The Perseids in 2018
Analysis of the visual data

Koen Miskotte

Dutch Meteor Society
k.miskotte@upcmail.nl

The Perseid campaign was successful in 2018, despite the lesser weather in southern Europe. This article covers the analysis of visual data gathered during August 2018. The Perseid filament showed some extra activity on August 12 around 20-21 UT. Striking was the high Perseid activity during the night of 13 on 14 August 2018 observed in Europe.

1 Introduction

With New Moon on August 11, 2018, there was good reason to plan a decent Perseid campaign. Many observing activities were set up worldwide again: for example, a very large group of observers was active near Petnica (known from, among others, the IMC 2017). The author was part of a Belgian / Dutch team of observers who had moved into a gite in southern France with a beautiful view of the starry sky.

Even though southern Europe had less stable weather during the period the Perseids were active, an enormous amount of data was reported on the IMO website. The best result since 2015, in which it is striking that there were considerably fewer observers active in 2018 compared to 2015. That means that there were more observers who observed longer, a good development. In the year 2017 the numbers of Perseids observed were lower because there was a lot of moonlight around the Perseid maximum. See also *Table 1*.

Table 1 – Overview of observation data received by the IMO.

Year	N PER	N Observers
2015	37724	375
2016	21480	257
2017	6536	140
2018	32757	232

2 Predictions

There were no spectacular predictions like in 2016. Peter Jenniskens announced that some extra activity could be observable on August 12, 2018 at 20^h UT ($\lambda_\odot = 139.79°$) as the result of an encounter with the Perseid filament (Rendtel, 2017). This dust trail is a collection of old material from comet 109P Swift Tuttle trapped in a mean-motion resonance. Jeremie Vaubaillon found a very old dust trail that might give a little extra activity on August 13, 2018 at 1^h37^m UT ($\lambda_\odot = 140.030°$).

3 Collecting the data

Most of the data was collected from the IMO website in September and October. In addition, the author also received some data from observers who do not report to IMO. All data was checked on the known criteria:

- Only data from observers with a known C_p were used
- Only data with limiting magnitudes of 5.9 or higher was used
- Only observations made with a radiant height of 25 degrees or more were used.
- Extreme outliers were removed.

The population index r

The population index *r* could be calculated for many nights. The magnitude distributions of observers with a good C_p determination were examined. The rule here is: The difference between the average limiting magnitude and the average magnitude of the Perseids may not exceed 4.5 magnitudes. In the end, 13085 Perseids could be used to determine the population index *r*. *Table 2* and *Figure 1* is the result.

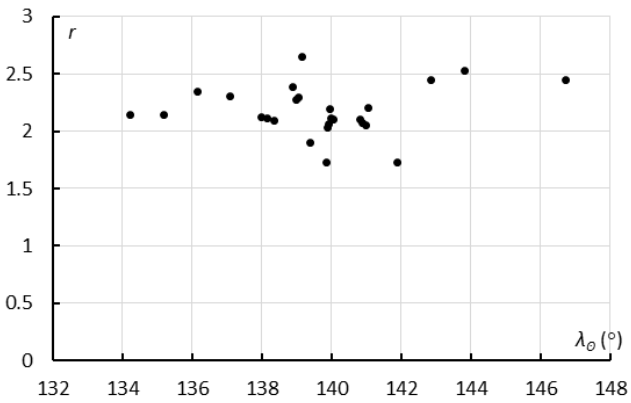

Figure 1 – Perseids 2018, population index r, 7 to 20 August 2018, graph based on Table 1.

Table 2 – The calculated population index r [-2; 5] for the Perseids in 2018. The sign ~ means that there was not enough data for a reliable population index r calculation r [–2; 5].

Datum	$\lambda_\odot$	r[–2;5]	nPER
5-8-2018 00^h UT	132.294	~	40
6-8-2018 00^h UT	133.252	~	40
7-8-2018 00^h UT	134.210	2.15	202
8-8-2018 00^h UT	135.168	2.15	227
9-8-2018 00^h UT	136.127	2.35	337
10-8-2018 00^h UT	137.086	2.31	411
10-8-2018 22^h UT	137.966	2.13	304
11-8-2018 02^h UT	138.126	2.12	298
11-8-2018 07^h UT	138.326	2.1	87
11-8-2018 21^h UT	138.886	2.39	281
11-8-2018 23^h UT	138.966	2.28	650
12-8-2018 01^h UT	139.046	2.3	994
12-8-2018 03^h UT	139.126	2.65	190
12-8-2018 05^h UT	139.206	~	45
12-8-2018 07^h UT	139.286	~	59
12-802918 09^h UT	139.366	1.9	57
12-8-2018 11^h UT	139.446	~	97
12-8-2018 20.5^h UT	139.826	1.73	195
12-8-2018 21.5^h UT	139.866	2.04	801
12-8-2018 22.5^h UT	139.906	2.07	824
12-8-2018 23.5^h UT	139.946	2.2	894
13-8-2018 0.5^h UT	139.986	2.12	1086
13-8-2018 1.5^h UT	140.026	2.11	1077
13-8-2018 21^h UT	140.806	2.11	156
13-8-2018 23^h UT	140.886	2.08	1003
14-8-2018 01^h UT	140.966	2.06	1415
14-8-2018 03^h UT	141.046	2.21	615
15-8-2018 00^h UT	141.887	1.73	395
16-8-2018 00^h UT	142.848	2.45	317
17-8-2018 00^h UT	143.809	2.53	223
19-8-2018 00^h UT	145.732	~	30
20-8-2018 00^h UT	146.694	2.45	46
22-8-2018 00^h UT	148.620	~	33

Although we did not observe at the exact same solar longitude in 2018 (but there is some overlap!) as in 2015, we did compare with the analysis from 2015 (Miskotte, 2016a, 2016b). *Figure 2* shows a comparison of the population index *r* of the Perseids as found during the two years.

