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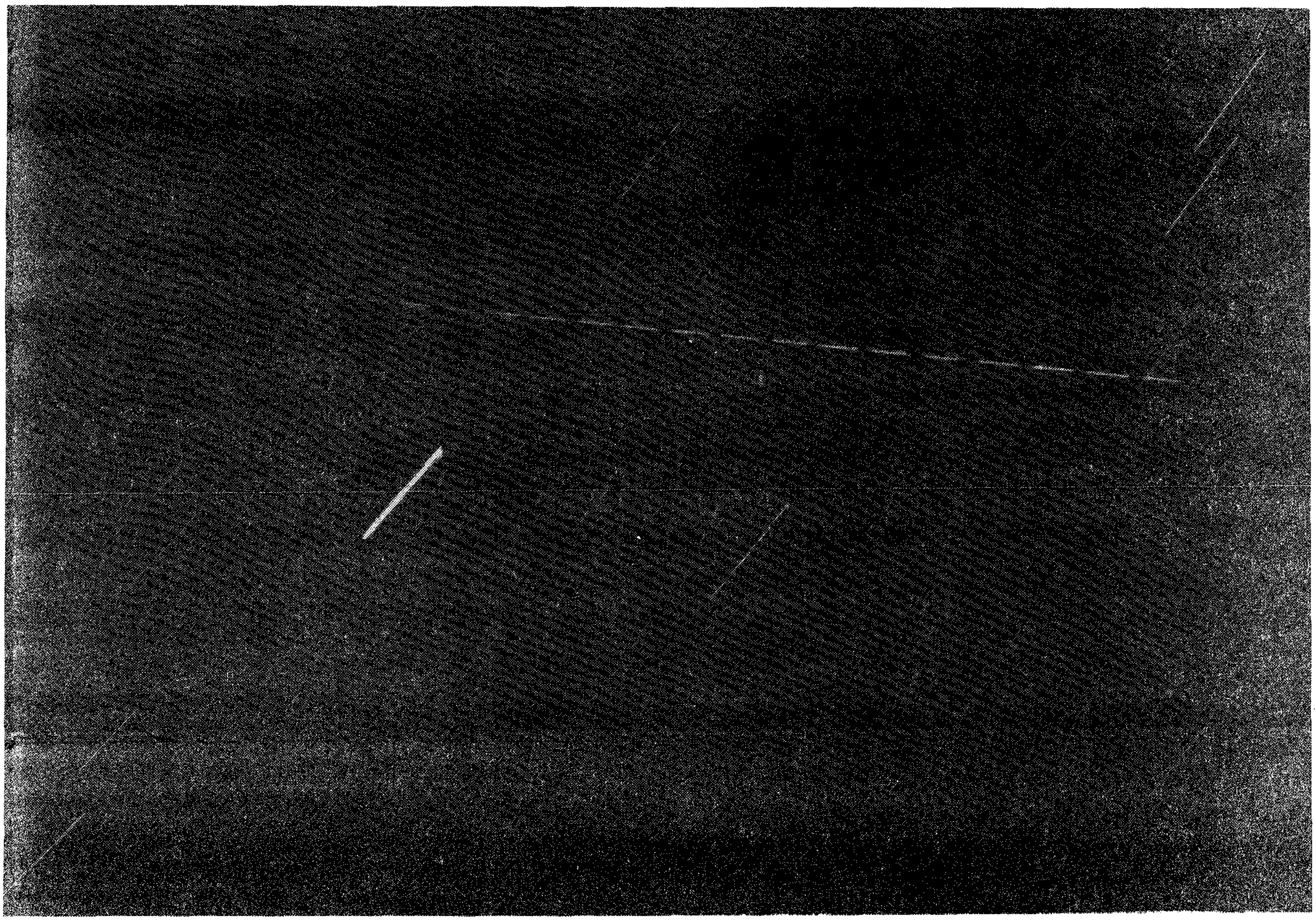
wgn

15 - 6

december '87

the international circular for meteor observers



A Perseid of magnitude -1.5, photographed by Klaas Jobse (Meteor Observatory Cyclops, Oostkapelle, the Netherlands) on August 15 at $21^h41^m27^s$ UT in Pegasus. The negative was exposed from $21^h36^m30^s$ to $21^h43^m30^s$ UT with a 50 mm 2.8 T.Max and a rotating shutter with two blades of 45° giving 25 interruptions per second.

werkgroepnieuws - meteoren

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v.u.: P. Roggemans, Dellingstraat 25, B-2800 Mechelen

WGN, volume 15, nr 6, december 1987, pp. 175–208

Contents - Inhoud

Useful Information

The February 1988 issue *(WGN 16:1)*

This issue will appear in Belgium in the first week of February. Contributions are due by *January 3* at the latest and should be sent to *Marc Gyssens* (address on inside of back cover).

Subscriptions 1988

The subscription rate for volume 16 is 300 BEF for 6 issues. Persons living in Belgium pay 200 BEF. Subscribers living outside Europe can pay a supplement for airmail delivery: 100 BEF for America (excluding Pacific islands), 150 BEF for Japan and 200 BEF for Australia, New-Zealand, Hawaii and other Pacific islands. Additional gifts are of course welcome. Pleasure make sure that we do retain the full amounts given above after deduction of banking and/or exchange charges. You can pay by a transfer from a postal giro account to the belgian giro account 000-0688050-29 of Paul Roggemans (address on inside of back cover) or by an international postal money order to him. Other "save" ways of payments are discussed on p. 153 in *WGN 15:4*.

Paul ROGGEMANS
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BELGIUM – Tel. (015) 41 12 25

Editoriaal

Dit is het laatste nummer van WGN van de jaargang 1987; een terugblik is dus zeker op zijn plaats. De belangrijkste verandering die zich in de loop van het bijna voorbije jaar heeft voltrokken, is ongetwijfeld de verfraaiing van de lay-out. Wij zijn dan ook verheugd te hebben mogen vaststellen dat de reacties hierop onverdeeld gunstig waren. Deze verbetering heeft er ook toe geleid dat WGN meer aanzien kreeg in het buitenland, en het feit dat we geregeld bijdragen van professionele astronomen mogen opnemen is hieraan zonder twijfel gedeeltelijk te danken. Langs de andere kant hebben we moeten vaststellen dat het aantal nederlandstalige bijdragen stelselmatig achteruitging: steeds meer auteurs schreven hun artikels in het Engels ten einde een groter publiek te kunnen bereiken, iets wat men hen zeker niet kan kwalijk nemen. Kortom, WGN is in het afgelopen jaar gegroeid van een Belgisch meteorenblad met vele buitenlandse correspondenten tot een echt internationaal tijdschrift.

Om deze onverhoopt gunstige evolutie te kunnen volgen, hebben de medewerkers aan WGN onlangs de koppen bij elkaar gestoken en besloten de feitelijke toestand in de realiteit om te zetten. Daarom zal WGN vanaf volgend jaar verschijnen als een internationaal meteorentijdschrift, volledig in het Engels, en los van de Vereniging voor Sterrenkunde (of welke andere organisatie) uitgegeven. Verder wordt ook de mogelijkheid opengelaten om rond WGN een internationale strucuur op te bouwen.

