Results of the IMO Video Meteor Network – December 2012

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The year 2012 ended with moderate weather conditions. In the first half of the month and after Christmas the observing conditions were quite ok, but in between there was a larger gap where we obtained only a few observations. Only 15 out of 73 cameras managed to obtain twenty or more observing nights. Last December, however, the weather was far from perfect either, so that we could increase the effective observing time compared to 2011 by ten percent to over 6,800 hours. The number of recorded meteors increased even by twenty percent to almost 40,000.

With Péter Bánfalvi , a new video observer from Hungary found his way to our network. Him, Szilárd Csizmadia and Zoltán Zelko are now operating one of the HUVCSE video systems, which are arranged in a multi-station configuration.

For the meteor count in December there is just one important factor – the weather during the Geminids. Observers with clear skies near December 13 can improve their totals significantly towards the end of the year. In 2012, we recorded 8,000 meteors in the night of December 12/13 alone. If the two adjacent nights are considered as well, the sums increases to 15,000 meteors. One reason was that the Geminid peak matched perfectly with new moon. Also the weather was quite cooperative these nights, so that most observers could observe at least on December 12/13 or 13/14. Those 691 meteors that Erno Berkó recorded with HULUD1 are unbeatable, but there are several other observers with over 400 meteors in a single night. Maciej Maciejewski, for example, recorded with his cameras far more meteors during the 2012 Geminids than in any previous night.
Figure 1 presents an overview of the Geminids' activity profile. Up to a solar longitude of 261° there was only a moderate rate increase. Thereafter the activity rose dramatically in the night of December 12/13. In the following night, the flux density was still a bit higher and reached a peak value of about 60 meteoroids per 1,000 km^2 and hour. That's slightly more than we measured during the 2012 Perseid maximum. Already one night later, the rates had dropped by about a factor of six, and after another day the Geminids could hardly be discerned anymore from the sporadic background.

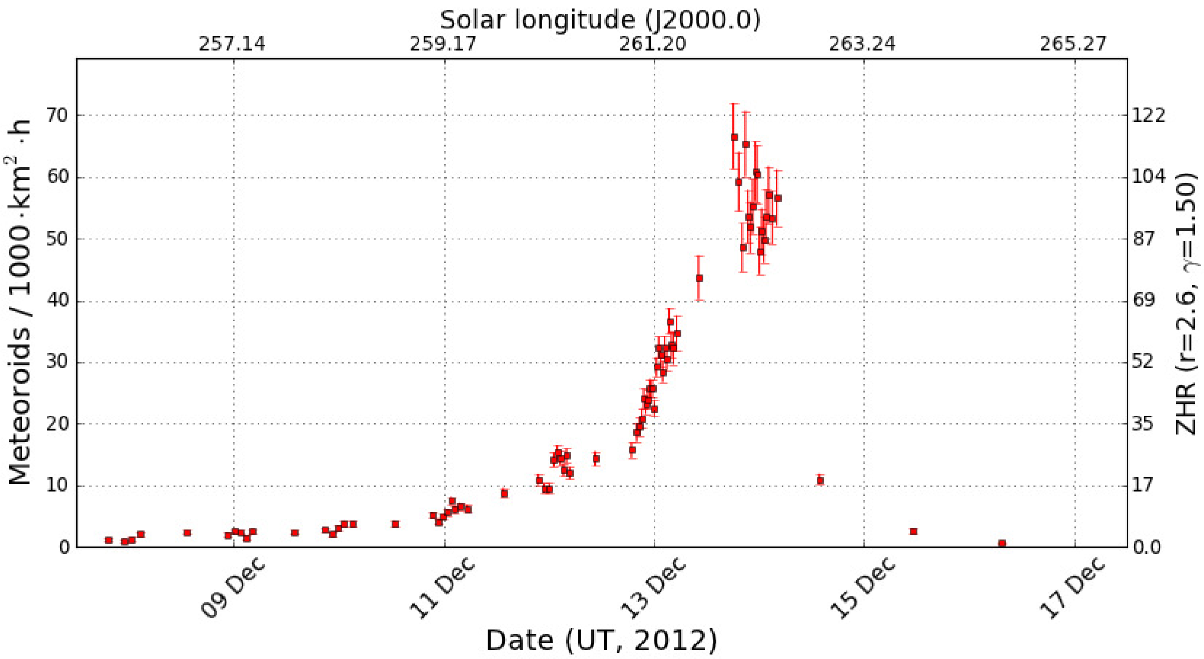

Figure 1: *Flux density profile of the Geminids from data of the IMO network in 2012.*

Figure 2 shows the Geminid peak between 261 and 263° solar longitude in detail, presenting also data from 2011. Also here we see a consistent picture and we can assume that the increase of rates at December 12/13 was only the beginning and continued towards later solar longitudes. The solar longitude interval with highest rates may in fact be missing in both years.

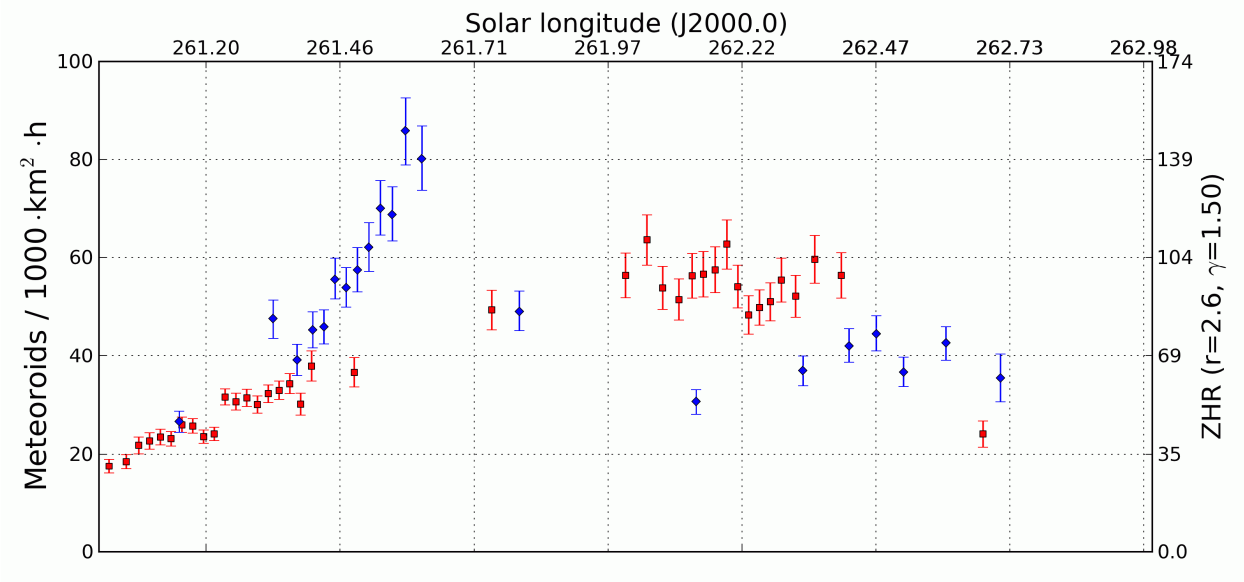

Figure 2: *Detailed activity profile of the Geminids from data of the IMO network in 2011 (blue diamonds) and 2012 (red squares).*

In the IMO video meteor database, the Geminids (4 GEM) represent the third strongest shower with over 36,000 meteors. If we consider, that the activity of the even more frequent Perseids and Orionids extends over a much longer time interval it becomes clear that there is no shower with more meteors in a single solar longitude interval than the Geminids. Figure 1 shows that the active period of the Geminids lasts no more than three days. So it was particularly interesting how long the shower would stand out from the sporadic background in our long-term analysis from spring 2012. The answer is given in table 1: Between November 30 and December 17 the Geminid radiant can be detected undoubtfully. As expected , the quality of the meteor shower parameters is high thanks to the large number of meteors, and there are only minor deviations from the MDC list values

Table 1: *Parameters of the Geminids from the MDC Working List and the analysis of the IMO network in 2012.*

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	262.1	-	113.2	+1.02	+32.5	-0.15	36.3	-
IMO 2012	261.5	248-265	113.3	+1.07	+32.4	-0.09	35.5	0

Mikhail Maslov had predicted meteors from comet 46P/Wirtanen (the original target of the Rosetta spacecraft) around the time of the Geminids. They would result from four dust trails between 1927 and 1947. The analysis of our data, however, revealed only about five possible shower members in each relevant night. Since at the same time a few hundred sporadic meteors were detected , these shower meteors are chance alignments only, so that we could not measure any activity from this comet.

