16	-	23	-	14	13
KISSZ	1	3	2	1	1	2	1	3	7	5	1	3	2	1	7
KOSDE	-	-	-	-	-	32	43	42	52	45	-	36	36	34	47
	-	56	48	36	33	10	-	22	19	29	45	41	-	-	-
	-	-	-	7	7	9	3	6	7	12	3	5	8	17	7
LOJTO	-	-	-	-	-	-	-	3	1	5	5	-	-	-	3
LOPAL	7	1	4	4	-	1	-	-	-	3	6	10	-	-	5
MACMA	-	-	-	2	1	1	-	5	-	-	7	5	9	-	9
	1	-	1	7	2	2	-	18	17	20	15	8	18	-	20
	-	-	-	7	-	-	-	10	12	7	4	6	13	-	8
	-	-	-	13	4	-	-	12	14	28	15	6	16	-	16
MARGR	5	6	1	-	-	1	-	-	4	2	-	1	-	-	-
MARRU	10	2	8	6	1	-	1	-	-	10	12	13	2	3	2
	4	-	-	-	-	-	-	-	1	10	5	15	1	-	7
MASMI	15	5	1	15	13	12	9	14	15	-	6	-	-	-	-
MOLSI	2	25	-	8	9	23	34	26	38	47	16	80	6	54	44
	-	-	-	-	-	-	-	-	6	4	-	18	1	6	20
	-	14	-	4	7	18	20	10	11	22	7	46	1	19	29
	-	-	48	36	5	41	-	18	36	39	3	14	43	9	9
	2	5	20	25	5	34	-	14	33	30	5	13	36	13	14
	9	17	24	19	8	13	2	16	15	4	-	-	-	-	-
	11	21	38	42	8	35	1	18	40	39	8	8	45	9	10
MORJO	3	7	7	3	4	-	11	7	11	7	4	12	-	5	10
MOSFA	12	6	2	-	9	8	18	4	4	5	6	5	1	3	5
OCHPA	15	11	3	-	11	11	8	11	13	5	4	14	5	6	10
OTTMI	4	2	6	5	11	-	-	-	1	6	7	-	10	6	4
PERZS	20	18	13	-	9	5	-	1	16	8	6	11	-	20	21
PUCRC	10	7	1	-	14	7	15	15	13	7	9	17	3	-	8
ROTEC	-	-	4	8	1	-	-	-	-	16	1	6	12	1	1
SARAN	7	2	7	3	2	-	-	-	2	6	13	10	2	-	13
	13	-	12	1	3	1	-	-	-	8	13	7	-	-	11
	13	8	13	-	7	1	-	-	-	20	19	13	-	-	19
	4	-	3	1	1	-	-	-	-	10	8	5	3	-	3
SCHHA	-	-	-	9	-	20	-	9	3	14	8	3	-	9	12
SLAST	12	9	2	-	-	-	4	10	11	9	4	19	7	11	15
	10	9	-	-	4	1	6	3	6	5	2	5	3	2	8
STOEN	17	18	-	-	22	17	32	21	16	10	13	17	-	16	22
	22	20	-	-	37	17	27	19	22	19	9	19	7	10	27
	23	-	-	-	45	36	27	26	28	14	22	30	8	25	20
STORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STRJO	-	-	-	3	4	13	-	8	8	15	12	3	11	14	6
	-	1	8	8	2	19	-	13	12	9	8	-	3	17	7
	-	1	2	3	-	12	-	7	7	7	5	3	6	10	4
	-	-	2	6	2	13	-	5	4	15	8	1	10	8	8
	-	1	4	4	3	14	-	10	6	7	-	-	7	11	7
TEPIS	-	1	9	-	5	4	-	8	10	6	3	8	5	7	16
	6	13	11	7	10	8	2	5	11	21	7	16	11	10	15
TRIMI	-	-	-	-	5	6	3	7	4	3	4	12	-	8	10
YRJIL	-	-	-	-	19	-	2	18	12	3	5	-	12	-	-
ZELZO	-	-	-	-	-	-	1	-	-	-	-	5	-	-	-
	-	-	-	-	-	-	3	-	-	-	-	1	-	-	-
Sum	606	592	496	421	572	680	485	758	992	1089	650	1041	633	650	1022

April	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	21	36	41	31	38	28	79	36	30	-	15	-	24	13	1
BANPE	-	-	4	1	-	12	17	3	-	-	8	1	-	1	-
BERER	-	-	25	16	20	43	103	34	22	13	31	-	-	1	-
	-	-	4	1	1	16	20	10	11	3	6	-	-	-	-
BOMMA	3	4	-	23	36	36	50	34	18	5	-	-	-	-	-
BREMA	-	9	5	13	12	8	16	22	2	1	-	14	4	-	13
BRIBE	11	10	16	16	16	11	35	12	1	-	-	14	9	3	16
	4	14	18	16	18	14	45	12	4	3	-	14	6	7	6
CASFL	-	20	20	19	33	38	28	26	8	7	-	-	17	-	-
	-	11	10	14	25	24	37	19	3	5	-	-	11	-	-
CRIST	-	2	-	29	23	40	18	28	18	-	-	-	22	-	-
	-	-	-	20	23	22	3	5	8	-	-	-	9	-	-
	-	5	-	42	45	65	47	38	21	-	-	-	28	-	-
DINJE	-	8	3	32	39	47	52	38	26	7	-	-	-	-	-
ELTMA	-	5	15	19	23	20	53	8	12	-	-	-	-	2	1
FORKE	-	5	22	13	23	52	6	22	16	-	18	-	7	4	-
GONRU	5	15	9	26	13	18	29	2	3	-	4	12	21	16	5