Zoals U ziet, werk genoeg aan de winkel voor 1988! Mocht U uw bijdrage nog niet hernieuwd hebben, doe het dan snel! Lezers in België betalen 200 BEF, anderen 300 BEF. Meer informatie over het abonnement vindt U op de binnenzijde van de voorkaft alsook op pagina 141 van het vorige nummer.

Alvast veel leesgenot met dit nummer en een goede gezondheid, veel heldere nachten en veel geluk in 1988!

Marc Gyssens

From the Editor

This is the last issue of WGN of volume 15, 1987, so let us look to what has been acomplished in the (almost) past year. The most important change that took place is undoubtedly the new lay-out. We were very pleased that this new layout was well-received by our readers, their reactions were unanimously positive. Partly because of the improvement in lay-out, WGN grew in 1987 from a Belgian meteor circular with many foreign correspondents to a real international journal. The best proof for this statement are the professional contributions which started to appear regularly in WGN.

In order to deal with this spectacular evolution, the team of WGN decided to publish WGN in 1988 as an independent international journal for meteor astronomers, which will be entirely in English, thereby answering to an often-heard criticism of many foreign readers. Also WGN will no longer be bound to a national astronomic association, which may open the way to build some kind of international meteor organisation around it.

As you can see, there is a lot to do in 1988! So please renew your subscription promptly if you did not already pay. Readers from abroad pay 300 BEF, and paying a suplement for airmail delivery is possible for non-European subscribers. More information can be found on the inside of the front cover and also on page 153 of the last issue.

Meanwhile, enjoy this issue of WGN and have a happy New Year!

Marc Gyssens

Actie-oproep: december-januari

Paul Roggemans

Tabel --- Maanlicht december 1987-januari 1988

Datum	k	Datum	k
vrijdag 4 december	0.98+	vrijdag 1 januari	0.91+
vrijdag 11 december	0.73-	vrijdag 8 januari	0.87-
vrijdag 18 december	0.10-	vrijdag 15 januari	0.23-
vrijdag 25 december	0.24+	vrijdag 22 januari	0.11+
		vrijdag 29 januari	0.80+

Nieuwe Maan:	20 december, 19 januari, 17 februari
Eerste Kwartier:	27 december, 25 januari, 24 februari
Volle Maan:	5 december, 4 januari, 2 februari
Laatste Kwartier:	13 december, 12 januari, 10 februari

1. De Geminiden

Deze zwerm wordt algemeen beschouwd als de meest actieve jaarlijkse zwerm. In 1985 overschreed de ZHR ver de 100 Geminiden per uur tijdens de nacht van het maximum. Het was een prachtig schouwspel: op een bepaald ogenblik verschenen vijf Geminiden haast gelijktijdig aan de hemel in het gezichtsveld. In de nacht van 13-14 december 1985 lukte het bijna om 1000 meteoren in één enkele nacht te observeren! In 1986 waren de omstandigheden verre van ideaal; een bijna volle maan deed vrijwel alle zwakkere meteoren teloorgaan in de fel verlichte hemel. Toch werden nog verrassend grote effectieve uurfrequenties genoteerd; de gecorrigeerde ZHR overschreed de waarde 100. Dit jaar zijn de omstandigheden veel gunstiger dan in 1986. In 1987 is het volle maan op 5 december. De eerste Geminiden gaan dus onverbiddelijk verloren in het maanlicht. De "rijkere" nachten, zoals 11-12 en 12-13 december laten al toe geruime tijd te observeren voor dat de maan boven de horizon verschijnt. Het is laatste kwartier op 13 december. Het maximum is voorzien voor de nacht van 13 op 14 december, meer bepaald op datum van december 14,5 (12^h UT). Aangezien de periode van maximale activiteit ongeveer 12 uren duurt, zal ook de nacht van 14-15 december uitzonderlijk rijk zijn. Het maanlicht zal vooral in de nanacht voor enige hinder zorgen. De maan verschijnt in België op de volgende tijdstippen boven de horizon:

December 11-12	21^h37^m UT	64% verlicht
	12-13	22^h48^m	55%
	13-14	23^h58^m	45%
	14-15	01^h10^m	36%
	15-16	02^h25^m	26%

Het doel van de Geminidenactie bestaat erin visueel het activiteitsverloop vast te stellen en de massaverdeling binnen de zwerm. Gezien de redelijk hoge Geminidenactiviteit, is het zeer aangeraden vooral tijdens de nachten 13-14 en 14-15 december te werken met een cassetterecorder. Let wel op: zorg ervoor dat het ding het uithoudt tijdens zeer koude nachten!

Fotografen hebben aan de Geminiden een dankbare zwerm met relatief veel heldere exemplaren. Poets de lenzen van uw camera's dus even op en breng ze in paraatheid voor de komende Geminidenactie. Geminiden zijn nog lang niet zo talrijk op foto verzameld. Een flinke verrijking aan gefotografeerde Geminiden zou wel eens voor de langverwachte studie van de Geminidenradiant en zijn dagelijkse beweging kunnen zorgen!

2. De Ursiden

Jarenlang hebben we U gewaarschuwd voor deze ondeugende, kleine zwerm en vorig jaar uiteindelijk hebben de Ursiden vele meteorenwaarnemers bij de neus genomen; lees de diverse bijdragen in deze jaargang van *WGN* (nvdr.: ook in dit nummer!) maar eens na! In 1987 zou het maximum zich moeten voordoen in de nanacht van 22 op 23 december, tussen 2^h en 4^h UT. De maan zal in het geheel niet storen! De nachten van 21-22, 22-23 en 23-24 december vormen dus een ideale periode om de Ursiden te observeren.

Tussendoor: gelukkig nieuwjaar en beste wensen voor 1988!

3. De Quadrantiden

In *WGN 14:6* en *15:1* (december 1986 en februari 1987) staat een uitgebreide beschouwing over deze zwerm. Helaas zullen we in 1988 niet dezelfde perfecte waarnemingsomstandigheden kennen als in 1987. Dit keer verschijnt het maximum theoretisch op 4 januari 1988 om 10^h UT. Sommige resultaten van 1987 wijzen er echter op dat het werkelijk maximum ruim 6 uur vroeger verscheen dan het theoretische maximum. Onderzoekers stelden vroeger reeds een regressie van de knopenlijn vast doordat het maximum in de loop der jaren vroeger en vroeger bleek op te treden. Eigenlijk gebeurt de verandering niet geleidelijk, maar in stappen, telkens wanneer de reuzeplaneet Jupiter een deel van de zwerm verstoort tijdens zijn passage. Een dergelijk effect werd in 1987 verwacht. Dit zou dan betekenen dat het werkelijke maximum in 1987 en ook in 1988 enkele uren vroeger verschijnt dan verwacht. Hierdoor zou het maximum dan in de vroege ochtend nog waarneembaar zijn met de radiant hoog boven de horizon. Helaas gebeurt dit Quadrantidenmaximum hoe dan ook slechts enkele uren na volle maan. Door de felle storig vanwege deze volle maan, zal de grensmagnitude eerder pover uitvallen. Probeer nochtans toch maar; als het helder weer is, mag U hoe dan ook flink wat Quadrantiden verwachten.