For the early evening hours of December 31 (16:10 UT), Jeremie Vaubaillon had forcasted a possible outburst of the December phi Cassiopeiids (446 DPC) caused by a close encounter with the 1969 dust trail. Several visual observers reported immediately after the events that they could observe only single shower members at best. An analysis of our video observations was conducted to support that result, but the analysis was more difficult than expected. The first question was: Where is the radiant located? Both the IMCCE website of Jeremie and other web pages referred to the MDC list. There the following shower parameters are given for a solar longitude of 252° (i.e. early December): α=19.8°, δ=58.0° and v_{inf}=19.8 km/s

Unfortunately, there is no radiant drift given. Our own analysis from October 2012 detected this shower in early December as well, but we found a quite strong drift in declination by 1.7° per day. Now if we use that value to calculate the radiant position we end up at a declination of 104°, which sounds rather unlikely. In addition there was confusion about the timing of the outburst. Beside the predicted time mentioned above the IMCCE website also states a solar longitude of 279.4584°, which translates to Dec 30, 2012, 22:17 UT.
Under these conditions, we started a radiant search in the solar longitude intervals 280.0-280.4° (New Year's Eve with 119 meteors) and 279.25-279.65° (one evening earlier with 456 meteors). There was no prominent radiant in the expected region of sky. In the first test, 4 out of 119 meteors formed a radiant at α=46.7°, δ= 66°, v_{inf}=20 km/s, and the second tests did not yield any sensible radiant at all. So we cannot completely rule out activity from the December phi Cassiopeiids, but the shower was definitely no eye catcher end of December 2012.

Finally we can see from the Ursids how a year with enhanced activity like 2011 compares to a "normal" year like 2012. Whereas the flux density reached values up to fifteen meteoroids per 1,000 km^2 and hour in 2011, the value was only close to four at the same solar longitude in 2012

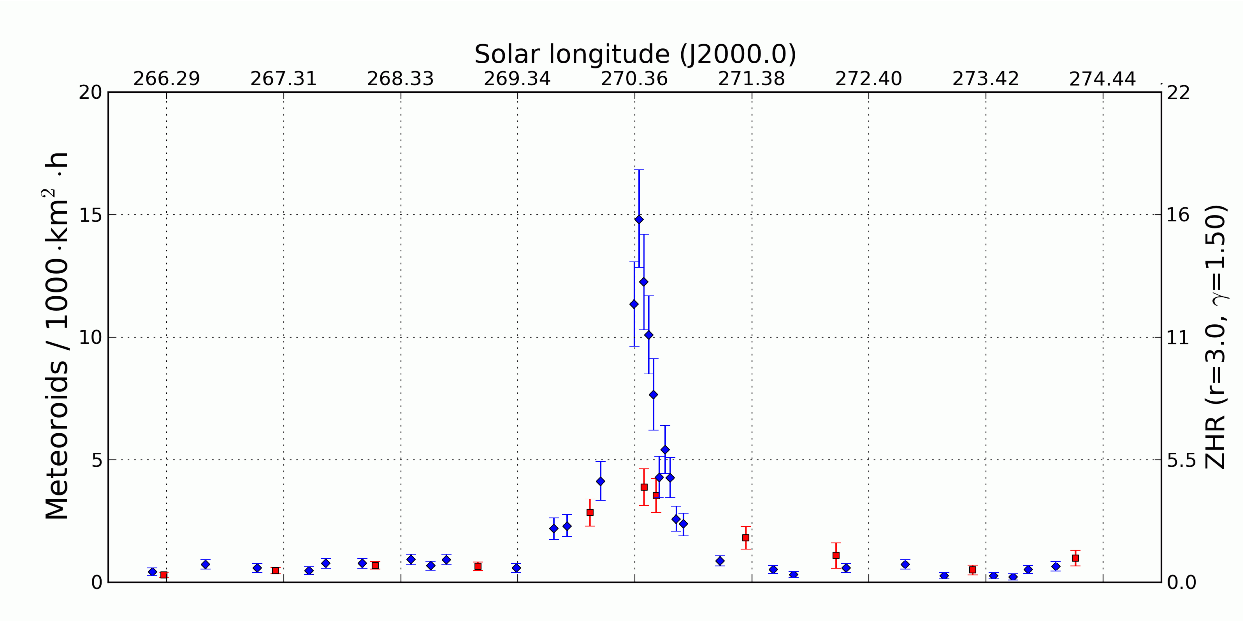

Figure 3: *Activity profile of the Urdis from data of the IMO network in 2011 (blue diamonds) and 2012 (red squares).*

The long-term analysis of the Ursids (15 URS) in based on more than 1,700 meteors. The shower could be safely detected between December 18 and 24. Just before Christmas it's the strongest source in the sky. Also for this shower, there is good agreement between our meteor shower parameters (table 2) and the values from the MDC list.

Table 2: *Parameters of the Ursids from the MDC Working List and the analysis of the IMO network in 2012.*

Source	**Solar Longitude**		**Right Ascension**		**Deklination**		**Vinf**	
	Mean [°]	**Interval [°]**	**Mean [°]**	**Drift [°]**	**Mean [°]**	**Drift [°]**	**Mean [km/s]**	**Drift [km/s]**
MDC	271	-	219.4	-	+75.3	-	34.8	-
IMO 2012	270.5	266-272	218.1	+1.8	+75.1	-0.3	32.0	-

Beyond this, December is rich in minor meteor showers. There are the psi Ursae Majorids (339 PSU), for example. Our meteor shower parameters presented in table 3 are based on 1,300 shower meteors. Even though the shower has a rank of four at the peak, but only beyond 20 at the borders of the activity interval, it can be detected remarkably well between December 1 and

16. There is only little scatter in the parameters and the shower has a concise profile with maximum at December 4. The agreement with the MDC values is very good!

Table 3: *Parameters of the psi Ursae Majorids from the MDC Working List and the analysis of the IMO network in 2012.*

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	**Interval [°]**	**Mean [°]**	**Drift [°]**	**Mean [°]**	**Drift [°]**	**Mean [km/s]**	**Drift [km/s]**
MDC	253	-	167.8	-	+44.5	-	61.7	-
IMO 2012	252	249-264	169.0	+1.1	+43.7	-0.5	61.5	-

Not so comfortable is the case of the December alpha Draconids (334 DAD), which is present with 1,400 meteors in our database between December 5 and 18. For several days the shower reaches a rank of eight and there is noticeable scatter in the meteor shower parameters during the full activity interval. Once more, the agreement with the MDC values is excellent (table 4), if the difference in solar longitude is taken into consideration.

Table 4: *Parameters of the December alpha Draconids from the MDC Working List and the analysis of the IMO network in 2012.*

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	**Interval [°]**	**Mean [°]**	**Drift [°]**	**Mean [°]**	**Drift [°]**	**Mean [km/s]**	**Drift [km/s]**
MDC	257	-	207.9	-	+60.6	-	43.1	-
IMO 2012	255	253-266	205.1	+0.8	+60.1	-0.3	42.8	-

Shortly before – between December 2 and 6 – we can detect the December kappa Draconids (336 DKD) in the data set. Our parameters presented in table 5 were derived from 700 meteors. Even though the shower is only active for a short amount of time, it is the second strongest source in the sky at times. There is only little scatter in the meteor shower parameters during the short activity period, and once more there is very good agreement with the parameters given by MDC.

Table 5: *Parameters of the December kappa Draconids from the MDC Working List and the analysis of the IMO network in 2012.*

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	**Interval [°]**	**Mean [°]**	**Drift [°]**	**Mean [°]**	**Drift [°]**	**Mean [km/s]**	**Drift [km/s]**
MDC	250	-	186.0	-	+70.1	-	44.8	-
IMO 2012	251	250-254	185.4	+1.3	+70.4	-0.8	42.9	-

The December Comae Berenicids (20 COM) are detected twice in our data – or maybe we shall better say: We find two meteor showers which resemble the Comae Berenicids.
The first shower is safely detected between December 6 and January 18 with minimal scatter in the shower parameters. The well-shaped, slightly asymmetric activity profile (steeper increase than decrease) shows a maximum between December 17 and 22. Apart from a short break during the Ursids, this shower is the strongest source in the sky from mid to end December. Almost 7,000 meteors from our database were assigned to that shower, whose average parameters are given in table 6.
The other shower is active in parallel between December 25 and January 4. Also this shower reaches a rank of three to four, whereby our shower parameters are based on more than 1,000 meteors. The scatter in the shower parameters is a little larger and the activity profile shows only a minor peak on January 1.
If we compare both showers with the MDC list values we find that none of them matches well to the December Comae Berenicids. The first shower fits from the velocity, but it deviates in the

radiant position by more than ten degrees. The deviation of the second meteor shower is only about five degrees, but therefore the velocity is clearly higher.
A more thorough check reveals that there is one shower missing in the MDC list, which was there in the past: The December Leonis Minorids (32 DLM) were removed, because they are supposed to be the same shower as the Comae Berenicids. Looking at table 6, however, we find that the Leonis Minorids fit much better to our first shower. In fact, if the difference in solar longitude is taken into account, there is perfect agreement in position and velocity. That underlines the finding in our 2009 analysis, that the December Leonis Minorids are the dominating and one and a half months long active meteor shower, whereas the December Comae Berenicids rather fit to the second, less present shower at the end of year.

