Results of the IMO Video Meteor Network – June 2017

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June cannot impress with notable meteor showers and the nights at the northern hemisphere are shorter at the begin of summer than in any other month. Still, this month often presents nice observing conditions to the observers, and 2017 was no exception in this respect. 57 out of 77 active video cameras managed to observe in twenty or more observing nights, SCO38 of Enrico Stomeo observed without any break at all. There were at least 30 cameras active in each night of June, at best times even up to 70 cameras. In total we collected over 7,100 hours of effective observing time, which falls just 40 hours short of the best result from June 2015. Those 18,500 meteors which have been observed in June are close to the average of the last few years.

The June Bootids in the last decade of the month were not detectable similar to the last few years. We recorded almost 50 potential Daytime Arietids at the beginning of June. However, from experience we know that there will be a certain "sporadic contamination" among these. The mean activity profile of the Arietids from all data since 2011 (figure 1) is also not quite meaningful yet.

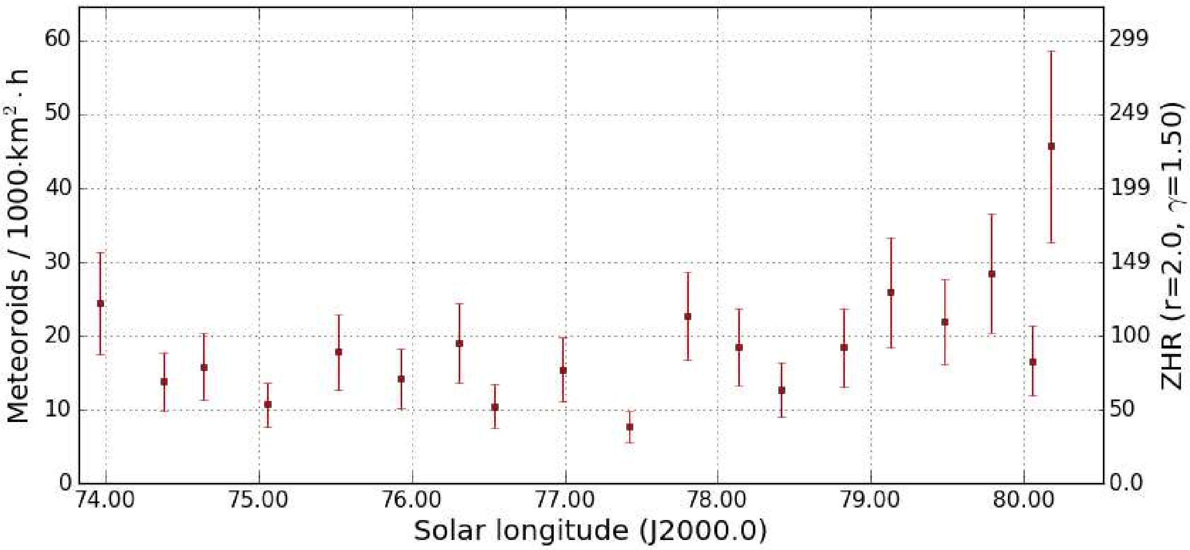

Figure 1: *Mean flux density profile of the Daytime Arietids 2011-2017, derived from video data of the IMO Network.*

So, let's continue the analysis of the effective collection area of a meteor camera from the previous report. We discussed, which parameters affect the effective collection area in which way.

Pixel-dependent parameters:

- the atmospheric segment covered by a pixel (area)
- the distance of the atmospheric segment (pixel) from the observer
- the distance of the pixel from the radiant and, thus, the expected angular velocity of shower meteors
- the altitude of the meteor shower radiant above the horizon (incl. zenith attraction)

Over the full field of view constant factors:

- the limiting magnitude of the camera
- the height of the "meteor layer" at which shower meteors light up on average
- the population index of the meteor shower

In the first implementation of the algorithm in 2010 the atmospheric extinction was calculated in addition. Later it was removed, because it is covered implicitly by the stellar limiting magnitude. The limiting magnitude of a camera is measured as an average value over the full field of view, because there are often too few stars to measure individual parts of the field of view independently. In case of low clouds, the moon inside the field of view or an observing direction close to the horizon with strong atmospheric extinction, the limiting magnitude may vary significantly. For this reason, we now introduced at least the differential extinction in the algorithm. Depending on the altitude, the extinction for each pixel is calculated with a constant of 0.35 mag per airmass (corresponding to the extinction at zenith). Thereafter, the average extinction is calculated over all pixels in the cameras field of view, and replaced by the measured average stellar limiting magnitude. Pixel closer to the horizon will get a somewhat smaller, and pixel closer to the zenith a somewhat higher stellar limiting magnitude than the measured average value. The effect of this correction is small, but it further improves the modelling of the effective collection area of the camera.

Short excursus: In the literature, the airmass which the star light has to travel depending on the zenith distance z is often given as

$$\cos^{-1}(z + 0{,}025 * e^{-11*\cos(z)})$$

The equation originates form the book "Twilight: A Study in Atmospheric Optics" from Rozenberg (1966). It should yield similar values that my geometrically derived equation to calculate the distance of the meteor layer from the observer, if the height of the meteor layer is replaced by the "height of the atmosphere". Indeed, both equations yield almost identical values if the height of the atmosphere is defined as 8 kilometers.

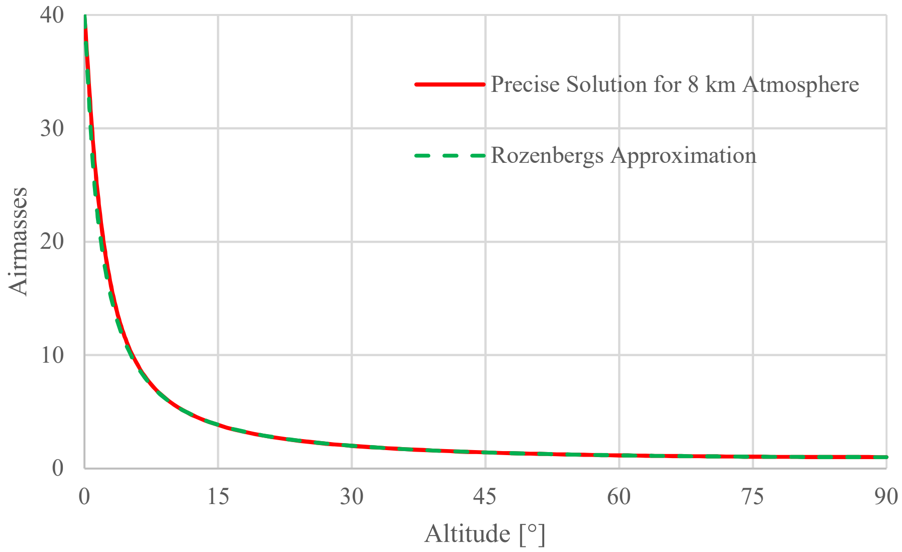

Figure 2: *Amount of atmosphere that star light has to travel depending on the altitude above the horizon. At zenith it is exactly one airmass.*

Closely linked to the effective collection area is the often-repeated question, in what direction a meteor camera would record most meteors. In the magazine "Sternschnuppe" of the "VdS Fachgruppe Meteore", issue 5-2 (1993), Mirko Nitschke once derived that the best observing direction would be between radiant and zenith.

Meanwhile we have a more accurate, with actual measures supported model. In the January report we had calculated the effective collection area exemplary for individual meteor showers and cameras – now we want to analyze the effect of each parameter in detail. For this purpose, the corresponding procedure of MetRec was moved into an extra program, that calculates the effective collection area per square degree under given boundary conditions. The result can be visualized statically and dynamically.

Let's first analyze with an example, what effect the above-mentioned parameters have on the effective collection area in principal. For this we select a meteor layer altitude of 100 km and a field of view 10° above the horizon. At this altitude, the distance from the meteor layer to the camera is 480 km. Thus, the cameras observe a piece of atmosphere that is 4.8 times as distant as at the zenith. Whereas 1° at zenith correspond to about 1.75 km at the meteor layer, it is 8 km in horizontal direction at the altitude of 10°. In vertical direction, the atmosphere is "squeezed", because we are looking at a tilted atmospheric layer, so one degree corresponds to even 34 km in vertical direction. The overall area of one square degree at the meteor layer increases by a factor of 95 from 3 km^2 at zenith to 280 km^2 at 10° altitude. The collection area only depends on the height of the meteor layer, which is between 75 and 110 km depending on the meteor shower velocity and the radiant height above the horizon. It is totally independent of the observing conditions at the ground.