Actie-oproep: radiowaarnemingen

Jeroen Van Wassenhove

In de eerste helft van december kan men naar de Geminiden luisteren. Het maximum verschijnt rond 14 december. Vorig jaar werden de Geminiden uitvoerig waargenomen. Wees ook dit jaar van de partij! De waarnemingsomstandigheden zijn (UT):

Z:	18^h-$\overline{00}^h$-10^h	N:	04^h-06^h-10^h en 18^h-21^h-00^h
ZW:	22^h-$\overline{04}^h$-10^h	NO:	18^h-22^h-01^h
W:	02^h-05^h-10^h	O:	18^h-22^h-02^h
NW:	03^h-06^h-10^h	ZO:	18^h-00^h-06^h

Slechts één Belgische radiowaarnemer was vorig jaar getuige van de verhoogde Ursidenactiviteit. Moge er zich dit jaar meer waarnemers toeleggen op deze verwaarloosde zwerm. U mag uw antenne-richting en periode kiezen zoals U wilt, daar de radiant circumpolair is. Drie richtingen zijn echter *ongunstig*: Z, ZO en ZW.

Op 1 januari 1988 verschijnen reeds de eerste Quadrantiden; de laatste op 5 januari. Het maximum van deze korte, maar hevige zwerm valt rond 3 januari. De waarnemingsomstandigheden voor deze zwerm zijn (UT):

Dit is het laatste nummer dat U ontvangt, indien U uw abonnement niet hernieuwt of hernieuwd heeft! Lees in dit verband het editoriaal op pagina 175!

N-Z: 11^h-14^h en 02^h-06^h

NO-ZW: 12^h-15^h

O-W: 14^h-18^h

ZO-ZW: 01^h-05^h

1 februari is de sluitingsdag van 1987. Alle nog resterende waarnemingen van 1987 worden tegen die datum verwacht! Vergeet ook uw technisch formulier niet.

Lardiers:

The Meteor Observing Place for Some Future Projects

Paul Roggemans

Between October 17 and 24, the author stayed in the Haute-Provence (France) to study the Orionids and to watch for ε-Geminids. The site of the observations was Lardiers, a place selected for some future projects in meteor astronomy. The October 1987 team counted 6 people: the author with Pierre and Tilly Vingerhoets as belgian participants and Evelyne Blomme, the french coordinator for meteor work within the *Société Astronomique de France*, with two of her colleagues. The first experience was very positive: the house is very comfortable and can be used by 9 people if necessary. A caravan can be used for another 6 people. A field in southern direction in front of the house enables observing from near the doorstep, so no nightly travelling is required. Lardiers is rather isolated in between the hills surrounding the village, which has only 60 inhabitants. The house we rent is situated a bit to the west of the village; there are no other buildings in between, apart from a farm. The site is one of the darkest places I have seen sofar in the Haute-Provence. The maire of the village gave his permission to switch off the street lights after 10 pm local time. Then it is perfectly dark; although at a considerable distance from the observing site, a single street light does quite a lot of harm to the darkness.

Observations in October were hampered by persistent bad weather several nights. Observations could be done on 4 out of 7 nights. The Orionid activity contributed to a good extend to the general rates. A number of possible ε-Geminids were seen as well from a distinct radiant somewhat northeast of the main Orionid radiant. It is rather difficult to distinguish their fast meteors from the Orionid activity. Anyway, no unusual ε-Geminid activity can be reported for the period of observation covered in Lardiers, France.

Next on the program we have the Geminid-Ursid project, again a cooperation of the french-belgian team. Participants leave on December 11 and return on December 23 or 26 at the latest. Some places are still free; please contact Paul Roggemans (address on inside of back cover) if you would like to join the team!

The major event next year will be the observation of the 1988 Perseids from August 6 to August 20. In order to organize this project for a group of observers, we invite interested participants to reserve a place by payment of 2000 BEF to Paul Roggemans (nvdr.: please read again what we said about payments from abroad on p. 153 of the previous issue of *WGN*). In order to overcome housekeeping problems, we shall pay someone to run the kitchen for us. The price for this arrangement (stay + food) would be 80 FF a day, which includes everything, except your travelling costs. Contact Paul Roggemans for further details; people wanting to participate should wait no longer to confirm their participation. Do not miss this unique opportunity to observe the Perseids from a perfect dark sky!

Apollo Asteroid 1987 SY and the δ-Leonid Meteor Shower

Duncan Olsson Steel, Lund Observatory

The recently-discovered Apollo-type asteroid 1987 SY has a theoretical radiant which is very close to that of the δ-Leonid shower, and the asteroid and stream orbits are similar: it is therefore suggested that this asteroid may be the parent of the shower.

The asteroid designated 1987 SY was discovered on September 25, 1987 by Eugene and Carolyn Shoemaker, using the 46 cm Schmidt telescope at Mount Palomar. Three positional measurements made over the next week allowed a preliminary orbit to be determined, which indicated this body to be an Apollo-type (Earth-crossing) asteroid; this orbit is (1) (epoch 1950.0):

Perihelion distance	q = 0.5900 AU
Semi-major axis	a = 1.4633 AU
Eccentricity	e = 0.5968
Inclination	i = 5°57
Argument of perihelion	ω = 291°44
Longitude of ascending node	Ω = 311°22

This orbit has a closest approach distance to the Earth (circular orbit assumed) of 0.026 AU; the theoretical meteor radiant, calculated as described in (2,3) is:

Date	February 18
Right ascension	α = 156°
Declination	δ = +20°
Pre-atmospheric velocity	V_∞= 21.6 km/s

This radiant is close to that of the δ-Leonid shower, which was identified by Lindblad (4) from a search of 2401 meteor orbits determined in the Harvard photographic survey (5); Lindblad found 24 (or 1% of the total sample) to be δ-Leonids, with the radiant parameters as follows:

Dates	February 5 - March 19
Right ascension	α = 159°
Declination	δ = +19°
Pre-atmospheric velocity	V_∞= 23.8 km/s

Clearly this observed radiant is very similar to the theoretical radiant of 1987 SY, except that the velocity is a little higher; however the asteroid's orbit is not yet precisely known. The δ-Leonid stream mean orbit deduced from the 24 Harvard meteors is (4):

Mean perihelion distance	$\bar{q}$ = 0.643 AU
Mean semi-major axis	$\bar{a}$ = 2.618 AU
Mean eccentricity	$\bar{e}$ = 0.747
Mean inclination	$\bar{i}$ = 6°2
Mean argument of perihelion	$\bar{\omega}$ = 259°0
Mean longitude of ascending node	$\bar{\Omega}$ = 338°1

Note that the values of $\bar{q}$, $\bar{a}$ and $\bar{e}$ are *not* precisely related as $\bar{q} = \bar{a}(1 - \bar{e})$, since these three paramaters are all separately derived as averages over the 24 meteors.