It is striking that there are roughly similarities between the two years. High population index *r* values leading up to and after the maximum. There is a little more variation during the maximum. Only both nights 13–14 and 14–15 August show major differences. In 2018 the *r* values are close to each other, in 2015 there is much more variation. First the *r* values found in 2015 are considerably higher than in 2018, at the end of the night 13–14 August 2015 the *r* values suddenly fall far below the level of 2018. It should be noted that the moment 13 August 2018 21^h UT is the same solar longitude as 03^h UT on August 14, 2015.

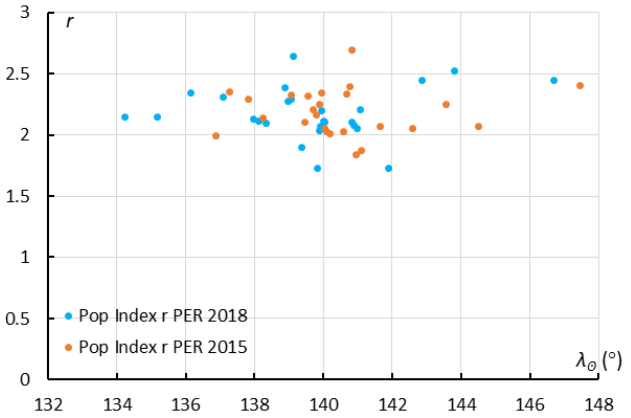

Figure 2 – Comparison of population index r of the Perseids in 2015 and 2018, period 7–20 August.

4 Zenithal Hourly Rates (ZHR)

ZHRs are always calculated in the Dutch Meteor Society according to the method of Peter Jenniskens as described in (Vandeputte, 2018, 2019).

$$ZHR = \frac{n \cdot F \cdot r^{6.5-LM}}{(\sin h)^{\gamma} \cdot C_p \cdot T_{eff}} \quad (1)$$

However, the radiant height correction γ is set to 1.0 instead of 1.4. When all the data was processed that met the criteria described in section 3, 14335 Perseids remained for processing. For the nights until August 10, all ZHR values were calculated per night (weighted average). For the night August 10 on 11 we could calculate the weighted average ZHR per continent (Europe and Amercia only!). The nights 11–12, 12–13 and 13–14 August the ZHR could be determined per hour over Europe and partly also for America. For the nights following August 14, the ZHR was again determined per night. The result is shown in *Figure 3*.

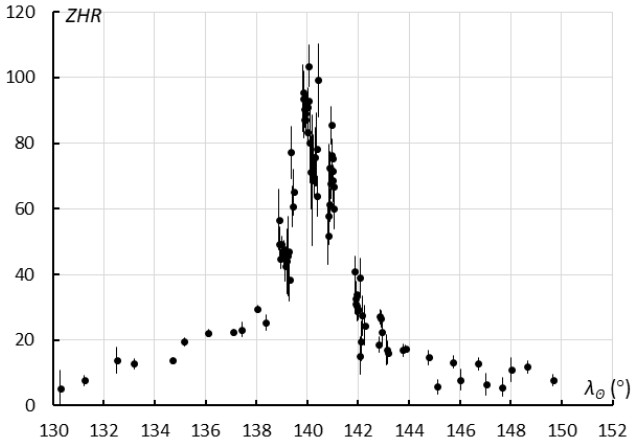

Figure 3 – ZHR of the Perseids in 2018, period 3–23 August.

At first glance, the graph shows (*Figure 3*) no strange events. The maximum ZHR found is slightly above 100.

Next, we zoom in on the individual nights 11–12, 12–13, 13–14 and 14–15 August.

11–12 August 2018

There is enough data available to zoom in on the Perseids activity in the night of 11–12 August over Europe and North America. A total of 2526 Perseids were used in the analysis for this period. The result is shown in Table 3 and *Figure 4*. These are ZHR values based on 15–30-minute counting intervals.

Table 3 – ZHR of the Perseids in the period from 11 August 2018 20^h UT to 12 August 2018 12^h UT. A total of 2526 Perseids were used for this table.