On the other hand, the following effects reduce the limiting magnitude of the camera:

- Due to the 4.8 times distance, the light intensity reduces according to the distance law quadratically by a factor of 23, which corresponds to about 3.4 mag.
- The angular velocity of meteors low at the horizon is so small, that the loss in limiting magnitude for a normal video camera is less than 0.1 mag compared to stars.
- The atmospheric extinction only 10° above the horizon is about 1.5 mag at a typical observing site at sea level.

In total we have a loss of 5 magnitudes, if we ignore the small effect of these factors at zenith. At a population index of 2.0 this corresponds to a reduction of the meteor number by a factor of 2^5=32, i.e. only one third compared to the 95-times increase of the collection area towards the horizon. At a population index of 3.0, the number of meteor decreases by a factor of 3^5=243. In the case, the reduction is by a factor of 2.5 larger than the increase of the collection area towards the horizon.

In case of large correction factors (i.e. in particular near the horizon), the population index is of essential importance. Also, the atmospheric extinction, i.e. the quality of the observing site, is of crucial importance near the horizon. The meteor shower velocity and the resolution of the meteor camera, on the other hand, become only important for observing fields closer to the zenith, because meteors near the horizon are generally quite slow due to the large distance. The absolute value of the limiting magnitude at zenith plays no role in this analysis, because it affects all areas in the sky in the same way.

Now we want to calculate the effective collection area of the full visible hemisphere for an average meteor shower. Its radiant has a declination of 10° and it is located south in our example. The shower has a velocity of v_{inf}=50 km/s and a population index of r=2.5. The resolution of the meteor camera is 10 pixels per degree and the variance of stellar images 1.0 (corresponding to a Mintron camera with 8mm ½" c-mount lens). Figure 3 depicts the effective collection area per square degree – the darker the value, the larger the collection area. The upper figure shows the full hemisphere with the zenith at center (north is up, east to the right), the lower figure depicts the view to the horizon in radiant direction. The grey levels reach linearly from 0 (white) to the corresponding maximum value (black). We do not give absolute values, since they are irrelevant for this comparison of different observing directions.

We recognize two areas with largest collection area and, thus, the highest probability to record a shower meteor: In the direct vicinity of the radiant and at about 15° altitude. There will be no meteors directly at the radiant, because their angular velocity is too slow and they are filtered out by the software as possible satellites. Close to the horizon, the collection area is nearly independent of the observing direction, because the meteor velocity is in principle quite small.

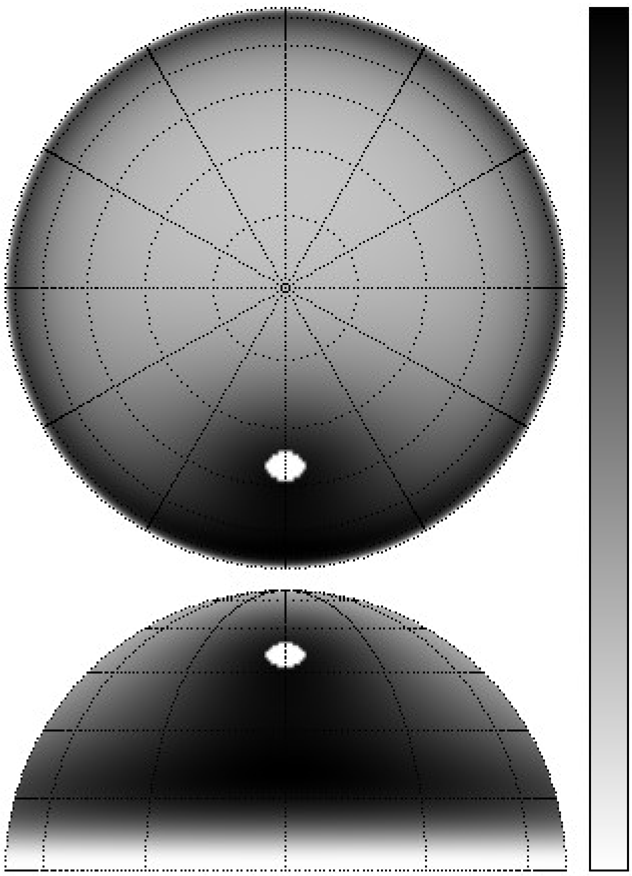

Figure 3: *Effective collection area of a meteor camera per square degree at the celestial sphere for an average meteor shower. Above is the total view of the sky with the zenith at the center, below is the horizontal view in radiant direction. White represents zero, black the biggest effective collection area.*

Let us now analyze the impact of each individual parameter in detail. Figure 4 compares a slow meteor shower with v_{inf}=30 km/s (left) and a fast shower with v_{inf}=70 km/s (right) under otherwise unchanged boundary conditions. Both figures are scaled independently for their maximum values (at the same scale, the right figure would be much brighter, because fast meteors have a lower limiting magnitude overall). In case of slower meteor showers, the "blind spot" at the radiant is larger and observing directions close to the horizon more effective. In case of larger velocities, regions close to the radiant and between the radiant and the horizon are preferred.

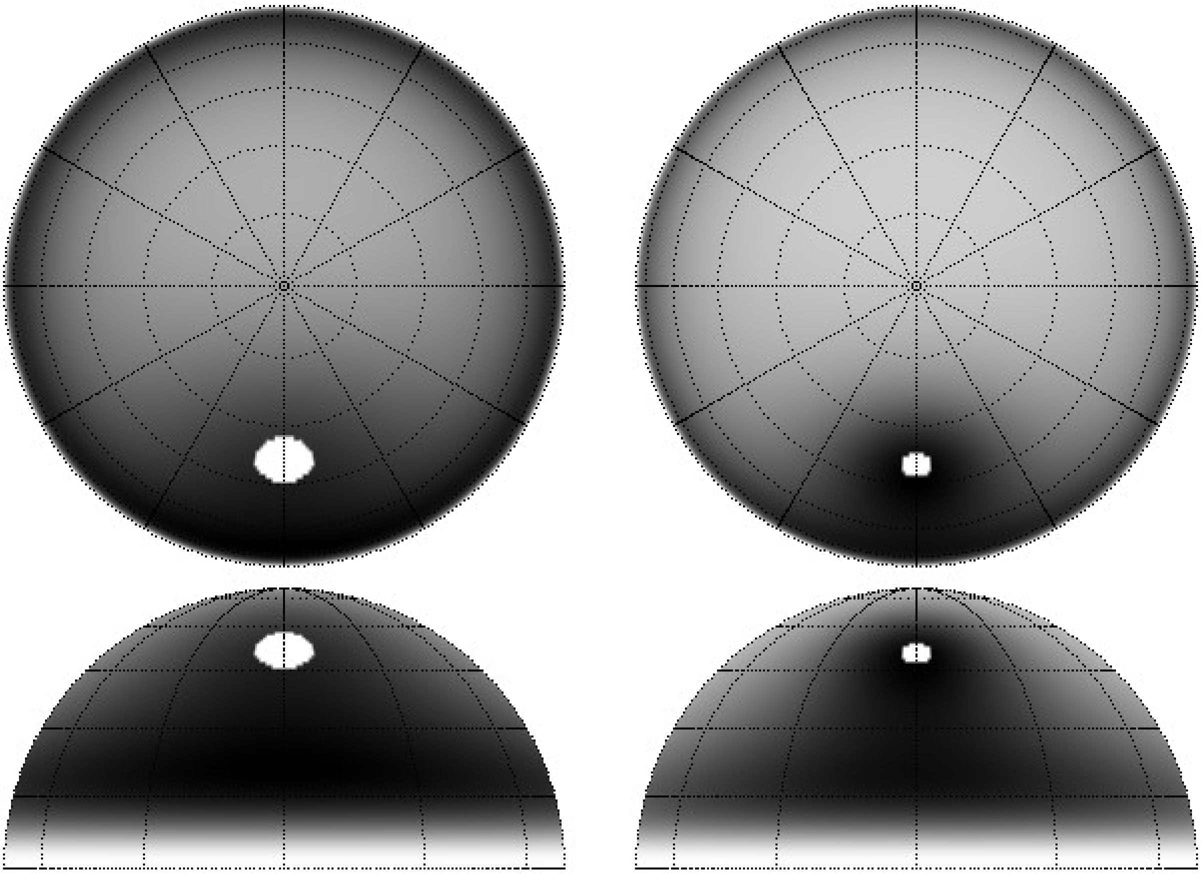

Figure 4: *Comparison of the effective collection area for a meteor shower with low (left) and high velocity (right). The grey levels of the two figures are scaled independently of each other.*

The impact of the population index and the extinction on the perfect observing direction is well-known from visual observations. In case of the Leonids storm in South Korea in 2001 with a low population index and extinction, for example, there were clearly more meteors visible close to the horizon than at higher altitudes. The effect was even more dramatic with the airborne missions at the same time, which observed practically without atmospheric extinction at all.