Direct comparison of the orbits of the δ-Leonids and 1987 SY render orbital discriminant values (see (6) for details) of:

D = 0.181 $\qquad\qquad$ D' = 0.124

so that a genetic relationship seems likely. Note that the major contributor to the D-values is the difference in the eccentricities, which also originates the deviation between the values of the pre-atmospheric velocity mentioned above. It will be interesting to see whether improvements in our knowledge of the orbit of 1987 SY lead to an upward revision of its eccentricity. A comparison of the directions of the perihelia of the δ-Leonids and 1987 SY support this conjecture of a parent-daughter relationship; the longitude of perihelion ($\pi = \omega + \Omega$) of each is:

π(δ-Leonids) = 237°.1 π(1987 SY) = 242°.7

so that the difference between the values is only 5°.6 (for example the η-Aquarids and the Orionids have values of π of about 27° different to each other, and even further from the value of π for comet Halley).

The above discussion has been aimed at indicating the possibility of the δ-Leonid meteor shower having been produced by the recently-discovered Apollo-type asteroid 1987 SY. If this is correct then it would be of considerable scientific importance. Later refinement of the asteroid's orbit and better knowledge of the shower parameters may be able to confirm this link, in which case there will be a surge of interest in the shower in the same way as the Geminids have gained in scientific significance since the parent body, asteroid 3200 Phaeton, was discovered in 1983. Meteor enthusiastics are therefore encouraged to plan suitable observation programs during the δ-Leonid activity period in February and March.

Acknowledgment

The author would like to thank his host at Lund Observatory, Dr. B.A. Lindblad, for discussions concerning the δ-Leonid meteors.

References

(1) *IAU Circular Nr. 4465*, dated 1987 October 4.

(2) D. Olsson-Steel, "Theoretical Meteor Radiants of Earth-Approaching Asteroids and Comets", *Australian J. Astron. 2*, 1987, pp. 21-35.

(3) D. Olsson-Steel, "Prospects for an Enhanced ε-Geminid Shower in 1987", *WGN 15:4*, 1987, pp. 109-101.

(4) B.A. Lindblad, "A Computerized Stream Search Among 2401 Photographic Meteor Orbits", *Smithson. Contrib. Astrophys. 12*, 1971, pp. 109-111.

(5) R.E. McCrosky, A. Posen, "Orbital Elements of Photographic Meteors", *Smithson. Contrib. Astrophys. 4*, 1961, pp. 15-84.

(6) J.D. Drummond, "A Test of Comet and Meteor Shower Associations", *Icarus 45*, 1981, pp. 545-553.

Erratum

In the article by Paul Roggemans "On the Perseid Meteor Stream (I) - Magnitude Data" in *WGN 15:5* (October 1987), some typing errors slipt in:

- on page 155, near the bottom, two Danish observers were not mentioned. Please add:

  Gotfred M. Kristensen (DK), Østergaard Olesen (DK)

- on p. 156, last paragraph, replace the sentences *The fluctuations ... small, 0.54.* by:

  The fluctuations on r_s are larger because larger r-values are more sensitive to statistical fluctuations. The high r-value for 8-9 August in 1986, is in strong contrast with the lowest r found in 1985 for the same night. The r-value of the Perseids is larger than r_s, $\Delta\bar{m}$ is rather small, 0.54.

We apologize for the inconvenience you might have experienced while reading this article.

The ZHR Profile of the 1985 Perseids, Recomputed

Paul Roggemans

The use of a zenith distance correction with a zenith exponent $\varepsilon = 1.0$ introduced short duration features on the ZHR profile, initially explained as the result of undercorrection. A new attempt to use another zenith distance correction with $\varepsilon = 1.5$ smoothed only some of the short duration features, but other fluctuations became more pronounced on the ZHR profile.

The hourly rate profile of the Perseids 1985 showed several short duration features which could not be explained right away (1). A possible explanation was found when it turned out that dips occurred in the hourly rate profile when the radiant distance was large. It was then suggested (2) that the correction for the zenith distance by sec Z (Z being the zenith distance) undercorrected. Another correction factor was proposed:

$$\sec^{\varepsilon} Z$$

The zenith exponent ε, according to researchers at the Skalnaté Pleso Observatory, would equal 1.47 for the Perseid shower. A detailed article on the zenith exponent ε appeared in (2). It should be remembered that

$$\varepsilon = 1.5 \log r + 1$$

The question then was if we would use $\varepsilon = 1.5$ instead of $\varepsilon = 1.0$, would the short duration features disappear? The data of the 1985 Perseids were reanalyzed applying a new zenith distance correction with $\varepsilon = 1.5$. Peter Pelgrims recomputed all the ZHR's for the period August 11.0 till August 16.0. The individual ZHR's were calculated and averaged similar to the procedure explained in (1). The following results were obtained (to be compared with the values in (1), Table 3):

Table 1 --- ZHR's for the Perseids 1985, computed with $\varepsilon = 1.5$.

Date	ZHR	Date	ZHR	Date	ZHR
Aug 11.1	42.6	Aug 12.8	104.3	Aug 14.4	51.4
11.2	37.3	12.9	115.1	14.5	33.2
11.3	45.3	13.0	90.1	14.6	21.9
11.4	39.0	13.1	111.2	14.7	40.6
11.5	49.0	13.2	98.2	14.8	65.2
11.6	39.6	13.3	104.6	14.9	43.5
11.7	39.8	13.4	79.9	15.0	24.0
11.8	49.5	13.5	91.6	15.1	41.5
11.9	66.7	13.6	64.2	15.2	18.9
12.0	66.4	13.7	62.9	15.3	10.5
12.1	98.8	13.8	80.1	15.4	13.4
12.2	100.0	13.9	83.6	15.5	22.4
12.3	109.5	14.0	49.7	15.6	18.6
12.4	112.4	14.1	59.1	15.7	16.2
12.5	91.8	14.2	81.6	15.8	23.8
12.6	74.8	14.3	69.9	15.9	33.8
12.7	109.6				

Some ZHR's are noteworthy. In (1), Figure 6 we found a dip at August 12.2, when USA observers' rates were obviously undercorrected by sec Z. The depression at August 12.5 and 12.6, when Japanese observers had the Perseid radiant low on their horizon, does not disappear with the new and stronger zenith distance correction. The problem with the Japanese ZHR's occurs also at August 13.6 and 13.7, when the zenith distance is of less significance. It is present on August 14.5 and 14.6 too. The recomputed ZHR's do not smoothen the hourly rate profile during the Japanese observing window. In Figure 1, the different observing windows are indicated by *A* (American), *J* (Japanese) and *E* (European). In Figure 1, we see the ZHR increasing between August 11.7 and 12.4, from 39.8 to 112.4. A remarkable depression at August 12.5 and 12.6 appears in both the results for $\varepsilon = 1.0$ and $\varepsilon = 1.5$. A small dip in the European period at August 13.0 cannot be explained by undercorrection for $\varepsilon = 1.0$ or $\varepsilon = 1.5$. The steady part in the ZHR profile around August 14.0 found for $\varepsilon = 1.0$ has disappeared and a dip in the European observing period has been introduced, similar to the dip noticed in Europe on August 13.0 and August 15.0. It seems worthwhile to look at the European rate variations per night.