Table 6: *Parameters of the December Comae Berenidcids and the December Leonis Minorids from the MDC Working List and the analysis of the IMO network in 2012.*

Source	**Solar Longitude**		**Right Ascension**		**Deklination**		**Vinf**	
	Mean [°]	**Interval** [°]	**Mean** [°]	**Drift** [°]	**Mean** [°]	**Drift** [°]	**Mean [km/s]**	**Drift [km/s]**
MDC/DLM	262		156.1		+32.7		63.3	
MDC/COM	274	-	175.2	-	+22.2	-	64.7	-
IMO 2012	269	254-298	162.5	+0.88	+30.0	-0.43	64.1	0
	280	272-283	185.7	+1.3	+11.7	-0.7	70.6	0

The detection of the rho Leonids (442 RLE) in our data is on the borderline. The shower is found between December 5 and 11 with about 600 shower members. At no time it reaches a rank below ten and there is also no clear activity profile. Still, the scatter of the shower parameters is at an acceptable level.
For this shower the deviation of our data from the MDC values (table 7) is such high that we have to ask ourselves whether it is indeed the same meteor shower.

Table 7: *Parameters of the rho Leonids from the MDC Working List and the analysis of the IMO network in 2012.*

Source	**Solar Longitude**		**Right Ascension**		**Deklination**		**Vinf**	
	Mean [°]	**Interval** [°]	**Mean** [°]	**Drift** [°]	**Mean** [°]	**Drift** [°]	**Mean [km/s]**	**Drift [km/s]**
MDC	262	-	155.6	-	+5.2	-	66.5	-
IMO 2012	256	253-259	152.5	+0.1	-5.6	-1.3	68.7	-

Also the Northern and Southern chi Orionids can be found in the IMO video data. The northern branch (256 ORN) is active between December 8 and 15 and with more than 1,200 meteors present in our database. The rank is between seven and eight and the scatter is moderate. The agreement with the MDC values is once more quite good (table 8).

Table 8: *Parameters of the Northern chi Orionids from the MDC Working List and the analysis of the IMO network in 2012.*

Source	**Solar Longitude**		**Right Ascension**		**Deklination**		**Vinf**	
	Mean [°]	**Interval** [°]	**Mean** [°]	**Drift** [°]	**Mean** [°]	**Drift** [°]	**Mean [km/s]**	**Drift [km/s]**
MDC	257	-	83.9	-	+25.5	-	27.3	-
IMO 2012	257	256-263	82.8	+0.8	+25.6	+0.2	26.3	-

Less comfortable is the situation with the southern component (257 ORS), which is detected with about 600 meteors between December 13 and 19. It’s rank stays above ten all the time, and the scatter in the shower parameters is slightly larger. The agreement between our shower parameters and the MDC values is worse (table 9).

Table 9: Parameters of the Southern chi Orionids from the MDC Working List and the analysis of the IMO network in 2012.

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	260	-	78.7	-	+15.7	-	24.2	-
IMO 2012	263	261-267	75.1	-0.2	+18.0	-1.8	21.4	-

Much better is the situation of the December sigma Virginids (428 DSV), which are present in our database with 1,200 meteors between December 17 and 31. Maybe their activity even reaches until the Quadrantids, but these intervals were skipped because of larger scatter.
The sigma Virginids do not show a clear activity profile, but reach a rank of four to five at Christmas time. The parameters of this shower, which are all in good agreement with the MDC values but the velocity, are given in table 10.

Table 10: Parameters of the December sigma Virginids from the MDC Working List and the analysis of the IMO network in 2012.

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	267	-	205.1	-	+5.5	-	66.9	-
IMO 2012	272	265-279	208.7	+0.8	+4.0	-0.2	69.4	-

700 alpha Hydrids (331 AHY) are found in our database between December 22 and January 8. The highest level of activity is reached on January 1with a rank of five. The scatter is moderate. Table 11 shows, that our shower parameters agree well with the MDC list values if the difference if solar longitude is taken into account.

Table 11: Parameters of the alpha Hydrids from the MDC Working List and the analysis of the IMO network in 2012.

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	286	-	127.6	-	-7.9	-	45.0	-
IMO 2012	280	270-288	125.0	+0.7	-7.4	-0.2	44.4	-

Finally also in December a shower with 900 members between December 8 and 24 was declared as unknown. On December 17, at maximum, it reaches a rank of five. Otherwise it is most of the time above ten. Still there is only little scatter in the meteor shower parameters so that is appeared unlikely that the shower was not yet detected before. Indeed, a comparison with the latest shower list yielded the December chi Virginids (335 XVI) that fit well to our data.

Table 12: Parameters of the December chi Virginids from the MDC Working List and the analysis of the IMO network in 2012.

Source	Solar Longitude		Right Ascension		Deklination		Vinf	
	Mean [°]	Interval [°]	Mean [°]	Drift [°]	Mean [°]	Drift [°]	Mean [km/s]	Drift [km/s]
MDC	256.7	-	186.8	+0.2	-7.9	-0.14	68.7	-
IMO 2012	265	256-272	192.8	+0.7	-11.2	-0.3	70.1	-

Let's come to the obligatory review of the year 2012. It was not just ONE successful year, but as in the last few years it was THE most successful year in the history of the IMO Video Meteor Network. 46 observers with an overall of 81 video systems contributed to the network – both figures are almost unchanged from last year (46/80). With 17 resp. 16 video systems, the Hungarian and German observers were most active, followed by Slovenia (12) and Italy (11). Further cameras were operated in Portugal (7), Poland, Spain and Belgium (each 3), the Czech Republic (2) as well as Australia, the Netherlands, Greece, Finland, France and the USA (each 1).

We could record meteors in all 366 nights with a range of 15 to 69 active cameras per night. The camera network did now grow in 2012, but the degree of automation has further increased and also the weather was quite comfortable. Thus, the effective observing time grew to well above 93,000 hours (2011: 69,000). We recorded more than 10,000 meteors in all months, whereby April performed worst with „only" about 13,000 meteors, and August was the highlight of the year with 75,000 meteors. Overall we could record more than 350,000 meteors in 2012 – a plus of 13% compared to the previous year. The average hourly rate was only 3.8 meteors (2011: 4.5) which is clearly below the average of previous years. In fact, only in 2004 the yield was still lower (3.4 meteors per hour).

In general, the weather was fine until summer, with particularly favorable conditions between January and March and in August. In the last quarter, the observing conditions were rather poor.

Table 13: *Monthly distribution of video observations in the IMO camera network in 2011.*

Month	# Observing Nights	Eff. Observing Time	# Meteors	Meteors / Hour
January	31	9,781.7	29,885	3.1
February	29	7,764.7	16,330	2.1
March	31	9,729.6	18,915	2.0
April	30	5,683.7	12,839	2.3
May	31	6,081.4	15,131	2.5
June	30	5,671.5	14,732	2.6
July	31	6,896.9	28,165	4.1
August	31	10,631.2	75,375	7.1
September	30	9,090.7	32,316	3.6
October	31	8,755.2	42,975	4.9
November	30	6,604.6	27,116	4.1
December	31	6,827.8	39,585	5.8
Overall	***366***	***93,519.0***	***353,364***	***3.8***

Many observers obtained the best result of their career. Four observers managed to collect more than 300 observing nights. On top is Antal Igaz of Hungary, who smashed the previous record of 2008 (336 nights) with a total of 346 nights. With a little distance he is followed by Rui Goncalves (Portugal, 328 nights), Sirko Molau (Germany, 323 nights) and Stefano Crivello (Italy, 316 nights). But also below the 300 nights limit the observers are densely packed. In 2005 you would have been on top with 250 nights – in 2012 you are just in midfield with that figure. Looking at the effective observing time we find similar names with slightly different order: Here Rui Goncalves takes the lead with 7,200 hours, followed by Antal Igaz with 6,300 and Carlos Saraiva with 6,100 observing hours. These figures clearly reflect the better observing conditions in the south.
With respect to the number of meteors, there is no deviation from the 2011 order. Just as in 2010 and 2011, Enrico Stomeo is far on top with over 34,000 meteors, followed by Sirko Molau with 29,000 meteors and Stefano Crivello with over 26,000 meteors. At this point, cameras with high sensitivity and yield are dominating.
In the long-term statistics of the IMO network, there were also some jubilees. Some observers managed to get their 1,000th observing night in 2012 (Stefano Crivello, Rui Goncalves, Mihaela Triglav-Cekada, Detlef Koschny und Antal Igaz), and Javor Kac even collected his 2,000th night. With respect to the meteor count, Enrico Stomeo became the second observer ever that collected more than 100,000 meteors, and Sirko Molau jumped the line of 200,000 meteors.