That is reflected in figures 5 and 6. At a population index of r=2.0 (figure 5, left) most meteors are visible close to the horizon – the radiant direction plays practically no role anymore. At a population index of r=3.0 (figure 5, right), however, areas close to the radiant are clearly preferred.

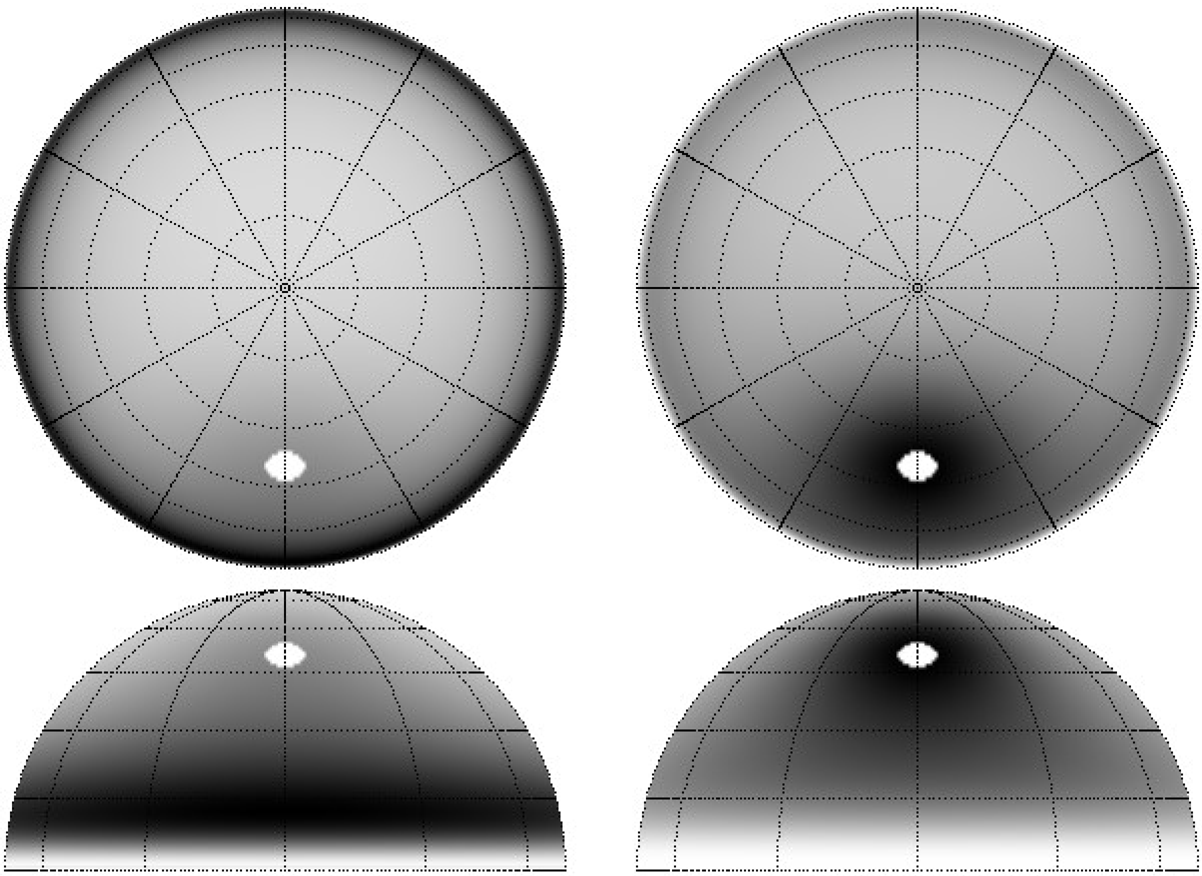

Figure 5: *Comparison of the effective collection area for a meteor shower with low (left) and high population index (right). The grey levels of the two figures are scaled independently of each other.*

The effect is similar at observing sites with different sky quality. At favorable observing sites with an extinction of 0.20 mag per airmass, fields of view near the horizon are clearly preferred (figure 6, left), whereas at poor observing sites with large extinction the areas near the radiant are preferred (figure 6, right).

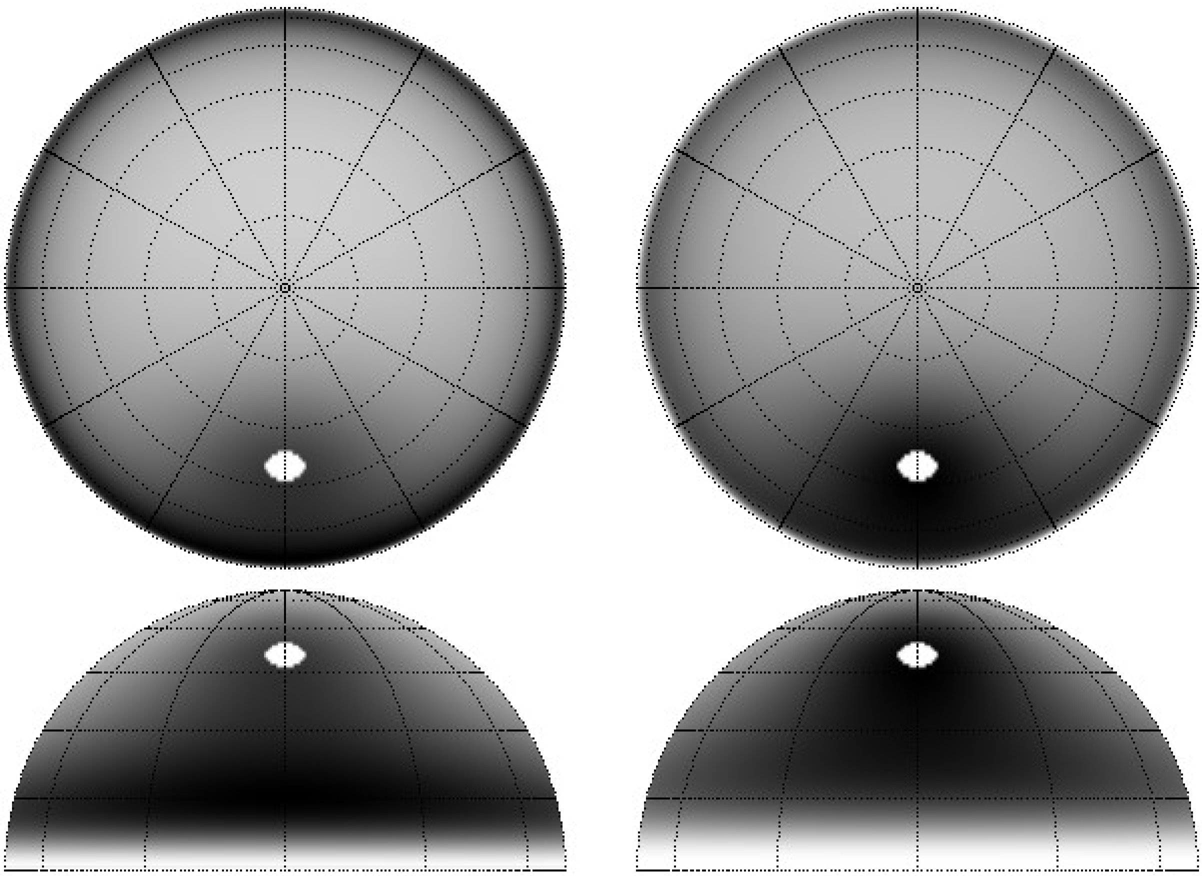

Figure 6: *Comparison of the effective collection area for observing sites with low (left) and high atmospheric extinction (right). The grey levels of the two figures are scaled independently of each other.*

Note that all figures so far are valid for a particular point in time only. Our unguided cameras, however, observe a full night long whereby the observing geometry changes significantly. If we observe our average meteor shower over six hours, whereby the radiant moves from east to south, we see that all positions close to the radiant smear out and in total the collection area close to the horizon improves (figure 7).

