The 1992 Perseids

New Outburst Announces Return of P/Swift-Tuttle

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An overview of visual and radio observations made during the peak time of the 1992 Perseids is given. The shower is found to have produced high activity near $\lambda_\odot = 139\overset{\circ}{.}45$ (eq. 2000.0). This is in good agreement with the nodal longitude of the newly rediscovered comet P/Swift-Tuttle (1992 t). This year's Perseid outburst appears to have been rich in large particles and roughly of similar or possibly greater intensity than the 1991 Perseid outburst. No entirely accurate indication of absolute activity levels is possible due to the presence of high correction factors resulting from moonlight. Both the 1991 and the 1992 outburst are clearly due to the presence of P/Swift-Tuttle being in the vicinity of its descending node.

1. Introduction

Before saying anything substantial about the Perseid shower in 1992, an important point must be made. The visual data received thus far demonstrate clearly—to the extent this was still necessary—that ZHR values obtained under a moonlit sky are meaningless as absolute figures. Indeed, the ZHRs various groups computed for their observations differ in some cases by more than an order of magnitude during the same time intervals! The explanation for this discrepancy is quite straightforward: if the atmospheric conditions are near-perfect, the lower contrast of the sky-background will affect the meteor limiting magnitude to a much greater extent than the stellar limiting magnitude, resulting in undercorrection. Poor atmospheric conditions, on the other hand, will yield a statistically small sample and result in huge correction factors, which can easily lead to overcorrection. Finally, observations obtained under moon-lit skies do not permit one to compute a reliable r-value and hence ZHR-value. Particularly in the case of an outburst, one cannot use the literature values for the population index for the Perseid stream, as the particles that gave rise to the outburst may have had different physical characteristics than the "main stream." Therefore, comparing observations of different observers, let alone correlating them by a perception analysis, is simply out of the question for the 1992 Perseids. The only relevance the rate data might have is that the ZHR profile obtained by a single observer over one night may give a clue as to how the shower activity evolved during the observing session.

In this overview, we will quote ZHRs of visual observations very sparingly to avoid later misinterpretations. In the instances where we do mention ZHR values, once again, these should only be used to compare shower activity during the various intervals of one observer's watch, and should *not* be attributed to any absolute value. As a consequence, we present here a largely qualitative—as opposed to a quantitative—picture of the 1992 Perseid activity around the shower maximum. This picture will be completed with descriptive features mentioned by various observers and radio data. Several observing groups have also sent us their data in article form, which is highly appreciated. These articles follow this summary report. Despite all this, most of the interpretations made below regarding the 1992 Perseids will have to remain tentative.

2. The 1992 outburst – observations in China and Japan

If the 1991 Perseid outburst were to recur in 1992 at exactly the same solar longitude (i.e., at $\lambda_\odot = 139\overset{\circ}{.}56$, eq. 2000.0 [1]), then European observers would have been ideally placed to witness the event on August 11 around 22^h UT, well into their night. That is why most observing groups on that continent were alert, despite the Full Moon.

Unfortunately, European observing groups did not see any outburst of Perseid activity around the predicted time. Several West-European observers, however, reported the impression that Perseid activity at dusk seemed to be much better than during the actual observing session, despite the low radiant elevation. This feeling was confirmed by Central-European observers who during their first hour of observing noted high activity, which rapidly dropped afterwards.

It turned out that a Perseid outburst had indeed occurred, but about 0°.1 in solar longitude earlier than last year, thereby now precisely coinciding with the longitude of the descending node of the parent comet, P/Swift-Tuttle.

This shift caused Asia rather than Europe to once again be ideally placed to observe the outburst. Unfortunately, the weather over most of China and Japan was cloudy and rainy. Two Chinese observers, Ouyang Tianjing and Chen Yu, nevertheless went out and saw Perseid activity pick up very sharply around 18^h50^m UT. One observer, Chen, saw 33 Perseids during 20 minutes in a sky that was 40% cloud-covered, under a limiting magnitude of only 3.3! From 20^h15^m UT onwards, rates started to decline rapidly, and around 21^h UT, most of the outburst was over. Both observers were very amazed by the spectacular show they had witnessed. They said that they saw many fireballs through the clouds "like small moons flying behind the clouds or like lightning flashing during a storm." A full report on the Chinese observations can be found after this article.

