e-Zine for meteor observers meteornews.org

MeteorNews

ISSN 2570-4745 VOL 2 / ISSUE 4 / NOVEMBER 2017

Capricornid fireball on July 30, at 22:33 UT
Photo taken with a Nikon D3100, with a Samyang 16mm F2.0 lens, with ISO 1600 settings
Exposure time was 20 seconds. Author: Kai Gaarder

- Tau Herculids in 2017
- Delta Aquariids 2017
- Perseids 2017
- SonotaCo network and CAMS
- Radio observation reports
- October Meteor Showers

Contents

Slow Meteors
Martin Dubs, Stefano Sposetti, Roger Spinner and Beat Booz 97

Tau Herculids in 2017 observed by CAMS
Carl Johannink, Jaap van 't Leven and Koen Miskotte 102

SonotaCo network and CAMS
Masahiro Koseki 105

The new method of estimating the ZHR using radio meteor observations
Hirofumi Sugimoto 109

A new meteorite fell in the region of Igdi (Tata, Morocco)
Abderrahmane Ibhi, Fouad Khiri and Lahcen Ouknine 111

CAMS BeNeLux results April – June 2017
Carl Johannink 112

2017 Southern Delta Aquariids from Morocco
Kai Gaarder 115

Visual observations from California July 2017
Robert Lunsford 117

2017 South delta Aquariid and alpha Capricornid observations from North Florida
Paul Jones 120

The Southern Delta Aquariids and Capricornids observed from Crete
Koen Miskotte 123

August 12/13, 2017 Perseid observations from Matanzas Inlet, Florida – impressive!!
Paul Jones 129

Perseids 2017: partly clear 12-13 August night for CAMS BeNeLux
Paul Roggemans 130

Perseid maximum from the Netherlands
Koen Miskotte 133

Early Aurigid observations from Norway
Kai Gaarder 135

A look at 14-15-16 October showers through CAMS
Paul Roggemans 136

2017 Orionid observations from North Florida
Paul Jones 138

October Meteor Observations from Southern California
Robert Lunsford 140

Radio Meteor Observation in the world: Monthly Report for June and July 2017
Hiroshi Ogawa 142

Radio Meteor Observation in the World: Monthly Report for August 2017
Hiroshi Ogawa 144

Fireball events
José María Madiedo 146

Slow Meteors

Martin Dubs, Stefano Sposetti, Roger Spinner and Beat Booz

FMA, Fachgruppe Meteorastronomie, Switzerland
martin-dubs@bluewin.ch, stefanosposetti@ticino.com,
roger.spinner@ogvt.org, bbooz@bluewin.ch

Slow meteors are studied with video observations and spectroscopy. A comparison of their orbits and spectra points to a common origin. Although they do not belong to some meteor stream, they deserve to be studied in more detail. The present paper tries to make a first attempt to characterize the common properties of this class of meteors.

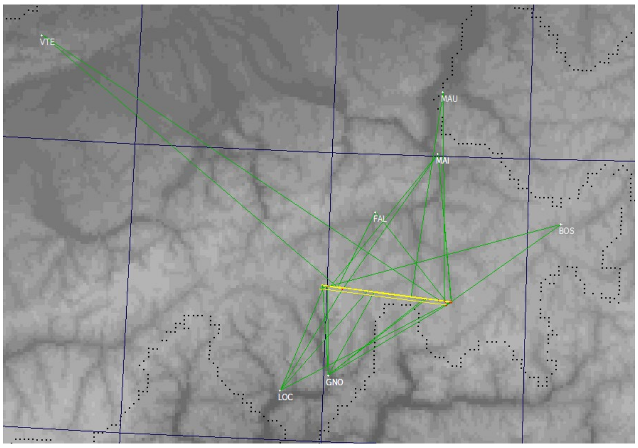
1 Introduction

In a previous paper (Dubs et al., 2017) we studied two slow meteors with very similar orbits. Having some more observations of slow meteors with a similar spectrum we started looking more closely for slow meteors. As our meteor group has been collecting data for over two years we searched our database of video meteor observations for similar meteors. Using the velocity v_g (geocentric velocity corrected for Earth gravitation) as a selection criterion we found a sufficient number in our database for a study of their properties. A connection of these meteors with near Earth asteroids belonging to the Apollo family is postulated.

2 Two case studies

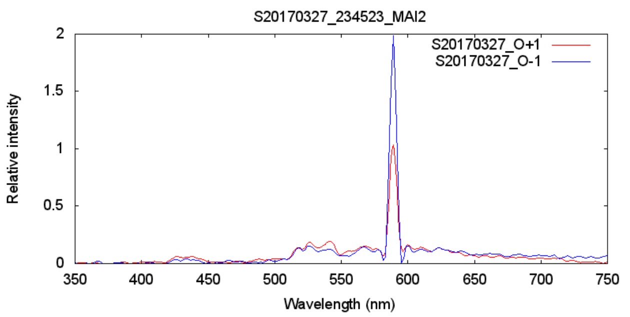
M20170327_234523

This meteor was recorded by 12 cameras at 8 stations of the FMA meteor network. Data from 7 stations were used for the trajectory (*Figure 1*).



The velocities v_0 calculated by UFO Orbit for the different observers were between 11.0 and 12.8 km/s with an average velocity of 12.56 km/s, resulting in a geocentric velocity v_g of 6.25 km/s after correction for terrestrial gravitation. An independent calculation by Beat Booz, including detailed analysis of the deceleration of the meteor gave slightly higher values for the meteor velocity (v_0 = 13.8 km/s and v_g = 8.56 km/s)[1]. These calculations also resulted in the meteoroid orbit elements (see *Table 1*).

The meteor crossed the field of view of a spectroscopic video camera at one station (Maienfeld, Watec 902H2 ultimate, f = 8mm, F/0.95, grating 600 L/mm, *Figure 2*).



The video spectrum was extracted and analyzed as described in (Dubs and Maeda, 2016). After linearization, stacking and calibration both the first order and the

[1] Further details on the calculation, images and videos of the meteor can be found on our website at http://www.meteorastronomie.ch/detaildatafk.php?id=80.

negative first order (on the left of the zero order) could be extracted (see *Figure 3*).

The saturation of the strongest line (Na I) is visible in the first order spectrum (much lower intensity than the corresponding line in the –1st order). The Mg- and Fe-lines (only partially resolved) are weak, similar to the spectrum of M20170102_015202, which was reported earlier (Dubs et al., 2017).

M20160809_001015

This meteor was found while looking through the database for slow meteors with long duration. It was observed by four stations with a total of 7 cameras, and a precise determination of the flight path was possible. Maximum observed duration was 10.5 s, with a small entrance angle into the atmosphere (*Figure 4*).

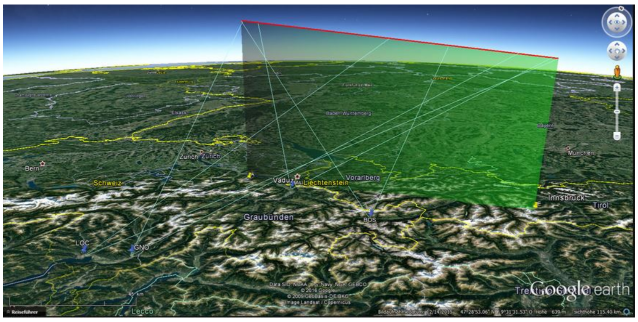


Figure 4 – Observed trajectory of M20160809_001015, 3-D visualization in Google Earth.

The velocities v_0 calculated by UFO Orbit for the different observers were between 12.1 and 14.5 km/s with an average velocity of 13.59 km/s, resulting in a geocentric velocity v_g of 8.28 km/s after correction for terrestrial gravitation. The calculation of Beat Booz gave similar results (v_0 = 13.32 km/s, v_g = 7.91 km/s, no deceleration determined).

Figure 5 – Peak image of M20160809_001015, recorded at Maienfeld.

The orbit calculation by Beat Booz shows that the meteoroid passed close to Mars, with a minimum distance of 0.0199AU before arriving at the Earth. The minimum distance is not very precisely calculated, small errors in the velocity or radiant direction may change the orbit significantly, but one may speculate about a connection. For a significant change of the meteoroid orbit by the gravitation of Mars the calculated distance was too large[2].

Unfortunately, the meteor was outside the field of view of all spectral cameras, therefore no spectrum is available for this meteor and no hint about the chemical properties of the meteor is possible.

Orbital elements

In order to complete this section about the observations, the orbital elements for these two meteors are given.

Both orbits have very low inclination and a perihelion distance close to 1 AU, osculating the Earth orbit with an aphelion distance in the asteroid belt, as shown in *Figure 6*. This will be discussed further in the next section.

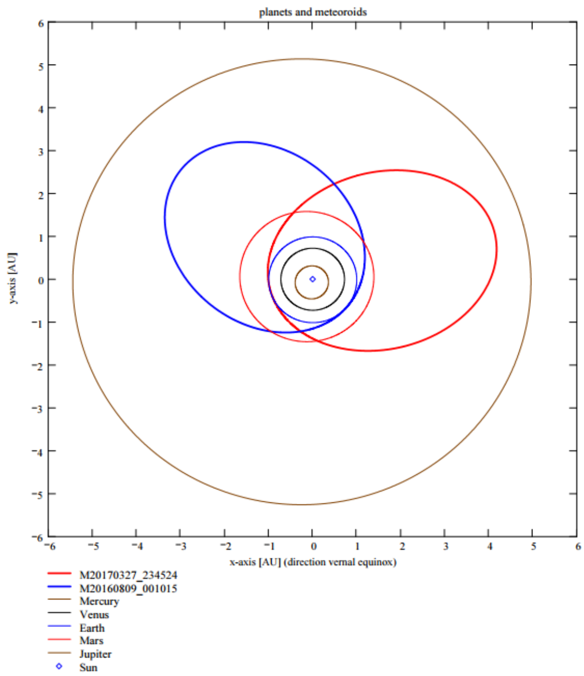
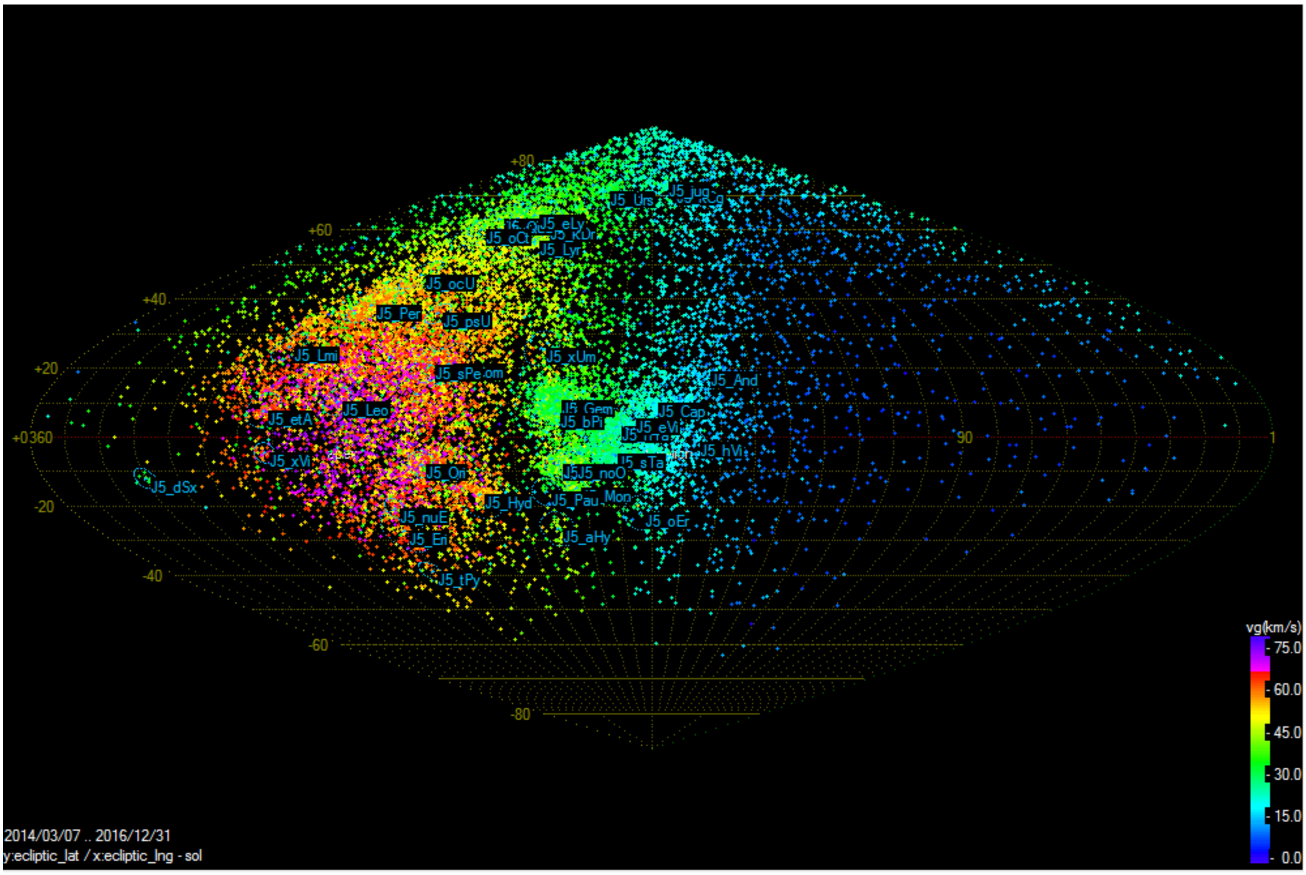


Table 1 – Orbital elements.

Meteor	20170327	20160809
a	2.6996	2.4667
q	0.9943	1.0137
e	0.6317	0.589
P(eriod)	4.4355	3.8741
ω	187.25	4.45
Ω	8.12	313.60
incl.	0.21	0.09

[2] The detailed observations and the calculation, including an animated view of the trajectory of the meteoroid in the solar system can be found at: http://www.meteorastronomie.ch/detaildatafk.php?id=75.

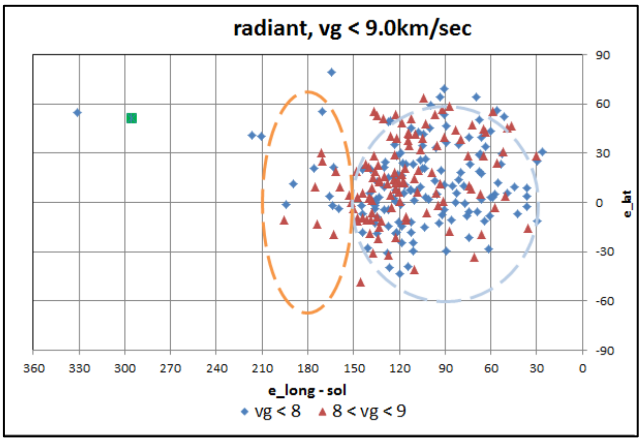


3 Database search for slow meteors

The Swiss meteor observation network of the FMA (Fachgruppe Meteorastronomie) is in operation since 2014 and covers most of Switzerland's sky and the neighboring regions with 47 cameras, located at 13 stations. During this time (3.4.2014 – 31.12 2016), 208791 meteors were observed, from which 26120 unified meteor orbits could be determined with UFO Orbit. The radiants of these meteors are shown in *Figure 7*.

For the following analysis the range of observations was restricted to the years 2015 and 2016, since during the first year the stations operated in a less reliable test phase. This reduced the number of observed meteors to 189530 with 25344 unified meteor orbits. The meteor data were uploaded regularly to the database server and analyzed and published on the FMA website after the end of each month[3].

UFO Orbit does not allow plotting the meteors within a specified velocity range, so a file containing all the orbit data of the unified meteor orbits was exported and further processed in an EXCEL worksheet. In this file the meteors within a range of geocentric velocities $0 < v_g < v_g(max)$ were selected. All meteor streams have $v_g > 15$ km/s, therefore choosing a smaller value for $v_g(max)$ excludes all meteors belonging to known streams. Reducing the value further also excludes many sporadic meteors. The number of meteors depends on the value of $v_g(max)$, but it is still large enough for a statistical analysis. For $v_g(max) = 9$ km/s, the number of meteor orbits is reduced to 254, or 1% of the complete sample. This may look unimportant, but it includes some prominent meteors, e.g. the largest fireball observed from Switzerland and Germany of the last two years on March 15, 2015, which probably landed in the Swiss Alps[4]. The radiants of these meteors are plotted in *Figure 8*.



[3] Results of UFO Orbit analysis of the data from the FMA network: http://www.meteorastronomie.ch/ergebnisse_sonotaco.html

[4] For a detailed study of this meteor see: http://www.meteorastronomie.ch/detaildatafk.php?id=25

The large scatter of the points does not indicate a close similarity of the orbits. However two groups can be distinguished, with some meteors not belonging to any group:

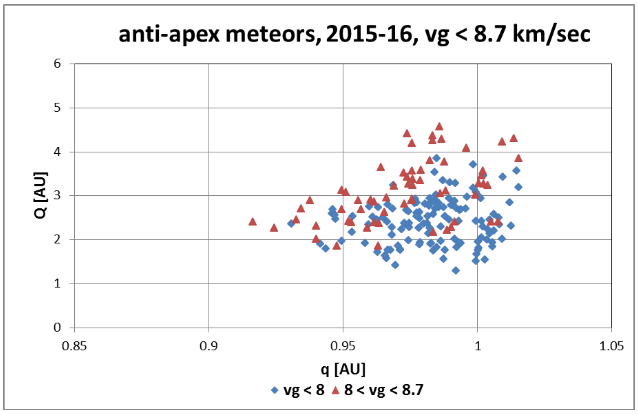
- The antihelion source centered around e_{long} – sol = 180° (± 30°)
- A diffuse source centered on e_{long} – sol = 90° (with a cone angle of approximately 60°); in the following called anti-apex source.

The antihelion source is well known (Rendtel, 2014). It consists of mainly small meteoroids in Earth-similar-orbits with small eccentricity, originating from asteroid collisions and which subsequently drift onto smaller orbits, e.g. caused by the Poynting-Robertson effect (Williams, 2002). This will not be discussed any further here.

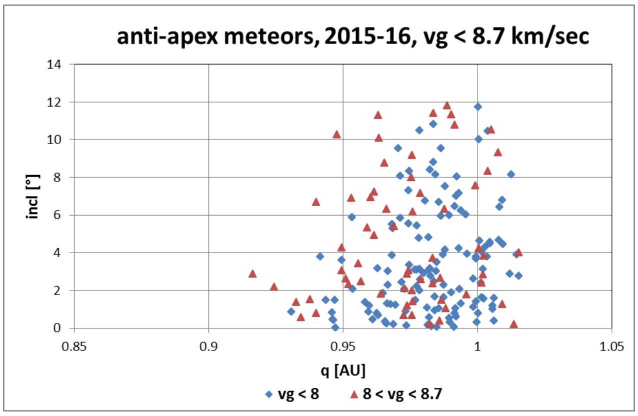
The anti-apex source is not specifically mentioned in the meteor literature and therefore it will be discussed here in some detail. The anti-apex is the direction opposite to the Earth orbital velocity (v_e). The heliocentric meteoroid velocity must therefore be larger in order to catch up with the Earth orbital motion: $v_e < v_h < v_e + v_g(max)$. Neglecting the eccentricity of the Earth orbit this gives limits for the semi-major axis (a) of the meteoroid orbit. In order to eliminate meteoroid orbits close to Jupiter we chose $v_g(max) < 8.7$ km/s, which results in an aphelion distance $Q < q_{Jup} = 4.95$ AU, using the relation (Porter, 1952):

$$\frac{v_h^2}{v_e^2} = 2 - \frac{1}{a} \qquad (1)$$

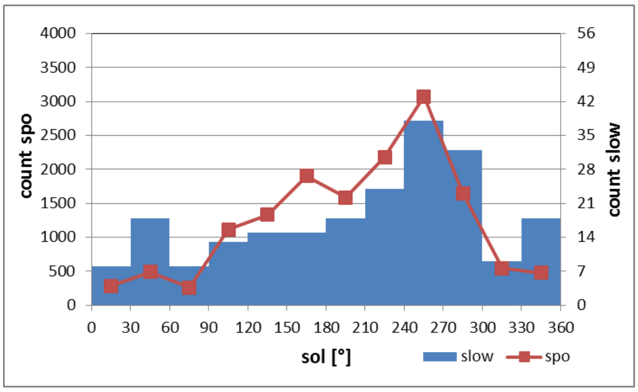
Figures 9 and 10 show the calculated orbital elements for these meteoroids with 30° < e_{long} – sol < 150° and $v_g < 8.7$ km/s.



As expected, the perihelion distances are smaller than $Q_e = 1.014$ AU (aphelion distance of Earth) with fairly low inclination < 12°, limited by a vector addition of v_g and v_h to values < 12.8° for a cone angle of 60°. These orbits correspond to Apollo asteroid orbits (a > 1, q < 1.014, Binzel et al., 2015). Aphelion distances Q of the meteoroids are smaller than q_J. Without going into the details of calculation, the probability of a collision between the meteoroid and the Earth is roughly proportional to the length of the overlapping region and the capture cross section. The length of the intersection region is largest for meteoroid orbits with q ≅ 1 and low inclination, crossing the Earth orbit at a very small angle. In addition, for low velocity v_g the capture cross section increases by a factor $\left(\frac{v_0}{v_g}\right)^2$ compared to fast meteors, because slow meteors are accelerated towards the Earth by gravitation (this can easily be calculated by the angular momentum conservation, the interception distance $r * v_g$ is equal to $R * v_0$ for an Earth grazing meteor, with R: radius of Earth plus atmosphere, $v_0 \geq 11.2$ km/s). In other words, slow anti-apex meteoroids have a high probability of being captured by collisions with the Earth.



During the year the number of slow meteors varies in a similar way to the number of sporadic meteors (see *Figure 11*). This includes the effects of length of the night and weather (quite often the weather is only good on only one side of the Alps, which reduces the number of observed meteors during these times). In addition the height of the anti-apex is highest during the winter months for an observer at northern latitudes, which is not really reflected in the data. On the other hand, it remains to be seen if the relative large number of slow meteors between sol 30°–60° and 330°–360° is just a statistical fluke.



4 Discussion

A connection between near Earth asteroids (NEA) and meteorites has been postulated by Binzel et al. (2015) and Borovička et al. (2015). It has been shown in the present study that slow anti-apex meteors have orbits similar to Apollo asteroids. Therefore it seems a reasonable assumption that these meteors are fragments of Apollo asteroids, produced in collisions with other asteroids or meteoroids. Unfortunately a direct connection to a parent body such as in asteroid families is difficult because the orbits of these meteoroids are not well enough known. Small variations in observed velocities v_0 produce larger errors of v_g, the velocity error of v_g is a factor v_0/v_g larger than the error of v_0. In addition, zenith attraction increases rapidly also for slow v_g, making the determination of the radiant unreliable. The appearance of slow anti-apex meteors at any time of the year indicates that not a single parent body can be responsible. On the other hand, the small entrance velocity $v_0 < 15$ km/s increases the chances for the survival of the meteoroid in the atmosphere, with some fragment arriving on the ground. The orbit of M20160809_001015 demonstrates that a meteoroid from Mars cannot be excluded. However it seems unlikely, as it would have to traverse the Martian atmosphere and need a sufficiently large initial velocity to leave the gravitational field of Mars. An asteroid origin seems much more probable. So far we have not been successful recovering a meteorite with a recorded flight path, but this is the goal as well as to record a spectrum, such as for the Benešov fireball (Borovička, 2016). Planned extensions of our network of video cameras, some equipped also for spectroscopic recordings, enhance the chances for a future detection and recovery of a meteorite. This may complement experiments such as OSIRIS-REx, which will return samples from asteroid Bennu in 2023 (Lauretta et al., 2017). As an amateur organization we cannot afford a satellite and a low cost project is important and hopefully we succeed before that date with finding a meteorite.

Acknowledgment

The following members of the Swiss FMA (Fachgruppe Meteorastronomie) contributed with their observations to the present study: Andreas Buchmann (ALT, BAU), Jochen Richert (BOS), Stefan Meister (BUE, EGL), José De Queiroz (FAL), Hansjörg Nipp (MAU) and Fredi Bachmann (OBE). Jonas Schenker presented and collected the data on our website.

References

Binzel R. P., Reddy V. and Dunn T. (2015). “Near Earth Object Population”. In Michel P., DeMeo F.E. and Bottke W. F., editors, *Asteroids IV*, pages 243–256.

Borovička J., Spurny P and Brown P. (2015). “Small Near-Earth Asteroids as a source of Meteorites”. In Michel P., DeMeo F. E. and Bottke W. F., editors, *Asteroids IV*, pages 257–280.

Borovička J. (2016). “Photographic spectra of fireballs”. In Roggemans A. and Roggemans P., editors, *Proceedings of the International Meteor Conference*, Egmond, the Netherlands, 2 – 5 June 2016. IMO, pages 34–38.

Dubs M. and Maeda K. (2016). “Calibration of Meteor Spectra”. In Roggemans A. and Roggemans P., editors, *Proceedings of the International Meteor Conference*, Egmond, the Netherlands, 2 – 5 June 2016. IMO, pages 65–68.

Dubs M., Sposetti S., Spinner R. and Booz B. (2017). “Two slow meteors with spectra”. *eMeteorNews*, **1**, 4–8.