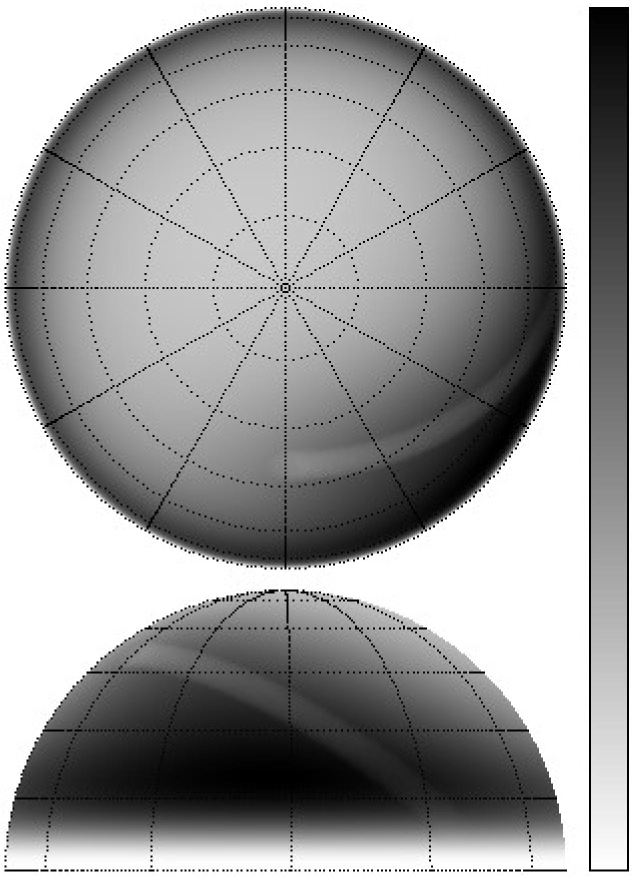

Figure 7: *Effective collection area per square degree at the celestial sphere for an average meteor shower, whose radiant is moving from east to south during six hours of observation.*

1. Observers

Code	Name	Place	Camera	FOV [°²]	Slim [mag]	Eff.CA [km²]	Nights	Time [h]	Meteors
ARLRA	Arlt	Ludwigsfelde/DE	LUDWIG2 (0.8/8)	1475	6.2	3779	23	56,9	258
BERER	Berkó	Ludanyhalaszi/HU	HULUD1 (0.8/3.8)	5542	4.8	3847	10	52,3	207
BOMMA	Bombardini	Faenza/IT	MARIO (1.2/4.0)	5794	3.3	739	29	153,1	524
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	20	75,1	163
BRIBE	Klemt	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	23	81,5	191
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	24	77,9	148
CARMA	Carli	Monte Baldo/IT	BMH2 (1.5/4.5)*	4243	3.0	371	28	101,8	448
CASFL	Castellani	Monte Baldo/IT	BMH1 (0.8/6)	2350	5.0	1611	25	120,4	214
CINFR	Cineglosso	Faenza/IT	JENNI (1.2/4)	5886	3.9	1222	29	173,6	336
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	27	133,4	346
			C3P8 (0.8/3.8)	5455	4.2	1586	25	107,7	216
			STG38 (0.8/3.8)	5614	4.4	2007	28	141,7	624
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	23	81,0	236
FORKE	Förster	Carlsfeld/DE	AKM3 (0.75/6)	2375	5.1	2154	19	71,8	234
GONRU	Goncalves	Foz do Arelho/PT	FARELHO1 (1.0/2.6)	6328	2.8	469	17	32,8	66
		Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	29	164,4	464
			TEMPLAR2 (0.8/6)	2080	5.0	1508	26	160,3	420
			TEMPLAR3 (0.8/8)	1438	4.3	571	24	128,2	131
			TEMPLAR4 (0.8/3.8)	4475	3.0	442	29	155,5	378
			TEMPLAR5 (0.75/6)	2312	5.0	2259	26	134,1	316
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	22	98,0	201
			ORION4 (0.95/5)	2662	4.3	1043	24	89,8	118
HERCA	Hergenrother	Tucson/US	SALSA3 (0.8/3.8)	2336	4.1	544	27	192,0	298
HINWO	Hinz	Schwarzenberg/DE	HINWO1 (0.75/6)	2291	5.1	1819	26	93,3	236
IGAAN	Igaz	Budapest/HU	HUPOL (1.2/4)	3790	3.3	475	22	84,8	64
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	25	106,0	116
			HUSOR2 (0.95/3.5)	2465	3.9	715	24	112,6	140
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	20	82,5	293
		Kostanjevec/SI	METKA (0.8/12)*	715	6.4	640	25	109,8	148
		Ljubljana/SI	ORION1 (0.8/8)	1399	3.8	268	25	115,2	348
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	20	90,1	434
			STEFKA (0.8/3.8)	5471	2.8	379	21	83,1	190
KOSDE	Koschny	Izana Obs./ES	ICC7 (0.85/25)*	714	5.9	1464	3	16,2	74
		La Palma / ES	ICC9 (0.85/25)*	683	6.7	2951	11	64,8	667
		Izana Obs./ES	LIC1(2.8/50)*	2255	6.2	5670	7	53,1	515
LOJTO	Łojek	Grabniak/PL	PAV57 (1.0/5)	1631	3.5	269	7	30,1	69
LOPAL	Lopes	Lisboa/PT	NASO1 (0.75/6)	2377	3.8	506	5	28,5	37
MACMA	Maciejewski	Chelm/PL	PAV35 (0.8/3.8)	5495	4.0	1584	23	67,5	161
			PAV36 (0.8/3.8)*	5668	4.0	1573	24	95,8	269
			PAV43 (0.75/4.5)*	3132	3.1	319	19	59,1	87
			PAV60 (0.75/4.5)	2250	3.1	281	25	94,2	264
MARRU	Marques	Lisbon/PT	CAB1 (0.75/6)	2362	4.8	1517	28	176,9	314
			RAN1 (1.4/4.5)	4405	4.0	1241	23	130,9	141
MASMI	Maslov	Novosimbirsk/RU	NOWATEC (0.8/3.8)	5574	3.6	773	11	19,1	57
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1230	6.9	6152	26	96,7	644
			ESCIMO2 (0.85/25)	155	8.1	3415	25	110,4	244
			MINCAM1 (0.8/8)	1477	4.9	1084	28	103,8	392
		Ketzür/DE	REMO1 (0.8/8)	1467	6.5	5491	21	58,4	286
			REMO2 (0.8/8)	1478	6.4	4778	23	61,9	332
			REMO3 (0.8/8)	1420	5.6	1967	20	70,3	306
			REMO4 (0.8/8)	1478	6.5	5358	21	69,0	404
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	2522	3.5	532	27	141,6	160
MOSFA	Moschini	Rovereto/IT	ROVER (1.4/4.5)	3896	4.2	1292	26	21,1	125
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	2944	3.5	358	18	72,7	106
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	22	77,6	114
PERZS	Perkó	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	23	103,9	232
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	14	52,6	126
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	23	126,3	177
			RO2 (0.75/6)	2381	3.8	459	26	146,0	224
			RO3 (0.8/12)	710	5.2	619	24	139,8	310
			RO4 (1.0/8)	1582	4.2	549	25	118,4	108
			SOFIA (0.8/12)	738	5.3	907	16	71,2	94
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4152	4.5	2052	26	92,7	88
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	24	82,9	152
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	563	6.2	1294	20	70,5	143
			KAYAK2 (0.8/12)	741	5.5	920	22	87,4	69
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	29	96,7	413
			NOA38 (0.8/3.8)	5609	4.2	1911	29	99,4	330
			SCO38 (0.8/3.8)	5598	4.8	3306	30	106,7	492
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2354	5.4	2751	22	76,6	287
			MINCAM3 (0.8/6)	2338	5.5	3590	22	75,3	184
			MINCAM4 (0.8/6)	2306	5.0	1412	2	8,9	21
			MINCAM5 (0.8/6)	2349	5.0	1896	22	75,9	212
			MINCAM6 (0.8/6)	2395	5.1	2178	20	73,9	168
TEPIS	Tepliczky	Agostyan/HU	HUAGO (0.75/4.5)	2427	4.4	1036	23	97,7	161
			HUMOB (0.8/6)	2388	4.8	1607	25	79,1	230
WEGWA	Wegrzyk	Nieznaszyn/PL	PAV78 (0.8/6)	2286	4.0	778	21	66,2	131
Sum							30	7128.5	18626

