

Perseids 2020: again, enhanced Perseid activity around solar longitude 141?

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In 2018 and 2019, a peak in Perseid activity was observed around solar longitude 141.0° , about ~ 30 hours after the traditional Perseid maximum. In 2018 this was only observed visually, in 2019 almost only with radio observations. Only the onset to the peak in 2019 has been observed visually in Europe. With two consecutive years of extra Perseid activity around sun longitude 141.0° , 2020 was eagerly anticipated.

1 Introduction

In August 2018, a number of DMS observers were located in the south of France in the town of Aubenas Les Alps. The aim was to observe the Perseids (Vandeputte, 2018). During the night of 13–14 August, the group noticed that there was a lot of Perseid activity, more than what you would normally expect around that time. Other European observers also reported this. An analysis of the author showed that there had been a nice peak in activity with a maximum ZHR of 85, more than 24 hours after the annual traditional maximum (Miskotte, 2019), just before $\lambda_\odot = 141^\circ$. The observations also showed that the population index r barely changed that night. From old data from 1986, 1994, 2002 and 2010, (weaker) peaks in activity were also found around solar longitude 141° .

In 2019, Michel Vandeputte, among others, was able to observe during the night of 13–14 August. He was not disappointed, especially at dawn there was an impressive increase in bright Perseids (Vandeputte, 2020; Miskotte and Vandeputte, 2019). Radio observer Felix Verbelen also noticed that the Perseids (especially the long-lasting reflections) were active well above normal level. Finally, it was also found that Hirofumi Sugimoto's radio analysis of the Perseids¹⁴ showed a nice peak in activity, which occurred shortly after solar longitude 141° .

Unfortunately, an analysis by the author showed that, besides Michel's observation (perhaps the first increase to the peak), hardly any other observations were available (Miskotte, 2019b). The data for 2020 was eagerly awaited. Would something happen again around solar longitude 141° ?

2 The situation in 2020

On August 13, 2020 around noon, the Belgian radio observer Felix Verbelen posted the following message on the VVS mailing list: "A bit against expectations, the maximum of the Perseids (so far) only came this morning, with numerous reflections, of which a number of fireballs. Attached are a few SpecLab images on 49.99 MHz here in Kampenhout, as well as a graph showing the development

of the number of reflections longer than 10 seconds since the beginning of the month. The counts continued until 08^h00^m UT this morning (more later)".

Immediately after this the author took a look at the graph of the Perseids on the website of Hirofumi Sugimoto¹⁵: indeed, another distinct peak!

It should be noted, however, that the peak of 2020 was 6 hours earlier than in 2019!

3 Analysis of the available data

The author searched on the IMO site for data during a period on 13 August 2020 around 09^h00^m UT. Only an observation of Michael Linnolt was found in that period. He observed from the Volcano National Park in Hawaii. Only 4 Perseids (magnitudes +1, +2, +4 and +5) are seen. That doesn't look spectacular, but if we look at the radiant height, it makes sense: it was only 4 degrees high. So, unfortunately, this observation cannot be used because the author only uses data with radiant elevations of 25 degrees or higher.

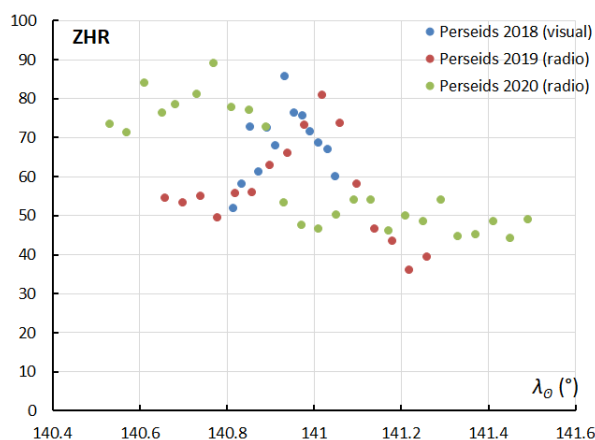


Figure 1 – Activity profiles of the Perseids for 2018, 2019 and 2020 around solar longitude 141° .