Lauretta D. S., Balram-Knutson S. S., Beshore E., Boynton W. V., Drouet dAubigny C., DellaGiustina D. N., Enos H. L., Gholish D. R., Hergenrother C. W., Howell E. S., Johnson C. A., Morton E. T., Nolan M. C., Rizk B., Roper H. L., Bartels A. E., Bos B. J., Dworkin J. P., Highsmith D. E., Lorenz D. A., Lim L. F., Mink R., Moreau M. C., Nuth J. A., Reuter D. C., Simon A. A., Bierhaus E. B., Bryan B. H., Ballouz R., Barnouin O. S., Binzel R. P., Bottke W. F., Hamilton V. E., Walsh K. J., Chesley S. R., Christensen P. R., Clark B. E., Connolly H. C., Crombie M. K., Daly M. G., Emery J. P., McCoy T. J., McMahon J. W., Scheeres D. J., Messenger S., Nakamura-Messenger K., Righter K. and Sandford S. A. (2017). “OSIRIS-REx: Sample Return from Asteroid (101955) Bennu”. eprint arXiv: 1702.06981. 89 pages.

Porter J. G. (1952). “Comets and Meteor Streams”, page 88.

Rendtel J. (2014). “Meteor Shower Workbook”. IMO.

Williams I. P. (2002). “The Evolution of Meteoroid Streams”. In Murad E. and Williams I.P., editors, *Meteors in the Earth's Atmosphere*, pages 13–32.

Tau Herculids in 2017 observed by CAMS

Carl Johannink, Jaap van 't Leven and Koen Miskotte

Dutch Meteor Society, the Netherlands
c.johannink@t-online.de
jvtleven@gmail.com
k.miskotte@upcmail.nl

During routine CAMS observations in the night of May 30-31 CAMS BeNeLux collected five meteors in just more than one hour, which are associated with comet 73P/Schwassmann-Wachmann. These five meteors appeared from a very narrow radiant, near RA = 210 degrees and Dec. = +29 degrees, geocentric velocity (v_g) ~12 km/s, with very similar orbits.
Further searches on the nights around this peak resulted in another twelve candidates.
The first five meteors very likely belong to the 1941-dusttrail of this comet, which was predicted to produce meteors with a geocentric velocity of 12.4 km/s, radiating from RA = 212.6 degrees and Dec. = +29.7 degrees, on May 31.136 this year (Lüthen et al., 2001). A short summary of historical visual observations is also given.

1 The observations

While processing all the data obtained during the night 30–31 May, we noticed immediately five meteors with virtually identical radiant positions, geocentric speed and orbital elements. Each single one of these meteors appeared within the time span of little more than one hour, to be more precise between 23^h39^m UT and 00^h45^m UT (*Table 1*). Almost instantly the comet 73P/Schwassmann-Wachmann emerged as being the possible source, according to predictions given for the year 2017 with likely meteor activity and considering the comet has an orbital period of 5 years. In this case the passage of this comet in 1941 can be considered to be the source of the meteors observed (Lüthen et al., 2001).

What was striking was that the radiant position of aforementioned meteors originating from the passage of this comet perfectly coincide with the predicted radiant position at RA = 212.6 degrees and Dec. = 29.7 degrees, as shown in *Figure 1*.

The question arose if, around this date, more orbits could be linked to this comet. Hence the decision to look for a possible match between the orbit of the comet 73P/Schwassmann-Wachmann, and the 1627 orbits that we could record with CAMS in the month of May 2017, as well as the 380 orbits recorded up to and including June 10 2017. For the comparison of all the orbits recorded with respect to similarities with the comet's orbit, the Drummond criterion was implemented (Drummond, 1981). In 2017 the orbital elements of 73P/Schwassmann-Wachmann are as follows[5]:

Orbital elements valid for 2017-03-28,0 TT = JDT 2457840.5 (based on 1040 observations between 28 November 2010 and 2 June 2017):

perihelion date	2017-03-16.84173TT
argument of perihelion ω (°)	199.38777
ascending node Ω (°)	69.66219
inclination i (°)	11.23692
eccentricity e	0.6855140
perihelion distance q (AU)	0.9721785

Next, meteors were selected from all those observed in the period of 20 May up to and including 10 June which fulfilled the Drummond criterion of $D_d \leq 0.06$.

Table 1 shows these meteors with their corresponding time of appearance and the stations that recorded them. The numbers in red concern the TAHs belonging to the dust from 1941.

Table 1 – Overview of the stations having recorded the τ Herculids with corresponding time of appearance and the D-criterion value (in red the five τ Herculids belonging to the dust trail of 1941).

Date	Time (UT)	Stations:	D_d
20.05.2017	22:39:45.37	_354_318	0,0543
22.05.2017	23:58:52.60	_395_365	0,0507
30.05.2017	23:39:49.72	_383_347	0,0095
30.05.2017	23:58:53.42	_802_322	0,0220
31.05.2017	00:19:35.57	_381_384	0,0134
31.05.2017	00:23:47.28	_395_399_383	0,0566
31.05.2017	00:35:20.56	_321_347	0,0344
31.05.2017	00:45:21.36	_384_381_324	0,0343
31.05.2017	01:39:12.08	_324_345_365_384_381_345	0,0347
31.05.2017	21:52:30.42	_351_801_361	0,0333
31.05.2017	23:20:29.75	_372_364_347_315	0,0438
01.06.2017	22:33:31.31	_000354_000326_000311_000314	0,0472
08.06.2017	22:50:56.35	_000323_000802	0,0368
09.06.2017	22:17:19.12	_000368_000342	0,0583
09.06.2017	22:59:31.00	_000367_000344_000388_000367	0,0376
10.06.2017	23:25:00.49	_000323_000349	0,0598
10.06.2017	23:25:44.89	_000345_000365_000395	0,0336

[5] MPEC 2017-L52

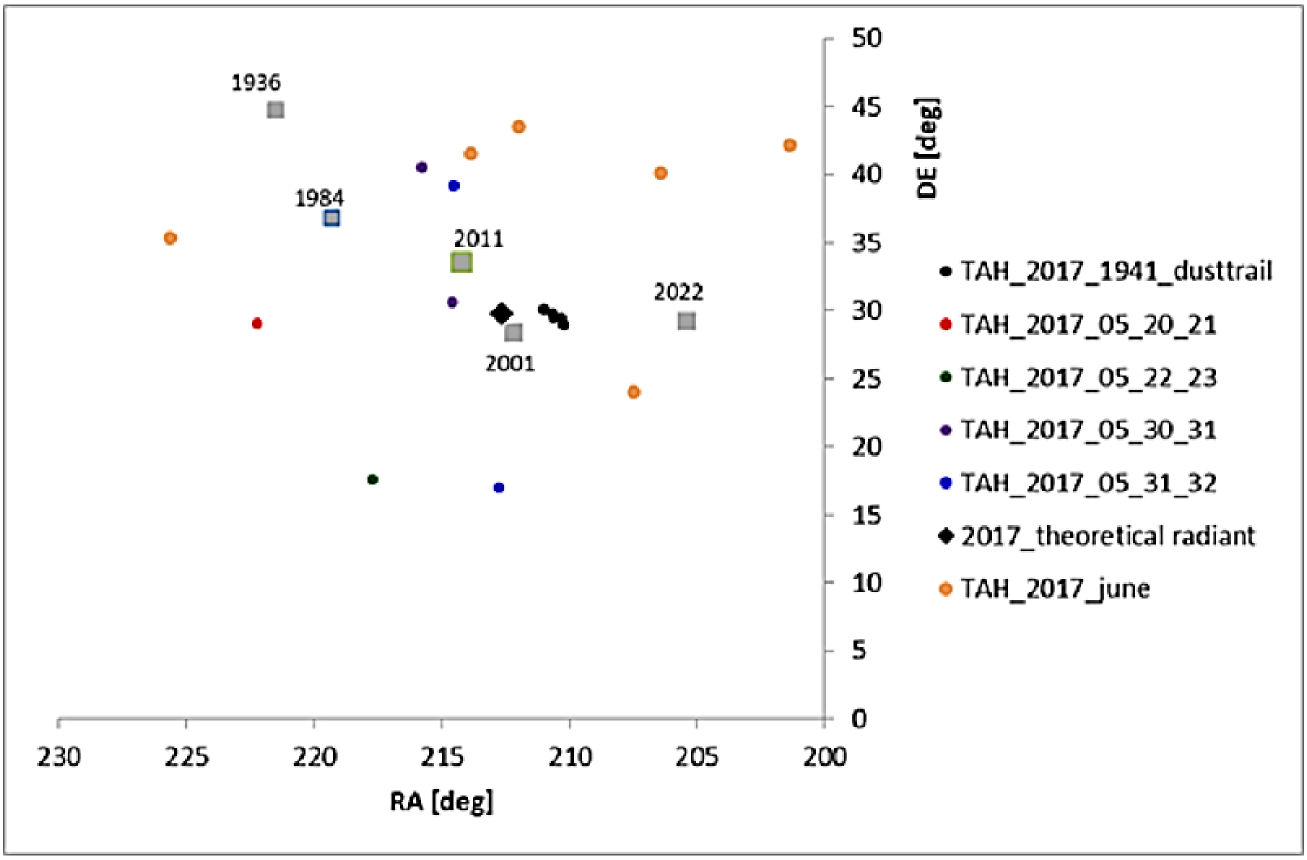


Figure 1 – Plot of the radiants of the 5 tau Herculids (TAH) of the 1941 dusttrail, the remaining tau Herculids, and the predicted radiant of the years with significant meteor activity.

Figure 1 shows the radiant of these meteors (shown as dots). Also presented, the predicted radiant positions of years in which TAH activity could be expected, as well as years in which some activity was recorded according to Lüthen, Arlt and Jäger (2001).

Table 2 – Maximum and minimum, mean and median values for radiant, geocentric speed and a number of orbital elements of the five tau Herculids (of the 1941 dust trail) recorded in the night of May 30–31 2017.

	2017 May 30–31			
	Min.	Med.	Mean	Max.
RA	210.19	210.56	210.53	210.95
Dec.	+28.89	+29.46	+29.51	+30.02
V_g	11.69	11.87	11.97	12.34
q	0.9893	0.9896	0.9898	0.9904
e	0.6415	0.6585	0.6606	0.6883
i	11.24	11.39	11.51	11.87
Π	269.34	269.46	269.43	269.51
H_{begin}	90.14	90.65	90.66	91.08
H_{max}	85.4	87.6	87.2	88.3
H_{end}	79.83	82.23	82.88	86.35

The concentration of the five tau Herculids originating from the 1941 dust trail and their proximity to the theoretical radiant predicted by Lüthen et al. (2001) is significant. The fact that the comet had several close passages to Jupiter in the past explains the rather large spread on the radiant positions in the separate years included in the plot. Besides that, the radiant is situated near the antapex in Hercules, therefore any small changes in the orbit result directly in large changes in the radiant position.

The similarities between the five tau Herculids of the 1941 dust trail are represented in *Table 2*, including the minimum, maximum, mean and median value for several orbital elements.

This result is the second successful confirmation of tau Herculids activity by CAMS. In 2011, when CAMS California was being started up, it recorded in total 12 meteors, among which 3 tau Herculids, on 2 June between 4^h00^m and 12^h13^m UT. These three meteors had a radiant position RA = 215.5 ± 0.4 degrees and Dec. = 34.0 ± 0.6 degrees[6].

Also in that year prediction and observation coincide to a large extent with less than 1 degree deviation of the radiant position in the prediction of possible activity on 2 June at around 5^h45^m UT (*Figure 1*) (Lüthen et al., 2001). The same article refers to the year 2022 too. According to, amongst others, Vaubaillon and Brown (Wiegert et al., 2005) a sort of 'diluting' effect on the density of the older dust trails can be observed, as these will probably be rather extended by then.

With the necessary premises based on the past (among others about the ZHR in 1930) they come to a ZHR score

[6] CBET 2817

of maximum 10 for the dust trails of 1892 and 1897. However, according to Lüthen, Arlt and Jäger (2001) the rather recent dust trail of 1995 is the one being closest to Earth. There is a good chance that this is a dust trail with a higher dust density as a result of the fragmentation of the comet into at least four pieces in 1995.

Besides that, the calculated distance between the 1995 dust trail and the Earth is, in that year, a lot smaller than in all the previous cases. In Maslov[7] we see, because of this reason, two peak moments for 2022.

The first peak, with a ZHR of some dozens, on 31 May 2022 at around 3^h11^m UT, caused by older dust trails, and a more substantial peak with regard to the 1995 dust trail at around 5^h15^m UT with a ZHR score of 600–700, possibly rising into the thousands. To conclude, *Figure 2* shows a plot of the orbital elements Π versus i for the complete dataset of tau Herculids.

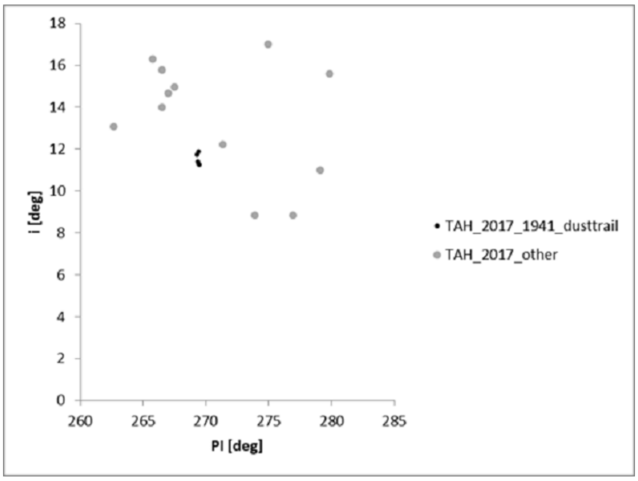


Figure 2 – Plot of Π versus i for the meteors discussed.

2 Conclusion

In the last decade of May 2017 and the first decade of June, 17 tau Herculids could be recorded. The close coincidence between the radiant position and the predicted value for activity of the 1941 dust trail in 2017 (Lüthen et al., 2001) is significant for five tau Herculids recorded in the night of 30–31 May.

Moreover, the remaining orbital elements and the light curves show a very similar picture. After 2011, 2017 is the second year in which activity of tau Herculids could be recorded, conform the predictions.

The predictions for 2022 currently vary between a ZHR score of ~10 and several thousands, depending on which dust trail is being considered. Hopefully, over the next few years, the model makers will be able to make a more reliable prediction about the activity in that year, especially for the dust trail of 1995.

In the period of 2000 up to and including 2014, only few tau Herculids were observed visually each year by Dutch observers.

Acknowledgments

A word of thanks to Reinder Bouma for valuable advice and critically reading through this article. And, of course, a word of thanks to all CAMS posts for their full commitment and swift processing of data.

References

Drummond J. D. (1981). “A test of comet and meteor shower associations”. *Icarus*, **45**, 545–553.

Jenniskens P., Gural P. S., Grigsby B., Dynneson L. , Koop M. and Holman D. (2011). “CAMS: Cameras for Allsky Meteor Surveillance to validate minor meteor showers”. *Icarus*, **216**, 40–61.

Jenniskens P., Nénon Q., Albers J., Gural P. S., Haberman B., Holman D., Morales R., Grigsby B. J., Samuels D. and Johannink C. (2016). “The established meteor showers as observed by CAMS”. *Icarus*, **266**, 331–354.

Lüthen H., Arlt R. and Jäger M. (2001). “The Disintegrating Comet 73P/Schwassmann-Wachmann 3 and its Meteors”. *WGN, the Journal of the IMO*, **29**, 15–28.

Wiegert P. A., Brown P. G., Vaubaillon J. and Schijns H. (2005). “The τ Herculid meteor shower and Comet 73P/Schwassmann-Wachmann3”. *Monthly Notices of the Royal Astronomical Society*, **361**, 638–644.

[7] http://feraj.ru/Radiants/Predictions/73p-ids2017eng.html

SonotaCo network and CAMS

Masahiro Koseki

NMS (The Nippon Meteor Society)
geh04301@nifty.ne.jp

You might think that the newly developed CAMS video system can get much more fine results than the system of SonotaCo network. There are small differences between them surely, but the comparison between the statistics of them reveals both data are comparable in accuracy. We find that the SonotaCo system cannot detect slow velocity meteors as good as CAMS but it is superior for faster meteors. There is a more important difference between them, that is, the definition of meteor showers and this is resulting in curious stream data.

1 Devices and software

Japanese meteor enthusiasts tried to use surveillance cameras (CCTV) in the 2000's and the SonotaCo network published meteor data on the WEB[8] for 2007–2016. First they intended to detect a meteorite fall and therefore they selected a wide field lens. Soon they noticed that a bright and short focus lens can catch more meteors than longer focus lenses. They have continued to use such lenses for example; the Watec WAT-100N, f6mm/F0.8. CAMS started its operation in 2010 and the devices are standardized as documented in Roggemans (2015). A CAMS camera can observe a field of view of 22.5 by 29.9 degrees, while a camera commonly used in Japan has a field of view of 56 by 43 degrees.

Japanese observers are using UFOCapture developed by SonotaCo and his useful computer software. The calculations and surveys can be easily carried out by any individual observer/researcher, while CAMS data are analyzed in a centralized procedure.

2 Data accuracy

CAMS data are now available only from October 21, 2010 to March 29, 2013 (Jenniskens et al., 2015). We therefore limited the use of SonotaCo data to 2010–13 and, then, the total amount of data becomes nearly equal.

It is easy to compare two observation systems by the statistics of two major showers; Perseids and Geminids, see *Table 1a* and *Table 1b*.

We can confirm that the two systems give a very similar mean/median and the standard deviations show that SonotaCo data seems to be better than CAMS. Further, you may notice the curious minimum and maximum radiant data (λ-λ_s, β) for CAMS. There are some clearly misplaced meteors among the Geminids and 9 meteors which belong to the HYD-shower should be excluded also. It seems there is some error in the search software of CAMS.

There is an excellent coincidence between both statistics. We realize that both systems can give results with the same accuracy for both slower as well as faster showers.

3 Observability in magnitude

CAMS uses a larger lens and, therefore, can detect fainter meteors than the optics used by the SonotaCo network. *Figure 1* shows clearly our expectation. But, it shows that CAMS caught bolides more often than what we expect from the magnitude distribution curve itself. The SonotaCo's distribution curve declines deeper for brighter meteors than CAMS. It is suggested that the magnitude measurement method is different in the two systems.

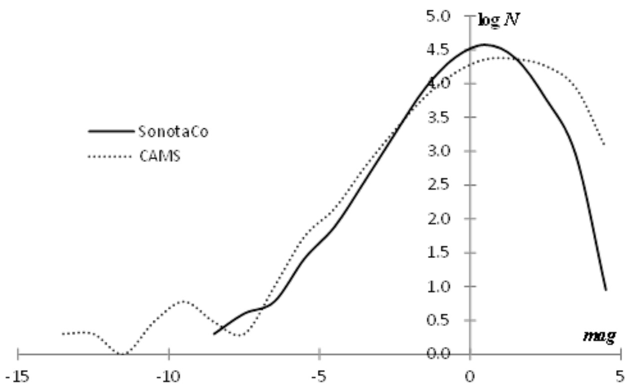


Figure 1 – Magnitude distribution of all recorded meteors by CAMS and SonotaCo network.

4 Observability in velocity

The author pointed out that the CCD observations (SonotaCo network) catch fewer meteors with a slow geocentric velocity than fast ones: "What do we see as ANT, Apex and Toroidal sources? – What are these meteors, where do these meteors come from, where are these meteoroids going?" (Koseki, 2015). *Figure 2* shows the comparison between the CAMS and the SonotaCo network meteors. The main peak concerns the Geminids, the second is the Apex source and the third are the Perseids. Hyperbolic meteors (V_g > 74km/s) are recorded more often in CAMS than in the SonotaCo network. CAMS can catch about twice as many slow meteors

[8] http://sonotaco.jp/doc/SNM/

Table 1a – Geminids; the first line in each statistics shows the values for CAMS and the second line the values for SonotaCo.

	λ−λs	β	Sol long	H beg	H end	Max Mv (m	Vg	e	q	i	ω	Ω	1/a
Min	174.3	-39.2	243.2	85.3	54.1	-6.1	6.8	0.128	0.059	4.0	0.7	81.5	-1.792
	195.8	1.0	236.0	50.8	40.5	-5.5	18.6	0.604	0.038	2.4	301.2	236.0	-0.221
Max	305.6	61.0	269.8	117.6	114.4	5.0	65.9	1.148	0.829	148.0	338.8	269.7	1.602
	217.6	17.2	289.2	189.0	173.0	3.9	48.5	1.036	0.346	55.9	340.3	289.2	1.290
Mean	208.1	10.5	261.1	97.0	85.0	1.6	34.1	0.891	0.144	23.3	324.0	261.0	0.749
	208.1	10.4	261.4	94.5	80.9	0.5	34.0	0.890	0.145	23.0	324.2	261.4	0.754
SD	2.41	1.56	2.22	2.51	4.43	1.38	2.00	0.026	0.020	4.01	8.21	4.93	0.119
	1.37	1.35	3.07	4.52	7.09	1.00	1.85	0.023	0.019	3.49	2.53	3.07	0.105
Median	208.1	10.5	261.7	97.0	85.5	1.7	33.8	0.889	0.145	22.9	324.3	261.7	0.766
	208.1	10.5	261.8	94.5	82.2	0.5	33.9	0.890	0.145	22.9	324.3	261.8	0.763

Table 1b – Perseids; the line order is same as *Table 1a*.

	λ−λs	β	Sol long	H beg	H end	Max Mv (m	Vg	e	q	i	ω	Ω	1/a
Min	275.9	29.5	116.0	89.4	65.8	-6.5	53.4	0.609	0.819	97.9	126.8	116.0	-3
	274.0	30.6	109.8	57.1	45.7	-7.3	34.6	0.187	0.360	82.1	18.0	109.8	-0
Max	292.2	47.3	157.2	142.7	115.8	4.7	84.8	4.070	1.002	128.9	167.9	157.2	0.
	292.5	43.3	170.2	160.8	133.1	3.6	69.8	1.817	1.003	128.1	171.8	170.2	1.
Mean	283.4	38.6	137.9	111.5	97.6	0.3	59.5	0.993	0.947	113.1	150.3	137.9	0.
	283.1	38.4	138.2	108.3	93.5	-0.2	59.0	0.948	0.947	113.0	149.9	138.2	0.
SD	1.85	1.77	5.54	4.04	4.79	1.52	2.40	0.218	0.020	2.98	4.99	5.54	0.
	1.83	1.53	5.73	4.15	6.07	1.12	1.98	0.123	0.031	2.89	8.22	5.73	0.
Median	283.3	38.5	139.3	110.9	98.0	0.4	59.1	0.951	0.949	113.1	150.4	139.3	0.
	283.0	38.5	139.3	108.2	94.4	-0.2	59.2	0.956	0.951	113.1	150.8	139.3	0.

Table 2 – Examples of the shower definition table for the SonotaCo network.

_code	_name	_sol1	_sol2	_solp	_ra	_dec	_dra	_ddec	_vg	_R	_dv	_IAU#	_IAUcode
_J5_Cap	_Alpha Ca	114.2554	138.378	126.1396	305.7054	-9.42002	0.498843	0.260231	22.35723	6	3	_#1	CAP
_J5_Com	_Dec. Com	243.981	311.1886	265.6826	159.7097	31.57298	0.794832	-0.32215	62.9684	6	4	_#20	COM
_J5_etA	_Eta Aqua	34.74393	68.66069	46.28019	338.3489	-0.76604	0.621568	0.290403	65.36826	5	5	_#31	ETA
_J5_Leo	_Leonids	220.9246	247.1227	235.4331	153.9164	21.85383	0.559125	-0.39007	69.96555	4	7	_#13	LEO
_J5_Lyr	_April Lyri	24.26708	41.59422	32.53246	272.5742	33.17207	0.817925	-0.29445	46.66568	5	5	_#6	LYR
_J5_Ori	_Orionids	178.8869	234.0035	207.9266	95.45098	15.52253	0.609658	0.013442	66.21321	4	8	_#8	ORI
_J5_Per	_Perseids	119.0332	160.4565	139.2121	47.18002	57.70816	1.165757	0.189175	58.7264	5	20	_#7	PER
_J5_Qua	_Quadrant	276.4105	291.086	283.1022	229.9551	48.96732	0.148969	0.166294	39.96465	5	6	_#10	QUA
_J5_sdA	_South. De	118.0303	145.4059	129.7355	341.88	-16.1768	0.619841	0.263918	39.41088	4	4	_#5	SDA
_J5_sTa	_South. Ta	177.9942	275.2837	219.7113	50.07141	13.36862	0.726863	0.161376	27.22767	6	5	_#2	STA

(V_g < 20km/s) than the SonotaCo network, although the photographic meteors in this slow velocity range exceed the Apex sources.