Day	UT	$\lambda_\odot$	Bins	PER	ZHR	±
11	20.78	138.877	5	38	56.7	9.2
11	21.58	138.909	14	97	49.4	5.0
11	22.49	138.945	22	216	44.7	3.0
11	23.50	138.986	38	471	49.3	2.3
12	0.41	139.022	42	542	46.5	2.0
12	1.41	139.062	31	449	45.0	2.1
12	2.33	139.099	11	257	47.5	3.0
12	3.13	139.131	4	80	42.7	4.8
12	4.65	139.192	2	20	44.0	9.8
12	5.65	139.231	1	14	45.6	12.2
12	6.48	139.265	2	27	46.9	9.0
12	7.37	139.300	2	34	38.3	6.6
12	8.58	139.349	5	94	77.3	8.0
12	10.48	139.425	5	100	60.7	6.1
12	11.21	139.454	4	87	65.1	7.0

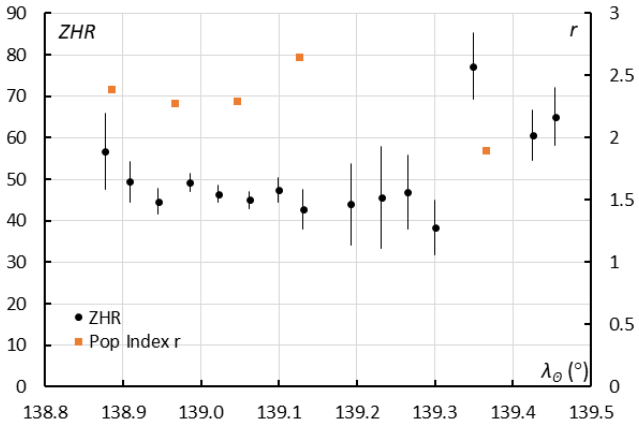

Figure 4 – The ZHR and population index r in one graph of the Perseids from the night between August 11, 2018 20^h UT and August 12, 2018 12^h UT. There was only enough data from Europe to calculate a reliable population index r. The standard r value of 2.20 was used for America.

Noticeable are the large error bars at the beginning of the night over Europe caused by a low radiant position and too few data. Large error bars are caused by the relatively low numbers of Perseids and few observers (with known C_p!) for American observers. We see a flat curve above Europe with a ZHR of roughly between 40 and 50, above North America increasing ZHRs leading (60 to 80) up to the maximum that was expected sometime in the night 12–13 August 2018 (Rendtel, 2017).

12/13 August 2018

A somewhat difficult night, especially for southern Europe. There is relatively few data after August 13, 2018 02^h UT. These are ZHR values based on 15–20-minute counts with a weighted average. A total of 5287 Perseids were used for this night. As mentioned earlier, there were two possible events that deserve attention (Rendtel, 2017), possibly some extra activity from the Perseid filament around August 13, 2018 20^h UT ($\lambda_\odot$ = 139.79°) and a very old dust trail that might give a little extra activity on August 13, 2018 at 01^h37^m UT ($\lambda_\odot$ = 140.030°). According to IMO, the maximum of the Perseids would fall between $\lambda_\odot$ = 139.8° and 140.3°, corresponding between 12 August 2018 20^h UT and 13 August 2018 08^h UT.

The results of this night are summarized in *Table 4* and *Figure 5*.

Table 4 – ZHR of the Perseids in the period from 12 August 2018 20^h UT to 13 August 2018 12^h UT.

Day	UT	$\lambda_\odot$	Bins	PER	ZHR	±
12	20.83	139.839	8	85	93.7	10.2
12	21.25	139.856	17	223	95.5	6.4
12	21.74	139.875	18	236	87.4	5.7
12	22.23	139.895	29	403	90.5	4.5
12	22.70	139.914	32	454	89.1	4.2
12	23.24	139.935	26	429	87.4	4.2
12	23.76	139.956	30	505	92.0	4.1
13	0.23	139.975	26	481	91.3	4.2
13	0.73	139.995	26	493	90.9	4.1
13	1.23	140.015	27	501	83.4	3.7
13	1.72	140.035	26	563	93.1	3.9
13	2.10	140.049	10	259	103.5	6.4
13	3.46	140.104	5	43	80.1	12.2
13	4.59	140.149	4	40	71.1	11.2
13	5.78	140.197	1	12	68.7	19.8
13	6.45	140.224	7	119	75.6	6.9
13	7.62	140.271	8	134	69.8	6.0
13	8.30	140.298	4	70	75.9	9.1
13	9.82	140.358	2	49	78.1	11.2
13	10.53	140.387	6	109	63.8	6.1
13	11.34	140.419	3	79	99.2	11.2

What is striking is a rather flat activity above Europe but at the end of the night a weak peak of activity with a ZHR of just over 100 is visible. Above North America lower ZHRs were recorded but with larger error bars due to lower numbers of Perseids and sometimes low radiant positions. The last ZHR point is rather high and is based on the observation of only one single observer.

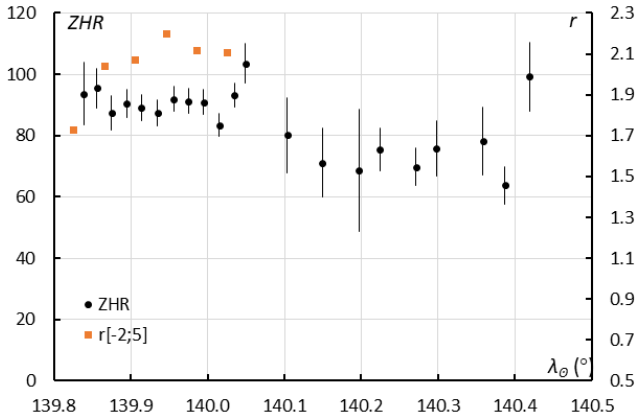

Figure 5 – The ZHR and population index r in one graph of the Perseids from the period between 12 August 2018 20^h UT and 13 August 2018 12^h UT. There was only enough data from Europe to calculate a reliable population index r. The IMO standard value of 2.20 was used for America.