Table 14 summarizes the details for all active observers of the IMO Video Meteor Network in 2012. The number of cameras and stations refers to the majority of the year.

Table 14: *Distribution of video observations over the observers in 2012.*

Observer	Country	# Observing Nights	Eff. Observing Time [h]	# Meteors	Meteors / Hour	Cameras (Sites)
Antal Igaz	Hungary	346	6,355.9	19,508	3.1	4 (3)
Rui Goncalves	Portugal	328	7,206.0	23,394	3.2	3 (1)
Sirko Molau	Germany	323	5,042.0	28,941	5.7	4 (2)
Stefano Crivello	Italy	316	5,286.4	26,286	5.0	3 (1)
Carlos Saraiva	Portugal	296	6,110.5	12,579	2.1	3 (1)
Enrico Stomeo	Italy	294	5,870.1	34,268	5.8	3 (1)
Mitja Govedic	Slovenia	288	4,360.1	14,310	3.3	3 (1)
Bernd Brinkmann	Germany	284	2,539.9	8,019	3.2	2 (2)
Flavio Castellani	Italy	278	2,074.6	7,587	3.7	2 (1)
Mike Otte	USA	277	1,401.7	5,375	3.8	1 (1)
Zsolt Perkó	Hungary	274	1,612.1	10,327	6.4	1 (1)
Rok Pucer	Slovenia	272	1,650.9	6,231	3.8	1 (1)
Maciej Maciejewski	Poland	271	3,238.5	8,250	2.5	3 (1)
Szofia Biro	Hungary	270	1,647.0	4,839	2.9	1 (1)
Karoly Jonas	Hungary	266	1,592.8	3,902	2.4	1 (1)
Szabolcs Kiss	Hungary	265	1,722.4	1,783	1.0	1 (1)
Istvan Tepliczky	Hungary	265	1,703.5	7,411	4.4	1 (1)
Leo Scarpa	Italy	262	1,551.3	4,740	3.1	1 (1)
Detlef Koschny	Netherlands	260	2,077.5	12,213	5.9	2 (2)
Javor Kac	Slovenia	258	5,117.9	20,773	4.1	5 (3)
Jörg Strunk	Germany	254	3,746.4	8,857	2.4	4 (1)
Maurizio Eltri	Italy	253	1,875.8	7,617	4.1	1 (1)
Hans Schremmer	Germany	247	1,325.5	4,078	3.1	1 (1)
Mihaela Triglav	Slovenia	244	972.4	3,610	3.7	1 (1)
József Morvai	Hungary	238	1,436.6	3,759	2.6	1 (1)
Grigoris Maravelias	Greece	237	1,400.9	5,485	3.9	1 (1)
Martin Breukers	Belgium	233	2,142.7	5,594	2.6	2 (1)
Erno Berkó	Hungary	223	3,411.9	16,411	4.8	3 (1)
Steve Kerr	Australia	221	1,500.1	8,788	5.9	1 (1)
Szilárd Csizmadia	Hungary	206	814.4	2,182	2.7	1 (1)
Mario Bombardini	Italy	191	1,108.3	5,402	4.9	1 (1)
Francisco Ocaña González	Spain	174	958.4	1,218	1.3	1 (1)
Eckehard Rothenberg	Germany	171	875.8	1,912	2.2	1 (1)
Paolo Ochner	Italy	159	341.2	1,743	5.1	1 (1)
Arnaud Leroy	France	155	814.6	858	1.1	1 (1)
Ilkka Yrjölä	Finland	139	510.9	2,112	4.1	1 (1)
Stane Slavec	Slovenia	137	441.0	1,277	2.9	1 (1)
Wolfgang Hinz	Germany	121	570.7	4,326	7.6	1 (1)
Rainer Arlt	Germany	68	348.3	413	1.2	1 (1)
Zoltán Zelko	Hungary	53	239.9	559	2.3	1 (1)
Rosta Štork	Czech Rep.	18	191.2	5,112	26.7	2 (2)
Luc Bastiaens	Belgium	17	85.7	69	0.8	1 (1)
Péter Bánfalvi	Hungary	13	97.1	667	6.9	1 (1)
Orlando Benitez-Sanchez	Spain	8	68.0	60	0.9	1 (1)
Ulrich Sperberg	Germany	8	47.6	320	6.7	1 (1)
Gregor Kladnik	Slovenia	5	32.5	199	6.1	1 (1)

There were also some changes in the list of the most successful video systems. The Top-10 is now almost exclusively occupied by cameras from south and southeast European countries. Whereby the best camera in 2011 yielded 277 nights, you had to collect at least 279 nights in 2012 to be among the ten best cameras (table 15)!

Two more cameras with over 10,000 meteors did not make it into the Top-10 list: STG38 (275 nights / 10,651 meteors) and HUBEC (274 nights / 10,327 meteors).

Table 15: *The ten most successful video systems in 2012.*

Camera	Observing Site	Observer	# Observing Nights	Eff. Observing Time [h]	# Meteors	Meteors / Hour
TEMPLAR3	Tomar (PT)	Rui Goncalves	311	2,295.2	5,878	2.6
SCO38	Scorce (IT)	Enrico Stomeo	291	1,996.4	12,596	6.3
BILBO	Valbrevenna (IT)	Stefano Crivello	291	1,928.5	9,193	4.8
RO1	Carnaxide (PT)	Carlos Saraiva	285	2,047.1	4,323	2.1
RO2	Carnaxide (PT)	Carlos Saraiva	284	2,101.6	4,855	2.3
NOA38	Scorce (IT)	Enrico Stomeo	283	1,932.5	9,337	4.8
MIN38	Scorce (IT)	Enrico Stomeo	283	1,941.2	12,335	6.4
HUDEB	Debrecen (HU)	Antal Igaz	282	1,705.4	5,252	3.1
HUBAJ	Budapest (HU)	Antal Igaz	282	1,393.9	4,505	3.2
REMO1	Ketzür (DE)	Sirko Molau	279	1,594,4	11,698	7.3

Finally we would like to thank all observers for their engagement. With a lot of enthusiams they managed to obtain this marvellous result. Special thanks to Stefano Crivello, Enrico Stomeo, Erno Berkó, Antal Igaz, Bernd Brinkmann and Rui Goncalves, who checked and corrected the data month by month together with Sirko Molau and thereby ensured the high quality of the database.