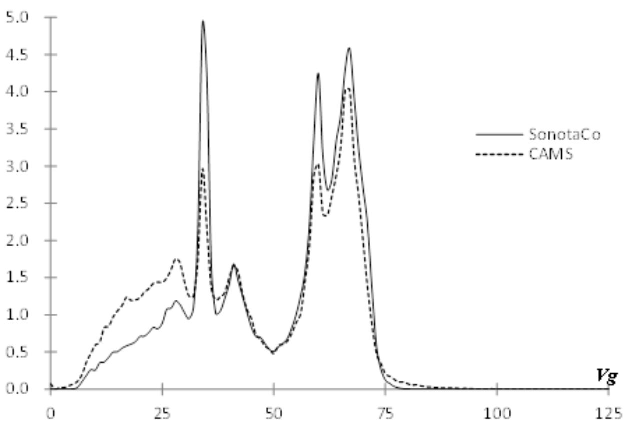


Figure 2 – Geocentric velocity distribution in percentage.

We can see the difference in the observability in velocity by comparing the moving mean magnitude per thousand meteors bin in function of the velocity (*Figure 3*). It is clear that CAMS can detect more faint meteors than SonotaCo over the whole range and the difference becomes larger for slower meteors. A shorter focal length camera records a meteor trail shorter than a longer lens such as used by CAMS. Fainter and shorter meteor trails might be rejected as noises in the SonotaCo network.

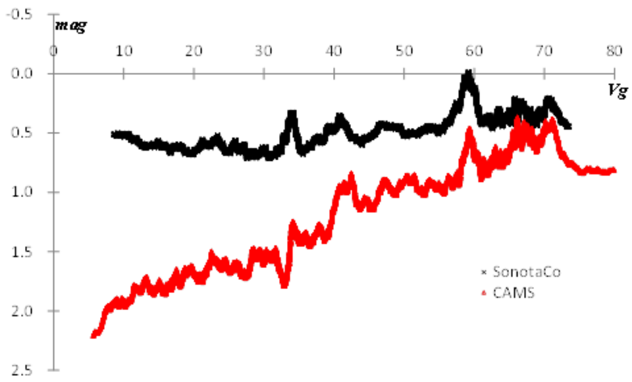


Figure 3 – Magnitude dependence on V_g.

If we suppose that CAMS can detect fainter meteors, we could expect that CAMS can record longer trails, that is, detecting more and go fainter. *Figure 4* gives a contradictory result for the Geminid meteors; the SonotaCo network gets more long trails on average. In the case of the Perseids, the beginning heights (H_b) of CAMS shift more upward than for SonotaCo's and they are located slightly above the latter. The end height (H_e) for the SonotaCo Perseids are clearly lower than those for

CAMS and the trail lengths are longer in SonotaCo than for CAMS. UFOCatcher might work well for a moving object, because it was developed to detect such unknown objects for surveillance purpose.

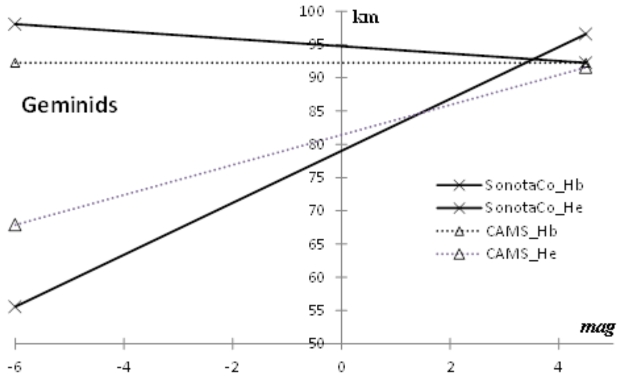


Figure 4 – Comparison of meteor trail length.

5 Meteor shower definition

The SonotaCo network uses a file named "*ALL_SHOWER_NAMES*" as definition and CAMS has a "*CAMS StreamFinder*". The details of the latter are unknown but the former file has been published and is listed partially as example in *Table 2*.

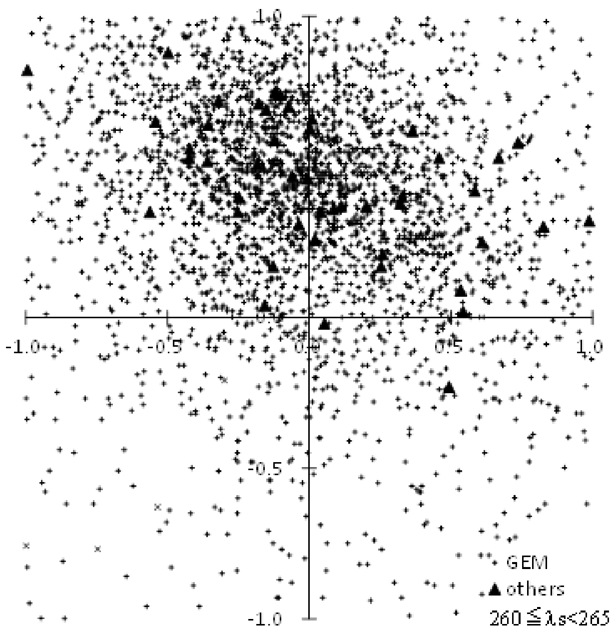


Figure 5 – Radiant distribution of GEM and DRG.

CAMS is splitting up the activity from a major shower into filaments. *Figure 5* shows the radiant distribution around (λ–λ_s, β) = (208, 10). Here 'others' mean not Geminids but DRG, a new shower imposed by CAMS. The CAMS' report (Jenniskens et al., 2016) describes the finding as follows;

"*As a final curiosity, a group of unusual Geminids was found to have relatively high ~39.5 km/s entry speed (7σ above the median 33.8 km/s of other Geminids) and a resulting high i ~ 28° and semi-major axis a ~ 1.5–3.0 AU (Fig. 11). Based on the medium measurement error, we expected only 3 such outliers. These are here called the December ρ-Geminids (#641, DRG).*"

But *Table 1a* shows that CAMS' Geminids have a spread of SD = 2.00 in geocentric velocity and *Figure 6* confirms the 'curious' situation with the DRG shower. The velocity distribution of DRG is well within that of the Geminids and therefore, the inclination of the orbits cannot be separated between GEM and DRG (see also *Table 1a*).

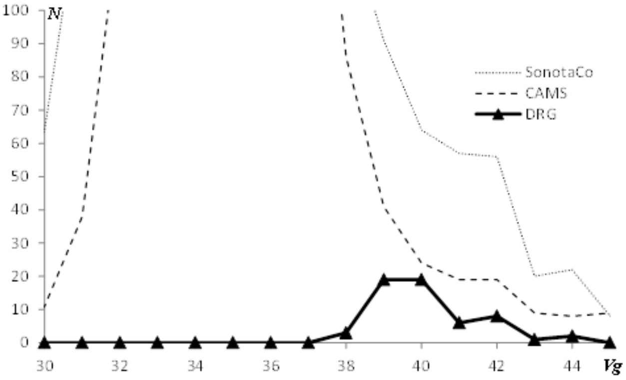


Figure 6 – Velocity distribution of GEM and DRG.

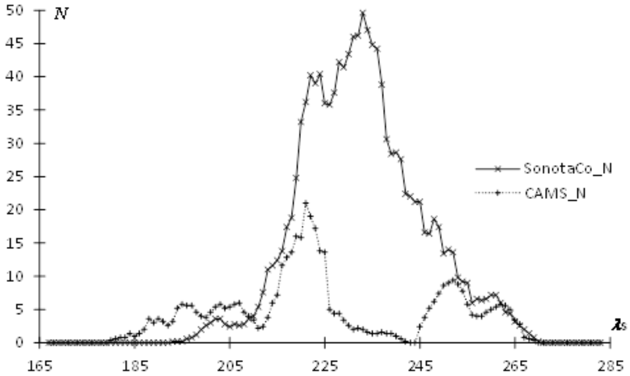


Figure 7a – Northern Taurids activity profile.

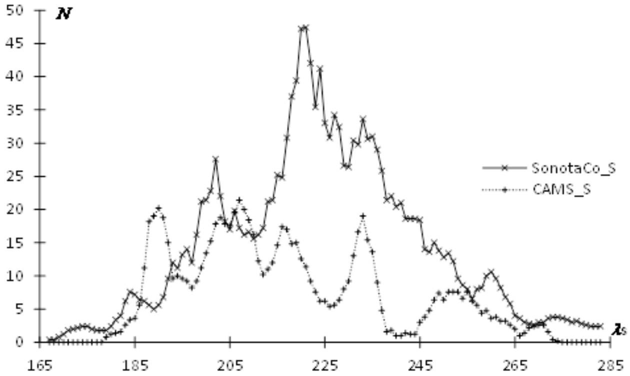


Figure 7b – Southern Taurids activity profile.

We can add one more shower with a strange definition from the CAMS data. *Figure 7a and b* show the Northern and Southern Taurids activity profiles by CAMS and SonotaCo network. Both SonotaCo's curves seem natural but the CAMS'curves display irregularly cut-offs at the position of the 'new showers'. We examine one of the most impressive dips near solar longitude 225 degrees. *Figure 8* shows the radiant distribution around (λ–λ_s, β) = (190, 0) by CAMS. N and S are Northern and Southern Taurids as defined by CAMS respectively and, 'others' in the northern activity represents 632 NET (November eta Taurids) and in the southern branch 625 LTA (lambda Taurids). It is clear why the 'Taurids' activity in CAMS changes so irregularly.

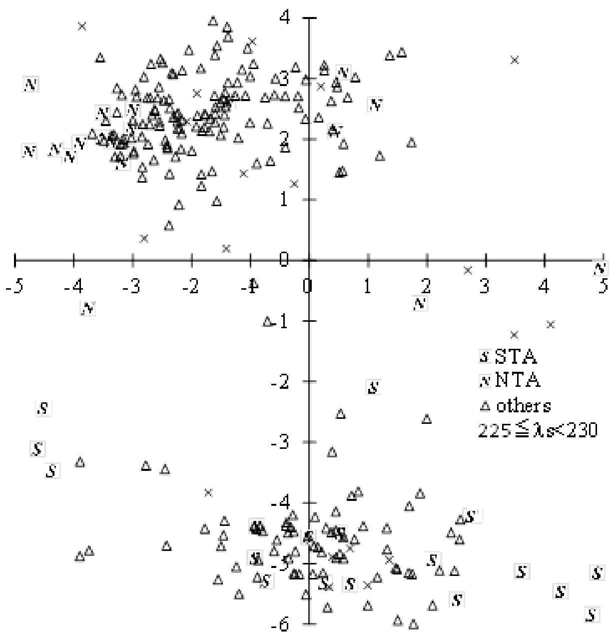


Figure 8 – Radiant distribution of NTA, STA, NET and LTA.

The author found out that 'Taurids' have three components, that is, a northern and two southern branches (see *Figure 7b*, around λ_s = 205 and 225, Koseki, 2012). But, 'Taurids' like listed in the IAUMDC are still in confusion and the author pointed out that the definition of a shower/stream differs from one to another (Koseki, 2016).

There are problematic shower definitions in the SonotaCo file (see *Table 2*). The author assumes that the readers are interested mostly in CAMS and does not describe such cases here.

6 Conclusions

We can find many discrepancies in two video observation systems but it is very important that individual data are published and can be used by other researchers to investigate further. We should be careful to quote the given results by the authors and we should know how to analyze the data provided by them.

References

Jenniskens P., Nénon Q., Albers J., Gural P. S., Haberman B., Holman D., Morales R., Grigsby B. J., Samuels D. and Johannink C. (2016). "The established meteor showers as observed by CAMS". *Icarus*, **266**, 331–354.

Koseki M. (2012). "Three components of 'Taurids". *WGN, the Journal of the IMO*, **40**, 129–138.

Koseki M. (2015). "What do we see as ANT, Apex and Toroidal sources? - What meteors are, where meteors came from, where meteoroids are going". *WGN, the Journal of the IMO*, **43**, 127–146.

Koseki M. (2016). "Research on the IAU meteor shower database". *WGN, the Journal of the IMO*, **44**, 151–169.

Roggemans P. (2015). "CAMS Cameras for All sky Meteor Surveillance: Manual for the CAMS BeNeLux network".

The new method of estimating the ZHR using radio meteor observations

Hirofumi Sugimoto

The Nippon Meteor Society
hiro-sugimoto@kbf.biglobe.ne.jp

It has been very difficult to estimate the Zenithal Hourly Rate in the case of radio meteor observations, although radio observing is a very useful method to capture all meteor activities even if the weather is bad or during daytime. This research tries to estimate the Zenithal Hourly Rate using radio meteor observations.

1 Introduction

As a known method for combining all radio meteor observations, H. Ogawa et al. (2001) published a new index that was introduced as the "Activity Level" Index. Although this index is very useful for compiling meteor activity profiles (period, level, etc.), it is impossible to compare it with visual observations.

This research tried to estimate the Zenithal Hourly Rate using radio meteor observations. By using this estimated *ZHR*, it becomes possible to compare and to discuss based the same reference table as the visual observations.

2 Method

The estimated *ZHR* is obtained by the following steps:

(1) Correcting the hardware features such as antenna, receiver, receiving level, etc. and removing sporadic meteors;
(2) Correcting the limiting magnitude;
(3) Correcting radiant elevation;
(4) Combining all calculated data.

2.1. Correction for hardware features

This step adopts the previous method by H. Ogawa et al. (2001). The first step is the same as to obtain the Activity Level index. The Activity level is derived from the following formula.

$$A(t) = \frac{N_{obs}(t) - N_{ave}(t)}{D_{ave}}$$

Where, N_{obs} is the hourly rate of the observed meteor echoes. N_{ave} is the background level valid for the past two weeks. N_{ave}, therefore, stands for the sporadic meteor activity. D_{ave} is the average number of meteor echoes for a day after two weeks. $A(t)$ means the activity level at time t.

2.2. Correcting limiting magnitude

The Corrected Hourly Rate is derived from the following formula:

$$CHR = A(t) * S_{bas}$$

Where, $A(t)$ is the Activity Level as described in previous subsection. S_{bas} is the daily number of sporadic meteors obtained with a Limiting Magnitude = +6.5. The number of sporadic meteors shows a variation during the year. Shigeo Uchiyama provides a result of visual observations. S_{bas} is obtained by comparing the observed radio data to the observed visual data (*Figure 1*). Radio meteor observing data were provided for about 800 months. This formula translates the radio results from the activity level into the visual results as a *CHR* (*Figure 2 and 3*).

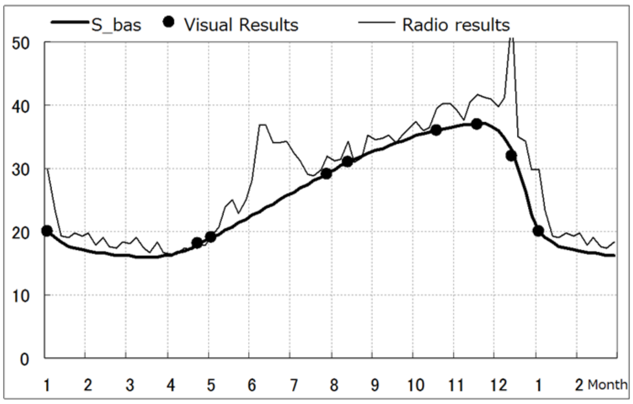


Figure 1 – The relationship between S_{bas}, visual results and radio results.

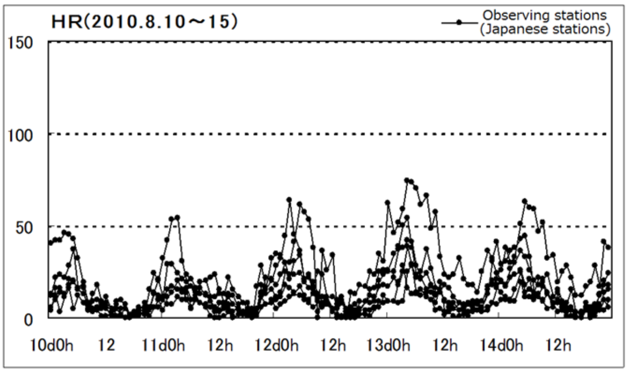


Figure 2 – Results for the Hourly Rate.

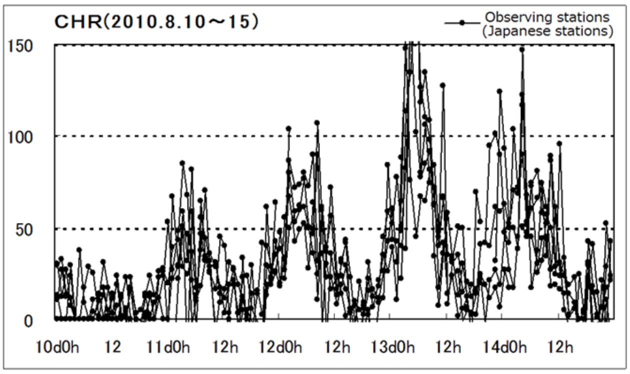


Figure 3 – Results for the *CHR*.

2.3 Correcting radiant elevations

This research basically uses only radiant elevations higher than 20 degree. The *ZHR* is obtained with the following formula:

$$ZHR = CHR * sin(h)$$

where, *CHR* as described in the previous subsection and *h* is a radiant elevation (*Figure 4*).

2.4 Combining all calculated data

The calculations of the previous sections are done for each observing station. Next we need to combine the data from all observing stations. As a final step we calculate the average for all observing stations at time *t* (*Figure 4*: bold line as the worldwide average).

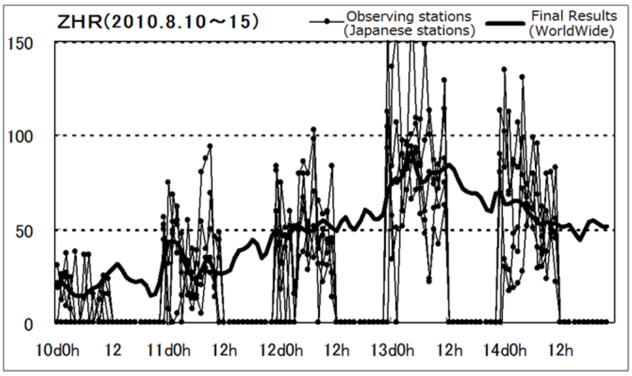


Figure 4 – Results of the estimated *ZHR* using worldwide data.

3 More corrections

3.1. Removing unusual data

Radio meteor observations sometimes have unusual observed data other than meteor activity. This is caused by noise, sporadic-E, receiving conditions etc. These obvious erroneous data are removed in this research.

3.2. Removing meteor shower activity in D_{ave}

D_{ave} sometimes includes some meteor shower activity. This is because D_{ave} is derived from observed data during previous two weeks. If one meteor shower has a long period activity, D_{ave} is influenced by this meteor shower. This method tries to remove this affected data when the radiant elevation is being corrected.

4 Results

This method succeeds to estimate the Zenithal Hourly Rate using radio meteor observations and the results are similar as the visual observing results.

This way it becomes possible to capture the Zenithal Hourly Rate even if the weather is bad or when a Full Moon interferes. Of course, it also becomes possible to monitor daytime meteor showers.

This methodology has already been used for many meteor shower results (see my website). It was sometimes successful to detect the activity of predicted outbursts.

Acknowledgment

We wish to thank all radio meteor observers in the world[9,10], Mr. Shigeo Uchiyama for providing visual data, Mr. Masayoshi Ueda for his advice to this research and transmitting stations.

References

Ogawa H., Toyomasu S., Ohnishi K. and Maegawa K. (2001). "The Global Monitor of Meteor Streams by Radio Meteor Observation all over the world". *Proceeding of the Meteoroids 2001 Conference*, 6–10 August 2001, Kiruna, Sweden. Ed.: Barbara Warmbein. ESA SP-495, Noordwijk: ESA Publications Division, ISBN 92-9092-805-0. Pages 189–191.

[9] http://www.amro-net.jp
[10] http://www.rmob.org/

A new meteorite fell in the region of Igdi (Tata, Morocco)

Abderrahmane Ibhi[1], Fouad Khiri[1,2] and Lahcen Ouknine[1]

[1]**Petrology, Metallogeny and Meteorites Laboratory, University Ibn Zohr, Agadir, Morocco.**
a.ibhi@uiz.ac.ma

[2]**Regional Center of Trades of Education and Training, Inzegane, Agadir, Morocco.**
fkhiri2009@gmail.com

A meteoritic body entered the Earth's atmosphere in the southern skies of Tata, in the rural commune of Ait Ouabelli (South-East Morocco), on Wednesday July, 12th, 2017 at 22:10 GMT. Its interaction with the atmosphere led to bright light flashes accompanied with detonations. It seemed to be brighter than an electric welding light. The bolide traveled from North to South and has experienced several fragmentation events along its atmospheric trajectory. This extraordinary and rare event is extremely valuable to the scientific community and it was the brightest and most comprehensively observed fireball in Morocco's astronomical history.

Figure 1 – The new meteorite dropped in the region of Igdi

Immediately after the fireball event hundreds of people moved to the site from surrounding Douars, villages and collectors of meteorite fragments from other cities (Erfoud, Laayoune, Marrakeche, Es smara, etc…) to search the meteorite fall despite the high temperature that was reached with 50°C. The first fragments were recovered the following day between Igdi, Ait Ouabelli, Boufalouss and Mofzou douars (*Figure 1*). Most of the specimens found were quickly identified as meteorites because they exhibited a prominent fusion crust that covers a part of their surface. The majority of these fragments are composed of relatively small pieces, with the largest officially reported being 1 kg as of this publication.

Indeed, subsequently a large number of eyewitness accounts were recorded and mapped by GPS. Now we are in a position to draw the ellipse of the strewn field of the Igdi meteorite, which starts in the north of Igdi and continues into the south direction above the natural barrier of the "Jebel Bani" which constitutes the border between Morocco and Algeria. The study is intended to serve as a case example for post-event data recovery and trajectory reconstruction in these areas not covered by all-sky-camera networks and with limited scientific infrastructure.

Figure 2 – Many of the region inhabitants came to assist in recovering the fresh fragments before valuable information could be lost due to bad weather conditions. Initial searches by nomads, through the direction of the bolide, produced the first few fragment (Photo mum).

Figure 3 – Scientist Abderrahmane Ibhi checking a meteorite fragment (Photo mum).

Acknowledgments

We are grateful to Rachid Benzakour (Ait Ouabelli), Christian Leloup (Azrou), Ait Ouzrou Mohamed (Agadir), Saleh Belhaouri (Tata) and Mohamed Lhou (Mofzou) for their assistance in the collection of information.

CAMS BeNeLux results April – June 2017

Carl Johannink

Dutch Meteor Society, the Netherlands
c.johannink@t-online.de

The second quarter of 2017 allowed for the collection of orbits during 78 nights of the total of 91 nights. 4398 orbits were added to the CAMS database in this period. Weather was very cooperative in April and June. Only the first half of May was hampered by some unsettled weather.

1 April 2017

April was dominated by a lot of clear nights and with the exception of the nights April 16/17 and April 21/22 (Lyrid maximum), CAMS BeNeLux was able to collect a reasonable number of orbits of meteors. Our cameras operated more than a total of 11000 hours.

All in all April was a very successful month indeed.

During the remaining 28 nights we collected 1235 orbits, and although we missed the Lyrid maximum, CAMS nevertheless obtained 62 orbits of Lyrids during other nights this month.

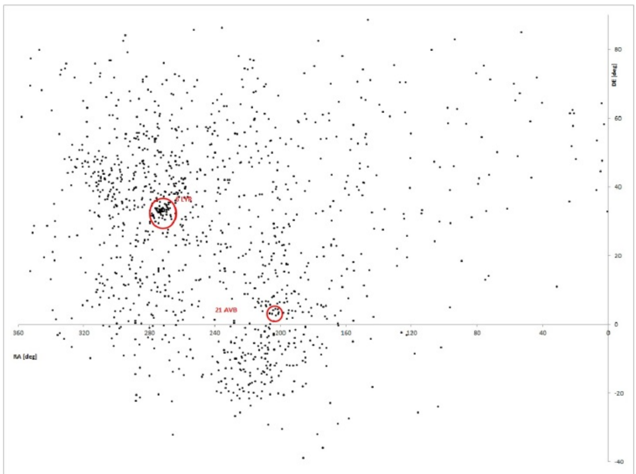


Figure 1 – Radiantplot for April 2017.

Robert Haas (Alphen aan de Rijn, Netherlands) expanded his CAMS station with CAMS 367 and 368 starting April 7th. *Jean-Marie Biets* (Wilderen, Belgium) added a third camera (CAMS 380) at his site on April 10th.

Felix Bettonvil (Utrecht, Netherlands) was able to restart his CAMS 376 on April 17th.

Unfortunately, *Tim Polfliet* (Gent-Belgium) stopped his CAMS activities (396) at the end of April.

Besides the Lyrids, activity from other 'confirmed' streams could be detected this month: April rho Cygnids (348 ARC), h Virginids (343 HVI) and the alpha Virginids (15 AVB).

From the latter we collected 15 orbits with the following mean orbital elements (between brackets the elements for this stream from Jenniskens et al. (2016):

- a = 2.47 [2.55]
- e = 0.6928 [0.716]
- q = 0.7479 [0.744]
- i = 6.1 [7.0]
- ω = 247.4 [247.9]

Finally, we found 22 members of the zeta Cygnids (40 ZCY), with the following mean orbital elements:

- a = 7.53 [3.93]
- e = 0.8138 [0.78]
- q = 0.9058 [0.90]
- i = 69.94 [74.9]
- ω = 142.3 [140.5]

2 May 2017

The month of May showed a rather unstable weather.