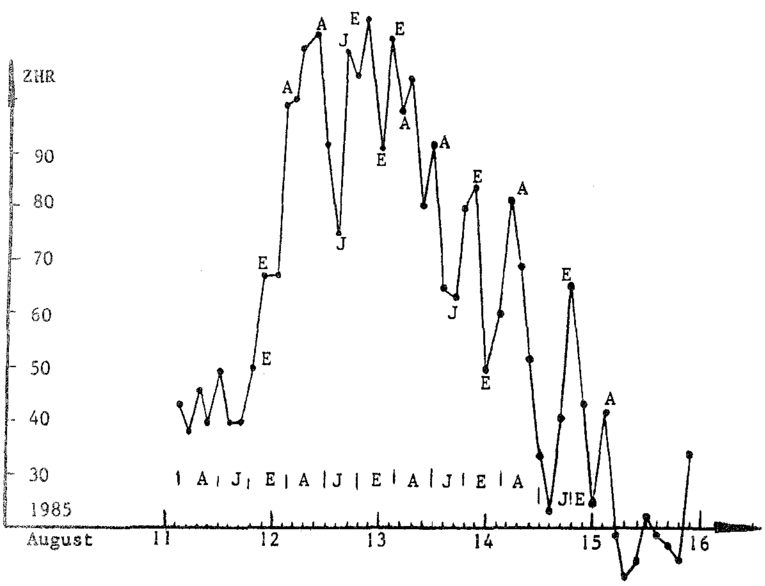


Figure 1 --- Perseids averaged ZHR profile 1985 computed with 0.1 day steps and $\varepsilon = 1.5$.

Because of the large fluctuations in the hourly rate profile as obtained for 0.1 day steps, we plotted the ZHR profile using a 0.3 day step (Table 2, Figure 2). The wide scatter on the data points seen in Figure 1, has been smoothened. The peak occurred at August 12.45, with a ZHR ($\varepsilon = 1.5$) of 108. At the time of maximum activity found in (1), August 12.75, a dip is found instead of a peak; for this time, only Japanese ZHR's were available! The 0.3 day step curve for $\varepsilon = 1.0$ (Figure 3) shows a similar shape. Here more data points were plotted and the horizontal part of the curve around August 14 is notable.

Table 2 --- Perseids 1985 ZHR values for $\varepsilon = 1.5$, averaged with a 0.3 day step.

Date	ZHR	Date	ZHR
Aug 11.00 - 11.29	37.4	Aug 13.70 - 13.99	69.3
11.30 - 11.59	39.5	14.00 - 14.29	50.9
11.60 - 11.89	46.0	14.30 - 14.59	no data
11.90 - 12.19	78.4	14.60 - 14.89	42.2
12.20 - 12.49	108.4	14.90 - 15.19	29.5
12.50 - 12.79	90.1	15.20 - 15.49	12.3
12.80 - 13.09	100.3	15.50 - 15.79	17.3
13.10 - 13.39	93.7	15.80 - 15.99	23.9
13.40 - 13.69	74.3		

We have to conclude that recomputing the ZHR using $\varepsilon = 1.5$ instead of $\varepsilon = 1.0$, does not improve the ZHR profile as the fluctuations are still well pronounced in the new curve.

The European observing window should be considered in detail as these data are obtained by observers all using the same observing method. The discrepancy with the Japanese results has been explained (3). The corrections applied by Japanese meteor workers yield systematic lower ZHR values. As a matter of fact, the Japanese ZHR's cannot be incorporated in a ZHR profile straight away with European ZHR's. The definition of a ZHR is indeed in a good agreement, but the method for corrections however is strongly different.

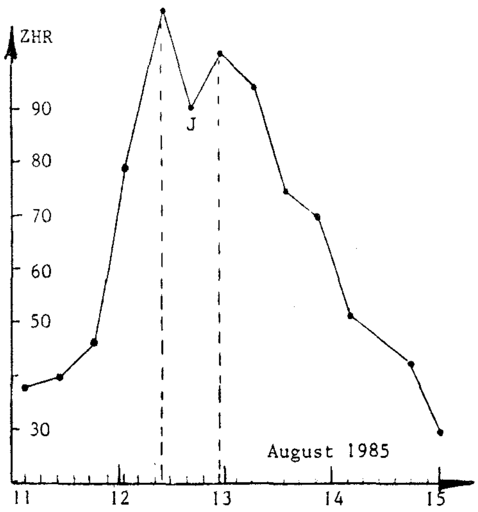


Figure 2 --- Perseids averaged ZHR profile computed with 0.3 day steps and ε = 1.5.

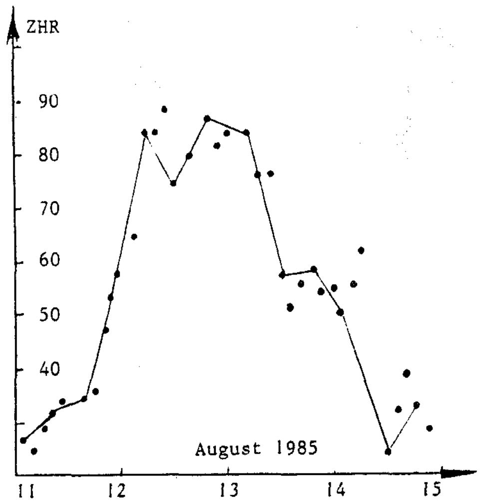


Figure 3 --- Perseids averaged ZHR profile computed with 0.3 day steps and ε = 1.0.

The 1985 Perseid results were a first attempt to construct a ZHR profile for a single year Perseid transit based on worldwide results. It turns out that a good agreement on a universal ZHR method with the necessary standard corrections, together with a uniform data representing system are urgently required to validate amateur meteor observations. The disagreement between world meteor groups distorted the 1985 ZHR profile much more than the choice ε = 1.5 instead of ε = 1.0 for the zenith exponent. If the current need for a worldwide relay of meteor observing teams could be satisfied, the problem of undercorrection for large zenith distances at one place would be solved by the availability of data from eastern longitudes.

References

(1) P. Roggemans, "On the Perseid Meteor Stream 1985", *WGN 14:4*, 1986, pp. 108-125.

(2) P. Roggemans, "Perseids 1985 and the Zenith Distance Correction", *WGN 14:5*, 1986, pp. 149-152.

(3) M. Koseki, *private correspondence*.

Nightly ZHR and HR variations for European Perseid Results 1985

Paul Roggemans

European Perseid ZHR's of 1985 enabled to consider the ZHR variation night by night. Results support the use of a zenith exponent $\varepsilon > 1.0$, while remaining post-maximum submaxima and depressions in the hourly rates are most likely due to a fine inner-core layered structure of the Perseid meteor stream.