1. Observers

Code	Name	Place	Camera	FOV [^{o2}]	St.LM [mag]	Eff.CA [km^2]	Nights	Time [h]	Meteors
ARLRA	Arlt	Ludwigsfelde/DE	LUDWIG1 (0.8/8)	1488	4.8	726	2	5.9	9
BANPE	Bánfalvi	Zalaegerszeg/HU	HUVCSE01 (0.95/5)	2423	3.4	361	13	97.1	667
BASLU	Bastiaens	Hove/BE	URANIA1 (0.8/3.8)*	4545	2.5	237	2	11.8	24
BERER	Berkó	Ludanyhalaszi/HU	HULUD1 (0.8/3.8)	5542	4.8	3847	12	90.9	1319
			HULUD2 (0.95/4)	3398	3.8	671	12	88.1	388
			HULUD3 (0.95/4)	4357	3.8	876	12	84.5	358
BIRSZ	Biro	Agostyan/HU	HUAGO (0.75/4.5)	2427	4.4	1036	18	137.2	582
BOMMA	Bombardini	Faenza/IT	MARIO (1.2/4.0)	5794	3.3	739	12	59.5	826
BREMA	Breukers	Hengelo/NL	MBB3 (0.75/6)	2399	4.2	699	2	2.9	6
			MBB4 (0.8/8)	1470	5.1	1208	5	28.9	82
BRIBE	Brinkmann	Herne/DE	HERMINE (0.8/6)	2374	4.2	678	15	49.6	130
		Berg. Gladbach/DE	KLEMOI (0.8/6)	2286	4.6	1080	14	46.5	179
CASFL	Castellani	Monte Baldo/IT	BMH2 (1.5/4.5)*	4243	3.0	371	19	215.1	747
CRIST	Crivello	Valbrevenna/IT	BILBO (0.8/3.8)	5458	4.2	1772	24	231.3	1434
			C3P8 (0.8/3.8)	5455	4.2	1586	24	221.7	946
			STG38 (0.8/3.8)	5614	4.4	2007	23	192.8	1521
CSISZ	Csizmadia	Baja/HU	HUVCSE02 (0.95/5)	1606	3.8	390	13	57.9	191
ELTMA	Eltri	Venezia/IT	MET38 (0.8/3.8)	5631	4.3	2151	16	151.6	1126
GONRU	Goncalves	Tomar/PT	TEMPLAR1 (0.8/6)	2179	5.3	1842	17	115.8	434
			TEMPLAR2 (0.8/6)	2080	5.0	1508	18	131.2	466
			TEMPLAR3 (0.8/8)	1438	4.3	571	21	143.6	430
			TEMPLAR4 (0.8/3.8)	4475	3.0	442	16	97.7	324
GOVMI	Govedic	Sredisce ob Dr./SI	ORION2 (0.8/8)	1447	5.5	1841	18	143.5	1103
			ORION3 (0.95/5)	2665	4.9	2069	17	107.9	612
			ORION4 (0.95/5)	2662	4.3	1043	17	112.9	616
IGAAN	Igaz	Baja/HU	HUBAJ (0.8/3.8)	5552	2.8	403	21	102.0	579
		Debrecen/HU	HUDEB (0.8/3.8)	5522	3.2	620	18	72.8	256
		Hodmezovasar./HU	HUHOD (0.8/3.8)	5502	3.4	764	18	92.0	433
		Budapest/HU	HUPOL (1.2/4)	3790	3.3	475	17	80.2	144
JONKA	Jonas	Budapest/HU	HUSOR (0.95/4)	2286	3.9	445	16	101.8	455
KACJA	Kac	Kamnik/SI	CVETKA (0.8/3.8)	4914	4.3	1842	10	65.7	396
		Ljubljana/SI	ORION1 (0.8/8)	1402	3.8	331	8	26.9	24
		Kamnik/SI	REZIKA (0.8/6)	2270	4.4	840	11	77.0	766
			STEFKA (0.8/3.8)	5471	2.8	379	11	57.1	419
KERST	Kerr	Glenlee/AU	GOCAM1 (0.8/3.8)	5189	4.6	2550	9	47.1	368
KISSZ	Kiss	Sulysap/HU	HUSUL (0.95/5)*	4295	3.0	355	14	108.6	166
KOSDE	Koschny	Izana Obs./ES	ICC7 (0.85/25)*	714	5.9	1464	26	212.2	2015
		Noordwijkerhout/NL	LIC4 (1.4/50)*	2027	6.0	4509	16	57.6	221
LERAR	Leroy	Gretz/FR	SAPHIRA (1.2/6)	3260	3.4	301	18	80.6	173
MACMA	Maciejewski	Chelm/PL	PAV35 (1.2/4)	4383	2.5	253	15	84.7	407
			PAV36 (1.2/4)*	5732	2.2	227	17	98.8	674
			PAV43 (0.95/3.75)*	2544	2.7	176	14	102.2	367
MARGR	Maravelias	Lofoupoli/GR	LOOMECON (0.8/12)	738	6.3	2698	18	113.6	577
MOLSI	Molau	Seysdorf/DE	AVIS2 (1.4/50)*	1230	6.9	6152	7	42.5	839
			MINCAM1 (0.8/8)	1477	4.9	1084	20	122.1	544
		Ketzür/DE	REMO1 (0.8/8)	1467	5.9	2837	21	87.7	724
			REMO2 (0.8/8)	1478	6.3	4467	23	94.7	648
			REMO3 (0.8/8)	1420	5.6	1967	16	72.2	206
MORJO	Morvai	Fülöpszallas/HU	HUFUL (1.4/5)	2522	3.5	532	19	123.8	380
OCAFR	Ocana Gonzales	Madrid/ES	FOGCAM (1.4/7)	1890	3.9	109	14	101.7	145
OCHPA	Ochner	Albiano/IT	ALBIANO (1.2/4.5)	2944	3.5	358	19	30.6	209
OTTMI	Otte	Pearl City/US	ORIE1 (1.4/5.7)	3837	3.8	460	13	76.2	605
PERZS	Perkó	Becsehely/HU	HUBEC (0.8/3.8)*	5498	2.9	460	20	151.9	1668
PUCRC	Pucer	Nova vas nad Dra./SI	MOBCAM1 (0.75/6)	2398	5.3	2976	11	60.9	375
ROTEC	Rothenberg	Berlin/DE	ARMEFA (0.8/6)	2366	4.5	911	13	53.7	146
SARAN	Saraiva	Carnaxide/PT	RO1 (0.75/6)	2362	3.7	381	19	133.8	402
			RO2 (0.75/6)	2381	3.8	459	20	159.9	520
			SOFIA (0.8/12)	738	5.3	907	18	154.9	374
SCALE	Scarpa	Alberoni/IT	LEO (1.2/4.5)*	4152	4.5	2052	15	106.7	647
SCHHA	Schremmer	Niederkrüchten/DE	DORAEMON (0.8/3.8)	4900	3.0	409	17	72.9	340
SLAST	Slavec	Ljubljana/SI	KAYAK1 (1.8/28)	563	6.2	1294	4	17.7	32
STOEN	Stomeo	Scorze/IT	MIN38 (0.8/3.8)	5566	4.8	3270	22	177.1	1952
			NOA38 (0.8/3.8)	5609	4.2	1911	22	179.7	1475
			SCO38 (0.8/3.8)	5598	4.8	3306	23	182.7	1982
STORO	Štork	Kunzak/CZ	KUN1 (1.4/50)*	1913	5.4	2778	2	15.7	209
		Ondrejov/CZ	OND1 (1.4/50)*	2195	5.8	4595	2	7.2	47
STRJO	Strunk	Herford/DE	MINCAM2 (0.8/6)	2362	4.6	1152	8	35.4	124
			MINCAM3 (0.8/12)	728	5.7	975	15	61.3	170
			MINCAM5 (0.8/6)	2349	5.0	1896	18	61.7	299
TEPIS	Tepliczky	Budapest/HU	HUMOB (0.8/6)	2388	4.8	1607	20	136.2	920
TRIMI	Triglav	Velenje/SI	SRAKA (0.8/6)*	2222	4.0	546	18	47.9	445
YRJIL	Yrjölä	Kuusankoski/FI	FINEXCAM (0.8/6)	2337	5.5	3574	3	31.0	129
ZELZO	Zelko	Budapest/HU	HUVCSE03 (1.0/4.5)	2224	4.4	933	4	21.2	69
Sum							31	6827.8	39585