Perseid filament active?

Regarding the possible extra activity due to the Perseid filament, there are indications that this has happened. At the start of their observations on August 12, 2018 at 20^h UT the observers in southern France saw relatively more bright Perseids, including a beautiful earth-grazing fireball of magnitude –4 moving from Cassiopeia to Sagittarius. Unfortunately, this data was not used because the radiant position at this location was still far below 25 degrees at that time. Data from, for example, *Jakub Koukal* from the same period[1] could be used and he saw three fireballs of –4, –5 and –6 between 21^h05^m and 22^h00^m UT.

Indeed, we see a very small peak in activity again just after 21^h UT, but it is very marginal. Luckily, there is solid support of the population index *r*. The population index *r* is very low at 12 August 2018 between 20^h-21^h UT, but rises quickly after 21^h UT. These are things that we would expect with a Perseid filament encounter. See also the 2016 analysis when the filament was very active (Miskotte, 2016a, 2016b). Also, it seems that the filament may have already been active before 20^h UT, but the data from that period shows too many mutual differences between the observers and is inadequate regarding radiant heights, limiting magnitudes and/or the lack of observers with a reliable C_p.

Was the old dust trail active?

Regarding the old dust track that would be active on 13 August 2018 at 1^h37^m UT (Rendtel, 2017), it is much harder to substantiate this, also, because the expected extra activity adds little to the already high activity. A peak was observed around 2^h06^m UT, about a half hour later. But this could also have been the normal maximum. The *r*-value also shows no strange behavior around that time. The "fingerprint" of an old dust trail is a temporary lower population index *r* and that has not happened.

13/14 augustus 2018: surprise, surprise!

Most observers in Europe observed a good Perseid activity during this night. The observers in the Provence also noticed this, the report of *Michel Vandeputte* (Vandeputte,2018;2019; Miskotte 2018) describes this very well: "*The Perseids were clearly active. The first hour was almost normal; but afterwards it went faster and faster. Perseids came in heavy flurries with sometimes multiple meteors per minute. In fact: this activity went unusually fast for a post maximum night! Most of the meteors were relatively weak, but a nice –5 also appeared in the Big Dipper: excitement of the observers. The author, for example, had a highest fifteen-minute count between 02^h15^m–02^h30^m UT with no less than 39 Perseids and I counted 102 Perseids in the last hour before dusk. In total even nearly 400 Perseids at 5 hours observational time! You can only see these numbers in a good (normal) maximum night!*".

Data from other parts of Europe also confirm these observations, the following message came from *Kai Gaarder* who observed from southern Crete (via FB communication): "*August 13–14 was a good night with surprisingly high activity. Hourly counts were around 90 in the morning hours. 15 minutes rates were around 10 in the early evening hours and reaching over 20 in the morning hours. I have not calculated the mean magnitudes yet but I had a feeling that the Perseids were richer in bright meteors in the range of +2 to –1, than the night before. Had to stop observing some 15 minutes earlier than normal because of an early morning flight home.*"

All this was a reason to analyze this night well. What is going on here? Observations were analyzed in the same way as the two previous nights. The ZHR values are based on 15–20-minute counts with a weighted average. A total of 2223 Perseids were used for this night. The result is shown in *Table 5* and *Figure 6*.

Table 5 – Perseids ZHR between 13 August 2018 21^h UT and 14 August 2018 04^h UT.

Day	UT	$\lambda_\odot$	Bins	PER	ZHR	±
13	21.28	140.817	3	35	51.8	8.8
13	21.72	140.835	4	42	58.0	8.9
13	22.23	140.855	8	109	72.7	7.0
13	22.69	140.873	10	139	61.2	5.2
13	23.20	140.894	12	202	72.4	5.1
13	23.69	140.913	14	224	67.8	4.5
14	0.23	140.935	10	225	85.5	5.7
14	0.72	140.955	10	217	76.3	5.2
14	1.20	140.974	12	261	75.4	4.7
14	1.66	140.993	12	260	71.5	4.4
14	2.15	141.012	8	216	68.6	4.7
14	2.65	141.032	6	199	66.8	4.7
14	3.09	141.050	3	94	60.0	6.2

[1] https://www.imo.net/members/imo_vmdb/view?session_id=77037

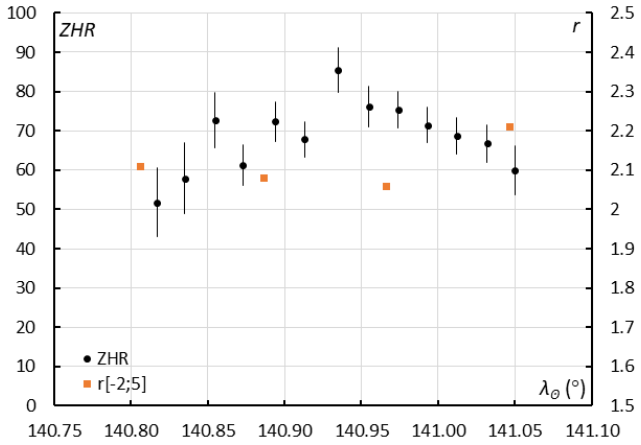

Figure 6 – The ZHR and population index r in one graph of the Perseids from the night of August 13, 2018 21^h UT to August 13, 2018 04^h UT.