During seven nights we couldn't collect any simultaneous meteor: May 2/3, 3/4, 4/5, 7/8, 11/12, 15/16 and 18/19.

The second part of the month was much more successful and in total we captured 1627 orbits in a little more than 8800 hours.

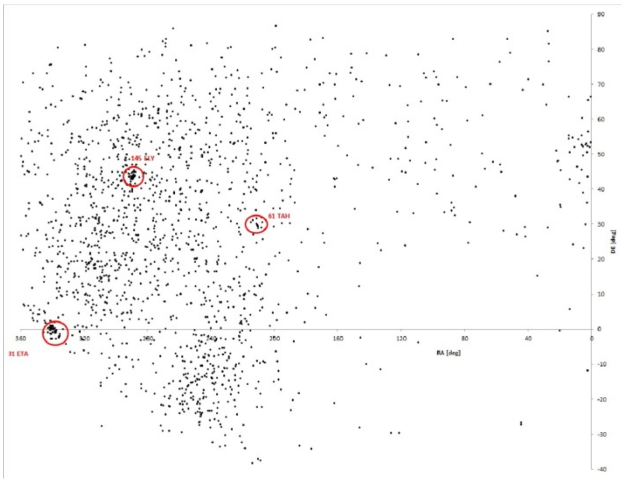


Figure 2 – Radiantplot for May 2017.

Martin Breukers (Hengelo, Netherlands) permanently installed camera 327 in our network on May 5th.

Piet Neels (Ooltgensplaat, Netherlands) expanded his station with two more cameras this month. CAMS 340 started on May 12th, and CAMS 345 on May 26th.

Apart from much activity from the Scorpius-Aquila-region, we collected data for the eta Aquariids, the eta Lyrids and the tau Herculids.

For details we refer to previous publications (Miskotte and Johannink, 2017; Miskotte et al., 2017).

3 June 2017

Never before since the start of our network in 2012, June was this successful. A total of 1536 orbits were collected during more than 6800 hours of capturing.

That is nearly a doubling of the highest June-rates since the start in 2012.

During only four nights our network was clouded out completely: June 7/8, 24/25, 27/28 and June 30/July 1.

Starting June 19th the station of *Felix Bettonvil* (Utrecht – Netherlands) is fully operable, since CAMS 377 could start the observations again.

Once again *Piet Neels* expanded his station with two more cameras. Since June 10th CAMS 349 is active, and since June 23rd CAMS 840 was added.

No special activity from confirmed streams (Jenniskens et al., 2016), nor unexpected activity was recorded.

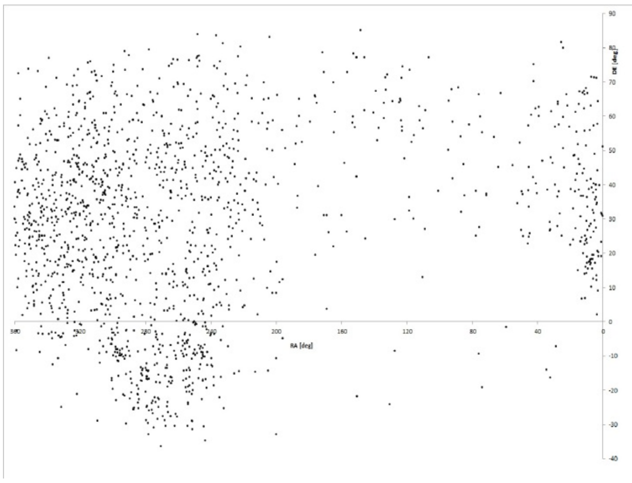


Figure 3 – Radiantplot for June 2017.

A lot of activity has been detected from the Ophiuchus-Scorpius region, as can be expected in this month. From the confirmed streams the Tau Herculids (61 TAH), northern June Aquilids (164 NZC), phi Piscids (372 PPS) and June rho Cygnids (510 JRC) showed activity on several nights.

We also noticed activity from the not yet confirmed epsilon Ursae Majorids (186 EUM).

Robert Haas (Alphen aan de Rijn, Netherlands, CAMS 360) and *Koen Miskotte* (Ermelo, Netherlands, CAM 352) caught a June Boötid on June 19th at 23:25:16 UT.

Piet Neels (Ooltgensplaat, Netherlands, CAMS 340) and *Klaas Jobse* (Oostkapelle, Netherlands, CAMS 338) captured another one on June 26th at 21:38:54 UT.

4 Conclusion

The second quarter of 2017 was very successful for CAMS BeNeLux, with a record number of orbits.

This is partly due to good meteorological circumstances, but a rearrangement of the aiming points of several CAMS cameras also plays a significant role. Thanks to *Paul Roggemans* who invested a lot of time to get a more optimal coverage of the sky above our countries.

Besides that, our network is still expanding, with several new cameras added to our network by some operators.

Acknowledgement

Many thanks to all participants in the CAMS BeNeLux network:

Hans Betlem (Leiden, CAMS 371, 372 and 373), *Felix Bettonvil* (Utrecht, CAMS 376 and 377) , *Jean-Marie Biets* (Wilderen, CAMS 380, 381 and 382), *Bart Dessoy* (Zoersel, CAMS 397 and 398), BISA / *Hervé Lamy* (Dourbes / Ukkel, CAMS 394 and 395/ 393), *Martin Breukers* (Hengelo, CAMS 320, 321, 322, 323, 324, 325, 326 and 327), *Franky Dubois* (Langemark, CAMS 386), *Luc Gobin* (Mechelen, CAMS 390 and 391), *Robert Haas* (Alphen aan de Rijn, CAMS 360, 361, 362, 363, 364, 365, 367 and 368), *Robert Haas / Edwin van Dijk* (Burlage, CAMS 801 and 802), *Klaas Jobse* (Oostkapelle, CAMS 331, 332, 337, 338 and 339) , *Carl Johannink* (Gronau, CAMS 311, 312, 313, 314, 315, 316, 317 and 318), *Koen Miskotte* (Ermelo, CAMS 351, 352, 353 and 354), *Piet Neels* (Ooltgensplaat, CAMS 340, 341, 342, 343, 344 and 345, 349, 840), *Steve Rau* (Zillebeke, CAMS 385 and 387), *Paul Roggemans* (Mechelen, CAMS 383, 384, 388, 389 and 399), *Hans Schremmer* (Niederkruechten, CAMS 803) and *Erwin van Ballegoij* (CAMS 347 and 348).

Their efforts are most important for the achievements of our network.

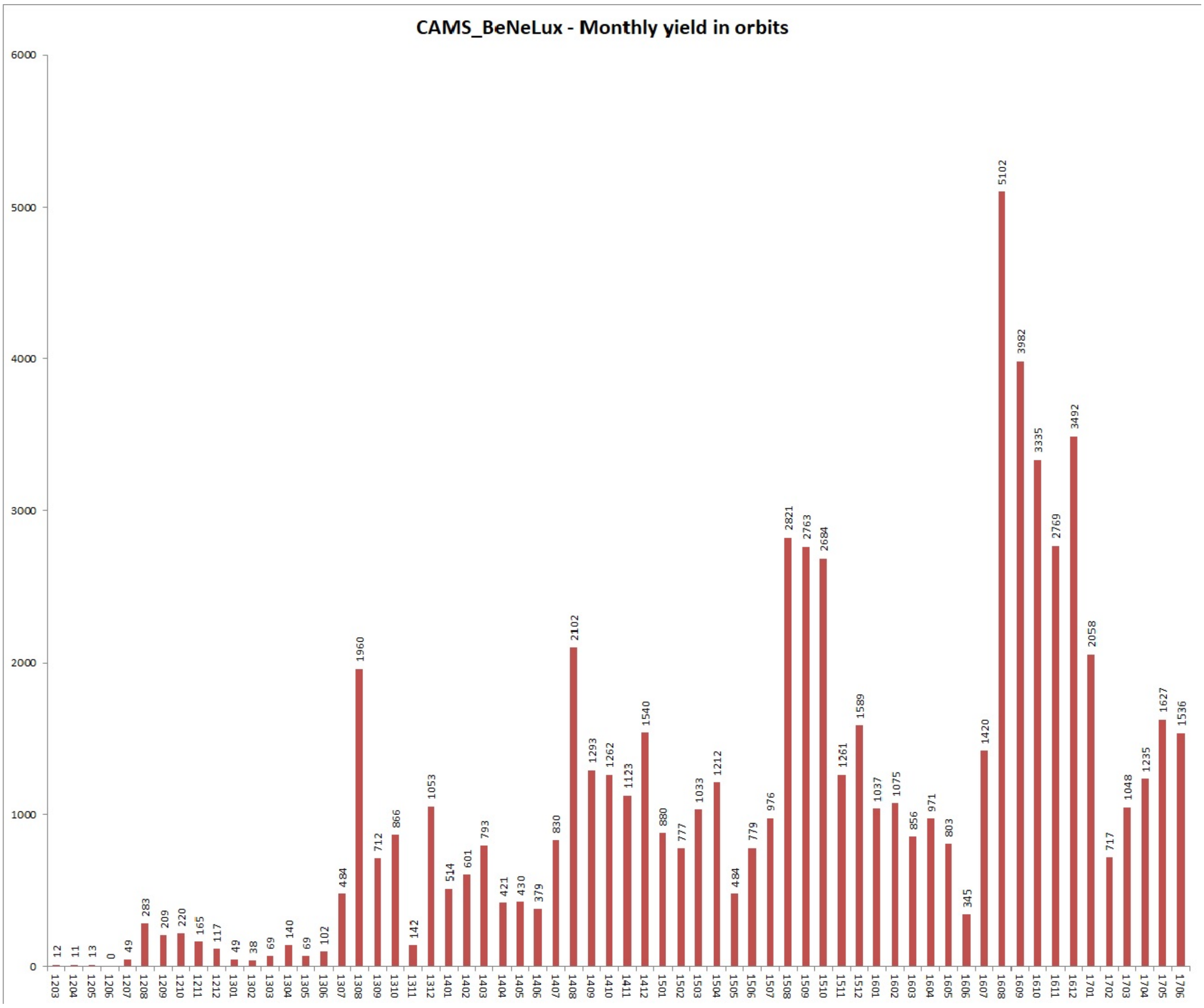


Figure 4 – Performance graph of CAMS BeNeLux: number of simultaneous orbits collected since the start of this network in March 2012.

References

Jenniskens P., Gural P. S., Dynneson L., Grigsby B. J., Newman K. E., Borden M., Koop M. and Holman D. (2011). “CAMS: Cameras for Allsky Meteor Surveillance to establish minor meteor showers”. *Icarus*, **216**, 40–61.

Jenniskens P., Nénon Q., Albers J., Gural P. S., Haberman B., Holman D., Morales R., Grigsby B. J., Samuels D. and Johannink C. (2016). “The established meteor showers as observed by CAMS”. *Icarus*, **266**, 331–354.

Miskotte K. and Johannink C. (2017). “Afval van een oude bekende: de eta Lyriden afkomstig van komeet IRAS-Araki-Alcock (C/1983 H1)”. *eRadiant*, **2017/3**, 69–73.

Miskotte K., van ’t Leven J. and Johannink C. (2017). “Tau Herculiden activiteit vastgelegd door CAMS”. *eRadiant*, **2017/4**, 76–85.

2017 Southern Delta Aquariids from Morocco

Kai Gaarder

kai.gaarder@gmail.com

The 2017 SDA campaign turned out to be a success due to good weather and observing conditions most of the time. It was a great experience to observe meteors in the Moroccan mountains, with all its sounds ranging from the bray of the mules calling each other over long distances, to the barking of the stray dogs and the flapping of the bats hunting insects around my sunbed! Every night around 03:30 the mosques started their calls for the morning prayer, creating a very special atmosphere during the late morning observations. The Southern Delta Aquariids was definitely a shower worth observing, and I hope I can return to a favorable latitude to observe them again in the future. Details of the observations can be found in the Visual Meteor Database on the IMO website.

1 Introduction

The Southern Delta Aquariids (SDA) is almost impossible to observe in the long summer nights at 60 degrees northern latitude. I therefore hoped to get at least 2 nights of observation of this swarm, during a long-planned family vacation to Morocco from July 13 to July 27. We would stay in a town called Martil situated on the north coast of Morocco, but light pollution here is too high to perform any kind of meteor observations. Due to this, I had also booked 2 nights from July 22 to July 24 for the whole family at a place called Caiat Lounge Refugee, situated at a dark site in the Rif Mountains. As the time of departure from Norway approached, I was more and more troubled with the thought of leaving Morocco just before the highest activity of the SDA kicked in. I got permission from my always understanding and caring wife, called the airline, and changed the dates for my tickets back to Norway. This way I would get 5 more days of observation when the highest activity was expected!

2 July 22 – July 23

On July 22, the whole family arrived at Caiat, and I was excited to check out the observing conditions. After rigging down some sunshields on top of the roof, I was ready for observations! The limiting magnitude turned out to be quite good, usually between 6.2 and 6.3. Some streaking headlights from the cars on a road nearby, was a bit annoying, but did not seriously affect the observations. Meteor activity was a bit on the disappointing side, with SDA and Capricornid (CAP) rates not exceeding 2 meteors an hour. The sporadic rate was around 4 in the evening, reaching 9 in the morning hours. Perseid (PER) activity also picked up good during the night, reaching 5 in the morning hours. The highlight of the night was a –2 magnitude, intense blue, slow moving Capricornid meteor. I would have loved to have this meteor in my photographic treasure chest, but it moved in the opposite direction from where I had my camera field. Totally I photographed 5 meteors this night, with my Nikon D3100 DSLR camera, with a Samyang 16mm F2.0 lens. A total of 49 meteors were observed visually in 4.25 hours.

3 July 23 – July 24

The next night I was observing from the roof again, and got much of the same results. SDA and CAP rates were not exceeding 2 meteors an hour. Sporadic rates were around 5 in the beginning of the watch, but climbing to 13 in the morning hours. Perseid activity was around 4 when the radiant was at its highest in the morning sky. A total of 64 meteors were observed visually in 5.37 hours. I had more luck with my photographic observations this night, with 10 photographed meteors. When daylight came, I had to return to Martil for my family's departure, but was already looking forward to return to Caiat on July 27 for more observations!

4 July 27 – July 28

On July 27, I decided to look for a new observing site, to get a little better horizon to the south, and escape from the occasionally annoying car lights. I found a good place a 20 minutes' walk up on a hillside nearby. And best of all, the meteor activity had picked up considerably! The SDA and the CAP started out with rates around 4 in the late evening sky, with SDA rates climbing to around 11 when the radiant was at its highest. Sporadic rates were surprisingly high this night, climbing from around 14 in the evening sky, to 24 in the morning sky! It seemed to be several centers of sporadic activity. Activity from the Gamma Draconids (GDR) was detectable, but did not exceed 2 meteors an hour. This activity is included in the sporadic count. It also seemed to be a center of sporadic activity in Cassiopeia, with many fast meteors coming from that region. Many slow moving, bright meteors were coming from the Aquila/Sagitta region, too high in the sky to be Capricornids, but with similar characteristics. I did not plot any of the meteors, but I guess video observations will reveal any activity from these possible radiants. The highlight of the night came during a break between 2 observing sessions, when a beautiful –3 magnitude Capricornid meteor, slowly moved over a large portion of the sky with an intense bluish color! A total of 173 meteors were observed visually this night, in 5.75 hours.

5 July 28 – July 29

On the next night, the sporadic activity was fairly constant between 12 and 17 meteors the whole night. The SDA's started out with 5 meteors between 23:00 and 00:00 UT, with the radiant still low in the sky. From midnight and onwards, rates were steady between 9 and 12, reaching 8 meteors (HR 16), the last half hour of observation between 03:15 and 03:45 UT. The Capricornids showed rates between 2 and 4, with occasionally bright shower members. 12 meteors were caught on camera, and 158 meteors were observed visually in 5.58 hours, making this night successful when it comes to both visual and photographic observations.

6 July 29 – July 30

I had great hopes for the next night, which I considered could be the best night regarding activity from the SDA radiant. The first 2 hours of observation between 23:00 and 01:00 UT, SDA rates were around 8 to 9 meteors an hour. The sporadics made a good show of bright meteors, with a 0 mag, –2 mag and a –4 mag in the first half hour of observation. Hourly rates were between 10 and 14 for the sporadics the first 2 hours of observation. 7 Capricornid meteors were also seen in this period. From midnight, the SDA rates climbed to 15, reaching 17 at its best when the radiant culminated around 03:00 UT. This was in line with the sporadic activity for the rest of the night. A total of 141 meteors were seen in 4.5 hours of observation, and 18 meteors were caught on camera, making this another successful night of my Moroccan SDA campaign!

7 July 30 – July 31

The next night, I went out early to take some photographs on a still moonlit sky. Camera was ready 22:30 UT, and only 3 minutes later I was rewarded with an awesome, slow mowing –3 mag Capricornid fireball, with 2 great flares right in the middle of my camera field! This meteor alone was worth all the hours with endless exposures showing nothing but satellites, or the hardly visible streak of a 2-mag meteor. Finally, I got the big one! From 23:30 to 01:00 SDA rates were around 10, similar or just below the sporadic rates. Activity was stable at around 10 to 02:35, when a sudden increase in SDA activity occurred! In the next half hour between 02:35 and 03:05, 14 SDA meteors were seen! The brightness also increased, with 3 meteors of 0 magnitude, and one of –2 magnitude. After this sudden burst of activity, rates declined to 9 meteors an hour for the next and final hour of observation this night. A total of 134 meteors were seen this night in 4.42 hours of observation. 11 meteors were photographed.

Figure 1 – -3 Magnitude Capricornid fireball on July 30, at 22:33 UT. Photo taken with a Nikon D3100, with a Samyang 16mm F2.0 lens, with ISO 1600 settings. Exposure time was 20 seconds.

8 July 31 – August 1

Before the final night of my stay at Caiat, I woke up to a bad weather forecast. Clouds were coming in from the south, and I was starting to prepare myself for a good night sleep! Clouds started to build up in the early evening, and the forecast for the next day was a total cloud cover. A last weather check before going to bed, was however a big surprise. Clouds had started to disappear, and at 23:45 the sky was clear, and I was ready to observe! The first hour, SDA rates were again 9 meteors and hour, and the sporadic rate was 11. The next half hour, SDA rates had climbed to 9 meteors, making a HR of 18. I also got the impression that the mean magnitude was a bit higher than the nights before. Unfortunately, the weather forecast proved right, and I had to give up observations at 01:20 when clouds came in again. This night I observed 39 meteors, in 1.58 hours, and 7 meteors were photographed.

Visual observations from California July 2017

Robert Lunsford

American Meteor Society (AMS), El Cajon, California, USA
lunro.imo.usa@cox.net

Three reports on visual meteor observations are presented, covering the 2017 July meteor activity.

1 July 23, 2017

I have been waiting for the moon to pass its last quarter phase so I can catch some of the mid-July activity. Unfortunately our area has been plagued by clouds so I had to wait until this morning to finally get a peak at the meteor activity. The sky was mediocre and very hazy, especially in the west toward San Diego. I decided to face southward to catch some of the early activity in that part of the sky. Activity started slow but picked up toward the bottom of the first hour. There was another long lull of activity centered at 10 UT (2am PDT). The remainder of the watch was pretty slow but without long periods of inactivity.

The highlight of the night was an impressive zero magnitude eta Eridanid (ERI) the shot upward toward though Pegasus and extinguished just before reaching Cygnus. It had a nice one second train that made tracing the path much easier.

The one north delta Aquariid (NDA) was slow, dim, and close to the radiant. I was looking right at it so I'm confident of the association. I don't know if anyone else has noticed but this radiant picks up right where the northern June Aquilids (NZC) leave off. They have nearly identical characteristics so we may be dealing with one shower with a long duration.

The two c-Andromedids (CAN) were a surprise, seen near the end of the watch. They both missed the current Perseid radiant by a wide swath and lined up well with the current predicted radiant near the star tau Persei. Good thing they shot southward or I would have missed them entirely.

It was nice to see the bright stars of Orion once again, rising in the east during the brightening dawn. I also look forward to seeing Sirius again toward the end of the month.

The forecast for tonight and the next few nights is not encouraging with tropical moisture predicted to move up from Mexico. As I look outside near sunset, the sky is clear and promising. If it's clear, I will be out.

Observer: Robert Lunsford (LUNRO)
Date: 17- Jul 23 Mean Solar Long: 120.520
Beginning Time (UT) 0900 Ending Time (UT) 1200
Total T_{eff}: 3.00
LOCATION: Blossom Valley, CA, USA
LONG: 116 51′ 37″ W LAT: 32 51′ 44″ N
Elevation: 304 m Bortle Scale: Class 5: Suburban Sky
Beginning Temperature/Relative Humidity: 67F-78%
Ending Temperature/Relative Humidity: 66F-83%
METHOD: Visual Recording on Tape/Video Recording

Showers Observed:

- CAN 02:56 (044) +53 00-00-02 2 Total
- CAP 19:56 (299) -11 01-01-00 2 Total
- ERI 01:52 (028) -18 00-01-00 1 Total
- NDA 21:48 (327) -06 01-00-00 2 Total
- PER 01:12 (018) +52 02-00-01 1 Total
- SDA 22:16 (334) -19 02-00-00 2 Total
- SPO 03-05-02 10 Total
- Hourly Counts 09-07-05 21 Total

Period 1 0900-1000 UT
F = 1.00 (0% Clouds) Mean LM 5.86
FOV 330 +00 TOTAL T_{eff}: 1.00
Mean Solar Long: 120.480

METEOR DATA:

CAP 1, NDA 1, PER 2, SDA 2, SPO 3 TOTAL 9

Magnitude Distribution:

- CAP -1 (1) Mean -1.00
- NDA +4 (1) Mean +4.00
- PER +1 (1) +4 (1) Mean +2.50
- SDA +3 (1) +4 (1) Mean +3.50
- SPO 0 (12) +3 (1) +4 (1) Mean + 2.33

Period 2 1000-1100 UT
F = 1.00 (0% Clouds) Mean LM 5.70
FOV 345 +00 TOTAL T_{eff}: 1.00
Mean Solar Long: 120.520

METEOR DATA:

ERI 1, CAP 1, SPO 5 TOTAL 7

Magnitude Distribution:

- ERI 0 (1) Mean +0.00
- CAP +2 (1) Mean +2.00
- SPO +3 (3) +4 (1) +5 (1) Mean + 3.60

Period 3 1100-1200 UT
F = 1.00 (0% Clouds) Mean LM 5.64
FOV 000 +00 TOTAL T_{eff}: 1.00
Mean Solar Long: 120.560

METEOR DATA:

CAN 2, PER 1, SPO 2 TOTAL 5

Magnitude Distribution:

- CAN +2 (1) +3 (1) Mean +2.50
- PER +3 (1) Mean +3.00
- SPO +3 (2) Mean +3.00

Total Magnitude Distribution:

- CAN +2 (1) +3 (1) Mean +2.50
- CAP –1 (1) +2 (1) Mean +0.50
- ERI 0 (1) Mean +0.00
- NDA +4 (1) Mean + 4.00
- PER +1 (1) +3 (1) +4 (1) Mean +2.67
- SDA +3 (1) +4 (1) Mean +3.50
- SPO 0 (1) +3 (6) +4 (2) +5 (1) Mean + 3.10

2 July 28, 2017

It was 1 year ago tonight that the July gamma Draconids produced an impressive outburst over Europe. If any such occurrence were to repeat in 2017, it would most likely occur over North America near 6 UT. I went out with little anticipation and that is exactly what I saw. Only 2 GDR's appeared during 2 hours centered on 6UT. I was actually surprised I caught 2 of them! The first one was slightly brighter than Deneb and shot past that star in Cygnus. The second was of 3rd magnitude and shot through the head of Draco. "Shot" may be an incorrect description as both of these meteor were fairly slow. Both evening hours produced 6 meteors each with a nice variety as you can see below. The sky appeared nice, more impressive than the limiting magnitude would indicate. After a short nap, I turned toward the south to view the activity there. Conditions had changed drastically for the worse. it was very hazy with clouds to the south and west. The clouds held back for 30 minutes but soon obscured the sky during the 3rd quarter of the hour. Looks like I'll need to make a trip to higher elevations if I am to see the SDA's at their best.