In order to investigate the hourly rate variations for some nights during the 1985 Perseid activity, the ZHR were averaged over 0.08 day periods (2 hours) with a step of 0.02 day. The results are listed in Table 1, on the next page.

Table ---- Perseid 1985 ZHR's 0.08 day (2 hours) averages(N = nr. of ZHR's used).

Date (Aug)	N	ZHR $\varepsilon = 1.0$		ZHR $\varepsilon = 1.5$		HR	
11.00	4	21	± 9	25	± 10	17	± 9
11.02	3	36	8	41	8	20	8
11.04	2	40	8	45	9	14	5
11.84	8	34	6	57	10	16	9
11.86	8	34	6	57	10	16	9
11.88	13	44	12	68	19	16	9
11.90	12	47	11	72	18	15	9
11.92	23	55	14	78	21	15	10
11.94	19	55	17	75	25	14	8
11.96	34	55	15	70	21	17	9
11.98	23	54	14	67	19	18	9
12.00	26	62	17	75	21	18	9
12.02	21	59	24	69	29	18	8
12.04	26	66	25	75	28	16	9
12.06	17	65	27	72	29	16	9
12.08	11	90	18	99	19	10	6
12.10	9	95	19	100	18	19	10
12.84	11	82	22	138	39	16	8
12.86	11	82	22	138	39	16	8
12.88	11	86	24	130	35	15	7
12.90	13	83	24	123	40	16	8
12.92	26	83	25	118	38	14	7
12.94	18	81	27	108	37	14	7
12.96	29	87	25	111	32	13	11
12.98	26	73	28	89	34	15	12
13.00	30	74	21	89	27	12	5
13.02	15	83	21	97	25	12	4
13.04	19	96	17	110	18	13	5
13.06	12	92	21	102	25	16	9
13.08	17	102	23	111	26	18	7
13.10	8	103	30	112	32	21	8
13.86	7	73	29	125	50	25	3
13.88	6	59	± 20	90	± 29	17	± 8
13.90	7	59	17	87	26	18	9
13.92	18	59	20	84	28	19	10
13.94	14	57	22	79	29	22	12
13.96	16	55	17	73	25	17	8
13.98	10	40	10	51	13	17	11
14.00	18	49	18	59	21	15	10
14.02	14	47	24	55	28	17	11
14.04	19	52	19	60	23	18	9
14.06	13	40	18	45	20	18	9
14.08	9	48	16	53	18	15	8
14.10	7	67	14	71	15	20	5
14.86	5	49	14	84	23	23	6
14.88	7	22	8	29	10	15	4
14.90	9	22	7	30	9	15	4
14.92	17	26	9	35	13	15	10
14.94	11	27	11	37	15	17	14
14.96	17	23	10	30	14	15	9
14.98	9	18	5	22	7	18	10
15.00	12	25	14	30	16	14	6
15.02	6	31	17	37	20	16	6
15.04	8	36	12	41	14	17	8
15.06	4	33	11	36	12	20	6
15.08	6	40	14	43	14	18	5
15.10	3	42	20	45	21	17	4
15.88	4	24	6	35	8	20	8
15.90	6	25	6	35	9	21	9
15.92	3	28	7	39	10	25	11
15.94	7	19	14	25	19	15	10
15.96	5	16	16	21	20	16	9
15.98	5	11	5	12	6	21	7

In Figure 1, the ZHR's for $\varepsilon = 1.0$ and $\varepsilon = 1.5$ are plotted and in Figure 2, the sporadic rates are shown. For each night, we computed the linear regression which at least indicates that the ZHR or HR were increasing or decreasing during the night. The following relationships were found per night (T is the time, expressed as the decimal date in August, like in the table above):

August 11-12	$\varepsilon = 1.0$	ZHR = $194.6\,T - 2271$
	$\varepsilon = 1.5$	ZHR = $113.2\,T - 1281$
	sporadics	HR = $0.88\,T - 5.5$
August 12-13	$\varepsilon = 1.0$	ZHR = $66.2\,T - 773$
	$\varepsilon = 1.5$	ZHR = $-127.7\,T + 1769$
	sporadics	HR = $6.7\,T - 72$
August 13-14	$\varepsilon = 1.0$	ZHR = $-58.8\,T + 876$
	$\varepsilon = 1.5$	ZHR = $-222.8\,T + 3187$
	sporadics	HR = $-15.11\,T + 229.5$
August 14-15	$\varepsilon = 1.0$	ZHR = $36.3\,T - 512$
	$\varepsilon = 1.5$	ZHR = $-33.5\,T + 540$
	sporadics	HR = $0.55\,T + 8.7$