If we look at *Figure 6* we can speak of a spectacular activity level. There is a peak of activity on August 14 at 00^{h}14^m UT ($\lambda_\odot$ = 140.935°). The activity reached a *ZHR* of 85 at that moment! As many observers reported, there were no high numbers of bright Perseids. The population index *r* is slightly below the normal value of 2.20 for almost the entire night and at the end of the night the *r*-value was rising above the mentioned value. It is striking that the lowest population index *r* values were found around the time of maximum.

The ascending wing of the ZHR profile (*Figure 6*) looks a bit messy, this may also have to do with the somewhat lower radiant heights at the start of the night. The descending wing of the profile looks very nice with a steady decreasing activity from *ZHR* = 85 to *ZHR* = 60 at the end of the night. The population index r does not show crazy things, so if there really is an increase in activity then this was caused over the entire visually observable magnitude spectrum.

To determine whether and to what extent there was some increased activity, we used old observational data around the solar longitude in which we could observe in 2018. Taking into account the moon and same solar longitude the years 1986, 1994, 2002 and 2010 are good for comparing to 2018. There was of course a lot of searching in both the IMO database and the visual database of the DMS. Unfortunately, there is not that much data available from observers with a good C_p determination. Below is a brief overview.

13–14 August 1986: 3 observers MISKO (Koen Miskotte), RISBA (Bauke Rispens), ROGPA (Paul Roggemans) with good (and high C_p) determinations, one single location (Puimichel, southern France) under top conditions (*lm* 6.5–6.7) with mistral and high transparency). Impression of data: reliable, a total of 862 Perseids.

13–14 August 1994: 2 observers MISKO and LANMA (Marco Langbroek) with good C_p determinations, one single location (Biddinghuizen, NL) under top conditions (*lm* 6.7 – 6.8!), Good transparency, zodiacal light was visible. The author remembers that the Perseid activity was rather disappointing compared to 1986! Impression of the data: good, but rather few meteors, only 239 Perseids.

2002: 5 observers ATAJU (Jure Atanackov), KACJA (Javor Kac), MISKO, LANMA and VANMC with good C_p determinations. two locations in (Slovenia), Lattrop in the Netherlands and Ellezelles in Belgium under top conditions (*lm* 6.3–7.0). Impression data: very good, personal differences in ZHRs small, a total of 851 Perseids.

2010: 5 observers (few DMS, most DMS observers were in Redortier southern France and they had it clear only for the first 1.5 hours with a too low radiant position): KACJA, LEVAN (Anna Levin), WEITO (Thomas Weiland), SAVBR (Branislav Savic) and VANMC with good C_ps. five locations (Slovenia, Israel, Crete, Serbia and Belgium. Good conditions (*lm* 6.2–6.7). Impression of the data: excellent, no strong mutual differences in ZHR, a total of 629 Perseids.

2018: Largest data set of observers with known C_p. 22 observers in good conditions, multiple locations in Europe. Impression of the data: fine, *lm* 5.9–6.8, a total of 2223 Perseids

To be able to compare these five years with each other, a fixed population index *r* of 2.20 has been used. The result of all these calculations are shown in *Figure 7*.

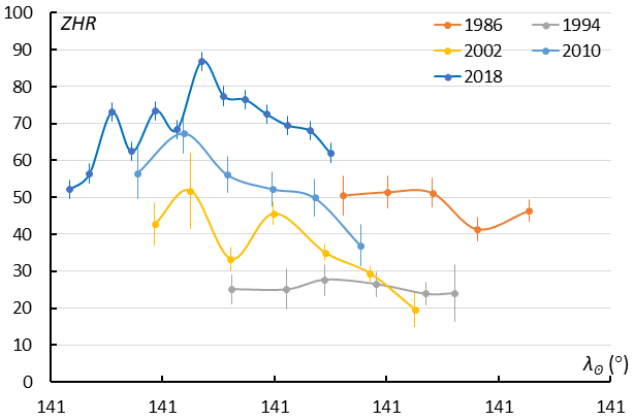

Figure 7 – Comparison of the Perseid activity during the nights of 13–4 August in 1986, 1994, 2002, 2010 and 2018. The lines between the points are to indicate more clearly to which years the ZHR points belong.

Table 6 – Maximal ZHRs and solar longitudes for the night of 13–14 August 1986–1994–2002–2010–2018.