Observer: Robert Lunsford (LUNRO)
Date: 17- Jul 28 Mean Solar Long: 125.127
Beginning Time (UT) 0500 Ending Time (UT) 0700
Total T_{eff}: 2.75
LOCATION: Blossom Valley, CA, USA
LONG: 116 51′ 37″ W LAT: 32 51′ 44″ N
Elevation: 304 m Bortle Scale: Class 4: Rural-Suburban Transition
Beginning Temperature/Relative Humidity: 70F-76%
Ending Temperature/Relative Humidity: 67F-86%
METHOD: Visual Recording using audio recording device

Showers Observed:

- ANT 20:16 (317) -16 00-01-00 1 Total
- CAP 20:16 (304) -10 00-01-01 2 Total
- GDR 18:40 (280) +50 01-01-00 2 Total
- PER 01:40 (025) +54 00-00-01 1 Total
- SDA 22:36 (339) -17 02-00-02 4 Total
- SPO 03-03-02 8 Total
- Hourly Counts 06-06-06 18 Total

Period 1 0500-0600 UT

F = 1.00 (0% Clouds) Mean LM 6.09
FOV 270 +60 TOTAL T_{eff}: 1.00
Mean Solar Long: 125.099

METEOR DATA:

GDR 1, SDA 2, SPO 3 TOTAL 6

Magnitude Distribution:

- GDR +1 (1) Mean +2.50
- SDA +1 (1) +3 (1) Mean +2.00
- SPO +2 (1) +3 (1) +4 (1) Mean + 3.00

Period 2 0600-0700 UT

F = 1.00 (0% Clouds) Mean LM 6.04
FOV 285 +60 TOTAL T_{eff}: 1.00
Mean Solar Long: 125.139

METEOR DATA:

ANT 1, CAP 1, GDR 1, SPO 3 TOTAL 6

Magnitude Distribution:

- ANT +3 (1) Mean +3.00
- CAP -1 (1) Mean -1.00
- GDR +3 (1) Mean +3.00
- SPO +2 (1) +4 (2) Mean + 3.33

Period 3 0900-0945 UT

F = 1.11 (10% Clouds) Mean LM 5.18
FOV 330 +00 TOTAL T_{eff}: 0.75
Mean Solar Long: 125.255

METEOR DATA:

CAP 1, PER 1, SDA 2, SPO 3 TOTAL 6

Magnitude Distribution:

- CAP +4 (1) Mean +4.00
- PER +2 (1) Mean +2.00
- SDA +2 (1) +3 (1) Mean +2.50
- SPO +1 (1) +2 (1) Mean +1.50

Total Magnitude Distribution:

- ANT +3 (1) Mean +3.00
- CAP –1 (1) +4 (1) Mean +1.50
- GDR +1 (1) +3 (1) Mean +2.00
- PER +2 (1) Mean +2.00
- SDA +1 (1) +2 (1) +3 (2) Mean +2.25
- SPO +1 (1) +2 (3) +3 (1) +4 (3) Mean + 2.75

3 29 July, 2017

This morning I was facing south to concentrate on the southern showers. As has been the case recently the humidity has been high and the transparency has been poor. The light dome from San Diego was bad, affecting the sky toward the west and southwest. So the sky east of the meridian was impressive but west of the meridian was poor. Despite this I managed to count 52 meteors during 3.33 hours of viewing. Both the first and last periods were strong but there was a noticeable dip in activity during the middle hour. The Southern delta Aquariids were the most active shower by a long shot. They did not reach the 10/hr rate but were still nice. The best meteor of the night was a –2 Perseid that shot through Pegasus and Aquarius. The one gamma Draconid seen was pure luck. Just before I quit for the night I heard a noise behind me and turned around to see a nice 2nd magnitude GDR skim the northern horizon heading eastward. It was a nice way to end the session!

Observer: Robert Lunsford (LUNRO)
Date: 17- Jul 29 Mean Solar Long: 126.202
Beginning Time (UT) 0840 Ending Time (UT) 1200
Total T_{eff}: 3.33 LOCATION: Blossom Valley, CA, USA
LONG: 116 51′ 37″ W LAT: 32 51′ 44″ N
Elevation: 304 m Bortle Scale: Class 4: Rural-Suburban Transition
Beginning Temperature/Relative Humidity: 66F (19C) – 82%
Ending Temperature/Relative Humidity: 64F (18C) – 87%
METHOD: Visual Recording using audio recording device

Showers Observed:

- ANT 21:12 (318 -16 01-01-01 3 Total
- CAP 20:20 (305) -10 01-00-00 1 Total
- GDR 18:42 (281) +50 00-00-01 1 Total
- JPE 00:14 (004) +15 01-00-00 1 Total
- PER 01:46 (027) +54 01-03-02 6 Total
- SDA 22:40 (340) -17 07-05-08 20 Total
- SPO 09-04-07 20 Total
- Hourly Counts 20-13-19 52 Total

Period 1 0840-0940 UT

F = 1.00 (0% Clouds) Mean LM 5.82
FOV 330 +00 TOTAL T_{eff}: 1.00
Mean Solar Long: 126.206

SHOWER DATA:

- 1 ANT +3
- 1 CAP +3
- 1 JPE +4
- 1 PER -1
- 7 SDA +1 (1) +2 (1) +3 (1) +4 (4) Mean +3.14
- 9 SPO +1 (1) +2 (3) +3 (1) +4 (1) +5 (3) Mean + 3.22

Period 2 0940-1040 UT

F = 1.00 (0% Clouds) Mean LM 5.78
FOV 345 +00 TOTAL T_{eff}: 1.00
Mean Solar Long: 126.246

SHOWER DATA:

- 1 ANT +2
- 3 PER -2 (1) +1 (1) +3 (1) Mean +0.67
- 5 SDA +2 (1) +3 (1) +4 (1) +5 (1) Mean +2.50
- 4 SPO +1 (1) +4 (2) +5 (1) Mean + 3.50

Period 3 1040-1200 UT

F = 1.00 (0% Clouds) Mean LM 5.74
FOV 000 +00 TOTAL T_{eff}: 1.33
Mean Solar Long: 126.286

SHOWER DATA:

- 1 ANT 0
- 1 GDR +2
- 2 PER 0 (1) +2 (1) Mean +1.00
- 8 SDA -1 (1) 0 (1) +1 (1) +2 (3) +3 (2) Mean +1.50
- 7 SPO +2 (1) +3 (2) +4 (3) +5 (1) Mean + 3.57

2017 South delta Aquariid and alpha Capricornid observations from North Florida

Paul Jones

The following are summaries of my late July/early August 2017 observations from North Florida. The weather was bad most nights, so systematic observations were not possible. I noticed and can confirm the obvious burst of South delta Aquariid activity that occurred on July 31!

1 Introduction

July/August 2017 meteor observations
Observer: Paul Jones

Observed for radiants:

- CAP – alpha Capricornids
- ERI – eta Eridanids
- ANT – Anthelions
- PER – Perseids
- SDA: South delta Aquariids
- PAU – Piscis Austrinids
- NDA: North delta Aquariids
- GDR – gamma Draconids
- JPE: July Pegasids

2 July 20/21 2017

Observer: Paul Jones, Location: North Bank of Matanzas Inlet, Florida, Lat.: 29.75N, Long.: 81.24W (approximately 15 miles south of St. Augustine, Florida). 10% cirrus cloud interference, Facing: south.

0325 – 0425 EDT (0725 – 0825 UT)
T_{eff}: 1.0 hour, No breaks.

- 4 PER: +2(2), +3(2)
- 4 SDA: +3(2), +4, +5
- 1 CAP: +1
- 2 ANT: +2, +4
- 8 SPO: +2, +3. +4(4), +5(2)
- 19 total meteors

5 of the 19 meteors (2 PERs, 1 CAP, 1 ANT and 1 SPO) left trains. Yellow and blue tints were seen in the brighter PERs and the SDAs.

3 July 21/22, 2017

Observer: Paul Jones, Location: North Bank of Matanzas Inlet, Florida, Lat: 29.75N, Long: 81.24W (approximately 15 miles south of St. Augustine, Florida).

0300 – 0400 EDT (0700 – 0800 UT) T_{eff}: 1.0 hour, No breaks, LM: 6.9, Clear, except for some very slight haze near the horizons, facing: south.

- 4 PER: +1, +3, +4, +5
- 3 SDA: +2, +3, +5
- 1 CAP: +1
- 2 ANT: +4(2)
- 11 SPO: +1, +2, +3(4), +4(2), +5(3)
- 21 total meteors

3 of the 21 meteors (1 PER, 1 CAP, and 1 SPO) left trains. Yellow and blue tints were seen.

0400 – 0500 EDT (0800 – 0900 UT) T_{eff}: 1.0 hour, No breaks, LM: 6.9, Clear, except for some very slight haze near the horizons, facing: south.

- 4 PER: -1, 0, +2, +4
- 4 SDA: +1, +2, +4, +5
- 1 CAP: +3
- 7 SPO: 0, +2(2), +3(3), +4
- 16 total meteors

3 of the 16 meteors (2 PERs and 1 SPO) left trains. Yellow and blue tints were seen.

4 July 24/25, 2017

Observer: Paul Jones, Location: North Bank of Matanzas Inlet, Florida, Lat: 29.75N, Long: 81.24W (approximately 15 miles south of St. Augustine, Florida).

0300 – 0400 EDT (0700 – 0800 UT) T_{eff}: 1.0 hour, No breaks, LM: 6.9, Clear, except for some very slight haze near the horizons, facing: south.

- 5 PER: 0, +1, +2, +5(2)
- 4 SDA: +2, +4(2), +5
- 3 CAP: 0(2), +3
- 1 ANT: +3
- 1 PAU: +2
- 1 JPE: +1
- 11 SPO: +2(4), +3(2), +4(3), +5(2)
- 26 total meteors

8 of the 26 meteors (1 PER, 3 CAP, 1 ANT, 1 SDA, 1 PAU and 1 SPO) left trains. Yellow and blue tints were seen.

0400 – 0500 EDT (0800 – 0900 UT) T_{eff}: 1.0 hour, No breaks, LM: 6.9, Clear, except for some very slight haze near the horizons, facing: south.

- 7 PER: +2, +3(4), +4, +5
- 4 SDA: +2(2), +3(2)

- 2 ERI: +2, +3
- 9 SPO: +2(4), +3(2), +4(3), +5(2)
- 22 total meteors

2 of the 22 meteors (1 PER, and 1 SPO) left trains. Yellow and blue tints were seen.

5 July 27/28, 2017

Observer: Paul Jones, Location: North Bank of Matanzas Inlet, Florida, Lat: 29.75N, Long: 81.24W (approximately 15 miles south of St. Augustine, Florida).

0400 – 0450 EDT (0800 – 0850 UT) T_{eff}: 0.8 hour, No breaks, LM: 6.5, 40% cloud interference, facing: south.

- 14 SDA: +2, +3(4), +4(5), +5(4)
- 6 PER: 0, +3, +4(3), +5
- 1 CAP: +1
- 1 ANT: +2
- 1 ERI: +1
- 1 GDR: +1
- 2 NDA: +2, +4
- 1 PAU: +3
- 9 SPO: +2(4), +3(2), +4(3), +5(2)
- 36 total meteors

7 of the 36 meteors (2 PERs, 1 PAU, 1 CAP, 1 ERI, 1 SDA and 1 SPO) left trains. Yellow and blue tints were seen.

6 July 28/29, 2017

Observer: Paul Jones, Location: Deltona, Florida, Lat: 28.8766 deg N Long 81.1803 deg W, private residence.

0300 – 0400 EDT (0700 – 0800 UT) T_{eff}: 1.0 hour, No breaks, LM: 5.0, Clear, except for some very slight haze near the horizons, facing: north.

- 11 SDA: +1, +2(3), +3(4), +4(3)
- 4 PER: +1(2), +3, +4
- 1 NDA: +3
- 1 CAP: -1
- 2 ERI: 0, +1
- 9 SPO: +3(4), +4(3), +5(2)
- 28 total meteors

6 of the 28 meteors (2 ERI, 2 PERs, 1 CAP, and 1 SDA, left trains. Yellow and blue tints were seen.

0400 – 0500 EDT (0800 – 0900 UT) T_{eff}: 1.0 hour, No breaks, LM: 5.0, 20% cloud interference, facing: north.

- 9 SDA: +1, 2(3), +3, +4(4)
- 6 PER: +2(2), +3(2), +4(2)
- 1 ERI: +2
- 1 GDR: +1
- 1 ANT: +3
- 1 CAP: +2
- 8 SPO: 0, +2(2), +3(3), +4(2)
- 27 total meteors

5 of the 27 meteors (1 PER, 1 GDR, 2 SDA and 1 SPO) left trains. Yellow and blue tints were seen.

0500 – 0550 EDT (0900 – 0950 UT) T_{eff}: 1.0 hour, No breaks, LM: 5.0, 20% cloud/twilight interference, facing: north.

- 3 SDA: +2, +3(2), +4(4)
- 5 PER: +2(2), +3(2), +4
- 3 ERI: 0, +1, +2
- 2 NDA: +2, +3
- 1 ANT: +3
- 2 SPO: +2, +3
- 26 total meteors

2 of the 16 meteors (1 PER, and 1 SPO) left trains. Yellow and blue tints were seen.

7 July 30/31, 2017

July 30/31, 2017 Observer: Paul Jones, Location: North Bank of Matanzas Inlet, Florida, Lat: 29.75N, Long: 81.24W (approximately 15 miles south of St. Augustine, Florida).

0330 – 0430 EDT (0730 – 0830 UT) T_{eff}: 1.0 hour, No breaks, LM: 6.9, Clear, except for some very slight haze near the horizons, facing: south.

- 22 SDA: +1(2), +2(3), +3(9), +4(5), +5(3)
- 6 PER: +2, +3(2), +4(2) +5
- 2 NDA: +3(2)
- 3 CAP: -1, +3(2)
- 1 ERI: +2
- 1 PAU: +1
- 1 GDR: +3
- 12 SPO: 0, +2(2), +3(2), +4(3), +5(4)
- 48 total meteors

8 of the 48 meteors (1 PER, 1 CAP, 3 SDA, 1 NDA, 1 PAU and 1 SPO) left trains. Yellow and blue tints were seen.

0430 – 0530 EDT (0830 – 0930 UT) T_{eff}: 1.0 hour, No breaks, LM: 6.9, Clear, except for some very slight haze near the horizons, facing: south.

- 15 SDA: 0(2), +1(2), +2(7), +3(2), +4(2)
- 9 PER: -1, +2(4), +3(3), +5
- 2 ERI: 0, +1
- 3 NDA: +3(3)
- 1 CAP: +3
- 1 ANT: +3
- 10 SPO: +2, +3(5), +4(2), +5(2)
- 41 total meteors

7 of the 41 meteors (2 PER, 2 SDA, 1 NDA, 1 ERI and 1 SPO) left trains. Yellow and blue tints were seen.

8 Aug 1/2, 2017

Aug 1/2, 2017 Observer: Paul Jones, Location: North Bank of Matanzas Inlet, Florida, Lat: 29.75N, Long: 81.24W (approximately 15 miles south of St. Augustine, Florida).

0410 – 0445 EDT (0810 – 0845 UT) T_{eff}: 0.5 hour, No breaks, LM: 6.9, Clouds interfered after 35 minutes, facing: south.

- 5 SDA: +1, +2, +3(3)
- 5 PER: -2(2), +2, +3, +5
- 1 NDA: +3
- 1 ERI: +3
- 6 SPO: 0, +2(2), +3(2), +4(2)
- 18 total meteors

4 of the 18 meteors (2 PER, 1 SDA, 1 SPO) left trains. Yellow and blue tints were seen.

The Southern Delta Aquariids and Capricornids observed from Crete

Koen Miskotte

Dutch Meteor Society
k.miskotte@upcmail.nl

I can look back on a very successful observing campaign. From the 9 nights there were eight clear. I could observe during 30.73 hours, resulting in 1077 meteors.

1 Introduction

Following the successful campaign in Revest du Bion during the Perseids 2016, I was looking forward to the summer of 2017. A Full Moon on August 8 meant poor conditions for the Perseids. Fortunately, this also meant that the conditions for the southern delta Aquariids and the Capricornids were good at the end of July. So I planned a vacation with my wife around the SDA and CAP maxima. With good memories of the end of July/early August 2001 (Chios Island) and 2003 (Crete) when I could successfully observe the southern summer meteor showers (Miskotte, 2002; 2004; Johannink et al.,2008) we decided to go back to Crete.

Figure 1 – Lenikos resort at Agia Galini. View on Lybian Sea.

2 Preparations

I was looking for a quiet and dark location at the south coast of Crete. The north coast is not an option: there is too much light pollution due to the mass tourism present there. On the south coast there is also a great advantage that the northern wind coming from the mountains comes down and becomes very dry. We chose for the Lenikos resort. This resort got very high ratings on the different review sites. The resort is located 3 km northwest of the small town of Agia Galini at a height of more than 150 meters. From there you have a beautiful view over the (dark …) Libyan Sea. A glance at Europe’s light pollution maps[11] taught me that the conditions near the resort should be good. The resort itself seems to emit some light, but a few hundred meters to the west it must be good. I expected a slightly lighter sky to the east with some light pollution of the towns of Agia Galini, Lampi, Kokkinos Pyrgos and Tymbaki.

We chose a period of 10 days between July 24 and August 2.

3 Journey

On Monday, July 24, we flew to Heraklion in the night. Upon arriving we were able to pick up the hired car and we drove to Agia Galini. Over the resort nothing but good: the cottage was very complete including a very well-functioning air conditioning, the breakfasts were more a high tea event giving you Cretans’ crispy and sweet snacks every morning. The cottage was thoroughly cleaned every day and there were three swimming pools.

Figure 2 – Our rented house at Lenikos Resort (Agia Galini, Crete, Greece).

The sky looked a bit hazy on arrival and it was hot (36 C). The well-known hazy layer above the sea was also present and thick, which started at 20-25 degrees altitude. I planned shorter sessions for these observations because I was on holiday with my wife and wanted to see and do things during the daytime. That meant early in bed in the evening, sleep a few hours and sleep a few hours more after the session.

4 Search for an observing site

At the end of the afternoon I searched the surroundings of the resort for a place where to observe. That was not easy.

[11] https://www.lightpollutionmap.info/

Figure 3 – The Milky Way on July 28, 2017. Camera: Canon EOS 6D equipped with a Canon EF8-15 mm fish eye lens (F set @ 9 mm) F 2.8.

On the Google Maps it looked very promising but on spot it was difficult because everything was deposited with fences, bushes or trees, or there was a house with loose dogs at night. I did not want to be disturbed during the observations, but I also did not want to be a source of disturbance for residents. A piece of "dirt-road" that started at the resort running west was explored. I found a place with a nice view south. Only drawback was that if there were cars driving at night you would be disturbed. On the way back I found a piece of land on a hill that was not deposited with fences. On the left (east side) there were dense bushes that shielded the possible lights of the resort. So that location would be my observing site!

5 The observations

24/25 July

Although I was tired of the trip, I decided to make my first observations during the first night. It was also a matter to build a rhythm. The alarm clock was set at 22:30 UT (01:30 local time). Because it's also warm at night at Crete (temperature staying well above the 25 C. degrees), I had a lightweight long pants (against insects) and a long sleeve T-shirt. A self-inflatable airbed and an improvised pillow (folded bath towel …). Because you dry out quickly, I also had a bottle of water. For the observations I had a DCF clock and a digital recording device.

Indeed, and unfortunately, the resort was "well" lit. I quickly walked the dirt road. I started the observation at 23:00 UT. The sky looked hazy, but wow, what an impressive milky way! The Lm was around 6.5 and 6.6. Indeed, the sky in the east was slightly lighter. But the south and especially west and north were dark.

Almost immediately meteors were seen. During the first hour the SDA's were not so active, but in the second and last hour they were more active. When I stopped at 2:00 UT with exactly 3 hours of observation time I had observed 71 meteors. In addition, a lot of beautiful meteors: a –2 Capricornids punched through Pegasus, somewhat later a –1 Perseid in Delphinus and later just before the end a beautiful orange 0 magnitude Capricornid in Cetus. The highest SDA hourly count was 8, the Capricornids kept it quiet with 2 meteors an hour.

In the background, I heard the sheep in the neighborhood, some crickets and sometimes a dog. Occasionally, a car passed on the road that was 100 meters above me. Aircrafts were hardly seen. It was still warm at night, just like in 2003. When I stopped it was 25 degrees. You really notice that the ground radiates the heat it had during the day, resulting in a warm damp back.

25/26 July

During the day the sky became very hazy. At one point, the whole sky was milk white, such as a heavy calima on La Palma. When I was ready to start with the observations at 22:25 UT the sky was still very hazy. However, the sky improved a bit in the course of this session, with the lm rising from 6.3 to 6.4. I could observe 3.68 hours and counted 78 meteors despite the hazy-ness. The highest SDA count was 8 again, although the lm was 0.2 magnitudes lower. The previous and this night the SDAs were weak, with the brightest members of magnitude +2. The most beautiful meteors were observed at 23:54 UT when a fast sporadic fireball of –5 appeared at 10 degrees altitude in southern direction. At 01:20 UT a beautiful yellow magnitude 0 Capricornid appeared, which "crumbled" in a 2-degree glitter tail. Wow, that was a nice one!!

At 23:43 UT I felt a clear but brief vibration (a few seconds) in the ground. With the earthquake near Kos a week before in mind, I recorded the time to verify this later in the Netherlands. However, a few days later I got a confirmation via a Facebook friend. On the chart he sent it appeared that in three places around 23:43 UT light earthquakes (2.3 a 2.5 on the Richter scale) were observed. So they were also felt at my location.

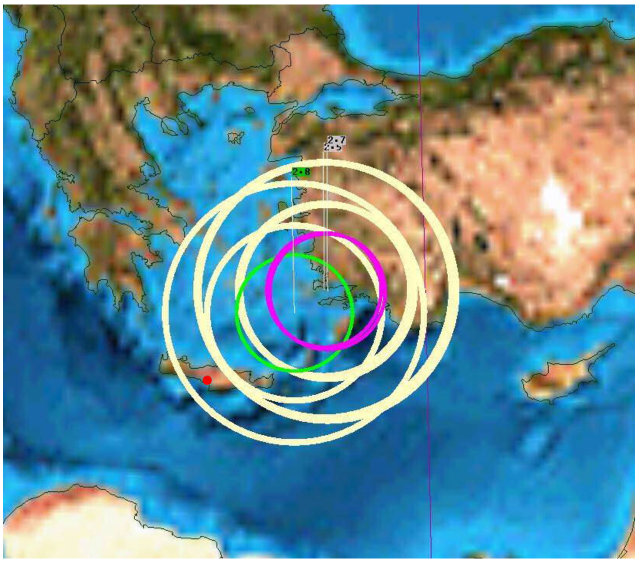


Figure 4 – Map of July 25 at 23:43 UT with some earthquakes. The red dot on Crete is the authors location.

26/27 July: no observations…

On July 26th, at the same time, two things happened: there was a strong northwestern wind. Above the mountains cumulus clouds appeared, spreading out southwards. At the same time, the haze was quickly disappearing. Unfortunately the cumulus clouds did not disappear in the evening. A short inspection of the sky at 22:00 UT: almost clouded out, so no observations this night. During the following day the then Northern wind became stronger and the cumulus clouds disappeared in the evening. The hazy layer above the sea was almost gone now. A very clear and blue sky appeared, promising dark skies during the coming night!

27/28 July

The alarm clock was set at 21:30 UT. A quick look out from the doorway: the stars of the Big Bear shining bright just above the mountains. Yes, this looked very good. Quickly to the observing site to start the observations at 21:50 UT. There was a strong northern wind blowing but what could I care about? Because the Milky Way was brilliant. Especially the part from Scutum to Sagittarius. The well-known deep sky objects were easily visible to the naked eye. During the last two hours, the zodiacal light was also visible, but because the slightly lighter sky in the eastern direction, not as beautiful as in Revest du Bion (southern France).

The meteor activity was of course a lot higher thanks to the very clear sky. During 4.28 hours, I counted 140 meteors. The SDA hourly counts increased to 12, the Capricornids up to 4, the Perseids to 10. The highest total count was 41 meteors. Nice stuff again, a –4 Perseid left behind a 5 second persistent train, but also a –2 SDA and -2 CAP were nice to watch

The gamma Draconids had an outburst last year (Roggemans, 2016). If it would take place again this year, it should be around 6 UT, for Europe during daylight. Despite this, I was alert to gamma Draconids during this night I counted in the next four consecutive hours. 1, 2, 2 and 0 GDRs. The most beautiful GDR was a magnitude 0. Two of the GDR's had a fluffy look.

28/29 July

The whole period after July 27 gave a very steady weather pattern: at day deep blue skies with sometimes a fast northern wind. At night crystal clear skies. The lm was always around 6.7. The SDAs were now around their maximum activity over the next three nights. That was noticeable with hourly counts up to 20 SDAs in an hour! The Capricornids had ball in the second hour (22:55 to 00:00 UT) with 11 Capricornids! The hours before and after the mentioned period I counted 3 (before) 2 and 4 CAPs (after). That already struck me in the field when I counted 4 Capricornids within 2 minutes around 23:42 UT.

This night no fireballs, yet another pair of Perseids of –1 and –2 were seen. However, the finest meteor was an Earthgrazer of +3 seen moving from the constellation of Phoenix (low southeast), via Pisces Austrinus, Capricornus and Aquila. In total, 183 meteors were observed in 4.27 hours.

29/30 July

This night was also crisp clear, lm 6.7. This night I took my Canon 6D and Canon EF 8-15 mm zoom fish eye lens with me. The SDAs displayed roughly the same hourly counts as the previous night. However, in the second hour, the numbers remained well behind compared with exactly the same period in the previous night. For only half an hour, only 1 SDA was seen. The next two hours gave the same activity as the previous night. Highlight this night was a –5 Capricornid at 23:57:25 UT near Pisces Austrinus. After the short –5 flare, the meteor fell into several fragments. In addition, a nice –1 SPO was seen, as well as some meteors with magnitude 0.

The all sky camera captured the –5 Capricornid and a possible –4 GDR just above the mountains. The total visual score this night is 177 meteors in 4.28 hours effectively.

30/31 July

Same conditions as the previous night, lm 6.7. Now the SDAs showed a bit lower activity with a maximum hourly count of 19. During this night many bright meteors were seen, so I really enjoyed the show!