Via Hirofumi Sugimoto I got the data used to create the graph on his website. Figure 1 shows the result of three graphs from 2018 (based on visual observations), 2019

¹⁴ <http://www5f.biglobe.ne.jp/~hro/Flash/2019/PER/index.html>

¹⁵ <http://www5f.biglobe.ne.jp/~hro/Flash/2020/PER/index.html>

(based on radio observations) and 2020 (based on radio observations). The following can be concluded from Figure 1:

- Compared to the peak of 2018, the 2019 peak was 2 hours later.
- Compared to the peak of 2018, the 2020 peak was just 4 hours earlier.
- If this is a new structure in the Perseid meteor shower then the maximum time seems to be swabbing between solar longitude 140.75° and 141.10°.
- The eruption in 2020 appears to be slightly stronger than that of 2019. How this is calculated by Hirofumi Sugimoto is described in Sugimoto (2017).
- The activity before the 2020 peak is higher than the other peaks, this makes perfect sense as this peak is closer to the traditional maximum.

The peaks of 2019 and 2020 were accompanied by many bright meteors. The radio observations of Felix Verbelen from 2019 and 2020 regarding the long-term reflections clearly show this. The run-up to the peak in 2019 was visually observed by Michel Vandeputte, among others there was an increase in bright Perseids.

But also in 2020, a group of observers seems to have seen something spectacular. Via Facebook, the author came across the following message from Paul Jones, a meteor observer who has been active for more than 40 years. He wrote: “WOW!!!! We had a very good Perseid display for an hour and a half for the ages this morning (8/13/20) from the Fairgrounds despite the clouds!! We had at least SIX Perseid fireballs and over twenty in all brighter than zero magnitude! We were speechless!! They were doing about 70 per hour as dawn broke, stunning bright and colorful ones popping in every direction, we were blown away!! It was slow going up until about 3:30 a.m., when the bottom fell out as only the Perseids can do! We had one –6, two –5, and three –4 Perseid fireballs this morning, plus at least 20 others in negative magnitudes! The –6 Perseid was a bolide that split the Great Square of Pegasus in half and left a smoke train that hung on the sky for almost three minutes!! We were going bonkers! One of the best displays I’ve seen in my 45 years of meteor watching!! Several ACAC and NEFAS members joined us and a few guests as well for an experience we will long remember...;o)..”

Paul gave some additional information via email: “I’ll do my best, the weather was a major problem for us and very cloudy for most of the Aug. 12/13 morning here in NE Florida. We only had ‘sucker holes’ most of the time. Sometimes up to 80% of the sky was overcast and 3/4 moon interference, so I was not able to get really good solid Perseid counts of any kind. It finally cleared off for most of the sky about 5:00 a.m. local time (9 UT) on 12/13. The Perseid rate started picking up quite a bit about 4:00 a.m. local time (8 UT) on 12/13 morning and most of the bright Perseids we saw were between 4:00 a.m. and 5:30 a.m. local time (EDT). We could not observe at all on Aug. 11/12 morning as the sky was overcast all night long.... We went back out on 13/14 morning, but the activity had waned quite a bit from the morning before, once again clouds were covering large parts of the sky during our 13/14 session as well”.

Paul Jones’s email shows that it was fairly clear on August 13, 2020 between 08^h00^m and 09^h30^m UT. Most of the bright meteors fell during that period. It is a pity that he was unable to provide good data due to the highly variable circumstances. In Figure 2 the radio ZHR curve of Hirofumi Sugimoto’s Perseids 2020 is marked with two red stripes. This is the time window mentioned above in which Paul Jones’s group saw the beautiful Perseid display. So, they were exactly observing during the peak of Perseid activity!

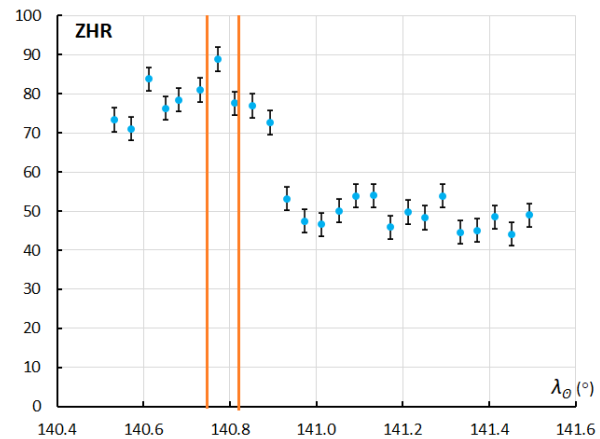


Figure 2 – Hirofumi Sugimoto’s Perseid radio ZHR curve between solar longitude 140.4° and 141.6°. Based on data from RMOB.