Year	$\lambda_\odot$	ZHR
1986	141.101	51 ± 4
1994	141.045	28 ± 4
2002	140.925	52 ± 10
2010	140.919	67 ± 6
2018	140.935	87 ± 6

A surprising result: the years 2002, 2010 and 2018 have shown a higher ZHR since 1994. The years 2002, 2010 and 2018 also always show a maximum ZHR between $\lambda_\odot$

140.90° and 140.95°. The maximum ZHRs in the mentioned 5 years are shown in *Table 6*. The duration of this higher activity is rather long, about 5 to 6 hours.

Table 7 – Overview of the Perseid activity between $\lambda_\odot$ 140.90° and $\lambda_\odot$ 140.95° for the period 2000–2040. Good years for Europe are of course 2026 and 2034, but 2025 also offers an opportunity to observe the decreasing wing of the activity, as in 2037. In 2023 the ascending wing could still be observed. The moon phases are rounded to 10 degrees and a + or – indicates whether it is an increasing or decreasing moon phase. Taken altogether, it is still possible to observe well with increasing phases of the moon up to 80+% and with decreasing phases of the moon from 40 to 50%.

Year	Solar Longitude	Date (start)	Start UT	End UT	Observed	Moon %	Best place to observe
2000	140.90–140.95	13–8–2000	08:40	09:55	~	90+	
2001	140.90–140.95	13–8–2001	14:48	16:04	~	40–	
2002	140.90–140.95	13–8–2002	20:53	22:08	21:30	30+	
2003	140.90–140.95	14–8–2003	03:06	04:22	~	96+	
2004	140.90–140.95	13–8–2004	09:20	10:34	~	10–	
2005	140.90–140.95	13–8–2005	15:26	16:41	~	0	
2006	140.90–140.95	13–8–2006	21:32	22:47	~	80–	
2007	140.90–140.95	14–8–2007	03:40	04:55	~	10+	
2008	140.90–140.95	13–8–2008	09:51	11:06	~	80+	
2009	140.90–140.95	13–8–2009	16:00	17:15	~	60–	
2010	140.90–140.95	13–8–2010	22:04	23:19	22:35	10+	
2011	140.90–140.95	14–8–2011	04:16	05:31	~	100	
2012	140.90–140.95	13–8–2012	10:30	11:45	~	10–	
2013	140.90–140.95	13–8–2013	16:37	17:52	~	40+	
2014	140.90–140.95	13–8–2014	22:44	00:00	~	85–	
2015	140.90–140.95	14–8–2015	04:56	06:11	~	0	
2016	140.90–140.95	13–8–2016	11:08	12:22	~	80+	
2017	140.90–140.95	13–8–2017	17:17	18:32	~	60–	
2018	140.90–140.95	13–8–2018	23:22	00:35	00:14	10+	Europe
2019	140.90–140.95	14–8–2019	05:30	06:15	~	100	North America
2020	140.90–140.95	13–8–2020	11:41	12:56	~	30–	Western north America, Pacific
2021	140.90–140.95	13–8–2021	17:47	19:02	~	30+	Asia
2022	140.90–140.95	13–8–2022	23:51	01:06	~	100	Europe
2023	140.90–140.95	14–8–2023	06:04	07:19	~	0	North America
2024	140.90–140.95	13–8–2024	12:13	13:18	~	60+	Western north America, Pacific
2025	140.90–140.95	13–8–2025	18:23	19:38	~	80–	Asia
2026	140.90–140.95	14–8–2026	00:30	01:45	~	0	Europe
2027	140.90–140.95	14–8–2027	06:41	07:56	~	90+	Atlantic Ocean, North America
2028	140.90–140.95	13–8–2028	12:59	14:14	~	50–	Pacific, east Asia
2029	140.90–140.95	13–8–2029	19:07	20:22	~	30+	Asia
2030	140.90–140.95	14–8–2030	01:09	02:14	~	100	Europe
2031	140.90–140.95	14–8–2031	07:21	08:36	~	10–	Atlantic Ocean, North America
2032	140.90–140.95	13–8–2032	13:28	14:43	~	40+	Pacific, east Asia
2033	140.90–140.95	13–8–2033	19:36	20:51	~	90–	Asia
2034	140.90–140.95	14–8–2034	01:42	02:57	~	0	Europe
2035	140.90–140.95	14–8–2035	07:49	08:03	~	80+	Atlantic Ocean, North America
2036	140.90–140.95	13–8–2036	14:04	15:19	~	60–	Pacific, east Asia
2037	140.90–140.95	13–8–2037	20:11	21:26	~	10+	western Asia, Eastern Europe
2038	140.90–140.95	14–8–2038	02:16	03:31	~	100	(Western) Europe
2039	140.90–140.95	14–8–2039	08:33	09:48	~	30–	Atlantic Ocean, North Amerca
2040	140.90–140.95	13–8–2040	14:42	15:57	~	30+	Pacific, east Asia

The expectation is of course not that from now on we will get higher ZHRs between $\lambda_\odot$ 140.90° and 140.95°. Because that would mean backwards in time that in the 60s or 70s there was no activity of the Perseids during the night of August 13–14. So perhaps this is a coincidence. In addition, the ZHR value from 1994 is very low and 1986 falls completely outside the solar longitude interval covered in 2018.