* active field of view smaller than video frame

2. Observing Times (h)

June	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	4.0	3.8	1.4	2.5	-	0.2	-	2.5	0.6	1.5	-	0.9	3.7	3.7	0.4
BERER	5.8	5.8	5.8	-	-	-	-	-	-	-	-	-	-	-	5.6
BOMMA	6.9	6.8	6.8	5.4	5.1	3.7	2.1	6.8	2.8	5.3	6.3	6.4	4.4	-	6.4
BREMA	4.7	2.1	-	4.7	3.5	1.5	-	4.3	4.6	4.5	1.6	-	4.5	4.4	3.8
BRIBE	-	2.4	-	4.4	4.5	2.9	4.1	4.5	2.9	4.8	0.9	-	4.7	4.7	1.7
	4.2	0.7	-	1.7	4.7	1.6	1.9	4.1	4.8	4.7	-	-	4.6	4.7	3.1
CARMA	6.3	6.0	4.2	1.1	-	2.6	5.8	6.3	0.5	5.1	4.4	4.4	0.7	0.6	2.0
CASFL	6.7	6.7	5.3	1.6	-	3.7	6.3	6.5	-	5.9	4.3	6.4	3.7	-	2.1
CRIST	6.8	6.9	6.8	6.3	6.0	4.5	2.4	6.8	5.2	6.6	6.7	6.6	6.4	-	6.4
	6.4	6.4	3.1	4.3	-	5.3	4.4	6.3	0.7	6.2	6.1	5.6	3.2	2.5	6.2
	6.3	6.4	0.2	1.5	0.3	4.0	6.3	6.1	1.4	6.3	6.2	6.2	3.6	2.5	6.1
DONJE	6.4	6.4	3.7	4.9	0.8	6.3	6.3	6.3	1.3	6.2	6.2	6.2	4.1	2.4	6.1
ELTMA	3.4	3.5	4.8	1.0	2.7	2.9	3.1	5.0	0.8	2.3	-	5.1	-	-	-
FORKE	-	1.0	0.2	5.0	-	-	-	5.1	0.9	3.0	-	4.6	3.7	4.9	-
GONRU	-	-	0.2	-	-	-	-	-	-	-	0.5	-	1.8	-	0.5
	7.4	0.3	7.2	7.3	1.1	7.2	7.2	-	7.1	7.1	6.4	2.1	6.9	4.4	7.1
	7.5	-	6.7	7.4	-	7.4	7.4	-	7.3	7.3	6.5	2.1	7.3	3.8	7.3
	7.1	-	6.8	6.5	-	7.1	-	-	7.0	7.1	5.0	-	7.1	1.7	6.7
	7.4	-	7.2	7.4	0.5	7.4	7.3	1.2	7.1	7.3	6.5	1.8	7.3	3.8	7.3
	6.8	-	6.4	7.3	0.3	7.0	6.9	-	4.3	6.7	4.0	2.0	7.0	-	6.6
GOVMI	-	-	5.6	1.3	2.0	-	2.8	5.8	3.7	3.6	5.7	2.2	-	5.7	5.8
	-	0.7	0.4	-	4.2	-	-	4.4	2.3	2.5	5.0	1.7	0.3	5.5	5.5
HERCA	6.3	8.5	4.7	8.2	7.9	8.5	6.3	5.4	8.0	8.2	8.4	8.0	8.4	7.6	8.4
HINWO	5.4	2.6	1.9	5.1	-	2.7	0.8	5.1	1.2	2.8	1.0	4.4	4.2	3.9	-
IGAAN	4.5	1.9	5.4	1.0	-	-	1.1	5.4	5.0	5.2	4.4	4.9	4.1	4.3	-
JONKA	5.8	1.6	5.9	0.2	1.2	-	-	5.7	3.5	5.0	5.2	3.7	5.6	5.7	5.7
	5.4	0.9	6.0	-	0.8	-	-	5.9	4.0	5.9	3.7	5.4	5.8	5.8	5.8
KACJA	-	2.8	6.0	0.3	1.6	-	-	6.0	4.9	0.5	5.9	5.4	3.6	5.2	4.1
	-	-	6.1	2.9	5.3	-	3.3	5.9	2.6	2.8	5.8	3.2	0.9	4.8	5.9
	3.9	3.2	6.4	-	4.3	-	-	6.5	5.5	4.7	6.5	5.8	4.6	4.0	2.7
	1.4	3.0	6.3	-	1.8	-	-	6.2	4.6	2.3	6.1	5.4	4.0	5.1	4.3
	0.2	2.9	5.6	-	0.8	-	0.4	6.2	4.8	0.5	6.1	5.2	3.8	5.3	4.0
KOSDE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.9	7.9	7.4	6.4	-	-	-	4.3	4.9	5.0	4.4	4.4	4.5	7.7	-
	8.0	7.9	7.5	6.4	-	-	-	-	-	-	-	7.8	7.9	7.6	-
LOJTO	-	5.3	-	-	-	-	-	5.3	4.8	-	-	1.6	-	-	-
LOPAL	7.3	-	-	-	-	-	-	1.3	6.9	7.1	5.9	-	-	-	-
MACMA	1.6	5.0	4.2	-	3.8	0.6	1.0	1.0	3.0	1.2	4.3	0.7	3.4	4.0	4.7
	1.7	5.3	5.4	0.2	5.2	2.9	2.9	5.1	5.1	5.1	5.2	3.0	4.7	4.5	5.0
	1.6	5.1	5.0	-	4.4	1.1	1.5	4.6	4.5	3.7	4.3	2.7	3.1	3.3	4.4
	2.0	5.2	5.1	0.2	5.1	3.1	3.0	5.0	4.9	4.9	4.9	3.0	4.8	4.5	4.8
MARRU	7.2	5.9	7.0	7.4	1.2	7.3	7.2	5.8	7.1	7.2	7.2	3.8	7.4	7.1	7.1
	7.5	4.6	3.1	6.7	-	7.3	6.9	-	4.1	7.4	7.2	-	7.4	7.3	7.3
MASMI	-	2.6	2.5	2.4	-	1.4	-	0.7	-	-	-	-	-	-	-
MOLSI	3.0	4.9	-	4.8	-	3.9	4.5	4.6	1.0	4.6	0.5	4.5	4.4	4.5	2.4
	3.7	5.5	-	5.5	-	4.5	4.7	5.4	-	5.2	1.0	5.1	5.3	5.1	2.5
	3.2	5.5	0.9	5.3	-	3.8	5.1	5.4	0.6	5.3	-	4.5	3.1	5.2	1.8
	3.9	3.8	-	0.9	2.9	-	1.5	2.9	0.7	3.0	-	-	3.5	3.5	-
	4.4	4.2	0.7	-	2.7	0.6	0.4	2.5	0.2	2.3	-	-	3.7	3.9	0.6
	4.8	4.7	-	1.0	3.4	1.0	-	3.6	0.9	3.7	-	-	4.3	4.4	-
	4.7	4.6	-	0.6	3.3	0.8	1.0	3.0	0.4	3.5	-	-	4.3	4.4	-
MORJO	6.1	1.7	6.1	5.0	4.2	-	2.5	6.0	5.9	6.0	5.9	5.8	5.7	5.9	5.9
MOSFA	0.8	1.2	0.4	0.2	-	0.2	0.9	1.5	0.3	1.5	0.3	0.7	-	-	0.2
OCHPA	-	3.3	4.5	1.4	-	1.2	5.9	4.8	0.4	6.5	2.2	5.8	-	-	-
OTTMI	7.1	3.2	-	4.5	3.9	4.2	0.7	3.4	0.7	1.3	0.3	1.5	0.2	-	-
PERZS	0.4	-	6.3	3.1	4.5	-	2.2	3.7	1.9	3.8	5.9	-	-	6.0	6.0
ROTEC	4.6	4.5	-	2.7	-	-	-	1.6	-	-	-	-	4.0	4.1	-
SARAN	7.4	2.5	6.4	5.3	-	6.9	7.2	-	7.7	7.7	7.7	-	7.5	7.5	7.9
	7.8	1.6	6.2	6.6	-	7.7	7.4	-	7.3	7.5	7.4	0.7	7.4	7.5	7.4
	7.5	3.2	7.4	7.1	-	7.4	7.3	2.8	7.5	7.4	7.4	0.3	7.4	7.4	7.3
	7.6	-	5.1	3.4	-	7.5	1.0	0.8	7.0	7.3	6.9	0.7	7.2	7.1	7.2
	-	-	-	4.5	-	6.3	2.2	-	4.2	5.1	5.4	0.2	7.0	7.3	7.4
SCALE	3.5	3.2	5.8	1.2	4.3	3.1	2.6	6.0	-	3.4	5.6	5.8	1.4	-	1.4
SCHHA	4.9	-	-	4.6	2.0	3.4	3.2	0.9	4.8	4.2	0.6	-	5.0	5.0	1.0
SLAST	-	2.2	5.1	-	4.0	-	-	3.3	3.6	0.8	5.2	5.2	3.0	3.4	3.7
	1.1	2.9	3.1	-	5.4	-	-	1.8	4.9	5.5	6.2	3.6	6.0	1.0	6.1
STOEN	4.7	3.8	5.5	0.9	2.1	3.6	3.3	3.9	0.8	3.3	5.3	6.2	2.2	0.5	1.4
	4.5	4.3	3.5	0.7	3.2	3.7	3.3	3.9	0.8	4.8	4.2	6.3	3.0	-	1.1
	5.2	4.1	6.0	1.2	3.9	4.4	5.2	6.5	0.9	4.2	5.3	6.3	2.0	0.6	0.6
STRJO	4.9	-	-	4.3	4.7	4.1	0.9	3.3	2.8	4.4	1.2	-	4.5	4.5	3.7
	4.9	0.4	-	4.2	4.6	4.2	1.2	3.9	3.6	4.4	1.0	-	4.3	4.3	4.0
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.9	0.4	-	4.2	4.7	4.2	1.4	4.2	2.5	4.4	1.0	-	4.4	4.4	3.0
	4.9	-	-	4.0	4.6	4.2	1.1	3.8	3.4	4.5	1.3	-	4.4	4.5	3.1
TEPIS	-	3.8	5.7	1.6	3.3	0.5	-	5.6	3.5	5.5	5.5	4.8	5.3	5.5	5.5
	5.8	1.0	5.6	0.8	2.0	-	0.2	5.6	0.8	4.5	1.3	2.2	2.0	2.3	1.1
WEGWA	4.9	4.9	4.2	-	1.0	-	3.8	4.8	-	4.5	4.3	3.0	1.4	1.8	3.5
Sum	313.0	233.5	272.8	218.6	153.8	201.6	189.4	282.9	233.8	323.6	277.7	215.9	297.1	274.6	266.7

