

Table 3 – Radiant motion of the Southern δ -Aquarids (J2000.0).

Source	Right ascension	Declination
This work	$\alpha = 339^{\circ}31 + 0.75 \times (\lambda_{\odot} - 125^{\circ}0)$	$\delta = -16^{\circ}85 + 0.22 \times (\lambda_{\odot} - 125^{\circ}0)$
Cook	$\alpha = 333^{\circ}2 + 0.80 \times (\lambda_{\odot} - 125^{\circ}0)$	$\delta = -16^{\circ}4 + 0.18 \times (\lambda_{\odot} - 125^{\circ}0)$
Kronk	$\alpha = 339^{\circ} + 0.8 \times (\lambda_{\odot} - 125^{\circ})$	$\delta = -17^{\circ} + 0.4 \times (\lambda_{\odot} - 125^{\circ})$
IMO	$\alpha = 339^{\circ} + 0.75 \times (\lambda_{\odot} - 125^{\circ})$	$\delta = -16^{\circ} + 0.21 \times (\lambda_{\odot} - 125^{\circ})$

6. Conclusion

We made a detailed research of the meteor showers with radiants in the region of Capricornus and Aquarius between end-July and mid-August. During our program, we observed many meteors within a short period of time. However, during our investigation, we found that the radiants were distributed over a wide area. Therefore, we consider that the conventional classification is inadequate. Visual observation using the conventional classification may prevent correct calculation.

References

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On the 1998 Perseids in Poland

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Visual observations of the 1998 Perseids are reported. Based on almost 900 hours of observing time collected by 35 observers, an activity profile from July 15 to August 25 is given. The maximum of activity with ZHR = 52 ± 3 was noted during the night of August 12–13, 1998 ($\lambda_{\odot} = 140^{\circ}0$). After averaging in shorter periods of time, the highest activity does not differ much from the mean level. The highest ZHR equal to 59 ± 8 was noted at $\lambda_{\odot} = 139^{\circ}96$ (i.e., August 12.87 UT). This result is significantly lower than values obtained for the traditional maximum of the Perseids during previous years. That difference diminishes after adopting a zenith exponent $\gamma \approx 1.4$, which may suggest that, for the Perseid shower, the zenith exponent is larger than 1.0. The minimum value of the population index r equal to 2.08 ± 0.03 , was obtained for the night of the maximum.

Theoretical calculations made by Williams and Wu [1] suggested that the new peak in the ZHR profile of the Perseid stream should decline in the years 1997–2000. Fortunately for meteor observers, it was still clearly detectable in 1997.

That year the maximum ZHRs equal to 137 ± 5 were noted at solar longitude $\lambda_{\odot} = 139^{\circ}71'$. The older, traditional maximum with $ZHR = 94 \pm 2$ occurred at $\lambda_{\odot} = 140^{\circ}03'$ [2]. These two moments were not favorable for Polish observers, but excellent weather conditions lasting from August 5 to August 25, 1997, allowed us to collect as much as $937^{\text{h}}23^{\text{m}}$ of observing time with 8273 Perseids detected [3]. The predictions for August 1998 were slightly better. The traditional maximum was expected around 22^h UT on August 12, which favors Central European observers, including the Polish watchers. On the other hand, the serious disadvantage was the Full Moon on August 8.

In spite of the poor weather conditions during last August, the Polish observers associated in the *Comets and Meteors Workshop (CMW)* again obtained a large sample of observational data. From July 15 to August 25, a group of 35 of our observers obtained $896^{\text{h}}57^{\text{m}}$ of observing time (908 ZHR estimates) with 3342 Perseids detected. The complete list of our observers with the corresponding effective observing times is as follows:

Konrad Szaruga (97^h72), Jarosław Dygos (94^h70), Paweł Trybus (62^h18), Andrzej Skoczewski (52^h44), Jacek Kluczewski (50^h25), Tomasz Żywczak (49^h05), Marcin Konopka (48^h58), Maciej Kwinta (45^h33), Wojciech Jonderko (41^h68), Krzysztof Socha (34^h12), Gracjan Maciejewski (32^h92), Aleksander Trofimowicz (30^h12), Arkadiusz Olech (29^h35), Mariusz Wiśniewski (28^h40), Krzysztof Kamiński (25^h73), Luiza Wojciechowska (24^h65), Paweł Brewczak (19^h35), Marcin Gajos (18^h63), Tadeusz Sobczak (15^h33), Cezary Gałan (13^h15), Tomasz Fajfer (13^h00), Lukasz Sanocki (10^h97), Michał Jurek (10^h33), Krzysztof Mularczyk (9^h92), Michał Marek (7^h00), Ewa Dygos (5^h75), Sylwia Hołowacz (5^h05), Tomasz Krzyżanowski (4^h41), Marcin Dzuła (3^h83), Katarzyna Skoczewska (3^h33), Waldemar Drozdowski (2^h30), Artur Szaruga (2^h12), Bartosz Dąbrowski (2^h00), Karol Fietkiewicz (1^h75), and Sylwia Chełmoniak (1^h50).