S. Nakano reports that he heard from Y. Yabu that an amateur group of 8 observers in Okinawa, Japan, saw about 200 meteors between 19^h and 20^h UT, under limiting magnitude about 3 [2]. J. Watanabe has also communicated that a group of 7 persons in the Niigata prefecture saw some 70 meteors between 18^h and 19^h UT [3]. These figures agree at least in order of magnitude with the Chinese data. Japanese radio observations confirm high activity around 19^h UT [3].

At the time of this writing, we have not yet received any news from the C.I.S. Their data could prove useful in complementing the picture we get from the few Far-Eastern groups that were not forced indoors by the poor weather.

3. European visual observations

In-as-far as it is possible to make such a statement in the given circumstances, most European groups report "normal" activity during much of their observing session. Dutch observers in the Netherlands and Switzerland report normal activity between roughly 21^h00^m and 0^h30^m UT. Higher activity, however, was noticed at late dusk (20^h30^m–21^h00^m UT), while several observers independently saw 3–5 Perseid fireballs in the preceding half hour to one hour, at early dusk. [2,4]

In most other West-European countries, observers seem to have missed the outburst altogether. This has at least been the case for Belgium, France, Norway, and England [2]. In Norway, however, observers report rates after 23^h30^m UT to be about 25% lower than between 21^h30^m and 23^h30^m UT. At several places in England, observing was hindered by cloudy weather. The editor for instance was in Slough at the time of the maximum, a few kilometers west of London Heathrow airport, and was unable to do anything meaningful. Alastair McBeath writes: "I seem to have caught the tail end of the Perseid outburst this year on August 11–12, although I was only able to watch from 21^h10^m to 21^h30^m UT. With a limiting magnitude of +4.0, bright Moon, twilight, and an average of 5% drifting clouds (until complete overcast returned shortly after 21^h30^m UT), I thought I had done quite well to spot 5 Perseids and a sporadic, bearing in mind the low Perseid radiant elevation." [5]

In Central Europe, several observers and observing groups noticed the end of the outburst as part of their regular observing. The Potsdam group (Rainer Arlt, Jürgen Rendtel, Ulrich Sperberg, Manuela Trenn and Nikolai Wünsche) was able to start only at 20^h40^m UT, thereby just missing the outburst. The ZHR was of the order of 100, and the number of brighter Perseids decreased remarkably after 0^h UT. André Knöfel started even later, in Langewiese. Ralf Koschack, however, managed to start observing at 20^h04^m UT from Weißwasser under—apart from the Moon—perfect sky conditions. We present his data for the night of August 11–12 in Table 1. The listed ZHR values probably suffer from undercorrection as explained in the Introduction, but we have to bear in mind the scatter in the whole sample of reduced data. The rates are lower than the average for the given period. With a corrected rate in the first interval about double the rates in subsequent periods, it is nevertheless clear that Ralf witnessed the final part of the outburst.

Table 1 – Observational data of Ralf Koschack on the Perseids during the night of August 11-12, 1992, including tentative ZHR values computed with $r = 2.6$ and $r = 2.3$ respectively.

Period (UT)	Lm	F	T_{eff}	h_{rad}	Per	$\text{ZHR}_{2.6}$	$\text{ZHR}_{2.3}$	non-Per
$20^{\text{h}}04^{\text{m}}$–$20^{\text{h}}40^{\text{m}}$	6.46	1.0	$0^{\text{h}}58$	28°	28	103	102	6
$20^{\text{h}}40^{\text{m}}$–$21^{\text{h}}15^{\text{m}}$	6.46	1.0	$0^{\text{h}}58$	32°	11	37	37	6
$21^{\text{h}}31^{\text{m}}$–$22^{\text{h}}54^{\text{m}}$	6.44	1.0	$1^{\text{h}}12$	39°	44	65	65	5
$23^{\text{h}}21^{\text{m}}$–$00^{\text{h}}45^{\text{m}}$	6.34	1.0	$1^{\text{h}}15$	51°	39	51	50	6

Elsewhere in this issue, Petr Pravec reports Czech observations from Sibenický vrch that started even earlier. Although most of the effort was in telescopic work, two observers, I. Míček and T. Nasku, watched visually in order to catch any unusual activity. Their data are given in Table 2. Note that both observers give a constant limiting magnitude for the whole observation which was identical. Obviously this is more a guess than a determined value; it is however a very critical parameter in the calculation of the ZHR. Nevertheless, both observers report rates during their first interval about three times as high as during most of the remainder of their observing session. Also notice that the Czech observations confirm a decline in Perseid rates after $23^{\text{h}}30^{\text{m}}$ UT, also mentioned by the Norwegian observers, which is consistent with the decline in the number of bright Perseids after midnight UT noticed by the German observers.