June	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	3.7	3.6	3.8	3.8	3.4	2.5	-	-	0.7	-	3.5	3.7	1.9	-	1.1
BERER	-	-	3.8	5.5	5.5	3.9	-	-	5.0	-	5.6	-	-	-	-
BOMMA	4.8	5.3	6.5	6.6	6.6	5.2	3.7	6.0	6.5	6.4	2.7	4.1	2.7	5.7	5.1
BREMA	2.2	4.4	4.4	4.4	4.3	4.3	-	-	-	-	4.4	-	2.5	-	-
BRIBE	3.9	1.4	4.7	4.7	4.4	4.6	-	3.8	-	2.7	3.7	0.9	4.2	-	-
	4.6	0.9	4.6	4.7	4.4	4.7	1.5	4.8	-	0.9	2.4	0.4	3.2	-	-
CARMA	5.1	4.9	5.1	3.8	4.5	2.4	3.4	5.5	2.9	4.6	1.0	-	0.9	3.7	4.0
CASFL	6.1	4.8	4.7	3.8	5.8	4.3	3.4	6.4	3.9	6.4	-	-	1.7	4.3	5.6
CRIST	5.9	6.0	6.6	6.6	6.7	6.7	6.7	6.5	6.7	5.4	5.3	5.1	3.0	5.9	6.1
	4.8	6.2	6.1	6.2	6.2	6.1	-	5.6	-	4.1	5.1	5.5	1.7	2.9	6.2
	5.1	6.2	6.2	6.2	6.0	6.2	-	-	-	-	3.2	-	2.1	0.2	2.9
DONJE	5.6	6.2	6.1	6.2	6.2	6.1	-	5.6	-	4.1	5.3	6.0	1.7	2.8	6.2
ELTMA	-	-	5.2	5.7	3.9	-	2.0	4.1	1.2	6.3	3.4	1.9	2.8	5.1	4.8
FORKE	-	-	4.9	4.9	4.6	4.9	-	4.6	4.4	1.5	4.7	3.9	-	-	5.0
GONRU	0.4	-	0.2	2.9	1.2	-	2.7	4.2	0.8	2.0	2.2	0.5	2.0	4.9	5.8
	6.8	2.9	5.7	6.8	7.2	5.0	7.1	4.5	4.1	6.5	4.0	5.1	6.3	6.4	7.2
	6.9	-	4.8	6.9	7.3	5.2	7.3	3.9	3.4	6.9	4.0	5.2	6.7	6.5	7.3
	5.9	0.2	0.3	6.6	7.0	4.6	6.9	4.0	3.0	5.9	2.5	-	6.2	5.9	7.1
	7.1	2.0	1.7	6.7	7.3	5.0	7.3	4.2	2.8	6.4	3.5	2.7	5.9	6.1	7.3
	6.2	-	0.8	6.6	7.0	4.5	7.0	3.5	3.1	5.8	3.0	1.9	6.0	6.3	7.1
GOVMI	1.9	-	5.7	5.7	5.6	5.7	4.8	5.4	-	2.5	5.7	5.4	-	5.4	-
	2.4	-	5.4	5.4	5.1	5.2	4.4	5.2	3.7	3.0	5.5	5.5	1.2	5.3	-
HERCA	8.3	8.1	8.3	8.3	2.9	4.9	5.1	8.2	5.7	4.6	6.8	8.0	-	-	-
HINWO	-	1.6	5.0	5.0	4.0	5.0	-	4.9	4.9	1.3	4.5	4.8	3.9	3.3	4.0
IGAAN	-	-	4.0	4.2	3.9	-	3.6	4.8	2.9	-	5.1	1.2	2.9	5.0	-
JONKA	-	3.4	4.0	5.6	5.7	5.3	3.9	4.9	3.9	-	5.6	0.9	2.7	5.3	-
	-	5.4	4.1	5.8	5.8	5.8	3.8	5.5	4.1	-	5.8	1.7	3.9	5.5	-
KACJA	2.3	3.8	5.8	5.8	-	6.0	-	-	-	-	4.4	2.5	-	5.6	-
	2.8	3.6	5.9	5.9	3.7	6.0	3.5	5.4	3.6	2.0	5.9	6.0	-	6.0	-
	3.5	5.9	6.1	6.4	1.9	5.9	2.9	5.3	2.4	0.3	4.9	5.3	-	6.3	-
	3.6	4.8	6.1	6.0	-	6.2	-	-	-	-	4.4	2.5	-	6.0	-
	2.9	3.7	6.0	6.1	-	6.0	-	-	-	-	4.3	2.4	-	5.9	-
KOSDE	-	-	-	-	5.8	6.3	4.1	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LOJTO	-	-	5.2	-	-	4.2	-	-	-	-	3.7	-	-	-	-
LOPAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MACMA	-	-	4.4	4.6	1.7	4.6	-	-	-	-	3.2	0.7	3.3	3.2	3.3
	-	-	5.0	5.0	2.2	5.0	-	-	-	-	3.8	1.9	4.5	3.6	3.5
	-	-	-	-	-	-	-	-	-	0.2	2.7	1.1	-	2.2	3.6
	-	-	4.8	4.8	2.1	4.8	-	-	-	1.2	3.7	1.6	4.0	3.3	3.4
MARRU	3.2	4.3	6.9	6.2	7.1	7.0	7.1	-	-	6.9	6.0	4.7	7.1	7.3	7.2
	7.3	-	4.9	-	5.8	7.0	6.7	1.3	-	2.2	4.3	2.3	5.4	-	6.9
MASMI	-	-	-	-	-	-	1.6	1.6	-	-	1.7	-	1.8	0.9	1.9
MOLSI	3.3	4.5	4.5	4.5	4.4	4.5	2.9	4.5	4.5	3.2	-	1.9	-	3.6	2.8
	4.1	5.2	5.2	5.2	5.2	5.2	4.0	5.2	5.2	4.2	-	2.2	-	2.9	3.1
	3.6	5.1	5.2	5.2	4.7	5.2	2.9	5.2	4.9	3.2	0.3	2.6	0.4	2.7	2.9
	3.5	3.5	3.4	3.6	3.5	2.7	1.4	-	-	-	3.4	3.4	2.9	-	0.5
	3.9	3.9	3.8	3.9	3.8	3.2	1.4	-	-	-	3.9	3.9	3.3	-	0.7
	4.3	4.3	4.3	4.3	4.3	3.1	1.5	-	-	-	4.3	4.4	3.7	-	-
	4.3	4.2	4.2	4.3	4.2	3.4	1.6	-	-	-	4.2	4.3	3.7	-	-
MORJO	2.7	5.9	5.8	5.8	5.9	5.7	5.8	5.9	5.5	-	5.9	3.0	5.5	5.5	-
MOSFA	0.8	1.9	1.2	1.7	0.4	0.3	0.3	0.8	0.3	0.9	0.2	-	0.2	0.7	3.2
OCHPA	6.2	6.1	4.2	5.7	2.6	-	-	5.2	-	4.6	-	-	2.1	-	-
OTTMI	0.8	0.7	1.5	-	-	-	6.8	5.9	6.7	6.9	5.6	-	4.8	-	6.9
PERZS	2.3	-	6.0	6.0	5.9	5.9	5.0	5.5	4.9	1.9	6.0	4.8	-	5.9	-
ROTEC	4.0	4.1	4.0	4.2	3.3	-	-	-	-	-	3.5	4.2	3.8	-	-
SARAN	7.1	0.2	6.0	5.2	1.1	0.6	1.6	-	-	3.3	4.6	-	-	7.2	7.7
	7.2	0.2	6.4	5.3	6.3	7.2	7.6	2.6	-	3.1	4.3	1.0	4.8	-	7.5
	7.1	-	6.3	5.5	6.3	7.3	7.3	1.9	-	3.4	4.8	2.5	-	-	-
	5.7	-	3.5	1.8	4.3	6.1	7.3	1.9	-	3.2	3.6	0.5	4.4	-	7.3
	3.3	-	2.9	2.4	-	-	-	-	-	-	4.6	-	-	3.8	4.6
SCALE	1.5	2.1	5.4	6.3	2.1	-	0.8	-	5.8	6.3	2.3	1.3	1.5	5.3	4.7
SCHHA	3.8	3.6	4.9	3.8	4.7	5.0	-	5.0	-	2.9	4.5	0.2	3.0	1.9	-
SLAST	-	5.2	2.2	5.3	0.7	4.9	-	5.4	-	0.9	-	3.2	-	3.2	-
	-	-	5.9	6.1	-	5.4	2.5	5.1	1.4	2.5	2.5	4.6	-	3.8	-
STOEN	2.8	2.9	5.1	6.3	2.3	0.8	0.9	5.0	1.6	5.2	-	1.1	4.4	6.3	4.5
	2.7	3.1	6.3	6.3	2.3	0.9	0.3	4.5	1.3	6.4	2.0	1.4	3.6	6.1	4.9
	2.2	1.6	5.9	6.2	2.2	1.1	1.3	3.8	0.8	6.4	2.6	1.2	3.6	6.2	5.2
STRJO	4.3	2.6	4.5	4.4	4.4	2.9	0.4	-	-	-	4.5	0.8	4.5	-	-
	3.7	2.4	4.3	4.2	4.2	2.6	-	-	-	-	4.2	0.4	4.3	-	-
	-	-	-	-	-	-	-	-	-	-	4.4	-	4.5	-	-
	4.3	2.6	4.2	4.4	4.3	2.9	-	-	-	-	4.2	1.0	4.3	-	-
	4.1	2.3	4.3	4.3	4.2	2.5	-	-	-	-	4.2	-	4.2	-	-
TEPIS	-	2.4	5.4	5.4	5.3	5.3	1.8	2.2	-	-	5.5	-	2.9	5.4	-
	-	1.0	5.4	5.2	5.3	5.2	3.3	3.7	-	-	5.5	1.0	2.9	5.4	-
WEGWA	-	-	4.3	-	1.7	3.8	-	1.1	3.9	1.8	-	-	1.9	3.4	2.2
Sum	226.9	181.2	330.3	343.2	282.7	290.8	179.2	210.1	126.5	170.4	267.1	160.3	187.4	226.1	191.3