Therefore, it is not clear to indicate what caused this extra activity, here are some possible explanations given by *Michel Vandeputte* and *Paul Roggemans*:

- Michel Vandeputte: "*It is rather to be considered whether this is the 'higher' activity from 2010 & 2018. It also is close to the cycles with increased Perseid activity: 2008–2010 are there the effects of the Saturn perturbation and 2018 the after effects of the last Jupiter perturbation? Perhaps a higher and wider background component is active in that period. According to the Maslov website, after 2018 we will start with normal to even lower Perseid activity. 2026 is then a good year to compare the observations with the years mentioned above. It will not be the moon affecting the observations with a solar eclipse on August 12 that year. In 2027 and 2028 we can prepare ourselves again for a Perseid show ala 2016!"*
- Paul Roggemans: "*The Perseid maximum is slowly shifting due to the regression of the line of nodes, but this cannot explain this 'off–set'. In the second half of the 1980s we saw a bump appear on the ZHR profile that grew in 1988 to a second maximum just before the traditional maximum. This was then wiped off the table because at that time I was the only one combining data from Europe, America and Japan. Nothing was visible in ZHR profiles based on only 6–7 hours observation intervals. With the Perseid outburst in 1991, it was clearly proven and when the parent comet was discovered, this new sharp peak turned out to be a fresh dust trail related to the perihelium passage of Swift Tuttle, a temporary phenomenon that was observed for several years.*

  The bump that now appears after the traditional maximum is, in my opinion, an older dust trail that has now revolved around the Sun more than 25 years after the perihelium passage parallel to the core of the Perseid meteor shower. Apparently, the density of this dust trail is still increasing year after year. The question is how far this will continue to increase? Maybe some nice surprises are coming? This dust trail will probably disappear again after some time. This kind of parallel dust flows is exactly what one can expect from the development of meteor streams. The nice thing is that every year this turns into a surprise party with the question whether or not activity will get more or less."

It is therefore clear that this interesting development must be further observed. In *Table 7* I give the times and locations where you must be to be able to observe this 2nd maximum. Of course, only if this 2nd maximum is a permanent phenomenon!

14–15 August 2018: many bright Perseids?

This night it was certainly fun watching the Perseids. For this night, 15–30-minute counts were used for which weighted averages were calculated. A total of 658 Perseids were used for this night. The ZHR values this night are between 30 and 40 above Europe and between 15 and 25 above North America. See also *Figure 8*. Striking was the population index *r* this night over Europe: with 1.70 it was very low compared to the nights before and after.

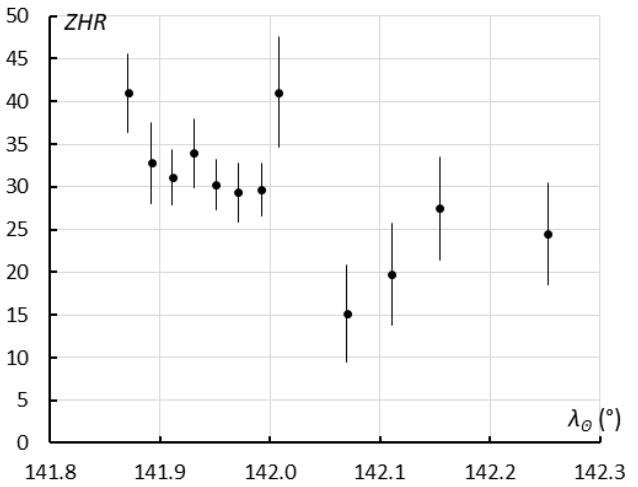

Figure 8 – ZHR of the Perseids between 14 August 2018 23h UT and 15 August 2018 10h UT.

5 Conclusions

A nice Perseids campaign in 2018, despite the bad weather in southern Europe. The Perseids filament showed some extra activity on August 12 around 20h–21h UT. What also was striking in 2018 was the high Perseid activity in the night of 13–14 August 2018 above Europe.

Furthermore, a call to the observers to observe at least 15 or more hours between July 25 and August 31. That way we can determine a reliable C_p values for more observers. And the more observers we have with good C_p, the more data we can use in the analyzes and the more reliable the results become.

Acknowledgment

A word of thanks goes to *Michel Vandeputte*, *Carl Johannink* and *Paul Roggemans* for critically reviewing and providing suggestions for this analysis. And a very big word of thanks to all observers who observed the Perseids of 2018, these are: *Ioan Adam, Rainer Arlt,Pierre Bader, Fodor Balazs, Ognjen Bašić, Orlando Benitez Sanchez, Felix Bettonvil, Dina Blagojevic, Maša Bogojević, Steve Brown, Viktor Buchenko, Rada Burmazović, David Buzgo, Alexandra Chobanova, Mikhail Chubarets, Jean Francois Coliac, Ilie Cosovanu, Magdalena Cosovanu, Tibor Csorgei, Thomas Daniels, Katie Demetriou, Peter Detterline, José Vicente Diaz Martinez, Polina Dimitrieva, Sofia Dimitrieva, Yiyang Ding, Janko Djuric, Huy Do Duc, Yuankeqin Dong , Julie Dostalova, Radek Drlik, Slomi Eini,*