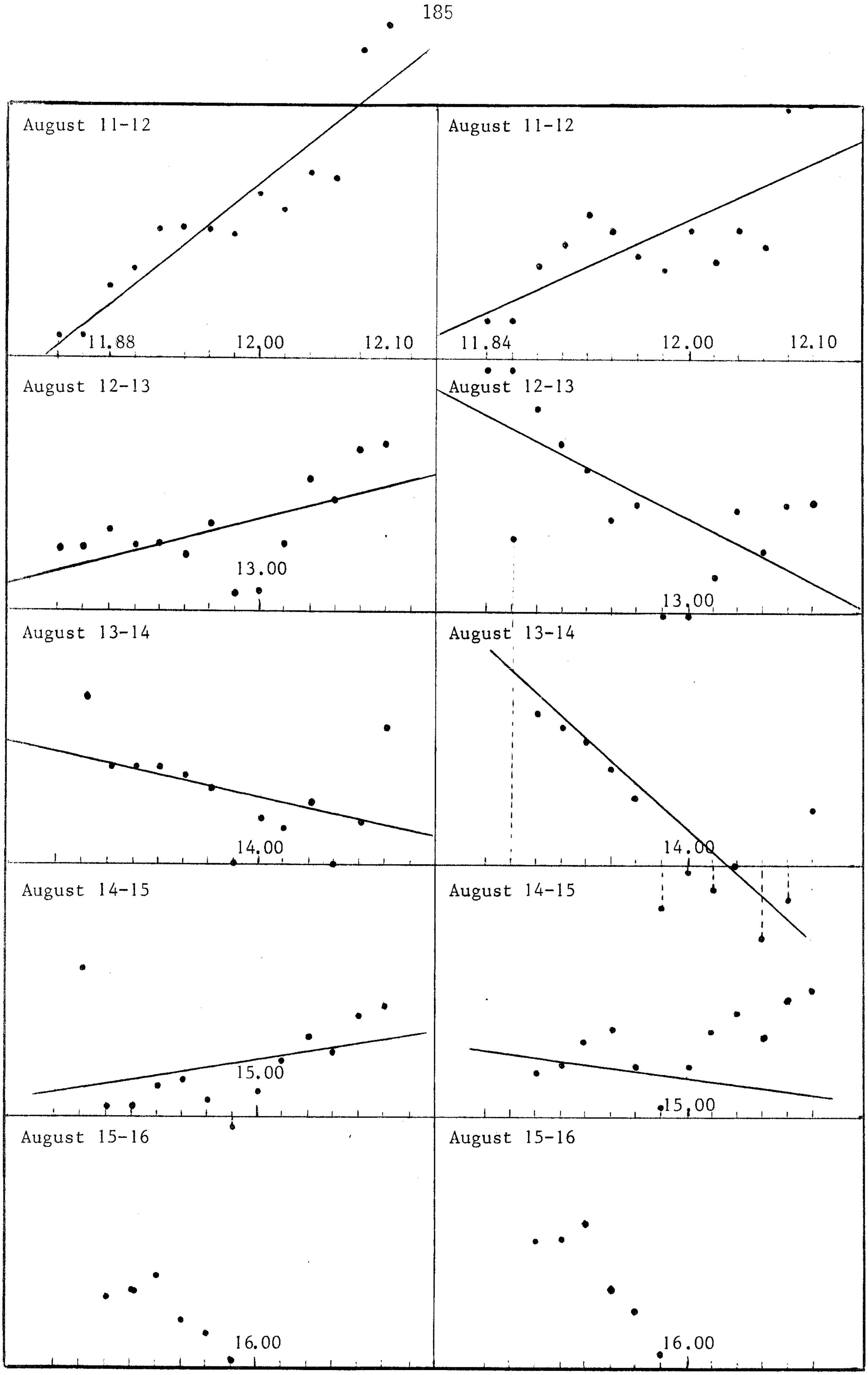
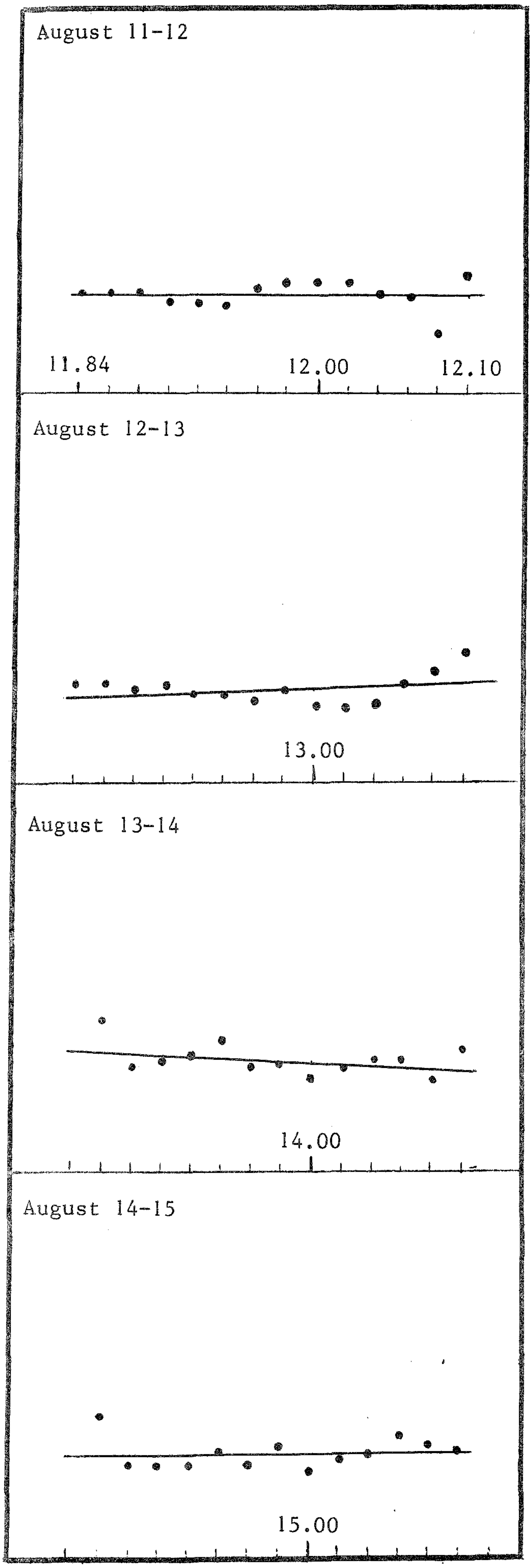


Figure 1 --- Perseid 1985 ZHR's 0.08 day averages for ε = 1.0 (left) and ε = 1.5 (right).



As it is in general accepted that the sporadic hourly rate increases towards the morning, we expected to see the HR increase towards 3^h UT. Surprisingly enough, during none of the 4 nights under consideration, the expected increment in HR could be observed. The observed facts are in contradiction with the theoretical expectations. An explanation for an individual observer could be fatigue. However these are averaged values for a lot of independent observers; they cannot be tired all at once. Another explanation could be that some minor shower meteors increased the evening sporadic rates slightly as only four showers were distinguished while observing. Minor shower meteors were counted as sporadics. For the Perseids we plotted both hourly rate variations with the ZHR as obtained from $\varepsilon = 1.0$ and $\varepsilon = 1.5$. This enables us to check the influence of the zenith distance correction upon the hourly rate evolution.

August 11-12 shows a strong increase in hourly rates as the Earth penetrated the core of the Perseids in denser regions of the stream. The rate increment is less steep for $\varepsilon = 1.5$.

August 12-13: for $\varepsilon = 1.0$, rates increased. However, from the global activity curve we know that maximum occurred at August 12.75 UT. The results found for $\varepsilon = 1.5$ show a decreasing ZHR from evening to morning hours, which is more consistent with the general picture. This would mean that $\varepsilon = 1.0$ undercorrects, assuming that the maximum appeared indeed on August 12.75 UT. Both pictures reveal a dip around August 12.98-13.00, followed by another increment of rates. This may be a trace of a fine inner layered structure within the Perseid stream with superimposed layers of dust separated by space with lower particle density.

August 13-14: ZHR's decrease in general, steep for $\varepsilon = 1.5$. Here we once again get the remarkable dips at August 13.98 and 14.06, less pronounced than at August 13.00 and not free of any risks for statistical fluctuations.

Figure 2 --- Sporadic activity (HR's 0.8 day averages) during Perseids 1985.

August 14-15: The rate variation for $\varepsilon = 1.0$ is unlikely; rates tend to increase 48 hours *after* the peak rate! The first data point may be too high, which influenced the line for $\varepsilon = 1.5$ quite a lot, otherwise the rate increase would be very clear as well for $\varepsilon = 1.0$ as for $\varepsilon = 1.5$. Another dip in the rate variation can be seen at August 14.98.

Some of these features cannot be explained as pure statistical fluctuations and these are more likely due to density variations along the Earth's transit throughout the stream. This means that Perseid activity can be surprisingly rich even a day or two apart from the main maximum.