3. Results (Meteors)

June	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	14	14	2	7	-	1	-	11	2	6	-	2	23	23	1
BERER	21	17	19	-	-	-	-	-	-	-	-	-	-	-	16
BOMMA	19	24	28	21	12	12	3	23	8	19	21	14	11	-	18
BREMA	7	1	-	10	8	2	-	7	20	13	3	-	16	11	5
BRIBE	-	2	-	8	5	2	4	8	8	28	2	-	11	14	6
	4	1	-	1	6	1	1	7	10	22	-	-	6	10	5
CARMA	8	25	7	5	-	17	24	41	4	26	14	18	4	1	6
CASFL	12	21	6	3	-	13	12	12	-	9	9	8	4	-	3
CRIST	20	11	11	21	3	9	1	22	4	8	18	12	11	-	4
	18	16	2	10	-	11	15	12	4	13	14	8	3	8	15
	11	10	1	5	2	7	9	11	2	17	17	9	4	1	10
DONJE	37	33	9	25	5	19	31	24	7	27	23	23	6	7	26
ELTMA	7	14	14	7	8	8	14	15	3	9	-	9	-	-	-
FORKE	-	1	1	22	-	-	-	8	4	13	-	8	9	25	-
GONRU	-	-	1	-	-	-	-	-	-	-	3	-	4	-	3
	15	1	16	28	3	25	16	-	23	17	16	3	15	9	21
	22	-	18	20	-	17	23	-	15	21	14	3	13	4	24
	12	-	7	9	-	7	-	-	7	6	5	-	4	1	7
	17	-	18	20	2	14	17	1	15	17	17	2	18	4	18
	10	-	17	19	1	23	15	-	6	19	1	1	10	-	21
GOVMI	-	-	10	1	3	-	5	11	5	6	8	3	-	10	16
	-	1	2	-	4	-	-	9	3	3	4	3	1	6	6
HERCA	5	19	9	15	17	7	4	8	8	8	17	10	22	15	19
HINWO	20	4	1	10	-	15	2	8	2	6	3	10	13	14	-
IGAAN	2	3	2	1	-	-	2	8	1	3	4	3	1	4	-
JONKA	6	4	4	1	1	-	-	1	3	4	6	7	6	6	7
	3	2	4	-	1	-	-	11	2	14	2	5	7	9	12
KACJA	-	6	19	1	3	-	-	32	8	3	16	23	5	16	9
	-	-	8	2	7	-	4	11	2	2	8	3	1	14	8
	11	8	19	-	13	-	-	20	24	10	26	20	10	4	2
	2	9	14	-	7	-	-	31	14	2	27	31	8	21	20
	1	7	13	-	1	-	1	4	10	4	17	16	5	5	4
KOSDE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	75	91	87	77	-	-	-	45	45	56	48	41	34	68	-
	75	76	69	82	-	-	-	-	-	-	-	71	77	65	-
LOJTO	-	12	-	-	-	-	-	7	13	-	-	5	-	-	-
LOPAL	13	-	-	-	-	-	-	2	11	9	2	-	-	-	-
MACMA	4	14	8	-	13	4	2	4	12	2	5	3	5	14	3
	2	16	12	1	13	3	9	13	17	11	17	11	8	14	23
	2	7	4	-	4	1	3	2	9	3	8	6	6	9	2
	4	21	15	1	8	2	8	9	18	12	17	14	15	19	19
MARRU	3	8	11	12	2	12	7	3	5	14	10	2	15	8	10
	7	6	5	11	-	12	15	-	6	3	9	-	4	7	10
MASMI	-	7	6	5	-	2	-	1	-	-	-	-	-	-	-
MOLSI	24	34	-	30	-	13	30	22	1	24	3	20	12	31	18
	2	11	-	2	-	10	12	16	-	14	1	10	6	28	7
	17	20	1	13	-	13	16	22	1	21	-	20	6	22	7
	17	22	-	1	12	-	2	11	5	9	-	-	15	25	-
	21	17	1	-	7	1	2	16	2	6	-	-	24	29	1
	27	20	-	2	9	2	-	12	3	11	-	-	18	22	-
	32	14	-	1	16	2	2	11	1	14	-	-	32	25	-
MORJO	6	1	5	2	1	-	6	6	4	4	10	9	9	9	5
MOSFA	5	7	3	1	-	1	6	10	2	9	2	6	-	-	1
OCHPA	-	4	5	1	-	3	10	17	1	14	2	11	-	-	-
OTTMI	3	2	-	7	1	4	4	8	4	9	2	8	1	-	-
PERZS	2	-	6	9	9	-	8	9	10	4	5	-	-	14	9
ROTEC	3	6	-	1	-	-	-	3	-	-	-	-	12	17	-
SARAN	8	4	10	11	-	14	16	-	7	11	9	-	5	4	9
	19	2	9	8	-	12	14	-	12	10	15	2	12	10	2
	24	5	10	15	-	21	19	2	16	27	29	2	20	16	22
	8	-	4	3	-	7	2	1	5	6	3	1	5	7	11
	-	-	-	6	-	9	10	-	5	6	3	1	6	4	7
SCALE	1	3	6	2	6	5	2	2	-	5	4	4	1	-	2
SCHHA	3	-	-	9	2	9	5	2	15	1	1	-	12	6	1
SLAST	-	3	6	-	5	-	-	7	2	3	6	9	3	4	8
	2	4	5	-	3	-	-	7	3	2	6	5	3	2	2
STOEN	13	12	26	8	10	17	21	5	1	13	14	17	7	3	6
	12	13	11	2	10	11	21	5	1	23	10	14	2	-	3
	20	17	12	5	15	30	16	27	2	25	20	27	7	3	1
STRJO	20	-	-	20	10	10	2	6	4	24	3	-	16	20	11
	15	1	-	11	12	13	1	5	9	11	3	-	15	14	8
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13	1	-	8	17	12	4	6	3	14	2	-	13	18	5
	10	-	-	9	13	13	1	6	9	4	2	-	19	9	6
TEPIS	-	5	5	4	3	3	-	15	1	7	10	8	9	11	8
	8	7	11	5	1	-	1	18	5	13	9	15	14	16	6
WEGWA	6	5	7	-	2	-	8	10	-	5	9	4	3	4	6
Sum	830	752	642	657	316	481	488	729	494	814	614	600	722	819	551