Table 2 – Observational data of I. Míček (MICIV) and T. Nasku (NASTO) on the Perseids during the night of August 11-12, 1992, including tentative ZHR values computed with $r = 2.6$ and $r = 2.3$ respectively.

Period (UT)	Lm	F	T_{eff}	h_{rad}	Per	$\text{ZHR}_{2.6}$	$\text{ZHR}_{2.3}$	non-Per	Obs
$19^{\text{h}}38^{\text{m}}$–$20^{\text{h}}04^{\text{m}}$	4.5	1.0	$0^{\text{h}}43$	24°	19	720	565	6	MICIV
$20^{\text{h}}04^{\text{m}}$–$20^{\text{h}}33^{\text{m}}$	4.5	1.0	$0^{\text{h}}48$	26°	10	315	247	6	MICIV
$20^{\text{h}}33^{\text{m}}$–$21^{\text{h}}03^{\text{m}}$	4.5	1.0	$0^{\text{h}}50$	28°	9	252	197	3	MICIV
$21^{\text{h}}03^{\text{m}}$–$21^{\text{h}}27^{\text{m}}$	4.5	1.0	$0^{\text{h}}40$	31°	9	293	229	4	MICIV
$21^{\text{h}}27^{\text{m}}$–$22^{\text{h}}01^{\text{m}}$	4.5	1.0	$0^{\text{h}}57$	34°	14	296	232	5	MICIV
$22^{\text{h}}01^{\text{m}}$–$22^{\text{h}}32^{\text{m}}$	4.5	1.0	$0^{\text{h}}52$	37°	9	192	150	1	MICIV
$22^{\text{h}}32^{\text{m}}$–$22^{\text{h}}56^{\text{m}}$	4.5	1.0	$0^{\text{h}}40$	40°	11	286	224	1	MICIV
$22^{\text{h}}56^{\text{m}}$–$23^{\text{h}}37^{\text{m}}$	4.5	1.0	$0^{\text{h}}68$	44°	19	270	212	3	MICIV
$23^{\text{h}}37^{\text{m}}$–$00^{\text{h}}18^{\text{m}}$	4.5	1.0	$0^{\text{h}}68$	49°	14	184	144	4	MICIV
$00^{\text{h}}18^{\text{m}}$–$01^{\text{h}}10^{\text{m}}$	4.5	1.0	$0^{\text{h}}87$	55°	9	85	66	4	MICIV
$19^{\text{h}}38^{\text{m}}$–$20^{\text{h}}04^{\text{m}}$	4.5	1.0	$0^{\text{h}}43$	24°	19	720	565	0	NASTO
$20^{\text{h}}04^{\text{m}}$–$20^{\text{h}}33^{\text{m}}$	4.5	1.0	$0^{\text{h}}48$	26°	13	410	320	5	NASTO
$20^{\text{h}}33^{\text{m}}$–$21^{\text{h}}03^{\text{m}}$	4.5	1.0	$0^{\text{h}}50$	28°	7	196	153	3	NASTO
$21^{\text{h}}03^{\text{m}}$–$21^{\text{h}}27^{\text{m}}$	4.5	1.0	$0^{\text{h}}40$	31°	10	325	254	2	NASTO
$21^{\text{h}}27^{\text{m}}$–$22^{\text{h}}01^{\text{m}}$	4.5	1.0	$0^{\text{h}}57$	34°	8	169	133	3	NASTO
$22^{\text{h}}01^{\text{m}}$–$22^{\text{h}}32^{\text{m}}$	4.5	1.0	$0^{\text{h}}52$	37°	8	170	133	3	NASTO
$22^{\text{h}}32^{\text{m}}$–$22^{\text{h}}56^{\text{m}}$	4.5	1.0	$0^{\text{h}}40$	40°	9	234	183	1	NASTO
$22^{\text{h}}56^{\text{m}}$–$23^{\text{h}}37^{\text{m}}$	4.5	1.0	$0^{\text{h}}68$	44°	14	199	156	8	NASTO
$23^{\text{h}}37^{\text{m}}$–$00^{\text{h}}18^{\text{m}}$	4.5	1.0	$0^{\text{h}}68$	49°	7	92	72	3	NASTO
$00^{\text{h}}18^{\text{m}}$–$01^{\text{h}}10^{\text{m}}$	4.5	1.0	$0^{\text{h}}87$	55°	12	113	88	8	NASTO