* active field of view smaller than video frame

2. Observing Times (h)

December	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	0.6	-	-	-	-	-	-	-	-	-	-	-
BANPE	-	-	1.0	-	0.5	-	-	-	5.7	7.0	12.0	11.4	11.5	5.0	-
BASLU	-	-	-	-	-	-	-	-	-	-	-	6.9	-	4.9	-
BERER	-	-	12.1	-	-	7.1	5.3	5.0	6.3	-	5.5	13.6	2.0	-	-
	-	-	12.6	-	-	8.6	6.3	4.3	8.6	-	5.2	13.7	2.0	-	-
	-	-	12.0	-	-	8.6	5.1	4.6	8.3	-	8.4	13.7	1.6	-	-
BIRSZ	4.4	-	9.5	-	-	-	-	-	5.3	1.2	6.9	9.1	11.3	6.2	-
BOMMA	-	-	4.3	4.3	6.2	6.0	-	-	7.2	-	7.4	10.3	-	-	3.4
BREMA	-	1.3	1.6	-	-	-	-	-	-	-	-	-	-	-	-
	-	2.0	7.4	-	4.5	2.3	12.7	-	-	-	-	-	-	-	-
BRIBE	-	0.2	4.8	1.1	3.4	3.2	10.4	4.0	0.8	-	0.2	5.3	-	1.2	-
	0.6	-	-	-	-	3.0	9.3	4.7	-	-	2.0	9.6	1.5	-	2.3
CASFL	-	10.1	11.1	12.1	12.8	11.8	-	12.9	12.9	12.9	12.9	-	-	-	12.7
CRIST	-	13.0	6.5	11.5	12.7	5.7	-	13.1	3.0	13.2	13.2	2.1	-	-	4.4
	2.4	12.9	5.5	11.7	13.1	5.0	9.7	13.1	1.3	13.2	13.2	1.6	-	-	-
	-	9.2	2.9	8.7	8.4	2.9	-	12.1	3.2	13.2	13.2	2.1	-	-	-
CSISZ	-	-	4.4	-	3.5	1.6	-	-	5.0	4.8	5.1	9.9	1.7	3.4	-
ELTMA	-	4.7	9.4	9.4	7.3	12.4	-	9.5	13.0	10.7	9.3	11.1	0.3	-	-
GONRU	11.7	11.2	-	7.9	-	-	0.5	8.8	8.0	12.5	10.7	1.1	-	-	-
	11.8	11.4	-	6.9	-	-	1.2	8.2	8.6	11.8	9.6	-	1.0	-	-
	12.7	12.7	-	9.5	-	-	4.6	12.3	5.7	12.8	6.6	1.2	-	-	1.0
	11.9	11.1	-	8.0	-	-	-	2.8	6.6	8.6	-	-	0.2	-	-
GOVMI	-	0.9	7.2	-	7.4	3.8	-	6.0	10.7	11.4	8.9	13.6	13.2	3.7	0.9
	-	0.2	4.6	-	3.1	2.2	-	2.0	7.8	-	5.8	13.3	13.4	3.4	1.2
	-	-	6.7	-	-	1.0	-	5.3	10.0	11.4	7.9	12.7	12.5	5.1	0.9
IGAAN	0.2	0.8	9.9	-	3.3	2.3	1.5	-	8.6	6.3	5.9	12.8	2.5	4.3	2.0
	2.5	-	4.1	-	-	0.6	10.9	-	9.6	0.6	-	0.5	2.6	-	-
	1.9	-	6.0	-	4.5	5.1	4.3	-	8.3	7.5	-	7.8	0.2	3.7	-
	4.0	0.2	10.0	-	4.6	3.6	1.9	0.7	6.1	-	6.5	12.9	-	0.4	-
JONKA	3.1	-	11.1	-	12.7	5.7	1.4	-	6.5	2.4	5.4	13.6	-	0.5	-
KACJA	-	-	3.4	-	-	1.0	-	5.0	13.1	11.2	7.6	-	-	-	-
	-	-	-	-	-	0.3	-	-	-	0.7	-	-	0.2	-	-
	-	-	3.8	-	-	0.5	-	5.0	13.2	10.9	8.6	0.5	-	-	-
	-	-	2.3	-	-	1.0	-	4.7	9.6	10.0	6.9	0.4	-	-	-
KERST	6.9	7.0	2.7	2.2	5.6	5.7	6.0	6.1	4.9	-	-	-	-	-	-
KISSZ	2.9	-	11.5	-	10.6	6.3	-	-	8.3	-	0.2	13.6	1.3	-	-
KOSDE	-	-	11.0	11.9	-	-	7.9	9.7	11.8	-	11.4	3.9	11.9	11.9	11.9
	1.6	3.5	4.3	0.6	4.9	-	6.1	-	4.5	8.8	3.5	4.1	-	4.7	-
LERAR	2.0	0.3	0.9	-	9.3	-	-	7.3	1.3	1.1	13.4	12.5	1.5	1.2	5.2
MACMA	8.3	-	-	-	6.4	7.6	-	-	0.3	-	-	-	11.4	-	-
	8.1	-	-	-	6.4	6.0	1.8	-	-	-	-	0.2	13.7	0.2	-
	9.1	-	-	-	6.4	5.3	1.1	-	-	-	-	-	13.8	-	-
MARGR	6.6	1.4	8.7	7.6	10.0	9.9	10.5	2.7	-	6.6	-	11.4	-	1.7	7.5
MOLSI	-	-	-	-	-	8.3	5.6	12.4	-	-	3.6	10.4	0.9	-	-
	2.4	-	-	1.0	-	10.6	5.0	12.0	-	-	3.7	12.8	3.2	-	3.1
	0.7	-	1.6	1.4	9.2	13.7	13.9	-	0.7	3.4	2.4	0.9	8.5	0.7	1.7
	0.6	-	2.3	1.8	10.1	13.9	14.0	0.4	1.0	3.8	3.2	0.9	8.3	0.9	3.3
	1.0	-	2.7	-	9.3	-	14.0	-	0.5	1.7	3.0	0.4	7.9	-	2.4
MORJO	-	1.1	12.6	-	9.9	6.5	6.0	-	8.5	5.8	5.1	10.5	0.6	4.0	-
OCAFR	-	-	-	-	-	-	-	-	11.5	11.6	11.4	5.5	-	-	1.2
OCHPA	-	1.0	1.9	0.2	-	-	-	2.8	0.6	5.7	-	-	-	-	0.1
OTTMI	-	-	-	7.5	0.3	-	-	-	-	6.0	5.7	10.7	8.1	-	-
PERZS	-	0.9	7.4	-	4.9	3.2	0.2	0.6	8.4	9.7	10.4	13.5	12.3	8.0	6.0
PUCRC	-	3.4	10.4	3.8	0.5	9.0	-	-	-	-	-	1.3	0.4	-	-
ROTEC	-	-	-	-	8.0	3.2	6.4	0.3	-	-	-	-	3.3	-	1.7
SARAN	12.0	8.7	1.3	-	-	-	12.5	12.4	5.6	12.5	8.6	3.4	-	-	-
	12.6	9.5	2.6	-	-	-	12.5	11.8	5.4	12.6	9.5	3.4	-	-	-
	12.5	8.7	11.4	-	-	-	11.5	12.1	4.1	12.1	8.2	3.3	-	-	-
SCALE	-	4.9	8.9	-	4.2	10.1	-	-	11.2	10.0	4.6	13.2	0.3	-	-
SCHHA	-	3.3	5.7	-	4.5	5.5	-	4.7	5.8	1.0	5.6	9.5	0.3	6.1	0.7
SLAST	-	-	2.7	-	-	-	-	-	5.1	4.6	5.3	-	-	-	-
STOEN	0.2	10.9	9.0	8.7	6.7	13.1	-	8.3	13.5	11.7	9.9	12.3	-	-	-
	0.2	12.0	8.9	9.1	7.2	13.3	-	9.4	13.7	11.8	9.9	12.1	-	-	-
	0.2	11.3	8.5	9.3	6.5	12.9	-	8.6	13.0	11.6	10.5	12.3	-	-	-
STORO	-	-	-	-	-	-	-	-	-	-	-	-	7.5	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	4.6	-	-
STRJO	-	1.9	-	-	-	8.0	12.1	-	0.5	-	-	-	6.0	-	0.6
	-	2.9	-	-	0.3	9.1	12.6	1.2	-	-	1.1	4.9	4.8	1.7	0.7
	-	2.5	0.7	0.2	3.5	8.7	12.5	0.7	0.5	-	1.4	4.8	6.7	1.7	-
TEPIS	5.4	-	9.2	-	5.6	9.3	6.5	5.7	5.3	2.4	5.7	9.1	13.0	6.2	-
TRIMI	-	1.2	2.8	-	3.0	2.5	-	-	-	-	3.6	10.8	5.6	-	3.8
YRJIL	-	11.7	-	-	-	-	-	-	-	-	-	-	-	-	-
ZELZO	2.2	-	5.3	-	10.1	-	-	-	-	-	3.6	-	-	-	-
Sum	162.7	210.0	329.2	157.0	271.4	307.0	263.8	273.3	359.0	348.8	369.4	422.5	233.6	90.8	78.7