June	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARLRA	20	24	16	26	8	8	-	-	1	-	22	21	3	-	3
BERER	-	-	23	25	15	19	-	-	11	-	41	-	-	-	-
BOMMA	9	24	28	26	14	14	8	15	26	26	9	21	16	22	33
BREMA	1	8	10	5	6	12	-	-	-	-	15	-	3	-	-
BRIBE	7	4	11	7	12	14	-	10	-	7	11	2	8	-	-
	9	1	9	10	6	13	2	11	-	2	4	2	5	-	-
CARMA	18	25	32	15	19	20	13	22	7	35	1	-	6	12	23
CASFL	8	6	12	11	3	3	10	13	1	15	-	-	3	8	9
CRIST	2	8	42	10	15	9	5	9	16	11	9	10	11	13	11
	6	22	19	22	26	25	-	17	-	5	14	9	2	8	22
	9	9	19	17	16	13	-	-	-	-	9	-	4	2	2
DONJE	14	19	29	44	45	36	-	24	-	10	22	25	2	21	31
ELTMA	-	-	11	17	13	-	3	5	7	16	11	6	8	13	18
FORKE	-	-	16	23	8	18	-	14	17	9	17	11	-	-	10
GONRU	2	-	1	6	3	-	9	5	1	1	6	2	4	9	6
	16	7	3	16	22	12	37	9	5	32	14	8	24	21	30
	12	-	3	17	27	11	24	6	6	23	11	4	20	26	36
	4	1	1	5	6	4	12	7	3	5	2	-	5	5	6
	12	3	2	13	19	5	23	10	4	24	7	6	19	16	35
	5	-	3	13	19	9	25	2	2	20	6	3	12	23	31
GOVMI	3	-	23	15	9	10	2	13	-	3	15	16	-	14	-
	4	-	8	8	4	13	1	5	1	3	7	10	1	11	-
HERCA	11	8	14	16	3	7	10	8	10	4	13	11	-	-	-
HINWO	-	3	11	20	7	14	-	11	13	4	9	9	10	2	15
IGAAN	-	-	7	4	1	-	2	2	3	-	4	1	3	3	-
JONKA	-	1	3	7	3	11	1	7	2	-	12	2	4	7	-
	-	4	2	4	8	5	3	9	4	-	9	2	4	14	-
KACJA	9	19	26	27	-	20	-	-	-	-	21	4	-	26	-
	4	1	9	10	2	9	3	5	2	5	8	11	-	9	-
	7	24	33	27	4	9	6	11	3	1	16	26	-	14	-
	9	26	46	47	-	34	-	-	-	-	38	5	-	43	-
	6	8	20	20	-	17	-	-	-	-	10	2	-	19	-
KOSDE	-	-	-	-	35	29	10	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LOJTO	-	-	16	-	-	4	-	-	-	-	12	-	-	-	-
LOPAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MACMA	-	-	4	10	3	13	-	-	-	-	15	1	4	11	7
	-	-	20	8	5	16	-	-	-	-	13	6	5	17	9
	-	-	-	-	-	-	-	-	-	1	9	4	-	2	5
	-	-	13	10	4	10	-	-	-	2	12	6	7	9	9
MARRU	4	4	10	9	11	14	22	-	-	31	8	10	14	26	29
	2	-	6	-	6	4	9	4	-	1	7	1	5	-	1
MASMI	-	-	-	-	-	-	5	5	-	-	9	-	7	4	6
MOLSI	11	49	39	56	37	40	11	39	31	26	-	7	-	20	16
	3	10	20	19	12	13	9	10	9	8	-	4	-	4	4
	8	24	24	32	13	24	14	23	12	15	1	9	1	6	7
	21	25	15	24	19	12	5	-	-	-	16	20	9	-	1
	17	29	20	21	28	13	3	-	-	-	33	28	10	-	3
	15	24	24	22	16	12	7	-	-	-	29	21	10	-	-
	27	27	32	34	38	16	7	-	-	-	27	27	19	-	-
MORJO	4	6	5	6	8	9	3	8	7	-	12	1	6	8	-
MOSFA	5	13	7	10	3	2	2	5	2	8	1	-	1	4	9
OCHPA	10	7	7	5	1	-	-	4	-	2	-	-	2	-	-
OTTMI	7	5	6	-	-	-	6	5	5	9	2	-	7	-	9
PERZS	3	-	13	22	14	14	2	11	9	5	24	12	-	18	-
ROTEC	13	8	11	6	10	-	-	-	-	-	6	24	6	-	-
SARAN	6	1	4	3	6	4	11	-	-	4	6	-	-	7	17
	7	1	3	1	7	11	15	5	-	5	13	1	10	-	18
	9	-	5	5	13	17	15	2	-	4	10	2	-	-	-
	4	-	2	1	2	4	7	3	-	3	3	1	7	-	8
	7	-	1	3	-	-	-	-	-	-	5	-	-	7	14
SCALE	1	4	3	7	1	-	2	-	2	6	3	4	3	4	5
SCHHA	11	9	11	2	8	11	-	9	-	9	11	1	3	1	-
SLAST	-	16	15	15	2	6	-	7	-	2	-	5	-	19	-
	-	-	7	7	-	1	1	3	1	1	1	2	-	1	-
STOEN	5	11	26	34	15	2	6	14	4	23	-	6	17	42	35
	5	12	29	21	4	2	2	10	3	20	8	6	8	34	28
	8	5	36	28	9	7	5	5	4	37	18	7	10	47	39
STRJO	21	10	20	12	24	9	2	-	-	-	20	1	22	-	-
	8	5	16	8	7	2	-	-	-	-	6	3	11	-	-
	-	-	-	-	-	-	-	-	-	-	13	-	8	-	-
	15	5	15	11	9	5	-	-	-	-	24	5	7	-	-
	9	5	10	15	10	3	-	-	-	-	11	-	4	-	-
TEPIS	-	5	9	10	7	6	4	5	-	-	14	-	3	9	-
	-	8	14	14	7	9	7	6	-	-	13	4	6	13	-
WEGWA	-	-	5	-	3	13	-	3	8	5	-	-	8	10	7
Sum	473	583	1015	1024	740	751	391	436	242	488	808	458	417	684	607