The Slovak observers from Banská Bystrica also reported their observations to *WGN*. As you can read in their contribution, about 12 visual observers watched between $20^{\text{h}}00^{\text{m}}$ and $1^{\text{h}}40^{\text{m}}$ UT. Again, strongly enhanced activity was noticed during the first hour of observing.

Istvan Tepliczký reports that Hungarian observers recorded very high activity around $19^{\text{h}}00^{\text{m}}$ UT, which returned to normal by $20^{\text{h}}15^{\text{m}}$ UT. A high number of bright Perseids was apparent. [2]

In a pending submission to *WGN*, Mark Kidger mentions Slovenian and Croatian observations. Herman Mikuz communicated data of the Javornik Astronomical Society (Ljubljana, Slovenia) yielding a ZHR of 730 between $20^{\text{h}}00^{\text{m}}$ and $20^{\text{h}}30^{\text{m}}$ UT under lm = 3.5 skies, compared to an

average 300 for the rest of the session. Korado Korlevic of the Visnjan Astronomical Society (Istra, Croatia) reported ZHRs of 225 between 20^h00^m and 21^h00^m UT compared to 148 between 21^h45^m and 22^h50^m UT, also under a limiting magnitude of 3.5.

At the time of this writing, we unfortunately do not yet have Bulgarian, Rumanian, Crimean, Tadjik or Siberian observations to further complete the picture drawn by Chinese and Japanese observers on the one hand and West- and Central-European observers on the other hand.