One can see the large difference between the number of observed Perseids in 1997 and 1998. Knowing that, in 1997, we did not observe any maximum and, in 1998, the time of the traditional maximum favored the Polish watchers, it seems very strange. The nature of that difference becomes clear after analyzing Figure 1, where we present the distribution of our observations made in July and August 1998.

The good weather conditions allowed us to collect the large amounts of data in the periods July 15–24, August 8–12, and August 15–20. Only the second of these periods was rich in high hourly rates of the Perseids; unfortunately, it coincided almost exactly with the Full Moon. In 1997, the situation was different. The majority of our data was collected during the moonless nights of the first part of August, when the rates were very high.

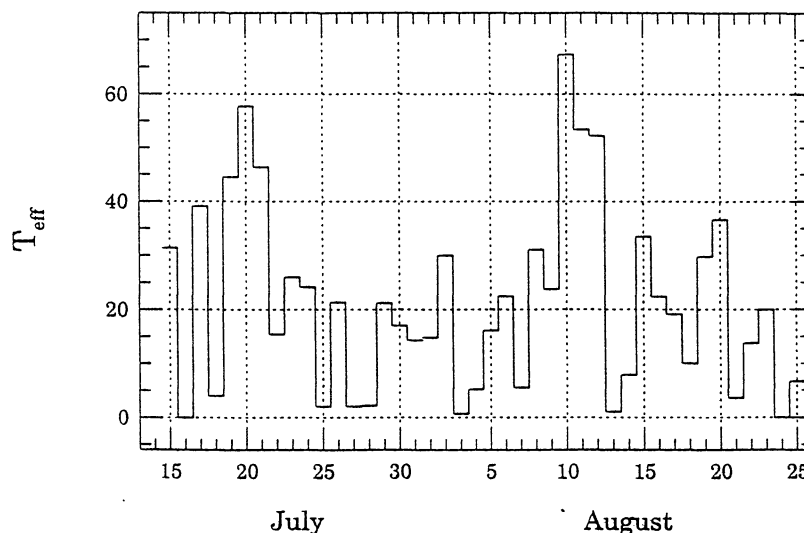


Figure 1 – Distribution of the observations made by Polish observers during July and August 1998.

In 1998, we obtained 3342 magnitude estimates. The distribution of this quantity for the 1998 Perseids is presented in Table 1. Using the probabilities of perception given by Koschack and Rendtel [4], we computed the values of the population index r . The evolution of this quantity around the maximum of activity is presented in Figure 2. Due to the Full Moon occurring on August 8, the error bars are large, but the minimum values of r equal to 2.10 ± 0.03 and 2.08 ± 0.03 were noted on August 11-12 ($\lambda_{\odot} = 139^{\circ}1$) and August 12-13 ($\lambda_{\odot} = 140^{\circ}0$), respectively.

Table 1 – Magnitude distribution of the 1998 Perseids in Poland.

Magnitude	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot
Meteors	13	36	87	170.5	327	457	646.5	736	641.5	202	25.5	3342

Knowing the population index profile and adopting a zenith exponent value $\gamma = 1.0$, we can compute ZHRs. The resulting activity profile of the 1998 Perseids is presented in Figure 3. The maximum ZHR value of 52 ± 3 was noted during the night of August 12-13. This is not a high value, and it differs significantly from the result presented by Arlt [5], who obtained $ZHR \approx 80$ at $\lambda_{\odot} = 140^{\circ}0$. Our maximum point is the average value of 69 ZHR estimates, and we decided to divide this point into 8 shorter bins each containing from 6 to 12 ZHR estimates. The result is shown in the upper panel of Figure 4. The ZHRs seem to oscillate around the mean value, and no clear trend is detectable. The highest point with $ZHR = 59 \pm 8$ was noted at $\lambda_{\odot} = 139^{\circ}96$ (August 12, 20^h40^m UT). This moment is in very good agreement with the result obtained in [5], but the value of the ZHR is still significantly smaller.