Reza Ensandoost, Frank Enzlein, Tomasz Fajfer,Kai Gaarder, Iglika Genova, Slaveja Georgieva, Vasilena Georgieva, Christoph Gerber, William Godley, Mitja Govedič, Filip Halaska, Milida Halaskova, Shy Halatzi, Torsten Hansen, Amir Hasanzadeh, David Havranek, Ida Havrankova, Davood Hemmati, Gabriel Hickel, Lumír Honzík, Jasmina Horvat, Lukas Hreha, John Hsueh, Glenn Hughes, Moran Idan, Milos Igrutinovic, Elitsa Ilieva, Emona Ilieva, Gerardo Jiménez López, Carl Johannink, Penko Jordanov, Hansub Jung, Károly Jónás, Javor Kac, Václav Kalaš, Omri Katz, Iva Kirova, André Knöfel, Davoid Kocian, Zdenek Komarek, Jiri Konecny, Peter Kostadinov, Jakub Koukal, Vladimir Krejci, Lukas Krejzlik, Macieje Kwinta, Daniel Kádner, Mikulas Laza, Anna Levin, Beáta Lešková, Gang Li, Michael Linnolt, Robert Liska, Eva Liskova, Ivana Liskova, Ole Lit, Hartwig Luethen, Caslav Lukic, Eduard Lungu, Robert Lunsford, Andjela Mahmutovic, Adam Marsh, Ken Marsh, Pierre Martin, Antonio Martinez Picar, Matea Mašinović, Bruce McCurdy, Fabrizio Melandri, Frederic Merlin, Barbora Michalcova, Andre Michalsky, Peter Mikloš, Tanja Miković, Isidora Milivojević, Koen Miskotte, Shai Mizrachi, Bojana Mićić, Jan Mocek, Amir Hossein Mohammadizadegan, Sirko Molau, Yulia Moralyiska , István Mátis, Haghighi Arash Nabizadeh, Jaroslav Navratil, Tomáš Nejdl, Raphael Ner, Zvi Ner, Rafael Neumann, Stariy Nicolay, Jos Nijland, Ana Nikolić, Mohammad Nilforoushan, Katarina Ninković, Vladimir Obradovic, Francisco Ocaña González, Matěj Otýs, Igor Parnahaj, Debora Pavela, Dunja Pavlović, Tomáš Pekárek, Nina Perović, R. Suyin Perret–Gentil, Niya Petrova, Katarina Petrovic, Julia Piatnicova, Lazar Popović, Sasha Prokofyev, Katerina Ptacnikova, Štěpán Ptáčník, Tobias Pudl, Jana Pudlova, Pedro Pérez Corujo, Jiří Příbek,mAlireza Rahimi, Ella Ratz, Denis Reichel, Ina Rendtel, Jurgen Rendtel, Janko Richter, Stephen Riley, Dalida Rittossa, Safiria Rittossa, Filipp Romanov, Bohus Rosko, Boris Rosko, Terrence Ross, Natalie Ryznarova, Jan Sadiv, Mirco Saner, Branislav Savic, Stefan Schmeissner, Kai Schultze, Diana Sekulić, Ben Sharp, Fangzheng Shi, Wei Shi, Costantino Sigismondi, Andrzej Skoczewski , Nela Sleskova, Tatana Sleskova, Teodora Srećković, Sergey Stariy, Toni Stipeč, Wesley Stone, Petra Strunk, Marek Svoboda, Ádám Szabó, Richard Taibi, Hanjie Tan, Tamara Tchenak, Alexandru Tehanciuc, Iurascu Teodor, Csilla Tepliczky, István Tepliczky, Aleksa Tesic, Snežana Todorović, Tomáš Toma, Yasuhiro Tonomura Yasuhiro, Oliver Toskovic, Martin Tran, Ondřej Trnka, Shigeo Uchiyama, Andras Uhrin, Marcela Vaclavikova, Peter van Leuteren, Hendrik Vandenbruaene, Michel Vandeputte, Anatliy Vasylenko, Alexandru Vatamanu, Kritina Veljkovic, Martin Vincencik, Katarina Vrhovac, Dušan Vukadinović, Josef Vyhnalek, Dita Větrovcová, Thomas Weiland, Ariel Westfried, Lukáš Winkler, Roland Winkler, Martin Wolmut, Anna Wrnatova, Oliver Wusk, Frank Wächter , Sabine Wächter, Quanzhi Ye, Zlatin Yovev, Yueyang Yu, Zohre Zarghami, Geng Zhao, Andrej Zrnić, Roman Čečil, Jan Šemora and *Przemysław Żołądek*.

References

Miskotte K. (2016a). “Perseïden 2015, een globale analyse”. *eRadiant*, **2016**, 23–33.

Miskotte K. (2016b). “Perseids 2015, a global analysis”. e*MetN*, **1**, 42–51.

Miskotte K. (2018). “Preview: Perseid observations from Aubenas Les Alps, Southern France”. *eMetN*, **3**, 277–279.

Rendtel J. (2017). IMO Meteor Shower Calender 2018, International Meteor Organisation.

Vandeputte M. (2018). “Perseiden actie te Aubenas les Alpes, Provence”. *eRadiant*, **2018**, 138–143.

Vandeputte M. (2019). “Perseid campaign at Aubenas Les Alpes, Haute Provence”. *eMetN*, **4**, 83–88.