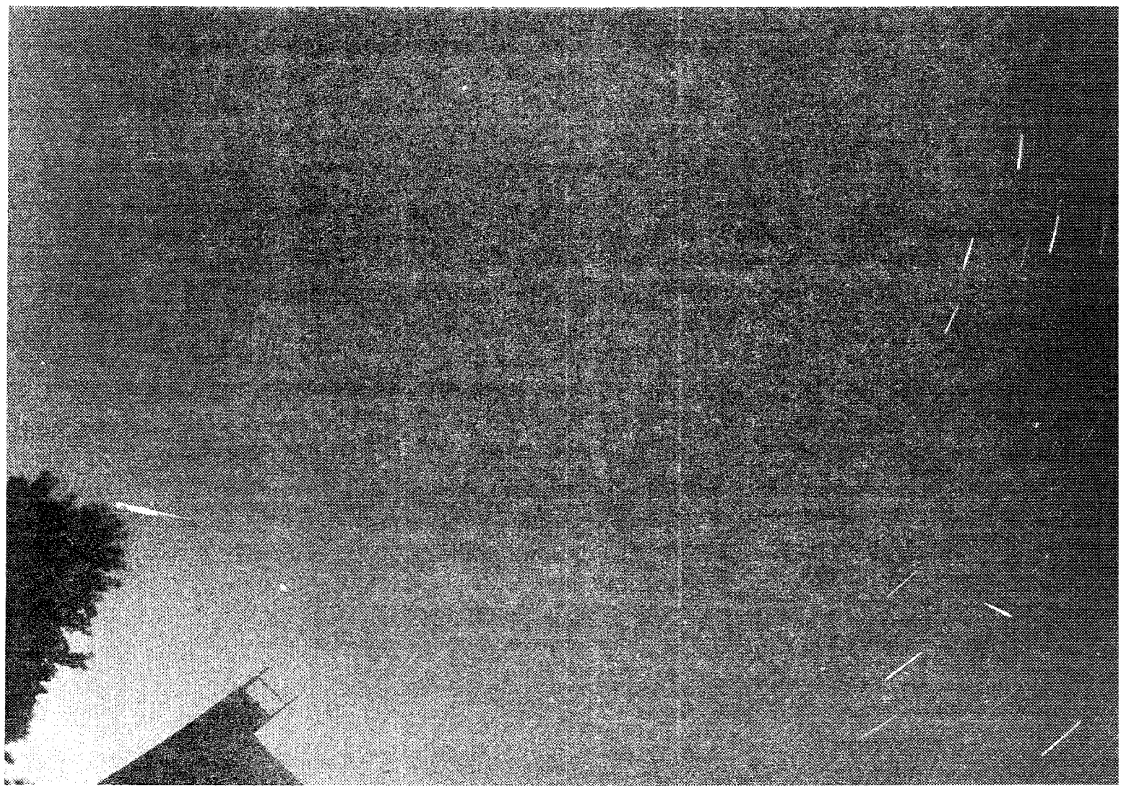

Figure 1 – Although the densest part of the Perseids was already passed, some bright shower meteors appeared later in the night of August 11-12, 1992. This exposure between $00^h03^m30^s$ and $00^h18^m00^s$ UT shows a −2.5 Perseid in Perseus at $00^h09^m25^s$ UT and another −4.5 Perseid in Camelopardalis at $00^h09^m40^s$ UT. The photo was taken by Jürgen Rendtel using a fish eye $f/3.5$, f = 30 mm and ORWO ISO 400/27° film in Gottsdorf, south of Potsdam, Germany.

4. North American visual observations

North America was worst-placed for viewing a possible return of last year Perseid's outburst, although they had the "traditional" Perseid maximum during their night time.

Most observers actually recorded their peak activity some 10 hours after the outburst, when the "usual" Perseid maximum coincided with high radiant elevations. Starting on the East Coast, the first author recorded Perseid rates topping 30 meteors per hour near 5^h UT, for corrected ZHR values near 150–200, falling off later in the session from London, Ontario, Canada. James Kirby, observing from Allegheny Observatory near Pittsburgh, Pennsylvania, had similar counts from 7^h–8^h UT, seeing 25 Perseids under lm = 5.0 skies. Bill Burmeister of Orlando, Florida, also saw 22 Perseids from 8^h–9^h UT under a limiting magnitude of +4, confirming the "traditional" Perseid peak near that time.

Further to the West, in Edmonton, Alberta, Canada, the Royal Astronomical Society of Canada held a watch with twelve participants. Their highest individual counts came from 10^h00^m–10^h30^m when Bruce McCurdy saw 20 Perseids with a limiting magnitude just above 5. This continuation of the regular peak was confirmed further South by observers such as Twyla Stickelman of Corning, California, who recorded 30 Perseids between 10^h30^m and 11^h30^m UT with a limiting magnitude better than 5.5. Bob Lunsford of the *ALPO* reports that most observers who had reported to him had recorded peak raw rates between 20 and 30 in the morning hours of August 12, his personal best being 35 Perseids from 11^h to 12^h UT under a 5.8 sky. The final North-American peak night observations were made by members of the Hawaii Meteor Group who, according to Mike Morrow, recorded roughly 20 Perseids in the interval 10^h45^m–12^h45^m UT under bad conditions.

Many observers also mentioned the high proportion of bright meteors during the peak this year; as this may be due to the Moon, no real conclusions can be drawn without better supporting data.

5. Radio observations

When poor observing conditions make it hard to interpret visual data, it becomes logical to turn to radio observations. A radio amateur in Wuppertal, Germany, said: "In my opinion, it was quite a poor shower, except for two hours on August 11, between 18^h30^m and 20^h30^m UT." According to a French amateur, the peak was at 19^h30^m UT. [2]

As Jeroen Van Wassenhove mentions in this issue, several radio observers did not cover the relevant period. Those who did (e.g., the team of the Urania Public Observatory in Belgium, and Gotfred Kristensen and Knud Bach Kristensen in Denmark), actually recorded an increase between 17^h30^m and 20^h15^m UT. In his *WGN* contribution, Gotfred Kristensen more particularly reports a real bombardment of bright and very bright radio-meteors starting at 17^h30^m and ending at 21^h10^m UT, quite remarkably a second outburst between 23^h15^m and 1^h25^m UT, and a less pronounced peak around 11^h UT on August 12, possibly corresponding to the "traditional" maximum.

Most radio reports however come from the United States. We give a brief overview based on a report communicated by Joe Rao [6].