December	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ARLRA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.3	-
BANPE	-	-	-	-	-	-	-	-	4.7	-	-	-	12.6	10.1	6.0	9.6
BASLU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BERER	-	-	-	-	-	-	-	-	-	-	-	-	11.2	9.1	8.3	5.4
	-	-	-	-	-	-	-	-	-	-	-	-	11.0	4.0	6.5	5.3
	-	-	-	-	-	-	-	-	-	-	-	-	6.5	3.8	6.6	5.3
BIRSZ	4.5	-	-	-	6.8	6.5	-	-	8.9	-	4.9	3.6	13.0	13.4	8.3	13.4
BOMMA	-	-	2.1	7.3	-	0.6	-	0.4	-	-	-	-	-	-	-	-
BREMA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRIBE	-	-	-	8.6	-	-	-	-	-	2.6	-	-	-	1.9	1.9	-
	0.4	-	-	8.5	-	-	-	-	-	-	1.1	0.6	-	1.1	1.8	-
CASFL	7.1	8.0	10.2	13.0	-	-	-	4.9	-	-	-	-	13.0	12.6	11.1	13.0
CRIST	10.9	11.1	13.2	13.0	-	9.1	1.9	4.2	-	-	11.9	6.4	11.9	13.2	13.2	12.9
	3.4	11.6	13.2	12.5	-	11.2	1.8	-	-	-	8.2	9.3	13.2	13.2	12.6	8.8
	0.2	10.3	13.2	13.0	-	9.0	5.5	6.2	-	-	8.3	6.2	10.4	13.2	8.2	13.2
CSISZ	-	0.7	-	-	-	-	-	-	6.2	-	-	-	-	4.1	7.5	-
ELTMA	-	8.5	6.7	-	-	-	-	-	-	-	-	-	-	13.5	13.0	12.8
GONRU	2.9	-	-	-	-	1.6	8.7	-	-	4.6	9.6	3.5	4.8	7.7	-	-
	4.3	-	-	-	3.8	-	8.8	3.0	-	11.3	12.7	4.2	5.1	7.5	-	-
	2.6	-	0.2	2.1	-	-	9.6	-	2.4	11.9	12.4	8.7	4.6	7.4	-	2.6
	2.6	-	-	-	2.2	1.0	5.3	-	-	10.0	11.5	4.8	4.4	6.7	-	-
GOVMI	-	-	-	-	6.2	-	-	-	6.2	-	4.4	-	13.6	13.4	-	12.0
	-	-	-	-	2.6	-	-	-	7.7	-	2.9	-	13.4	13.3	-	11.0
	-	-	-	-	3.7	-	-	-	8.0	-	0.3	-	12.3	12.7	1.1	1.3
IGAAN	-	2.8	-	0.2	-	-	-	-	13.2	0.8	1.6	1.3	-	9.9	11.8	-
	-	1.2	2.9	4.4	8.1	-	-	-	4.9	-	1.7	3.5	6.6	3.2	4.9	-
	-	2.0	-	-	7.3	-	-	-	11.1	1.0	0.9	-	8.5	11.2	0.7	-
	-	-	-	0.4	-	-	-	-	-	-	5.2	2.9	9.5	4.4	6.9	-
JONKA	-	-	-	2.1	6.7	-	-	-	-	-	4.6	-	8.9	12.2	4.9	-
KACJA	-	-	1.8	7.0	-	-	-	-	-	-	-	-	10.0	5.6	-	-
	-	-	-	4.5	-	-	-	-	-	-	3.2	0.2	12.9	4.9	-	-
	-	-	2.0	13.7	-	-	-	-	-	-	-	-	10.8	8.0	-	-
	-	-	2.7	5.5	-	-	-	-	-	-	-	-	5.5	8.5	-	-
KERST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KISSZ	-	-	-	-	12.0	-	-	-	-	-	4.8	6.0	8.4	11.9	10.8	-
KOSDE	11.9	11.9	9.9	6.3	7.9	5.1	6.9	4.7	3.1	6.4	0.9	5.8	2.6	7.5	8.5	9.5
	3.6	-	-	1.8	-	-	-	-	-	1.5	1.7	-	-	2.4	-	-
LERAR	3.7	7.2	-	-	-	0.3	-	3.8	-	5.1	-	-	-	-	4.5	-
MACMA	-	-	-	0.3	1.2	-	3.1	-	-	2.5	1.9	0.3	13.7	8.1	6.7	12.9
	-	-	-	0.7	4.9	-	8.4	-	-	2.7	2.1	1.6	13.7	8.3	7.1	12.9
	-	-	-	-	5.8	-	8.6	-	-	3.8	2.4	2.3	14.4	8.3	8.1	12.8
MARGR	-	1.5	6.3	-	-	-	-	-	-	6.6	5.1	-	-	3.7	5.8	-
MOLSI	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.2	2.0	2.9	-	-	-	-	5.9	6.1	0.3	6.0	-	3.6	10.9	13.7	13.7
	1.2	-	-	-	-	-	-	-	1.2	5.8	2.9	6.9	-	2.0	4.4	4.5
	2.1	-	-	-	-	-	-	-	1.7	5.1	3.3	3.5	3.2	2.4	4.5	4.4
	-	-	-	-	-	-	-	-	2.1	4.8	3.8	9.5	-	-	4.6	4.5
MORJO	-	-	-	2.4	6.7	-	-	-	11.2	-	2.5	4.1	8.6	13.6	-	4.1
OCAFR	-	7.5	-	-	-	5.3	-	8.5	0.4	5.4	11.2	6.1	9.8	6.3	-	-
OCHPA	-	0.7	2.6	3.2	0.2	1.9	1.2	-	-	-	0.5	0.6	2.0	1.1	2.4	1.9
OTTMI	-	0.4	-	-	-	-	13.2	-	7.7	-	2.1	-	-	5.8	3.5	5.2
PERZS	-	-	-	-	10.1	-	-	-	7.2	-	5.4	-	11.1	11.6	11.2	9.8
PUCRC	-	7.6	11.7	12.3	-	-	0.5	-	-	-	-	-	-	-	-	-
ROTEC	3.3	-	-	-	-	-	-	-	-	4.8	2.6	5.1	-	4.9	3.8	6.3
SARAN	-	1.9	4.9	1.9	-	-	7.8	-	-	8.4	9.7	9.1	-	10.4	1.6	1.1
	-	-	5.5	3.4	3.6	1.3	10.4	-	-	11.3	12.8	12.8	-	12.1	1.7	5.1
	-	-	2.0	3.3	-	1.2	10.5	-	-	11.5	12.6	12.6	-	12.6	-	4.7
SCALE	-	3.3	-	-	-	-	-	-	0.2	-	-	-	3.8	13.2	12.4	6.4
SCHHA	-	4.8	-	10.5	-	0.3	-	-	-	3.1	-	-	-	-	-	-
SLAST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STOEN	-	7.3	7.6	3.9	-	4.2	-	2.4	-	-	0.7	0.4	7.7	13.2	11.9	13.5
	-	7.9	8.4	4.2	-	3.2	0.2	2.2	-	-	0.5	-	6.8	13.7	11.8	13.2
	-	7.6	7.5	5.2	-	5.5	0.4	3.6	-	-	1.3	0.3	7.8	13.4	12.3	13.1
STORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.2
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6
STRJO	-	-	-	5.1	-	-	-	-	-	-	-	-	-	-	1.2	-
	-	-	-	8.0	-	-	-	-	-	-	0.5	8.0	-	4.4	1.1	-
	-	-	-	6.4	-	-	-	-	-	0.3	0.6	7.0	-	2.9	0.6	-
TEPIS	-	-	-	-	4.6	3.4	-	-	10.0	-	3.5	2.6	-	6.7	8.7	13.3
TRIMI	1.3	0.3	-	5.3	-	0.6	-	-	3.2	-	0.7	0.5	1.0	1.0	-	0.7
YRJIL	-	-	-	-	-	10.5	8.8	-	-	-	-	-	-	-	-	-
ZELZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum	70.5	128.1	137.5	200.0	104.4	81.8	121.6	49.8	127.4	131.6	207.5	160.3	351.9	462.2	303.5	311.0