	3	20	8	24	13	7	27	3	1	-	10	12	21	16	6
	2	3	1	5	5	1	12	-	-	-	3	5	5	4	-
	4	12	8	20	18	10	27	2	-	-	11	10	18	10	1
	4	16	4	24	9	5	19	2	-	-	4	10	19	6	1
GOVMI	8	-	16	19	18	25	46	7	21	4	19	-	-	4	-
	8	-	1	-	-	-	-	-	5	-	-	-	-	-	-
	7	-	5	-	-	14	24	2	8	-	12	-	-	-	-
HERCA	11	2	17	12	21	15	34	28	9	10	-	14	12	19	20
HINWO	-	14	21	17	24	51	8	24	19	-	13	-	16	5	-
IGAAN	-	-	13	1	6	13	40	21	9	7	12	-	-	5	2
	3	-	7	6	8	16	30	8	3	8	7	-	-	3	-
	-	-	3	-	1	7	9	4	-	-	1	1	-	1	2
JONKA	-	-	7	2	7	10	26	13	6	2	7	4	-	4	1
	-	-	3	2	5	15	20	4	9	5	8	2	-	2	-
KACJA	5	-	-	25	41	52	72	-	26	-	-	-	-	20	9
	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-
	3	-	2	7	1	17	23	-	5	2	-	-	2	6	1
	6	-	-	44	51	67	74	-	49	-	-	-	-	34	9
	1	-	-	23	32	-	41	-	18	-	-	-	-	18	7
KISSZ	-	-	5	4	5	11	18	6	8	1	6	1	-	-	1
KOSDE	53	46	35	52	36	68	46	37	25	37	26	27	33	14	33
	62	87	48	61	34	83	80	58	56	18	75	45	57	63	58
	-	17	19	17	14	19	-	16	-	3	3	12	6	2	-
LOJTO	4	-	-	-	8	1	30	8	3	2	-	5	-	-	-
LOPAL	-	3	1	8	8	1	18	-	-	-	-	2	4	4	-
MACMA	12	16	1	-	11	33	62	57	6	22	5	14	4	33	7
	28	14	2	1	16	33	65	35	7	12	6	14	2	19	5
	21	10	1	-	6	18	33	15	3	7	-	13	1	8	-
	28	18	5	1	13	37	44	34	12	21	5	17	3	28	5
MARGR	-	-	10	-	2	25	17	29	1	9	-	-	22	17	15
MARRU	3	7	5	19	12	6	28	-	1	-	8	9	14	7	8
	-	10	-	14	12	-	33	2	-	-	2	3	10	10	1
MASMI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLSI	-	6	63	73	68	85	64	69	60	-	47	-	37	10	-
	-	-	16	11	18	25	18	16	14	-	14	-	18	4	-
	2	2	32	35	42	42	52	41	35	-	25	-	26	6	-
	33	39	35	33	35	24	100	56	31	2	3	-	36	12	2
	24	50	39	39	52	16	86	51	33	4	4	1	28	8	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	36	45	37	35	49	25	71	58	34	2	3	-	36	5	2
MORJO	1	-	10	6	6	10	28	-	10	2	8	3	1	2	6
MOSFA	-	2	9	-	9	21	24	15	1	-	-	-	-	-	-
OCHPA	-	-	7	12	10	16	11	6	-	-	-	-	7	-	-
OTTMI	9	2	7	-	9	10	23	13	-	13	9	8	7	5	6
PERZS	10	-	14	14	19	35	49	2	16	-	15	-	-	12	14
PUCRC	-	-	-	-	-	-	-	-	-	-	-	-	-	7	2
ROTEC	16	9	15	14	26	11	40	18	16	-	3	-	9	4	-
SARAN	4	4	2	12	15	1	34	1	-	-	1	2	8	12	2
	3	12	12	16	8	1	27	-	-	-	10	6	3	3	9
	4	12	9	22	16	4	29	-	-	-	-	8	18	7	5
	1	7	1	13	10	5	19	1	-	-	5	2	10	2	1
SCHHA	3	13	17	12	16	18	42	14	-	4	-	12	12	2	5
SLAST	1	-	2	21	30	42	34	-	9	13	-	-	4	11	1
	2	-	-	4	6	12	10	-	5	3	-	-	3	3	4
STOEN	3	4	36	34	9	18	35	6	9	-	-	-	-	6	1
	1	4	18	24	31	29	53	11	16	-	-	-	1	7	1
	5	3	24	33	36	25	66	4	25	3	-	-	-	7	2
STORO	-	-	-	-	-	112	9	-	-	-	-	-	-	-	-
STRJO	-	11	11	13	21	3	35	18	6	5	-	18	13	9	10
	-	6	7	8	13	1	37	14	3	7	-	14	17	5	6
	3	6	6	8	12	1	25	11	4	2	-	7	11	7	3
	1	13	6	11	19	4	29	22	3	7	-	18	10	9	5
	1	14	8	8	24	3	28	14	1	4	-	9	14	8	10
TEPIS	1	-	13	9	7	17	36	10	10	2	8	5	-	2	-
	4	-	20	17	19	32	43	29	17	7	26	9	-	7	5
TRIMI	5	-	2	11	9	17	20	2	11	6	5	-	-	11	4
YRJIL	-	3	2	7	4	-	21	15	11	2	-	-	1	-	3
ZELZO	-	-	5	-	-	6	-	4	8	-	10	-	-	-	-
	-	-	4	1	-	9	-	4	1	-	9	2	-	-	-
Sum	493	706	929	1295	1473	1834	2842	1289	902	302	534	399	737	602	343