- 22:51 UT: –7 CAP near Pisces Austrinus. The end flare put the southeastern sky into light!
- 00:19 UT: Near the SDA radiant appeared a –3 SDA. A very short path, almost a point meteor. At first I thought of an Iridium flare, but it went too fast.
- 00:41 UT: a –3 Perseid with 5 seconds persistent train in Pisces with two flares.
- 00:51 UT: a –2 Perseid in Pegasus
- 01:29 UT: a –4 Perseid in Cetus.
- 01:41 UT: a –1 Perseid in Pegasus
- 01:57 UT: a –1 SDA in Aries

Figure 5 – The alpha Capricornid of July 29 @23:57:25 UT. Camera: Canon EOS 6D. Lens: Canon EF 8-15 mm zoom fish eye lens. The brightest star in the middle is Fomalhaut (Pisces Austrinus).

Figure 6 – A possible Gamma Draconid on July 29, 2017 @ 21:12 UT. Camera: Canon EOS 6D. Lens: Canon EF 8-15 mm zoom fish eye lens.

Figure 7 – At the right a Capricornid fireball with bright endflare, 30 July 2017 @ 22:51 UT. At the left a bright Perseid captured 10 minutes later. Camera: Canon EOS 6D. Lens: Canon EF 8-15 mm zoom fish eye lens.

Figure 8 – Composition of all bright meteors photographed in the night of 30/31 July 2017. Four Perseids are visible and a bright kappa Cygnid. Note the Southern Delta Aquariid as almost point meteor near the radiant. Camera: Canon EOS 6D. Lens: Canon EF 8-15 mm zoom fish eye lens.

And besides all this bright stuff, a whole lot of magnitude 0 and +1 meteors were seen. Furthermore, in the eastern direction, a nice series of Iridiums were seen up to magnitude –6. The all sky camera captured all bright meteors. One of them I did not see, a possible –4 KCG.

31 July/1 August

This night I started later because of the fast growing moon phase. When I started at 22:20 UT the moon was still low in the west, but already behind the mountains. The Lm was 6.4, but within a half hour it was 6.7 again. This night I really noticed that the SDAs had passed their maximum, as were the Capricornids. The maximum SDA hourly count was 11 versus the 19 SDA's of the previous night.

There were also less bright meteors. A Perseid of magnitude –1 was the brightest meteor next to three magnitude 0 SDA's. In total, 144 meteors were seen in 3.92 hours.

01/02 August

Last night at Crete and because of the moon again a shorter session. I could observe between 23:11 and 02:11 UT. During these three hours I counted another 103 meteors. Maximum hourly rate for SDAs was 7. Despite the lower number of meteors now, many bright meteors were seen.

- 23:32 UT: –1 KCG in Delphinus
- 23:35 UT: –2 PER in Andromeda
- 23:48 UT: –1 SDA in Pisces
- 23:56 UT: –1 SPO Earthgrazer from Pegasus, Aquarius and Pisces Austrinus.
- 00:14 UT: –1 PER in Cassiopeia
- 01:13 UT: –1 SDA from Pegasus to Pisces
- 01:45 UT: Again a –1 SDA, in Pegasus
- 01:53 UT: Beautiful end of the Crete action: A –4 Capricornid appeared in Cygnus, showing three flares.

Table 1 – Overview of meteor observations Koen Miskotte.

Date	T.eff (m)	Lm	SDA	CAP	PER	PAU	ANT	GDR	KCG	SPO	Tot
24/25-7	180	6,52	17	5	10	2	2	0	0	35	71
25/26-7	215	6,37	22	6	7	1	6	0	0	36	78
27/28-7	257	6,68	36	12	20	2	2	5	0	63	140
28/29-7	256	6,68	67	20	18	5	5	3	0	65	183
29/30-7	257	6,7	58	13	25	2	5	1	0	73	177
30/30-7	264	6,69	65	12	24	5	11	1	0	63	181
31/01-8	235	6,65	38	7	25	3	4	0	1	66	144
01/08-8	180	6,62	20	8	25	0	4	0	1	45	103
Totaal	30,73 hr	6,61	323	83	154	20	39	10	2	446	1077

On Wednesday afternoon we left the resort by car to Heraklion. After a very long period of waiting at the airport, we could fly back to Schiphol at 3 o'clock at night. When we landed it rained … jup, we were back in the Netherlands …

References

Miskotte K. (2002). "Meteoren waarnemen vanaf Chios eiland". *Radiant*, **24**, 80–83.

Miskotte K. (2004). "Meteoren waarnemen op Kreta". *Zenit*, **juli/augustus**, 375–376.

Johannink C., Miskotte K. and Jobse K. (2008). "Resultaten van de Aquariiden-campagne op La Palma juli 2008". *eRadiant*, **2008-4**, 98–107.

Roggemans P. (2016). "Outburst of July gamma Draconids". *eMeteorNews*, **1**, 80–81.

August 12/13, 2017 Perseid observations from Matanzas Inlet, Florida – impressive!!

Paul Jones

jonesp0854@gmail.com

A summary is given of the visual observations of the 2017 Perseid maximum in Florida.

Amazingly, it cleared off pretty well for us last night, so Neal, Shadow and Shade Brown and I returned to the trusty east parking lot at Matanzas Inlet (MI) for two remarkably productive hours of 2017 Perseid meteor observing.

I logged two hours of observations from 10:00 p.m. to midnight and ended up with a total of 34 meteors, with 21 of them being Perseids. Encroaching clouds and moonlight after 11:30 combined to make us close up shop early. A total of 6 of the 21 Perseids seen were stunning, spectacular earthgrazers that had Neal and I hoping and hollering, big time!

By far the very best Perseid of the night came in the second hour. It was a mind blowing, 70+ degree long, –1 magnitude Perseid "grazer" that had a distinctly peachy pink coloration to it and left a spreading train behind it. WOW! We had it in sight for almost five seconds total as it shot down the summer Milky Way, Cygnus to Ophiuchus. It was, I believe, the very first PINK colored meteor I have ever, ever seen in forty three years of meteor watching!

Here is my data from the session:

Observed for radiants:

- ANT – Anthelions
- PER – Perseids
- SDA: South delta Aquariids
- NDA: North delta Aquariids
- CAP – alpha Capricornids
- KCG – kappa Cygnids

August 12/13 2017, observer: Paul Jones.

Location: North Bank of Matanzas Inlet, Florida, Lat: 29.75N, Long: 81.24W (approximately 15 miles south of St. Augustine, Florida).

1000 – 1100 EDT (0200- 0300 UT), T_{eff}: 1.0 hour, No breaks, LM: 6.5, 25% cirrus cloud interference, Facing: east.

- 5 PER: 0, +1, +2, +3(2)
- 1 ANT: +2
- 4 SPO: +3(3), +4
- 10 total meteors

2 of the 5 Perseid meteors were earthgrazers and four of them left trains. Yellow and blue tints were seen in the brighter PERs.

1100 – 1200 EDT (0300- 0400 UT), T_{eff}: 1.0 hour, No breaks, LM: 6.5, 35% cirrus cloud and moonlight interference, Facing: east.

- 16 PER: -1, 0, +1(3), +2(5), +3(3), +4(3)
- 1 KCG: +2
- 1 SDA: +1
- 6 SPO: +2(2), +3(3), +4
- 24 total meteors

10 of the 16 Perseid meteors left trains and 4 were earthgrazers. The minus one Perseid had a peachy pink color to it and yellow and blue tints were seen in all the other brighter PERs and the KCG.

The Perseids really picked up nicely during the second hour as their well-known "spurting" effect was noted once again – two or three would be seen in quick succession, followed by lengthy lulls in activity. That amazing minus one, peachy pink Perseid grazer we saw, stands out as one of the top ten most visually beautiful meteors I have ever seen!

Perseids 2017: partly clear 12-13 August night for CAMS BeNeLux

Paul Roggemans

Pijnboomstraat 25, 2800 Mechelen, Belgium
paul.roggemans@gmail.com

A brief description is presented of the 2017 Perseid maximum seen as a video camera operator.

1 Introduction

After several weeks of rather exceptional good conditions for the BeNeLux CAMS network, weather deteriorated into a worst case scenario towards the Perseid maximum. Clouds and rain showers circulated over Western Europe in all directions making any reliable forecast difficult. 10–11 and 11–12 August did not reveal any single star with a complete overcast sky. Some gaps occurred late afternoon August 12, good to raise some hope for the night. When the CAMS computer started, the sky was saturated with clouds again and when some intense rain showers followed each other, it looked hopeless as these showers seemed to get formed out of nothing on the rain radar. After 23^h UT some gaps appeared and yes here and there a star became visible… Was it going to happen after all? The rain radar showed strokes with rain showers moving quickly towards our German neighbors.

Figure 1 – 2017 August 12, $23^h32^m49^s$ UT on CAMS 383 at Mechelen, Belgium, while the last clouds disappeared.

2 Clear sky for 12–13 August 2017?

Around 23h20m UT I could see more stars appear on the CAMS-monitor and I noticed some meteors in just few minutes on the monitor. Some cameras got more than 50% clear sky while others got filled up with new clouds. Impossible to predict what it would become, overcast again or would the rest of the night be this mixture of clear gaps with fragments of clouds? CAMS do register meteors in these circumstances but the moving clouds generate huge numbers of false detections which must be eliminated manually on sight. I decided to go to sleep as it looked rather hopeless.

Figure 2 – 2017 August 13, $00^h13^m16^s$ UT on CAMS 383 at Mechelen, Belgium.

Figure 3 – 2017 August 13, $00^h31^m39^s$ UT on CAMS 388 at Mechelen, Belgium.

3 Clear sky after all

Morning 4^h UT my clock alerted me that the CAMS had to be switched off. I still did not thrust timers :-). I saw a crystal clear sky with a nice golden color where the Sun was few degrees below the horizon. Yes! We must have had at least a while clear sky! I started the camera calibration routine of CAMS and looked at the stacked images as the CAMS software took a snap every few minutes to find the best astrometry result for each camera for this night. A little bit after 1^h UT the last clouds had disappeared from all camera fields. Every now and then I saw a meteor trail on the stacked images during calibration. Wow, this was better than I would have expected. At my location the Sun reaches -8° under the horizon at 3^h30^m UT this night, when twilight ends the CAMS recording session.

Figure 4 – 2017 August 12, $23^h32^m49^s$ UT on CAMS 383 at Mechelen, Belgium.

Figure 5 – 2017 August 13, $03^h13^m54^s$ UT on CAMS 384 at Mechelen, Belgium.

Figure 6 – 2017 August 12, $23^h21^m15^s$ UT on CAMS 389 at Mechelen, Belgium.

Once the camera fields were all recalibrated for the night, I could start the confirmation. The CAMS detection software had registered over 4000 meteor look-alike moving objects, but how many of these were clouds, planes or birds? Until 1^h18^m UT most detections proved to be false detections caused by clouds illuminated by the Moon, but numerous meteors were spotted in the gaps between the clouds. Deleting so many false detections felt like some fitness training for my right index finger, delete, delete, delete, delete? Oeps, no, back, that was a meteor… I went slower through the frames with clouds than usual as every few frames with clouds there was a meteor to be spotted. I came across one bright meteor which meanwhile I know that *Koen Miskotte* observed this visually as a –6 with a bright persistent train visible for 15 seconds and Koen has it on his all-sky camera (*Figure 11*). I also recorded many rather faint trails near the bright Moon.

Figure 7 – 2017 August 13, $03^h05^m35^s$ UT on CAMS 388 at Mechelen, Belgium.

Figure 8 – 2017 August 13, $00^h29^m41^s$ UT on CAMS 389 at Mechelen, Belgium.

I spent more than 1 hour on the confirmation, as I did not want to miss any meteor trail between the clouds, while on other nights I tend to browse quickly through cloudy periods. It was worthwhile, 496 meteors in less than a half clear night! Although I got less than half of the night clear sky, it felt more like the glass was half full as I had expected much less!

Figures 1 to 10 are a small selection of meteors recorded at Mechelen, Belgium 2017 August 12–13. The identification is on top of the photo with camera number, date time of the start of the bin-file with 256 images with 25 images per second. The exact time of the meteor is between 0 and 10 seconds of this time indication.

Figure 9 – 2017 August 13, 02ʰ41ᵐ16ˢ UT on CAMS 389 at Mechelen, Belgium.

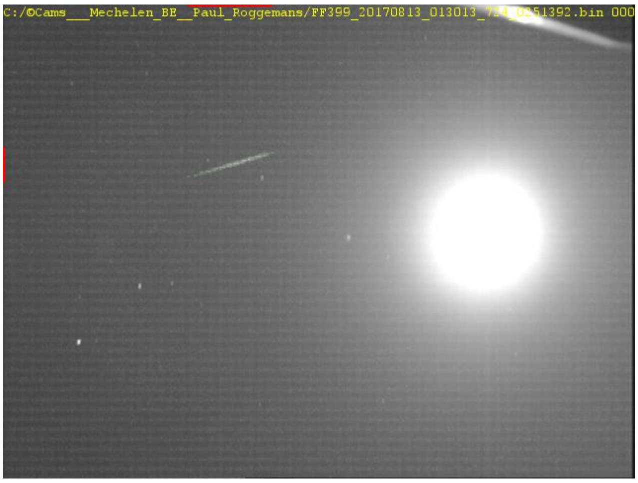


Figure 10 – 2017 August 13, 01ʰ30ᵐ13ˢ UT on CAMS 399 at Mechelen, Belgium.

Figure 11 – 2017 August 13, 00ʰ58ᵐ37ˢ UT Perseid fireball of –6, on CAMS 389 at Mechelen, Belgium.

Perseid maximum from the Netherlands

Koen Miskotte

Dutch Meteor Society
k.miskotte@upcmail.nl

It is from 2012 ago that I had a (partly) clear Perseid maximum from Ermelo/The Netherlands. In T_{eff} 3.23 hours I counted 119 PER, 2 SDA, 1 ANT, 2 KCG and 15 sporadic meteors. The all sky camera captured 3 Perseids of magnitudes -3, -4 and -6. The 4 CAMS systems captured 385 meteors during these three hours. I am satisfied with this result! Next year again from the Provence!

1 Introduction

After the successful Southern Delta Aquariid campaign from southern Crete, I hoped that I could observe the Perseids for a few nights in the Netherlands. Unfortunately, the weather, like so often, wasn't cooperative. Only the night of 5/6 August was partly clear. Between 23:27 and 02:30 UT I observed 35 meteors. The Moon disturbed the observations all night, so the limiting magnitude did not exceed 5.5. Highest hourly count of the Perseids was 8. Overall, I saw 21 Perseids (PER), 2 Southern Delta Aquariids (SDA) and 12 sporadic meteors (SPO).

As mentioned, the rest of the week the Netherlands had bad weather. The night Friday to Saturday 11/12 August I was surprised by a clear sky when I came out of bed for work (at 01:30 UT). A clearing was moving from west to east over the Netherlands. I quickly started the all sky camera but after 30 minutes it was cloudy again with some rain.

Figure 1 – Perseid fireball magnitude –6, August 13, 2017 at 00:58 UT.

2 12–13 August 2017

Saturday during the day it was mostly cloudy, with some small clearings in the afternoon. Around 20:00 UT I looked on the internet at SAT 24, the rain radar and the weather outside. There were some clearings just before the Dutch coast. I compared the current weather situation with the prediction for 20:00 UT with the HIRLAM model. Hirlam's prediction for 20:00 UT was in very good agreement with the current weather situation. According to HIRLAM, clouds would disappear around 23 UT in Ermelo, so the alarm clock was set just before that time. 22:55 UT: weather inspection outside. Hmm, mostly cloudy but clear at low altitude north-northwest. Indeed, the sky cleared around 23:15 UT and at 23:20 UT I could start with the visual observations.

Figure 2 – Perseid magnitude –3 near the radiant.

The first meteor was immediately a beautiful one: a magnitude 0 Perseid in the Big Dipper. The limiting magnitude was despite the Moon high at the sky with lm = +5.7 during the first hour (23:20-00:20 UT). The Moon was just behind the edge of my roof and chimney. That first hour I counted 40 Perseids. Some beautiful appearances next to the many Perseids of magnitude 0 and +1:

- 23:34 UT: –2 Perseid from Cygnus to Lyra with a persistent train of 4 seconds.

- 23:55 UT: near the radiant a –3 Perseid with a 4 seconds persistent train. This one was captured by the all sky camera. In addition to the 40 Perseids, I also observed 1 SDA, 1 ANT, 1 KCG and 4 SPO.

Between 00:20 and 00:21 UT there is a very short threat to the clear sky. A weak southwest wind came up. Between 01:11 and 01:12 UT I had to take a short pause for just a minute. At a few tens of meters high, low-hanging almost transparant clouds moved quickly from southwest to northeast, causing the limiting magnitude dropped to +3. As fast as they came they disappeared.

In this period (T_{eff}. 1.00 hour) I counted 34 Perseids with an average limiting magnitude of 5.6. Nice stuff at:

- 00:42 UT: –1 Perseid in Cepheus, persistent train for 2 seconds
- 00:58:20 UT: –1 Perseid low in the west just above the trees
- 00:58:37 UT: Flash! Perseid of –6 in the constellation of Lyra leaves a very clear persisting train of magnitude +2. It was visible for 15 seconds. This Perseid fireball is also recorded with my all sky camera.
- 01:00 UT: –1 Perseid in Perseus with a persistent train of 2 seconds

Between 01:21 and 01:30 UT I had to stop again for the very low-hanging clouds that passed very quickly. I suspected it was the haze and/or fog on the nearby Groevenbeek Heide (a heath) that was blown away by some wind.

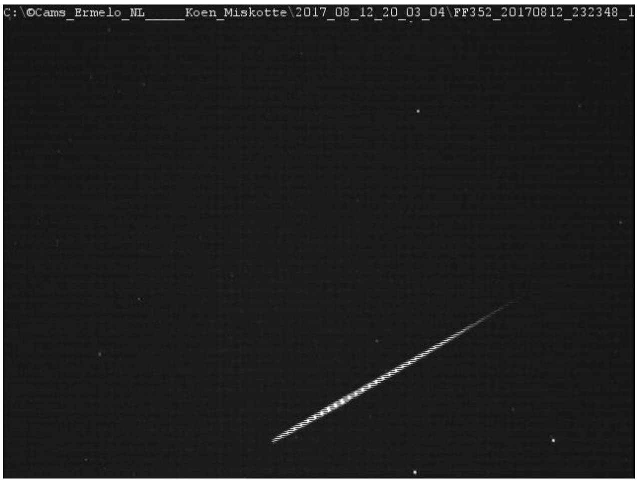


Figure 3 – 2017 August 12, $23^h23^m48^s$ UT on CAMS 352 at Ermelo, the Netherlands.

After 01:30 UT the clouds disappeared quickly and the sky stayed clear until dusk. However, the air had become a little bit hazy, which made the average limiting magnitude slightly lower: +5.3. In this third period between 01:30 and 02:33 UT (T_{eff}. 1.033 hours) I counted 37 Perseids, 1 SDA, 1 ANT and 6 SPO. A lot of bright stuff in the +1 class, only at 02:11 UT a beautiful magnitude –2 Perseid with a broken persistent train in Pegasus. After that a couple of Perseids of magnitude 0 and +1 appeared.

The last 12 minutes (02:33 to 02:45 UT) I counted 8 Perseids (limiting magnitude of 5.1).

Figures 3 to 6 are some captures from the CAMS cameras 351, 352, 353 and 354.

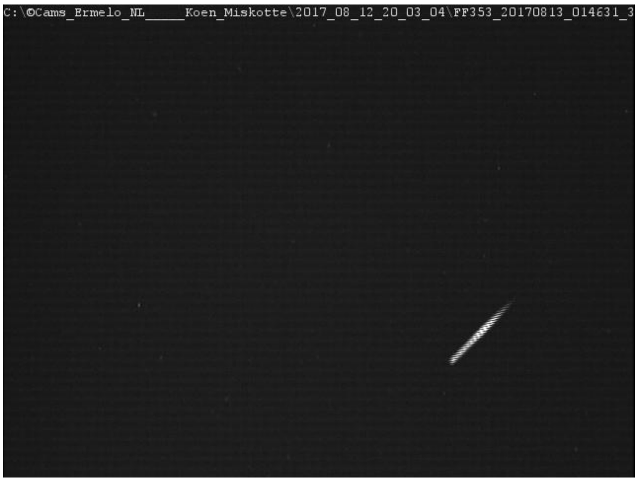


Figure 4 – 2017 August 13, $01^h46^m31^s$ UT on CAMS 352 at Ermelo, the Netherlands.

Figure 5 – 2017 August 13, $01^h14^m08^s$ UT on CAMS 352 at Ermelo, the Netherlands.

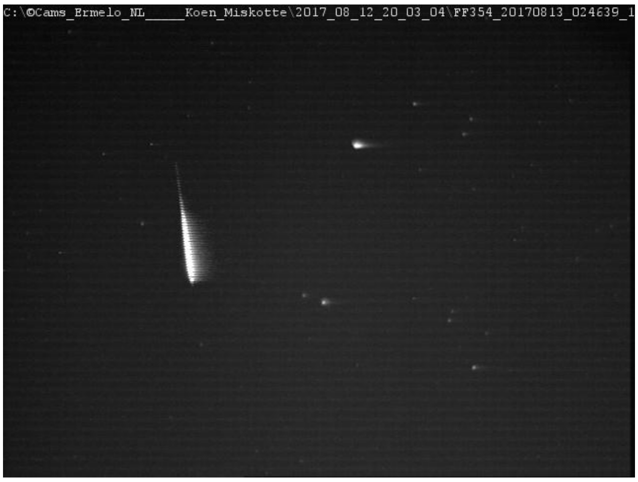


Figure 6 – 2017 August 13, $02^h46^m39^s$ UT on CAMS 352 at Ermelo, the Netherlands.

Early Aurigid observations from Norway

Kai Gaarder

kai.gaarder@gmail.com

I am very satisfied to have been able to detect early activity from the Aurigids, and observed and photographed my first Nu Eridanid meteor. Also the new observation site proved very good, offering a better limiting magnitude and better horizon than from home. I cross my fingers for more clear nights, and hope to follow Aurigid activity in the nights around expected maximum on September 1.

1 Introduction

It is a rare event that a cloudless, moon free night falls on a Saturday, but this was the case on August 26. Although no major showers were active, I decided to head out in the field to watch for some early Aurigid meteors. This night I wanted to try out a new observation site, situated on a hill about 20 minutes driving from home. I hoped that this place would provide a better horizon, and maybe a slightly better limiting magnitude, than my usual observation site.

2 August 26: 20:45 – 21:45

I started observations 20:45 UT. This is too early for the Aurigids to reach a useful radiant elevation, but I decided to look for Antihelion meteors, and late Kappa Cygnids, while waiting for the Aurigids. The observation site lived up to my expectations, with Lm quickly improving below 6.0, and with good horizon in all directions. Sporadic activity started out quite good, with 11 meteors the first hour. The first hour was highlighted with a 1 magnitude, red, slow moving Kappa Cygnid, starting in Andromeda and ending up in Aries. This meteor was also captured on camera, making a nice composition with the Pegasus square and the Andromeda galaxy!

T_{eff}: 1.00 – Lm: 6.06 – F: 1.00 – RA: 345 – Dec: +55

- Spo: 0, 2(2), 3(2), 4(2), 5(3), 6 – Total 11 meteors.
- K-Cyg: 1 – Total 1 meteor.
- Ant: No meteors

3 August 26: 21:45 – 22:50 – 2-minute break.

In the next hour activity seemed a little lower, until 22:44 when 4 sporadic meteors appeared within a minute! This was a much-needed wake up call, in a somewhat quiet hour of meteor observing. These meteors sent the sporadic hourly rate to 10, and on top of this, the first 5 magnitude Antihelion was also seen. There were no bright meteors for my camera this hour, all meteors being between magnitude +2 and +5.

T_{eff}: 1.050 – Lm: 6.24 – F: 1.00 – RA: 345 – Dec: +55

- Spo: 2(3), 3(2), 4(3), 5(2) – Total 10 meteors.
- K-Cyg: No meteors.
- Ant: 5 – Total 1 meteor.

4 August 26: 23:00 – 00:00

The time had now come for Aurigid observations, and I was excited to see if I could detect any activity from this source. After 12 minutes a nice 1 magnitude, white, medium speed sporadic meteor appeared in Aries, moving into Pisces, leaving a short smoke train in the sky. And best of all, just below the center of my camera field! I had to wait in 52 minutes for the first Aurigid, a 3 magnitude meteor in Andromeda. This was right in the center of my field of view, so shower association is very certain. 3 minutes later a nice 3 magnitude Antihelion meteor slowly moved all the way from Pegasus, through Aries and Triangulum. It is always a pleasure to watch these slow moving, often long and characteristic meteors, that stands well out from most of the sporadic meteors seen. The sporadic activity continued to decline, with 7 meteors observed this hour, all between magnitude +1 and +6.

T_{eff}: 1.00 – Lm: 6.30 – F: 1.00 – RA: 0.00 – Dec: +55

- Spo: 1, 2, 3, 4, 5(2), 6 – Total 7 meteors
- Ant: 3 – Total 1 meteor.
- Aur: 3 – Total 1 meteor.
- Nu Eri: No Meteors.