3. Results (Meteors)

December	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ARLRA	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
BANPE	-	-	2	-	1	-	-	-	21	48	57	162	281	13	-
BASLU	-	-	-	-	-	-	-	-	-	-	-	15	-	9	-
BERER	-	-	127	-	-	121	49	34	57	-	41	691	11	-	-
	-	-	26	-	-	35	14	6	20	-	17	202	7	-	-
	-	-	27	-	-	33	13	4	16	-	8	219	4	-	-
BIRSZ	7	-	21	-	-	-	-	-	5	3	47	84	203	21	-
BOMMA	-	-	37	42	56	57	-	-	75	-	100	320	-	-	27
BREMA	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-
	-	3	22	-	6	2	49	-	-	-	-	-	-	-	-
BRIBE	-	1	8	1	6	11	36	4	3	-	1	23	-	6	-
	1	-	-	-	-	5	28	3	-	-	9	88	4	-	3
CASFL	-	45	30	35	46	25	-	47	46	85	117	-	-	-	27
CRIST	-	92	18	74	69	5	-	126	5	160	246	3	-	-	8
	8	69	5	65	64	6	20	73	2	99	164	2	-	-	-
	-	94	22	84	89	15	-	132	11	174	223	1	-	-	-
CSISZ	-	-	15	-	3	1	-	-	8	7	24	65	20	6	-
ELTMA	-	55	38	39	43	70	-	91	64	147	87	305	2	-	-
GONRU	48	42	-	12	-	-	1	33	36	84	53	3	-	-	-
	62	44	-	18	-	-	1	38	42	75	50	-	3	-	-
	53	46	-	16	-	-	7	43	23	80	43	1	-	-	3
	66	44	-	18	-	-	-	14	44	48	-	-	1	-	-
GOVMI	-	1	25	-	19	25	-	27	59	83	59	324	315	10	4
	-	1	13	-	1	10	-	6	32	-	31	193	229	3	3
	-	-	18	-	-	2	-	13	42	45	33	97	265	12	2
IGAAN	1	4	32	-	7	6	2	-	33	25	73	281	34	17	1
	20	-	13	-	-	1	40	-	58	3	-	1	15	-	-
	1	-	28	-	6	15	4	-	37	25	-	195	1	11	-
	1	1	8	-	1	2	2	2	2	-	16	75	-	1	-
JONKA	3	-	24	-	40	18	1	-	10	7	23	209	-	2	-
KACJA	-	-	5	-	-	5	-	86	136	45	51	-	-	-	-
	-	-	-	-	-	1	-	-	-	2	-	-	1	-	-
	-	-	16	-	-	1	-	76	173	130	111	1	-	-	-
	-	-	2	-	-	3	-	81	118	55	78	1	-	-	-
KERST	60	67	21	20	40	36	47	41	36	-	-	-	-	-	-
KISSZ	3	-	17	-	10	6	-	-	6	-	1	84	2	-	-
KOSDE	-	-	98	123	-	-	44	58	116	-	222	64	255	97	97
	2	7	12	2	21	-	12	-	12	59	9	38	-	18	-
LERAR	8	1	2	-	8	-	-	9	8	3	47	51	16	5	3
MACMA	21	-	-	-	20	6	-	-	1	-	-	-	264	-	-
	36	-	-	-	26	18	3	-	-	-	-	1	454	1	-
	14	-	-	-	7	8	3	-	-	-	-	-	232	-	-
MARGR	18	4	21	20	51	36	44	10	-	59	-	205	-	5	11
MOLSI	-	-	-	-	-	125	54	150	-	-	67	439	1	-	-
	13	-	-	3	-	42	13	41	-	-	26	242	19	-	9
	3	-	6	5	42	132	180	-	3	10	48	11	139	3	13
	3	-	13	4	43	123	170	1	6	14	50	6	135	1	17
	2	-	4	-	12	-	54	-	1	1	15	4	81	-	2
MORJO	-	2	34	-	23	9	4	-	16	9	30	156	1	11	-
OCAFR	-	-	-	-	-	-	-	-	7	24	23	30	-	-	3
OCHPA	-	6	11	1	-	-	-	20	5	40	-	-	-	-	1
OTTMI	-	-	-	43	1	-	-	-	-	59	73	191	103	-	-
PERZS	-	6	34	-	15	24	1	4	59	127	143	556	377	38	68
PUCRC	-	40	52	28	2	46	-	-	-	-	-	34	11	-	-
ROTEC	-	-	-	-	19	9	15	2	-	-	-	-	46	-	7
SARAN	39	29	8	-	-	-	43	30	26	42	36	29	-	-	-
	41	48	5	-	-	-	48	46	20	67	46	37	-	-	-
	35	25	13	-	-	-	42	23	10	38	25	24	-	-	-
SCALE	-	22	19	-	29	37	-	-	28	80	42	314	2	-	-
SCHHA	-	25	18	-	18	7	-	17	16	6	41	104	2	35	1
SLAST	-	-	5	-	-	-	-	-	4	13	10	-	-	-	-
STOEN	1	108	53	54	59	126	-	107	129	217	221	496	-	-	-
	1	65	31	46	43	89	-	87	110	149	140	403	-	-	-
	1	109	53	63	59	114	-	122	159	190	226	460	-	-	-
STORO	-	-	-	-	-	-	-	-	-	-	-	-	150	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	39	-	-
STRJO	-	3	-	-	-	11	37	-	2	-	-	-	54	-	2
	-	9	-	-	1	20	42	1	-	-	3	27	30	1	2
	-	17	1	1	7	22	64	1	2	-	4	51	62	6	-
TEPIS	5	-	39	-	14	34	11	25	16	9	66	141	364	34	-
TRIMI	-	9	23	-	20	21	-	-	-	-	37	140	62	-	29
YRJIL	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-
ZELZO	1	-	18	-	26	-	-	-	-	-	24	-	-	-	-
Sum	578	1186	1197	818	1073	1576	1198	1734	1976	2646	3437	7899	4297	366	343

December	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ARLRA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-
BANPE	-	-	-	-	-	-	-	-	7	-	-	-	28	23	9	15
BASLU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BERER	-	-	-	-	-	-	-	-	-	-	-	-	68	53	64	3
	-	-	-	-	-	-	-	-	-	-	-	-	23	10	26	2
	-	-	-	-	-	-	-	-	-	-	-	-	10	5	18	1
BIRSZ	9	-	-	-	13	15	-	-	21	-	19	4	26	35	24	25
BOMMA	-	-	21	83	-	5	-	3	-	-	-	-	-	-	-	-
BREMA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRIBE	-	-	-	22	-	-	-	-	-	3	-	-	-	4	1	-
	1	-	-	28	-	-	-	-	-	-	2	1	-	3	3	-
CASFL	9	33	41	45	-	-	-	12	-	-	-	-	23	32	24	25
CRIST	37	74	98	47	-	87	7	2	-	-	38	53	49	46	39	51
	6	41	61	38	-	56	5	-	-	-	10	52	31	26	33	10
	1	80	95	60	-	89	13	10	-	-	45	77	51	60	54	41
CSISZ	-	2	-	-	-	-	-	-	8	-	-	-	-	11	21	-
ELTMA	-	11	50	-	-	-	-	-	-	-	-	-	-	50	29	45
GONRU	10	-	-	-	-	1	34	-	-	15	40	1	9	12	-	-
	10	-	-	-	5	-	49	1	-	21	27	7	6	7	-	-
	2	-	1	5	-	-	23	-	7	25	27	10	1	5	-	9
	10	-	-	-	2	3	19	-	-	21	16	4	6	8	-	-
GOVMI	-	-	-	-	9	-	-	-	30	-	22	-	48	27	-	16
	-	-	-	-	6	-	-	-	15	-	5	-	28	25	-	11
	-	-	-	-	6	-	-	-	14	-	2	-	36	22	2	5
IGAAN	-	6	-	1	-	-	-	-	28	1	5	2	-	9	11	-
	-	1	6	4	24	-	-	-	13	-	4	14	30	8	1	-
	-	5	-	-	11	-	-	-	21	2	6	-	36	28	1	-
	-	-	-	1	-	-	-	-	-	-	10	2	4	12	4	-
JONKA	-	-	-	10	29	-	-	-	-	-	15	-	39	18	7	-
KACJA	-	-	3	15	-	-	-	-	-	-	-	-	31	19	-	-
	-	-	-	1	-	-	-	-	-	-	2	1	15	1	-	-
	-	-	6	135	-	-	-	-	-	-	-	-	87	30	-	-
	-	-	5	20	-	-	-	-	-	-	-	-	25	31	-	-
KERST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KISSZ	-	-	-	-	9	-	-	-	-	-	2	2	11	7	6	-
KOSDE	89	119	97	38	59	31	73	32	44	60	20	26	9	45	41	58
	7	-	-	3	-	-	-	-	-	6	3	-	-	10	-	-
LERAR	3	3	-	-	-	1	-	2	-	2	-	-	-	-	1	-
MACMA	-	-	-	2	2	-	8	-	-	7	8	2	21	14	16	15
	-	-	-	4	1	-	15	-	-	8	9	4	31	22	13	28
	-	-	-	-	6	-	10	-	-	7	5	4	24	11	14	22
MARGR	-	13	18	-	-	-	-	-	-	32	2	-	-	17	11	-
MOLSI	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	1	2	-	-	-	-	13	4	1	8	-	2	22	47	24
	3	-	-	-	-	-	-	-	6	35	8	51	-	5	17	4
	5	-	-	-	-	-	-	-	5	11	5	3	2	3	19	9
	-	-	-	-	-	-	-	-	2	3	5	12	-	-	5	3
MORJO	-	-	-	1	8	-	-	-	15	-	4	8	23	25	-	1
OCAFR	-	4	-	-	-	8	-	5	2	12	11	4	8	4	-	-
OCHPA	-	5	19	24	1	13	8	-	-	-	3	4	12	7	16	13
OTTMI	-	2	-	-	-	-	38	-	28	-	11	-	-	29	9	18
PERZS	-	-	-	-	27	-	-	-	39	-	32	-	30	39	38	11
PUCRC	-	38	61	59	-	-	4	-	-	-	-	-	-	-	-	-
ROTEC	11	-	-	-	-	-	-	-	-	5	2	17	-	4	5	4
SARAN	-	1	7	7	-	-	25	-	-	19	20	11	-	21	3	6
	-	-	9	2	14	1	24	-	-	19	31	21	-	19	1	21
	-	-	3	10	-	3	23	-	-	19	36	24	-	17	-	4
SCALE	-	2	-	-	-	-	-	-	1	-	-	-	14	24	26	7
SCHHA	-	21	-	21	-	2	-	-	-	4	-	-	-	-	-	-
SLAST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STOEN	-	18	61	17	-	24	-	9	-	-	7	2	56	65	57	65
	-	18	75	21	-	19	1	5	-	-	1	-	29	40	47	55
	-	19	66	25	-	23	1	14	-	-	10	1	55	69	68	75
STORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	59
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
STRJO	-	-	-	13	-	-	-	-	-	-	-	-	-	-	2	-
	-	-	-	15	-	-	-	-	-	-	2	11	-	5	1	-
	-	-	-	18	-	-	-	-	-	1	1	33	-	7	1	-
TEPIS	-	-	-	-	7	10	-	-	15	-	24	7	-	29	26	44
TRIMI	9	3	-	43	-	3	-	-	20	-	4	3	6	7	-	6
YRJIL	-	-	-	-	-	49	40	-	-	-	-	-	-	-	-	-
ZELZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum	226	520	805	838	239	443	420	108	345	339	569	478	1043	1187	869	819