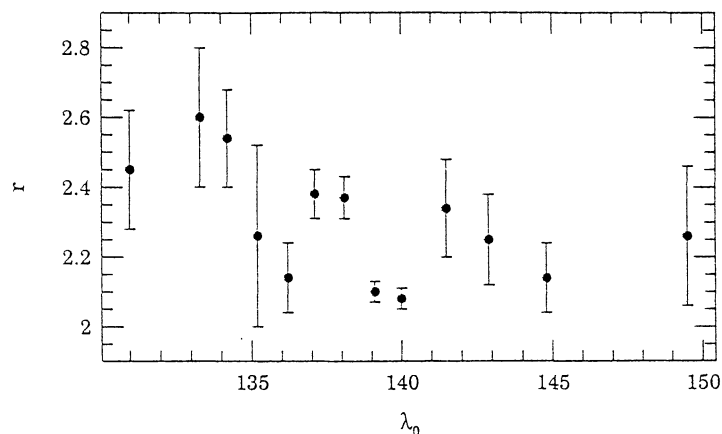


Figure 2 – Profile of the population index r of the 1998 Perseids.

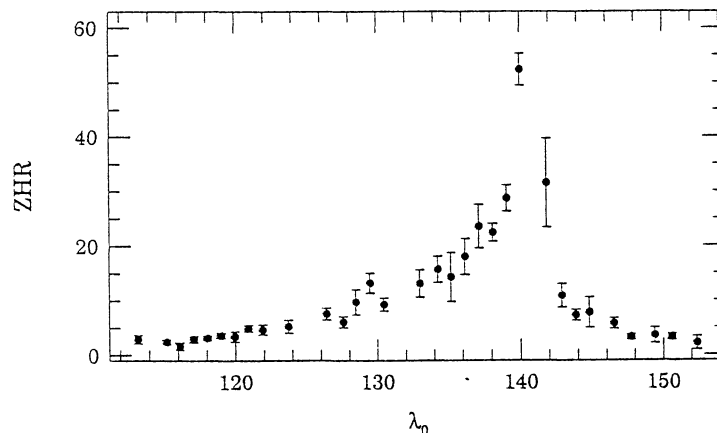


Figure 3 – ZHR-profile of the 1998 Perseids.

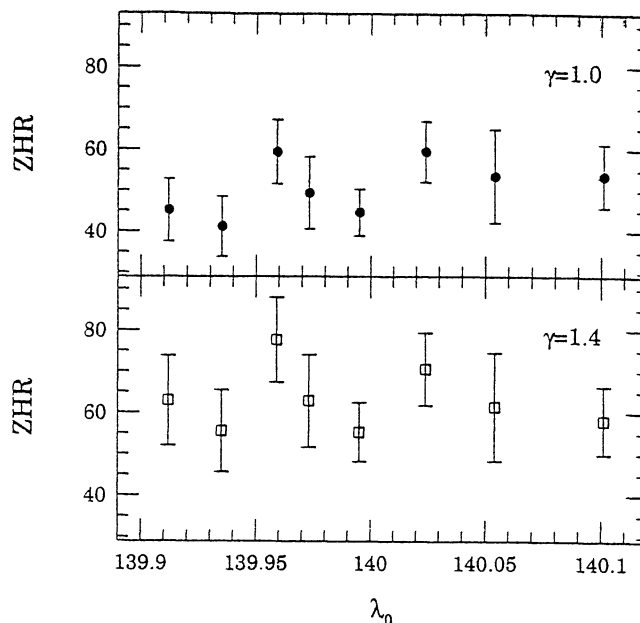


Figure 4 - The activity profile around the traditional maximum of the 1998 Perseids. The upper panel is obtained for $\gamma = 1.0$, and the lower panel for $\gamma = 1.4$.

We recalculated our ZHR profile for the night of August 12-13 using zenith exponent $\gamma = 1.4$. The result is presented in the lower panel of Figure 4. Now, ZHRs are larger with the highest point having $ZHR = 78 \pm 10$. This is almost the same level of activity as noted by Arlt [5], but he adopted $\gamma = 1.0$. The explanation of this fact may lay in the distribution of our observations from August 12-13. The beginning of this night was clear at almost all Polish locations. Unfortunately, the good weather conditions lasted shortly, and, at the end of the night, only few of our observers had clear skies. So, the majority of our ZHR estimates obtained on August 12-13 were made during the evening, when the radiant altitude is low. The computation of the ZHR values is more sensitive for the value of zenith exponent for low altitudes of the radiant than for the high ones. Arlt's [5] result was presumably obtained from a more uniformly distributed sample, and adopting $\gamma = 1.0$ was enough for producing the higher values of ZHR. The arguments above suggest that, especially for the maximum of activity of the Perseid shower, the zenith exponent may be larger than 1.0. A similar result for the 1993 Perseid maximum was obtained by Bellot Rubio [6].

The preliminary results presented by Arlt [5] showed that the activity of the new peak in 1998 was around $ZHR \approx 180$. It suggests that the new peak is still clearly visible in the activity profile. The New Moon on August 11, 1999, will give an excellent opportunity to study in detail the ZHRs around the Perseid maximum.

Acknowledgments

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