5 August 27: 00:00 – 01:05 – 5-minute break

The last hour of observations activity was on the rise again, with 10 sporadic meteors seen, all between magnitude +3 and +6. Antihelion activity was also good, with 2 long, slow moving meteors of magnitude +2 and +3. Also this hour Aurigid activity was detectable. Only 1 minute before the end of the watch, a 4 magnitude Aurigid appeared between Andromeda and Cassiopeia, right in the center of my field of view. The “meteor of the hour” was undoubtfully a long, magnitude 1, medium speed Nu Eridanid meteor at 00:28, streaking up from the eastern horizon, from Aries and into Andromeda. This meteor was also photographed, so shower association is very certain.

T_{eff}: 1.00 – Lm: 6.23 – F: 1.00 – RA: 0.00 – Dec: +55

- Spo: 3(2), 4(3), 5(3), 6(2) – Total 10 meteors.
- Ant: 2, 3 – Total 2 meteors.
- Aur: 4 – Total 1 meteor.
- Nu Eri: 1 – Total 1 meteor.

A look at 14-15-16 October showers through CAMS

Paul Roggemans

Pijnboomstraat 25, 2800 Mechelen, Belgium

paul.roggemans@gmail.com

Two clear nights, 14-15 and 15-16 October allowed collecting a large number of orbits by the CAMS BeNeLux network. A look at the radiant distribution reveals distinct activity from a number of major as well as minor meteor streams. Apart from the Orionids and Taurids, the October Ursae Majorids (OCU-333) displayed a remarkable strong activity.

1 Introduction

The night of 14-15 October had delivered no more than a single orbit during 5 years of BeNeLux network activity 2012-2016, weather having been year after year unfavorable. After two weeks of mediocre weather the Benelux CAMS network enjoyed a couple of network wide clear nights. The unfortunate night of 14-15 October of previous years turned out to be a perfect night in 2017. In a single night, the CAMS Benelux network managed to collect as many as 711 orbits! Also 13-14 and 15-16 October were very productive.

To point attention to the new online CAMS tool, let us look at the results for such a single night of CAMS. Check out the CAMS website[12] to discover the tool.

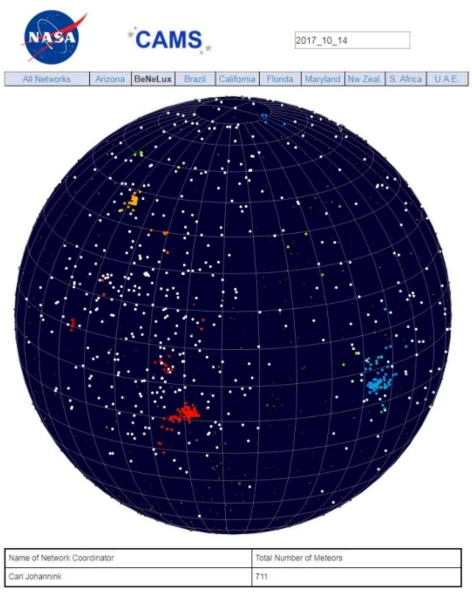


Figure 1 – The radiant distribution 14-15 October 2017 for the BeNeLux CAMS network.

2 14-15 October

As many as 711 radiants were obtained from accurately determined trajectories and orbits, for the CAMS BeNeLux network only. This results in a very nice radiant plot which shows the major stream radiants as well as a number of poorly known minor meteor streams (see *Figure 1*). Luckily our colleagues from some other CAMS network managed to obtain good results for this night too. The global picture, combining data from all networks marks the shower activity even more distinctly (see *Figure 2*).

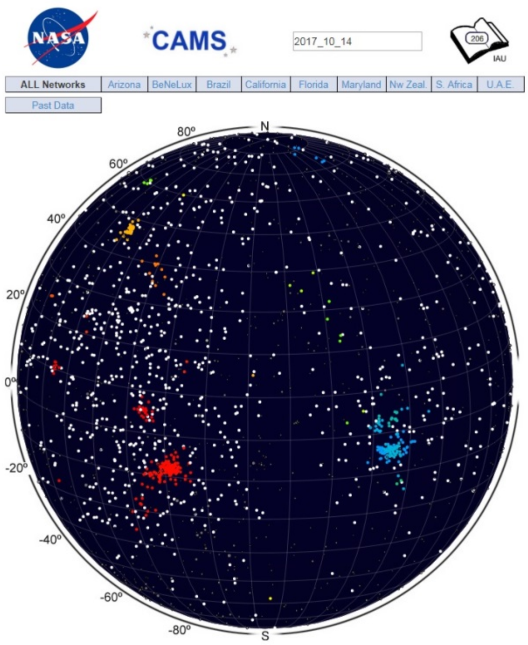


Figure 2 – The radiant distribution for all available CAMS networks data for 14-15 October (data as available on 18 October 2017).

With only a part of the different CAMS networks having datasets uploaded an impressive number of 1258 orbits were collected for this single night. Using the orbit to check for possible association with known meteor streams or stream components, we count as many as 153 Orionid orbits, 42 Southern Taurids, 16 Northern Taurids, but also distinct activity from so called minor showers. Xi Arietids with 44 orbits and the October Ursae Majorids catch our attention. All the showers that could be detected in the sample of orbits available for 14-15 October are listed in *Table 1*.

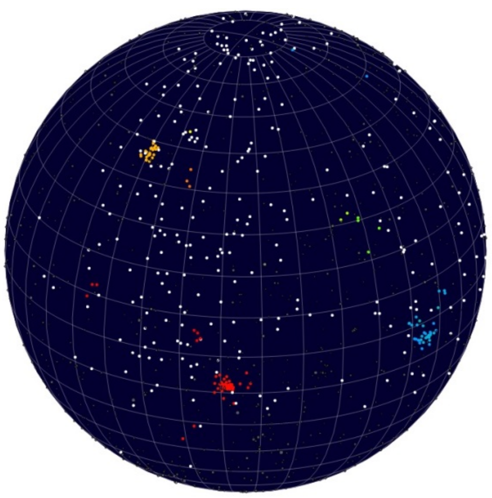
[12] http://cams.seti.org/FDL

Table 1 – Number of orbits for all identified meteor streams based on the orbit association.

IAU Number	Code	Shower Name	Number of Meteors
0	SPO	sporadic meteors	[871]
2	STA	Southern Taurids	[42]
8	ORI	Orionids	[153]
17	NTA	Northern Taurids	[16]
22	LMI	Leonis Minorids	[2]
23	EGE	epsilon Geminids	[19]
25	NOA	Northern October delta Arietids	[15]
101	PIH	pi Hydrids	[1]
208	SPE	September epsilon Perseids	[2]
225	SOR	sigma Orionids	[9]
333	OCU	Oct. Ursae Majorids	[35]
338	OER	omicron Eridanids	[2]
386	OBC	October beta Camelopardalids	[3]
388	CTA	chi Taurids	[1]
480	TCA	tau Cancrids	[8]
557	SFD	64 Draconids	[6]
613	TLY	31 Lyncids	[2]
624	XAR	xi Arietids	[44]
714	RPI	rho Piscids	[1]
715	ACL	alpha Camelopardalids	[12]
716	OCH	October chi Andromedids	[4]
745	OLD	October lambda Draconids	[4]
818	OAG	October Aurigids	[1]
875	GER	gamma Eridanids	[1]
880	YDR	Y Draconids	[1]
902	DCT	delta Cetids	[2]
903	ATR	alpha Triangulids	[1]

3 15-16 October

Just 24 hours later, CAMS BeNeLux managed to collect again a lot of orbits although clouds interfered at some CAMS stations. The night totaled still 422 orbits for the BeNeLux contribution (see *Figure 3*). Combining with the early available data from some other CAMS networks, yet again a very distinct radiant map includes many radiants for which the orbit could be matched with known meteor streams. *Figure 4* marks a few of the main contributing meteor showers. Notice the remarkable distinct activity of the October Ursae Majorids (333-OCU). *Table 2* shows the stream distribution according to the orbit association.



Name of Network Coordinator	Total Number of Meteors
Carl Johannink	422

Figure 3 – The BeNeLux radiant distribution for 15-16 October. Notice the October Ursae Majorids activity (orange dots).

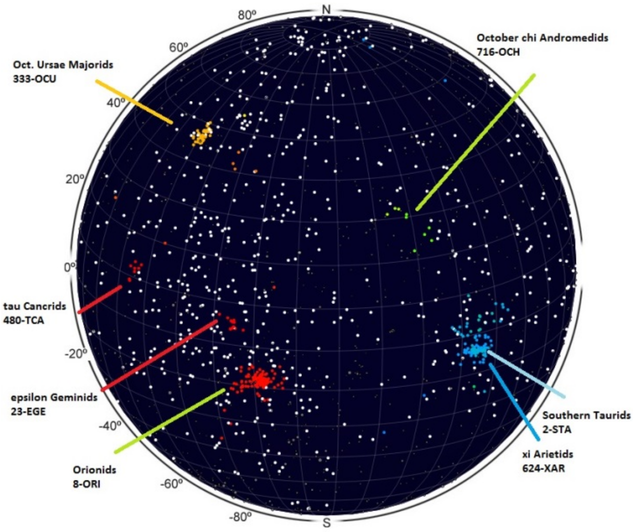


Figure 4 – The radiant distribution for the data as available on 18 October for all CAMS networks with a number of meteor stream radiant marked on the map. *Table 2* lists the details.

Some distinct meteor streams share the same radiant area, although the meteors have a distinct different orbit, only a subtle difference in geocentric velocity allows distinguishing the origin of these meteors. This raises indeed questions to which extend statistical stream searches based on backwards prolonged trails and apparent angular velocity make sense to identify meteor showers. An interesting experiment will be to match and compare the single station radiant association with the finally obtained radiant position from triangulation. This could teach us how reliable single station radiant associations are and what is the threshold in the activity level to have a statistical relevant estimate of a stream activity.

Table 2 – Radiant list based on the orbit associations with known meteor showers.

IAU Number	Code	Shower Name	Number of Meteors
0	SPO	sporadic meteors	[660]
2	STA	Southern Taurids	[38]
8	ORI	Orionids	[140]
17	NTA	Northern Taurids	[15]
22	LMI	Leonis Minorids	[1]
23	EGE	epsilon Geminids	[12]
25	NOA	Northern October delta Arietids	[10]
208	SPE	September epsilon Perseids	[1]
225	SOR	sigma Orionids	[3]
333	OCU	Oct. Ursae Majorids	[44]
338	OER	omicron Eridanids	[1]
384	OLP	October Leporids	[2]
386	OBC	October beta Camelopardalids	[3]
480	TCA	tau Cancrids	[8]
557	SFD	64 Draconids	[3]
613	TLY	31 Lyncids	[1]
624	XAR	xi Arietids	[41]
715	ACL	alpha Camelopardalids	[4]
716	OCH	October chi Andromedids	[6]
880	YDR	Y Draconids	[1]
902	DCT	delta Cetids	[1]

2017 Orionid observations from North Florida

Paul Jones

jonesp0854@gmail.com

Two reports on visual meteor observations are presented, good Orionid and Taurid activity has been observed.

1 Oct. 19/20, 2017 Awesome!

I was quite surprised and pleased to find the skies beautifully clear this morning for a change and was able to take full advantage of them indeed at Matanzas Inlet. Observing conditions were superb with no clouds and a nice sea breeze to blow the bugs away.

The three-hour marathon session was a total joy as the pre-maximum Orionids were coming hot, bright, and heavy throughout the session and a few of the other active radiants kicked in nicely as well. I was kept quite busy indeed. Without further adieu, here is my full report:

Observed for radiants:

- ORI: Orionids
- STA: South Taurids
- NTA: North Taurids
- EGE: epsilon Geminids
- LMI: Leonis Minorids
- SPO: sporadics

Date: Oct., 19/20, 2017. Observer: Paul Jones.
Location: north bank of Matanzas Inlet, Florida, 15 miles south of St. Augustine, Florida.
Lat: 29.75 N, Long:81.24W
LM: 6.5, sky conditions: clear, Facing: SE.

0330 – 0430 EDT (0730 – 0830 UT)
T_{eff}: 1 hour, clear, no breaks.

- 18 ORI: 0(3), +1(2), +2(2), +3(3), +4(3), +5(5)
- 4 STA: +1(1), +2(2), +3(1)
- 2 NTA: +1(2)
- 2 EGE: +3(2)
- 13 SPO: +2(2), +3(2), +4(6), +5(3)
- 39 total meteors

6 of the 18 ORIs, 2 of the NTAs and 2 SPOs left visible trains, most common colors were gold and yellow in the brighter ORIs.

0430 – 0530 EDT (0830 – 930 UT)
T_{eff}: 1 hour, clear, no breaks.

- 23 ORI: -3(1), 0(2),+1(3), +2(3), +3(5), +4(5), +5(4)
- 3 STA: +2(1), +3(1), +4(1)
- 2 NTA: +1(1), +3(1)
- 2 EGE: +2(1), +3(1)
- 12 SPO: +1(1), +2(1), +3(4), +4(3), +5(3)
- 42 total meteors

8 of the 23 ORIs, 1 of the STAs and 3 SPOs left visible trains, most common colors were gold and yellow in the brighter ORIs and SPOs.

0530 – 0630 EDT (0930 – 1030 UT)
T_{eff}: 1 hour, 20% clouds and twilight interference, no breaks

- 26 ORI: -2(1), -1(1), 0(2),+1(3), +2(4), +3(7), +4(5), +5(3)
- 2 STA: +3(1), +4(1)
- 1 NTA: +3(1)
- 2 EGE: +2(1), +3(1)
- 11 SPO: -1(1), +1(1), +2(1), +3(4), +4(2), +5(2)
- 42 total meteors

10 of the 26 ORIs, 1 of the STAs and 5 SPOs left visible trains, most common colors were gold and yellow in the brighter ORIs and SPOs.

I was very impressed with the many brighter ORIs that showed up this morning. Usually, the ORIs are rather faint and short in duration and path length. Not this morning however, every few minutes, a bright and colorful ORI would shoot out of the radiant leaving a glittering train etched against the sky.

Interestingly, all three of the negative magnitude ORIs I saw were seen tracking north of the radiant in almost exactly the same paths through Auriga and Perseus, shooting north from the radiant. This is common with many major showers, interesting to speculate on what causes this phenomenon. The Taurid radiants were active this morning also, contributing many slow-moving meteors that were very nice counterpoints to the extremely swift-moving Orionids.

There were a few vivid spurts in activity throughout the session; however, the most dramatic one occurred at the start of the third hour! I saw eight meteors in the first three minutes of the third hour – an amazing mix of ORIs, Taurids and sporadics all hitting one after another! Overall, however, the ORI activity was very evenly spaced out through much of the session and the meteors were seen all over every inch of the sky with the radiant crossing the meridian. I almost needed eyes in the back of my head to catch them all!

I'll be out again in the morning, weather permitting, as this show has only just begun, baby!! Hope to have some company out there… ;o).

2 Oct. 20/21 2017

Fellow ACACers Neal, Shadow and Shade Brown joined me at Matanzas Inlet (MI) this morning for three more hours of monitoring the 2017 Orionid (ORI) meteor shower. We went from 3:15 to 6:15 a.m. all told, and I had results almost identical to the previous morning. The first hour I had 24 ORIs. I fell just short of the "magic" 30 per hour rate threshold on the ORIs during the second hour with 29. Then, unexpectedly, the ORI rate dropped in half and I had only 16 during the third hour. Most unusual! Here is my data:

Observed for radiants:

- ORI: Orionids
- STA: South Taurids
- NTA: North Taurids
- EGE: epsilon Geminids
- LMI: Leonis Minorids
- SPO: sporadics

Date: Oct., 20/21, 2017. Observer: Paul Jones
Location: north bank of Matanzas Inlet, Florida, 15 miles south of St. Augustine, Florida
Lat: 29.75 N, Long:81.24W
LM: 6.2, sky conditions: 10% cirrus haze, Facing: South.

0315 – 0415 EDT (0715 – 0815 UT)
T_{eff}: 1 hour, clear, no breaks

- 24 ORI: 0(1), +1(1), +2(6), +3(7), +4(6), +5(3)
- 5 STA: +1(1), +2(1), +3(2), +4(1)
- 1 NTA: +4(1)
- 2 EGE: +2(1) +3(1)
- 8 SPO: +2(1), +3(3), +4(2), +5(2)
- 40 total meteors

5 of the 24 ORIs, 1 of the STAs and 1 SPO left visible trains, most common colors were gold and yellow and some bluish tints in the brighter ORIs.

0415 – 0515 EDT (0815 – 0915 UT)
T_{eff}: 1 hour, clear, no breaks

- 29 ORI: -1(2), 0(2),+1(2), +2(5), +3(11), +4(6), +5(1)
- 4 STA: +1(1), +2(2), +3(1)
- 1 EGE: +3(1)
- 9 SPO: +2(2), +3(3), +4(3), +5
- 43 total meteors

7 of the 29 ORIs, 1 of the STAs and 1 SPOs left visible trains, most common colors were gold and yellow and bluish tints in the brighter ORIs and SPOs.

0515 – 0615 EDT (09315- 1015 UT)
T_{eff}: 1 hour, 20% clouds and twilight interference, no breaks

- 16 ORI: +1(1), +2(2), +3(6), +4(5), +5(2)
- 2 STA: +3(1), +4(1)
- 1 EGE: +3(1)
- 7 SPO: +2(1), +3(2), +4(3), +5(1)
- 26 total meteors

4 of the 16 ORIs, 1 of the STAs left visible trains, most common colors were gold and yellow.

Overall, the ORIs were much fainter this morning, but still very active until that mysterious third hour came along! It could be fatigue crept in on us or sky conditions were somewhat weaker, it was just a noticeable drop indeed! Oh well, it's why we get out there to find out what is going on! I'll be back at it again in the morning, clear skies permitting. I just can't get enough… ;o).

October Meteor Observations from Southern California

Robert Lunsford

American Meteor Society (AMS), El Cajon, California, USA
lunro.imo.usa@cox.net

Two reports on visual meteor observations are presented, good Orionid and Taurid activity has been observed.

1 2017 Orionids

I have been out on 5 mornings so far in mid-October to view the Orionid shower from my yard located in the rural foothills east of San Diego. On all mornings I faced nearly due south about half-way up in the sky. The first morning was the 18th when I only counted 3 during 2.5 hours of viewing. It had been cloudy all day but was expected to clear by midnight. I woke at midnight but skies were still too cloudy to observe. It wasn't until 3:30 PDT that the skies cleared sufficiently to view. As soon as I started high clouds began to appear again. I watched for 40 minutes before giving up. That first session produced 3 meteors and no Orionids. I did notice the western horizon was clear so there was still hope of seeing more activity before dawn arrived. Conditions improved by 5:20 PDT so I resumed counting for another 40 minutes. Even though there were some passing clouds, this session was more productive producing 11 meteors.

I had to work the next two nights so my next session was on Saturday morning Oct 21. On that morning I watched from 03:00 to 06:00 PDT and counted 25 meteors, 12 of them belonging to the Orionid shower. The highest hourly rate was 6 and rates actually fell as the morning progressed. Minor showers were quiet too as only 1 Southern Taurid was seen. To be fair, conditions were poor with hazy skies and high humidity.

On Sunday morning Oct. 22, conditions were better with less haze and lower humidity. I watched from 2:00 to 6:00 PDT with a 10 minute break during the second hour. In the 3.83 hours I watched I counted a total of 61 meteors, 43 belonging to the Orionid shower. The hourly rates for the Orionids really jumped around ranging from 8 to 16 to 8 to 11. The second hour should have produced 19 had I been able to view a full 60 minutes. Needless to say I was a bit underwhelmed at the activity. The LM's were just under 6.0 to start but fell to the low 5's as the morning progressed. Bright Orionids were scarce with magnitude –1 being the brightest recorded. Once again minor showers were scarce with only 1 Leonis Minorid being seen. I was really surprised at the lack of Taurid activity.

I had to work Monday morning Oct. 23 but still managed an hour of viewing from 1:30-2:30 PDT before heading off to work. Skies were very good and the humidity less than 20%. The LM was 6.11 which allowed me to see 17 total meteors during this hour. 11 of these were Orionids including a –5 fireball that shot into the northwestern sky. I also counted 2 Southern Taurids and 1 distinct chi Taurid, from a radiant just west of the Pleiades.

I was out for 3 hours on Tuesday morning Oct. 24 from 3:00 to 6:00 PDT. Skies were once again clear and transparent. It was warm too with a steady temperature at 72F (22C). I counted a total of 41 meteors including 23 Orionids. The hourly rates for the Orionids were 5-8-10, a steady climb like one would expect. No Orionid fireballs this morning but had a couple at –2 and –1. The minor showers finally appeared producing 2 STA, 2 EGE, and 1 LMI. I also had a possible zeta Cancrid which appears on current activity charts from CAMS and Canadian radar.

The weather is expected to remain clear the remainder of the week so I will be out at least one hour on each night until it either clouds up or the moon begins to interfere.

2 October 28

I was out for 4 hours this morning. The humidity was a little higher (44%) than during recent sessions therefore the sky was just a tad hazy. I decided to look a bit higher in the sky and more toward the east to get better skies. The move paid off as all 4 hours had an LM between +6.1 and +6.2. The exact timing I was out was 1:30-5:30 am PDT (8:30-12:30 UT). I started out looking about 20 degrees south of the Pleiades and just let the sky drift by. This would have been a great night to break out the telescope as the stars were barely twinkling. Despite the slightly hazy conditions Canopus outshone Rigel at an altitude of less than 5 degrees. The temperature was about 10 degrees cooler than my other Orionid sessions. It started at 62F (17C) and fell to 58F (14C) by the end. Now for the details:

I counted a total of 40 meteors during the watch, not that impressive There were several large gaps in activity that didn't help. The hourly counts were 10-7-13-10. A majority of the meteors were 3rd magnitude with nearly all of the remainder evenly split between 2nd and 4th magnitude. The number of 5th magnitude meteors equaled the number of +1 and brighter. The brightest meteor of the session was an orange dart that left a 1 second train. It lined up with the lambda Ursae Majoris radiant (LUM).

The Orionids were poor with rates of 3-2-1-2. There were no Orionids brighter than +2.

The Taurids were more active with the STA's producing 1-1-3-1 and the NTA 1-0-0-1. Those rates are still poor considering the date. Nearly all of the Taurids were faint with the exception of a +1 STA. No chi Taurids (CTA) or omicron Eridanids (OER) were seen this morning.

I saw my first 2 nu Eridanids (NUE) this morning from a radiant just east of the Orionids. They would have been counted as Orionids except they shot southward and the radiant was definitely further east than expected for the Orionids.

The Leonis Minorids were poor this morning with only 1 shower member seen. No kappa Ursae Majorids (KUM) or Andromedids were seen. Once the Moon passes full and we have a little darkness between dusk and moonrise, I plan to check the Andromedids out.

All the numeric details on this session can be found at: https://www.imo.net/members/imo_vmdb/view?session_id=75473

I'm working the next two nights so no viewing until Monday night/Tuesday morning for me. The weather forecast is not good early next week so we will have to see whether I can keep viewing or not.

Radio Meteor Observations in the world: Monthly Report for June and July 2017

Hiroshi Ogawa

h-ogawa@amro-net.jp

Radio Meteor Observations in the World: Monthly Reports for June and July 2017 by the International Project for Radio Meteor Observation (IPRMO).
This report is not only based on Japanese stations but also on data from Europe, North America and South America.

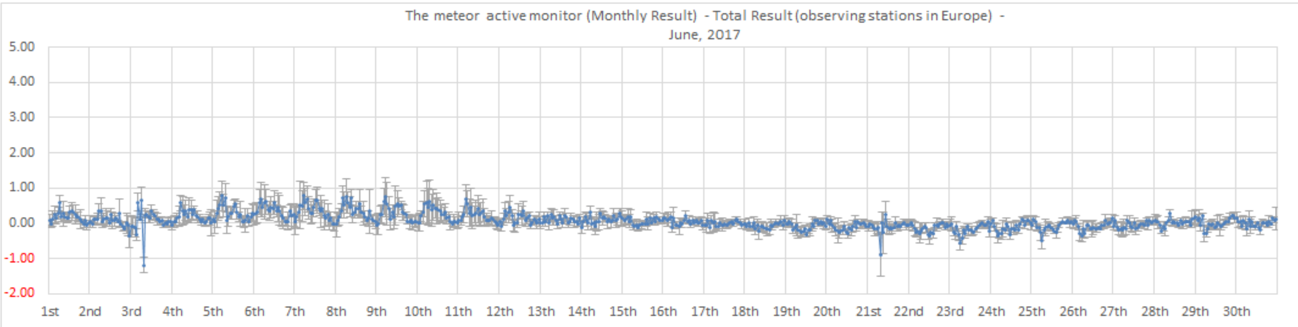


Figure 1 – Monitored result for June 2017 for the European region.