Long time Perseid radio observer Shelby Ennis of Elizabethtown, Kentucky, listened from 14^h00^m to 20^h00^m UT. At 18^h45^m UT, "pings suddenly began picking up." A big long burst of nearly 5 minutes from the northeast was heard. Another burst followed at 18^h58^m, while at 19^h00^m, "a big flurry of activity commenced." By 19^h30^m UT, the bursts were "tapering off,"and at 19^h35^m, the activity was over. Ennis thought the activity lasted shorter than in 1991, but was comparable in strength.

Paul Kelly in Milo, Maine reports that the Perseid outburst commenced very suddenly at 18^h56^m UT. According to Kelly, the actual peak occurred around 19^h30^m UT, and ended less than half an hour later as activity quickly subsided. He also reports a lot of long-lasting signals, suggesting the particles causing the outburst were quite large. Kelly compared the 1992 outburst to that in 1991 as "as good as, if not better than last year's intense display."

Emil Pocock of Lebanon, Connecticut, reports a sharp radio peak between 19^h00^m and 19^h35^m UT. During that period, communication thanks to meteor scatter was possible at least 50% to 75% of the time. Pocock described the rise to the Perseid maximum as "sudden and dramatic", and felt that activity was—at least for a short time—comparable to 1991.

Radio observers in California and Colorado also witnessed the Perseid outburst, but give a somewhat earlier time for it. These differences in the peak times reported by several radio observers and the wide variations in activity levels underscore the difficulty in interpreting radio observations made with differing forward scattering geometries. It should also be noted that most of the ham radio operators mentioned observed at higher frequencies than most radio meteor observers and hence recorded activity mainly due to large particles, hence the great number of long lasting echoes are from truly large meteoroids.

6. Conclusions

In summary, we can say that all data available right now are reasonably consistent, so that there can be little doubt there was a Perseid outburst on August 11 starting with a very sharp rise in activity around 18^h50^m and ending with a somewhat less sharp decline around 20^h30^m. As to the intensity of the outburst, it is very difficult to draw any definite conclusions. Tentatively, we suggest that, based on both the visual and radio observations reported, the outburst was comparable to last year's. The scarce data from China and Japan, however, leave some room for speculating about even higher activity. Perhaps the time of the peak is the only parameter we can obtain with certainty, while the activity level may remain unreliable even if many more data are being included in a global analysis.

7. Postscript

The very day this article was finalized, we learned about the rediscovery of the Perseids' parent comet P/Swift-Tuttle, the details of which can be found elsewhere in this issue. To some extent, the rediscovery is the logical conclusion of a series of events [7,8,1] starting with a tiny new peak in the rate profile of the 1988 Perseids [7], the last of which was the 1992 outburst, at a solar longitude precisely corresponding with the nodal longitude of P/Swift-Tuttle. In this regard, Paul Roggemans and Dr. Brian Marsden deserve a lot of credit, the former for having recognized the reality and the relevance of the double peak of the 1988 Perseids, and the latter for having revived as early as 1973 the suggestion that P/Swift-Tuttle is identical to P/Kegler [9].

Of course, the return of P/Swift-Tuttle raises expectations for enhanced Perseid activity in 1993 as well. Regarding the intensity of the previous Perseid outbursts, Rao [6] makes an interesting observation. It turns out that the orbits of P/Swift-Tuttle and the Earth have drawn closer together during the past two centuries. Presently, the orbits are separated by only 0.001 AU at the descending node, compared to 0.005 AU in the 19th and 0.024 AU in the 18th century. This may explain why no records exist of remarkable Perseid rates in the 18th century, while rich displays were seen in 1861 and 1862. If this explanation is correct, there is good reason to suspect that yet another outstanding Perseid display will indeed occur in 1993. It should be noted here that the actual orbital distance of 0.001 AU is comparable to the orbital distance between the Earth and the Leonids in 1833!

If the solar longitude of this outburst remains the same, it should be expected on August 12, 1993 around 1^h UT, ideal for Europe, while the end of it may be noticeable form North America's East Coast. In view of what happened this year, however, it is possible that the peak will occur up to 0.1 day (i.e., 2 to 3 hours) earlier. The Moon will be some 4 days before New and should not present as much interference as in 1992. Whatever exactly happens in 1993, we can look forward to some exciting Perseid returns in the coming years!

References

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