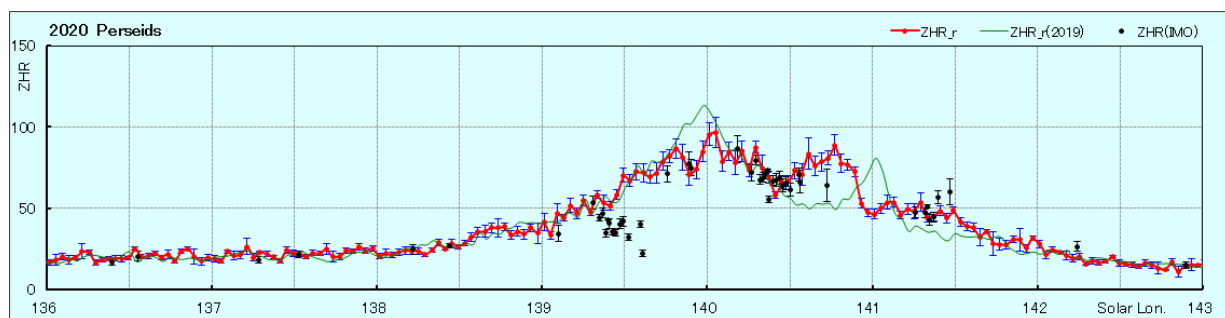


Figure 3 – Perseid ZHR curve based on radio observations (RMOB). The green line is last year’s Perseids graph.

Table 1 – Overview of the three peaks found from 2018–2020 and the possible times when they occur at the same solar longitudes in the period 2021–2024.

Year	λ_o	λ_o	λ_o	Moon
2018		140.935°		
2019			141.020°	
2020	140.772°			
	Date & time	Date & time	Date & time	
2021	13-8-2021 14 ^h 36 ^m UT	13-8-2021 18 ^h 40 ^m UT	13-8-2021 20 ^h 48 ^m UT	+ 45%
2022	13-8-2022 20 ^h 48 ^m UT	14-8-2022 00 ^h 45 ^m UT	14-8-2022 02 ^h 53 ^m UT	–95%
2023	14-8-2023 02 ^h 53 ^m UT	14-8-2023 06 ^h 57 ^m UT	14-8-2023 09 ^h 05 ^m UT	–20%
2024	13-8-2024 09 ^h 03 ^m UT	13-8-2024 13 ^h 08 ^m UT	13-8-2024 15 ^h 15 ^m UT	+ 60%

4 Discussion and questions

As a result of all this, there are a number of questions:

- Is this “new” structure caused by the same phenomenon over and over again? There is quite a difference in time between 2019 and 2020. The latter fell almost six hours earlier than in 2019 and is therefore somewhat closer to the traditional maximum. The 2018 visual curve is in between.
- In 2019 and 2020 there is clearly a beautiful display with many bright meteors. This is somewhat supported by visual observations. In 2018, the r value remained virtually unchanged during the new peak with normal values of around 2.0.
- Will this structure remain active? Table 1 provides an overview of the past three years and at what time any peaks in 2021–2024 will occur. In soft yellow, the preferred times for Europe if the observed peaks occur at the same solar length.

The motto here is clear: observe, observe and observe again!

Acknowledgment

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References

- Miskotte K. (2019). “Perseids 2018: an analysis of the visual perception data”. *eMetN*, **4**, 135–142.
- Miskotte K., Vandeputte M. (2019). “Perseids 2019. Another peak around solar longitude 141.0°?”. *eMetN*, **5**, 25–29.
- Sugimoto H. (2017). “The new method of estimating the ZHR using radio meteor observations”. *eMetN*, **3**, 109–110.
- Van deputte M. (2018). “Perseid campaign at Aubenas Les Alpes, Haute Provence”. *eMetN*, **4**, 83–88.
- Van deputte M. (2020). Private communication.