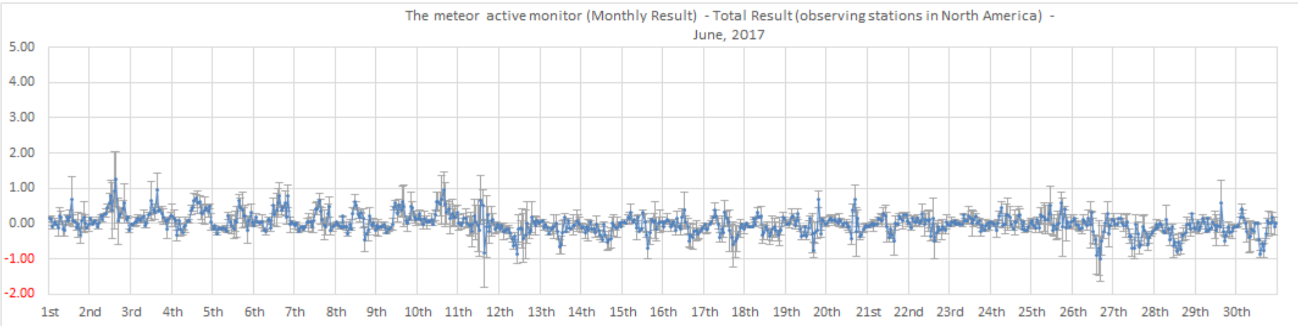


Figure 2 – Monitored result for June 2017 for the North American region.

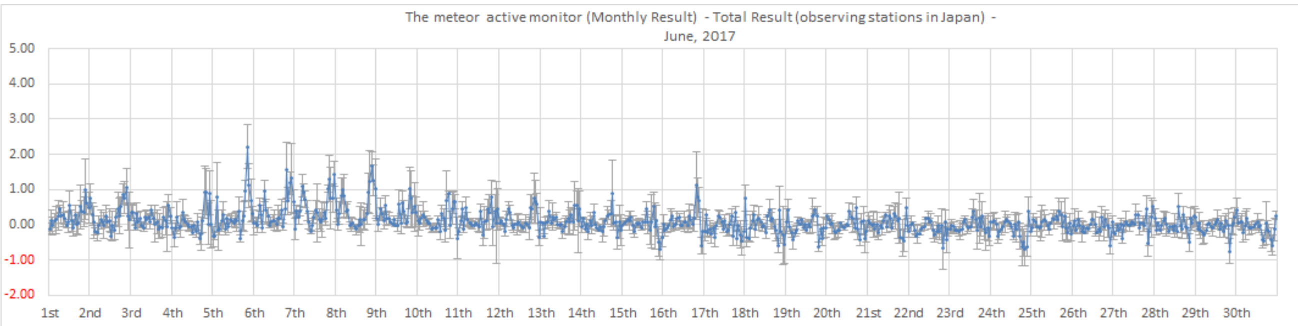


Figure 3 – Monitored result for June 2017 for Japan.

1 June 2017

The graphs show monitoring results from three areas: Europe with 10 observing stations (*Figure 1*), North America with four stations (*Figure 2*) and Japan with eight stations (*Figure 3*). For the first and second ten days, all areas observed high activity. It seems that this was the activity with daytime meteor showers. Although some high activity levels were above the usual level (0.0±0.4) except for the period of daytime shower activity. Some uncertain weather occurred and some meteor activity may be due to observing errors.

2 July 2017

The graphs show monitoring results from four areas: Europe with 15 observing stations (*Figure 4*), North America with six stations (*Figure 5*), South America with three stations (*Figure 6*) and Japan with eight stations (*Figure 7*).

High activity was clearly observed during the last ten days in North and South America as well as in Japan. It seems that this activity was caused by the delta Aquariids. The reason for the lower activity level in Europe is that the observing stations in Europe are at higher latitude. Therefore, the radiant elevation is lower than at other areas. These graphs are not considering the radiant elevation.

In the North American region, a small distinct activity was observed around 11th–12th. Although the activity level index was not above the usual level in Japan, some observing stations caught the same results. I do not know which activity this was.

The reason for the wide error-bars in South America is that the number of observing stations is too small.

Acknowledgment

- Radio Meteor Observing Bulletin (RMOB).
- Radio Meteor Observation in Japan (RMOJ).
- All radio meteor observers.

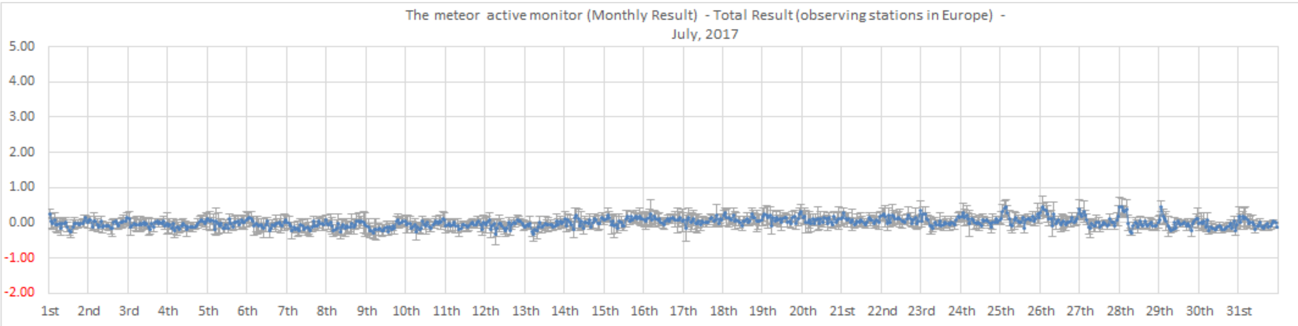


Figure 4 – Monitored result for July 2017 for the European region.

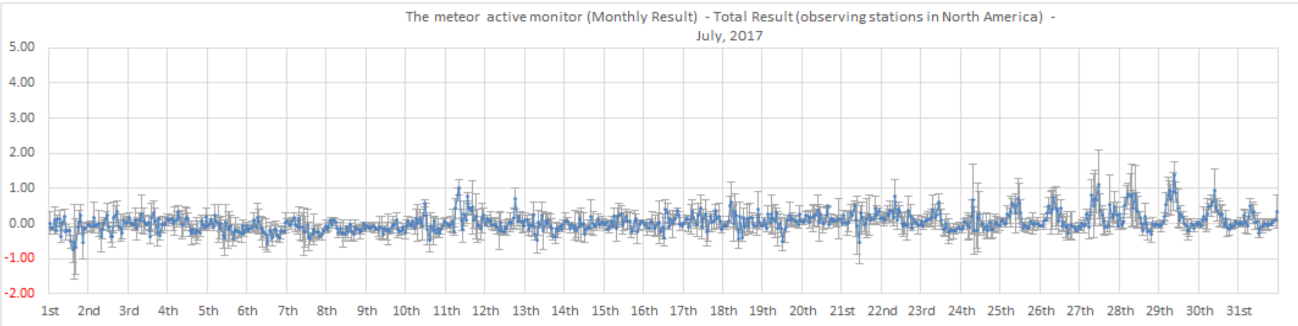


Figure 5 – Monitored result for July 2017 for the North American region.

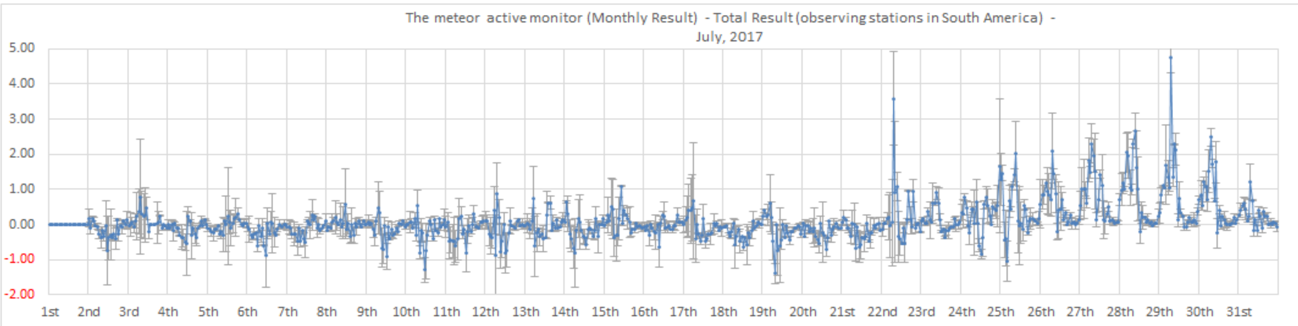


Figure 6 – Monitored result for July 2017 for the South American region.

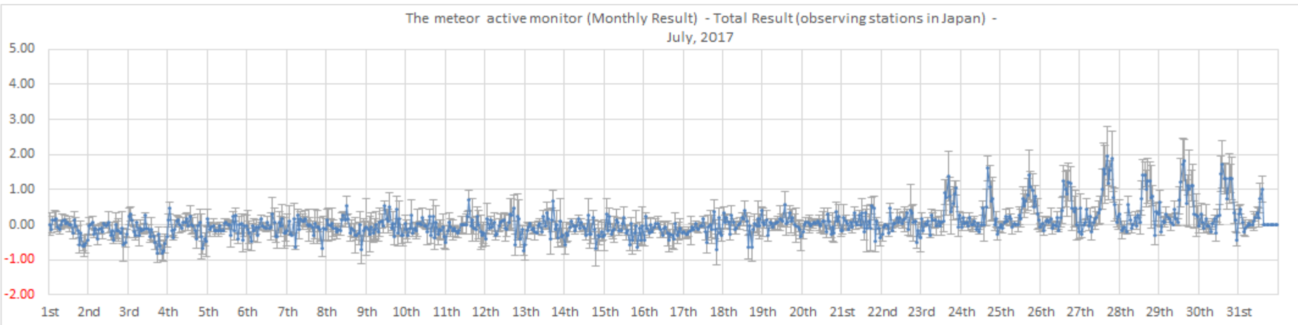


Figure 7 – Monitored result for July 2017 for Japan.

Radio Meteor Observations in the world: Monthly Report for August 2017

Hiroshi Ogawa

h-ogawa@amro-net.jp

This report provides the results for the month of August 2017, including two major meteor showers, δ-Aquariids and Perseids 2017. These results were provided by the International Project for Radio Meteor Observations (IPRMO). δ-Aquariids displayed possibly a weaker activity this year than other years. On the other hand, the Perseids displayed the same activity level and profile as normal years.

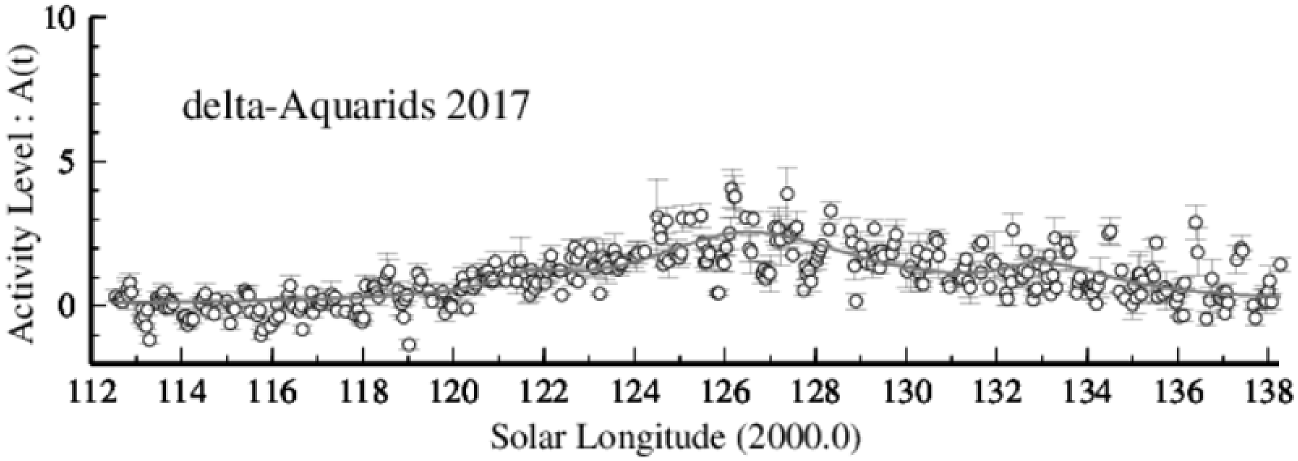


Figure 1 – δ-Aquariids 2017 using data from 29 observing stations in 11 countries.

1 Delta-Aquariids 2017

From the end of July to first of August the δ-Aquariids peak occurred. Although a distinct activity has been observed during this year, it is possible that the activity level in this year was weaker than previous years. The estimated maximum level was 2.5 at solar longitude = 126°.50 (29th July). FWHM has –72.0 hours and +84.0 hours. The beginning of the distinct activity was around solar longitude =118° and ended around 138°. After the peak time, the decrease occurred later around 132°–134°.

You can see past results on our website[13].

2 Perseids 2017

The Perseids 2017 showed the same activity level as in normal years. The estimated peak time was around solar longitude = 139°.91 (16:30 UT on 12th August) with a maximum activity level = 1.5. FWHM had –13.0 hours and +18.0 hours. Although higher activities were observed in 2014 and 2016, 2017 compares again to the 2013 activity level (normal annual activity level).

You can see past results on our website[14].

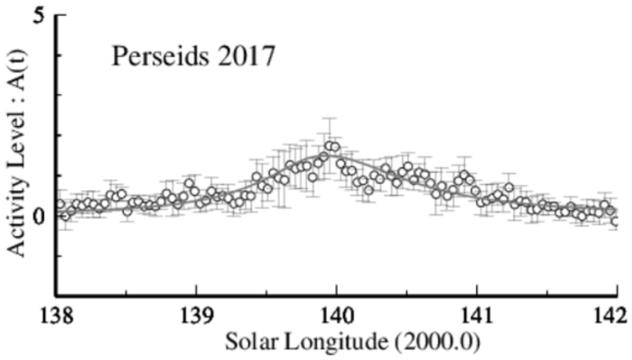


Figure 2 – Perseids 2017 using data from 29 observing stations in 10 countries.

3 August 2017

Following four graphs show the monitoring results in Europe with 15 observing stations (*Figure 3*), North America with six stations (*Figure 4*), South America with three stations (*Figure 5*) and Japan with eight stations (*Figure 6*).

The higher activity in the first ten days of August was influenced by the δ-Aquariid activity. Perseids were observed from almost all stations except from South America. At the end of August, some stations caught an increase of the activity level between 29th – 31st. It is not clear what caused this activity.

[13] http://www.amro-net.jp/meteor-results/07_aqrdelta.htm
[14] http://www.amro-net.jp/meteor-results/08_perseids.htm

Acknowledgment

- Radio Meteor Observing Bulletin (RMOB)
- Radio Meteor Observation in Japan (RMOJ)
- All radio meteor observers.

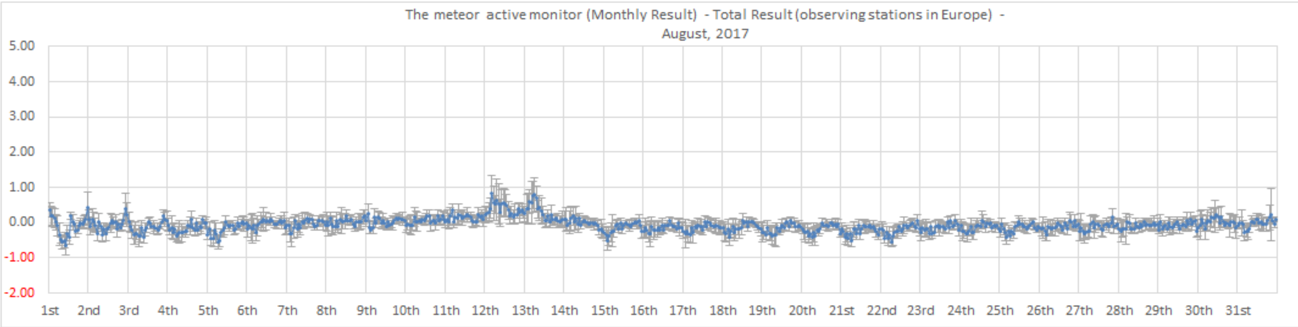


Figure 3 – Monitored result for August 2017 for the European region.

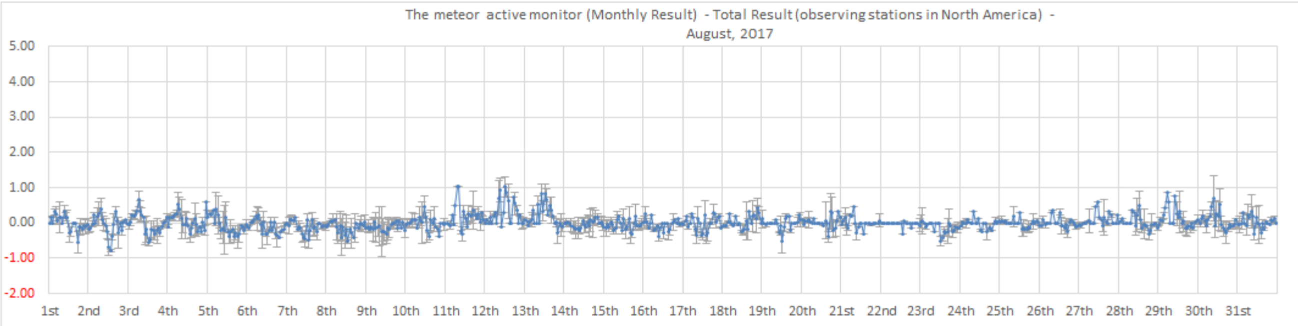


Figure 4 – Monitored result for August 2017 for the North American Area.

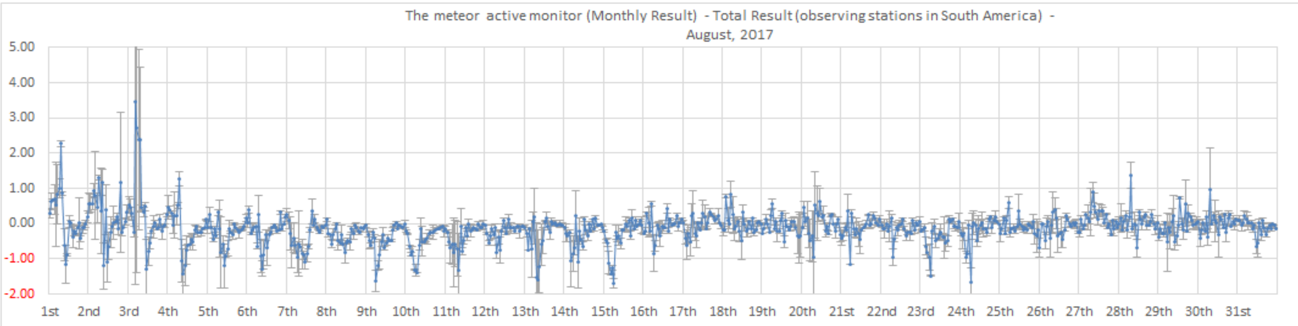


Figure 5 – Monitored result for August 2017 for the South American Area.

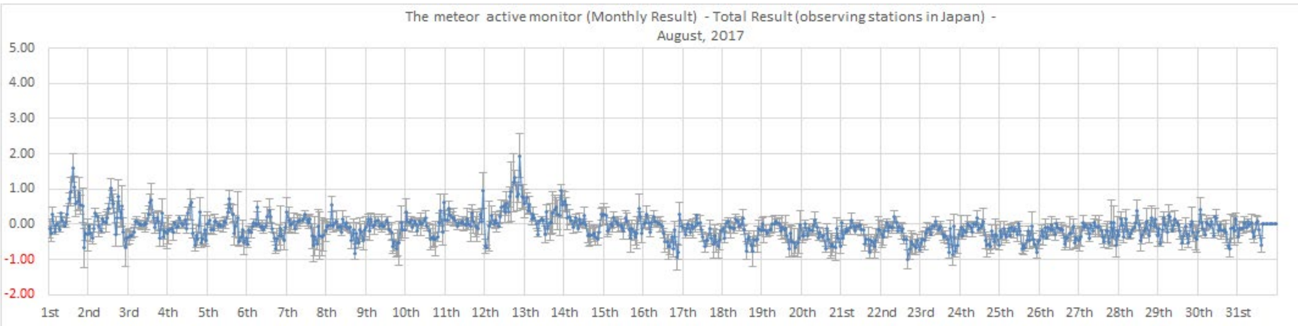


Figure 6 – Monitored result for August 2017 for Japan.

Fireball events

José María Madiedo

Universidad de Huelva, Facultad de Ciencias Experimentales
jmmadiedo@gmail.com

An overview is presented of exceptional fireball events which got covered in Meteor News during the period July – October 2017.

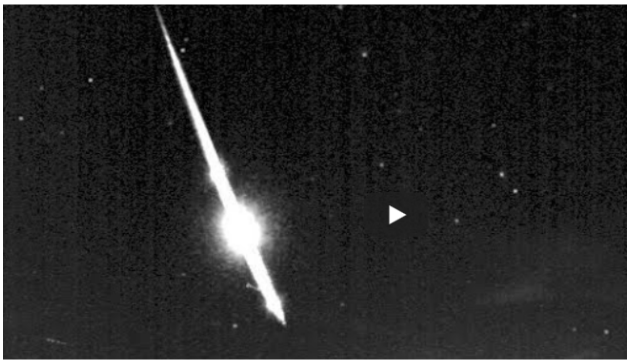
1 Fireball over the Mediterranean Sea on 4 July 2017

This sporadic fireball overflew the Mediterranean Sea on 4 July 2017 at 0:09 UT (2:09 local time). According to the preliminary analysis of this event, the bolide began at an altitude of about 80 km above the sea level and ended at a height of around 50 km.

The fireball was recorded in the framework of the SMART Project from the astronomical observatories of La Hita (Toledo, Spain), Calar Alto (Almería, Spain) and Sevilla (Spain).

2 Large asteroidal fireball over Madrid

This stunning fireball overflew Toledo and Madrid on July 27 at 00:35 local time (22:35 Universal Time on July 26). The event was produced by a rock from an asteroid that hit the atmosphere at around 54.000 km/h. The fireball began at a height of about 80 km and ended at an altitude of 45 km.



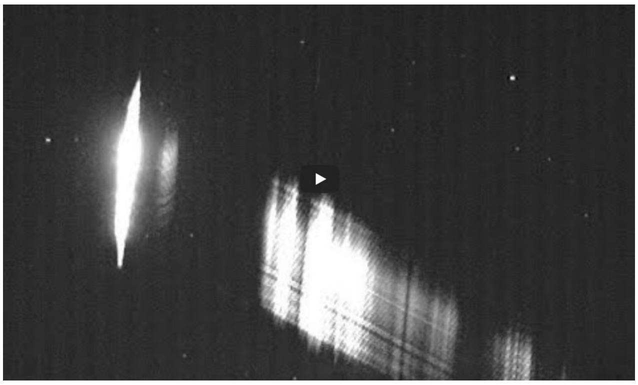
It was recorded in the framework of the SMART Project from the astronomical observatories of Calar Alto (Almería, Spain) and La Hita (Toledo, Spain). The bolide was also detected from other meteor stations operated by the Spanish Meteor Network (SPMN).

3 Beautifull Perseid fireball on 5 August 2017

This beautiful Perseid fireball was recorded on 5 August 2017 at 4:20 local time (2:20 universal time). It was produced by a fragment of Comet Swift-Tuttle that impacted the atmosphere at about 210.000 km/h. The fireball began at a height of about 130 km and ended at an altitude of around 82 km above the ground level. It was recorded in the framework of the SMART Project from the astronomical observatories of La Hita (Toledo, Spain), Sevilla and Huelva.

4 Stunning fireball on 12 Sept. 2017 at 1:35 universal time

This amazing fireball was recorded on the night of 12 September 2017 at 3:35 local time (1:35 universal time). The event was produced over Spain by a fragment from an asteroid that hit the atmosphere. The fireball began at a height of about 84 km and ended at an altitude of around 31 km. It was recorded in the framework of the SMART Project from the astronomical observatories of Calar Alto (Almería), La Hita (Toledo, Spain), Sevilla and Huelva.



The mission statement of MeteorNews is: "Minimizing overhead and editorial constraints to assure a swift exchange of information dedicated to all fields of active amateur meteor work." Easy and fast submission of content online, no subscription registration and no membership fees. MeteorNews is free available and dedicated to active amateur meteor observers.

To contribute on a regular bases you are welcome to become MeteorNews-editor, please contact Jakub Koukal (Account administrator) to create your editor account. To contribute on a casual bases, please send your text to one of the editors. For more info read:
http://meteornews.org/writing-content-for-emeteornews/

Webmaster & account administrator:

Jakub Koukal (Czech Republic): Koukal@wachal.cz

Contributing to this issue:

- ***Martin Dubs***
- ***Kai Gaarder***
- ***Carl Johannink***
- ***Abderrahmane Ibhi***
- ***Paul Jones***
- ***Richard Kacerek (eMeteorNews Covers)***
- ***Masahiro Koseki***
- ***Jakub Koukal (Meteor News webmaster)***
- ***Robert Lunsford***
- ***José Maria Madiedo***
- ***Koen Miskotte***
- ***Hiroshi Ogawa***
- ***Paul Roggemans***
- ***Hirofumi Sugimoto***

ISSN 2570-4745 Online publication http://meteornews.org.

Listed and archived with ADS Abstract Service: http://adsabs.harvard.edu/bib_abs.html?eMetN

MeteorNews Publisher: Valašské Meziříčí Observatory, Vsetínská 78, 75701 Valašské Meziříčí, Czech Republic