Short Notes

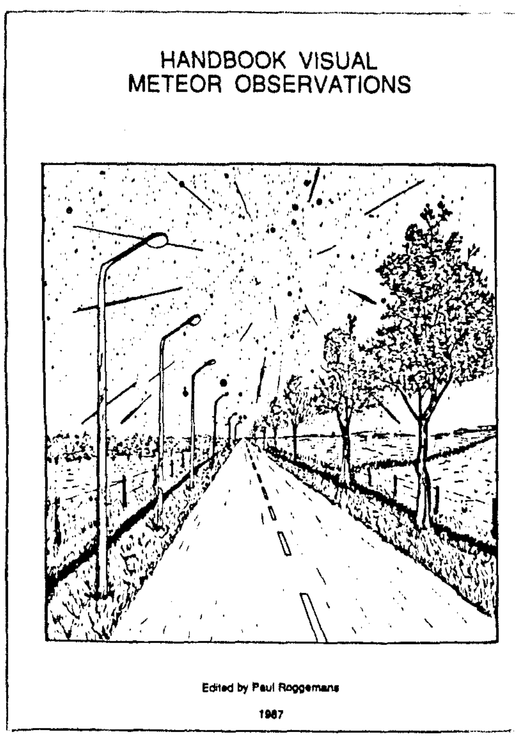
Important Note for Subscribers

Marc Gyssens

As explained on page 175, *WGN* will be *entirely in English*, starting from the next issue. Please note that this issue is the last one you will receive unless you pay your dues for 1988. So, please, renew promptly!

We remind you that the subscription rate for 1988 is 300 BEF (200 BEF for subscribers living in Belgium). Please read again what we wrote in the previous issue concerning ways of payment. We also remind you that you can also pay for airmail delivery, as explained in the previous issue.

Finally, we must ask to people who want to pay by *Eurocheque* to *write their Eurocheque card number on the back of the cheque*, otherwise we cannot encash this check without being charged for banking costs. We also recall that a Eurocheque for *WGN* must be maid payable to Paul Roggemans, be drawn in Belgian francs in a Belgian city (e.g. Brussels).



Handbook Visual Meteor Observations

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ε-Geminids 1987

Under this title, we have grouped together some preliminary results on the activity of the ε-Geminids, in response to an article of dr. D. Olsson-Steel in WGN 15:4. Visual observations from southern France communicated by Paul Roggemans show some minor activity, but nothing unusual. This is confirmed by Belgian radio observations as far as known to us yet and by a report of Klaas Jobse (meteor observatory Cyclops, Oostkapelle, the Netherlands) who organized an Orionid watch around October 22-23. Although his report arrived too late for publication in this issue, we quote: "The number of ε-Geminids observed by us was not high; they were clearly lower than the number of Taurids. Sometimes it was difficult to distinguish the ε-Geminids from the equally fast Orionids." We also received radio data about meteor activity around July 21, the time of the second approach between the Earth and the orbit of comet 1987c. Although some activity is suspected, not enough confirmation could have been obtained. In any case, if there was unusual meteor activity on July 21, it must have been caused by very faint meteors; this is in remarkable agreement with the magnitude distribution obtained by Paul Roggemans for 9 ε-Geminids (in October).

The ε-Geminids 1987 in Southern France

Paul Roggemans

The author et al. observed meteors in Southern France from October 17 till 24. Although they noticed some ε-Geminid activity, nothing unusual was seen.

The Orionid observations in southern France were strongly hampered by poor weather. I was able to observe on 4 out of 7 nights. As I planned to spend evening hours to variable star work and the second part of the night to meteors, my observing time was indeed very well overcrowded. Finally I got more clear sky in pre-midnight hours, but then Orionid and ε-Geminid radiants are below or low on the horizon. So meteor work came up with only 7 hours netto observed time and 141 meteors, while I managed to do only 25% of my variable star program. The few results I have, show some ε-Geminid activity. It is difficult to distinguish between ε-Geminids and Orionids. No unusual ε-Geminid activity occurred during the observed time, but some shower members have been reported by myself and by my co-observers P. Vingerhoets and E. Blomme.

Table 1 --- Hourly rate data obtained by Paul Roggemans, October 1987.

Date	Period (UT)	T_{eff}	Lm	F	Ori	Tau	εGe	Spor
Oct 17-18	00^h45^m-02^h00^m	1.25	6.3	1.00	10	3	3	20
18-19	03 11 -04 35	1.40	5.9	1.00	11	0	3	16
19-20	23 40 -01 12	1.66	6.2	1.00	13	0	3	18
23-24	20 30 -21 00	0.50	6.2	1.00	0	2	0	5
23-24	21 00 -22 00	0.95	6.2	1.00	0	2	0	4
23-24	22 00 -23 30	1.50	6.2	1.00	11	2	0	15

Table 2 --- Magnitude distribution of the Orionids 1987

Date	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
Oct 17-18	0	0	1	4.5	3.5	1	0	10	3.45
18-19	0	0.5	0.5	5	3.5	1.5	0	11	3.45
19-20	0	0.5	3.5	3.5	3.5	2	0	13	3.23
23-24	0	1	1	3	5	1	0	11	3.35
Total	0	2	6	16	15.5	5.5	0	45	3.37

Table 2 --- Magnitude distribution of the Taurids 1987

Date	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
Oct 17-18	0	0	0	1.5	1	0.5	0	3	3.67
23-24	0	0	1	2.5	1.5	1	0	6	3.42
Total	0	0	1	4	2.5	1.5	0	9	3.50

Table 3 --- Magnitude distribution of the ε-Geminids 1987

Date	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
Oct 17-18	0	0	0	0	2	0.5	0.5	3	4.50
18-19	0	0	0	0	2.5	0.5	0	3	4.17
19-20	0	0	0	0	1.5	1.5	0	3	4.50
Total	0	0	0	0	6	2.5	0.5	9	4.39

Table 4 --- Magnitude distribution of the sporadics, October 1987

Date	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
Oct 17-18	0	0	1	3.5	9	6	0.5	20	4.08
18-19	0	0	3	0	3.5	7.5	2	16	4.34
19-20	0	2	3	3	6.5	3	0.5	18	3.39
23-24	0	0.5	2	7	8.5	5.5	0.5	24	3.75
Total	0	2.5	9	13.5	27.5	22	3.5	78	3.87

Radio Work in Connection with the ε-Geminids

Jeroen Van Wassenhove

Radio observations were set up in Belgium and Denmark to see whether the July 21 approach of the Earth to the orbit of comet 1987*c*, which, according to D. Olsson-Steel, is the parent body of the ε-Geminids in October, also gives rise to meteor activity. Only one observation shows enhanced activity; if this activity was connected to comet 1987*c*, it must have been produced by very faint meteors.

In (1), D. Olsson-Steel pointed out that comet 1987*c* might be the parent comet of the ε-Geminids, which appear in October. In his article dr. Olsson-Steel points out that, apart from the one in October, there is another approach between the comet's orbit and the Earth, at July 21. Four Belgian observers carried out observations around July 21, 1987 to see whether any unusual meteor activity was present. Their results are as follows:

Table 1 --- Observations of Maurice De Meyere (St.-Martens-Latem) at 66.17 MHz between 05^h30^m and 06^h30^m UT.

Date	Uncorr. counts	Date	Uncorr. counts
July 18	59	July 21	73
19	56	22	51
20	Sporadic-E	23	49
Average	57.9 ± 9.5		

Table 2 --- Observations of Dirk Artoos (Mechelen) at 88.30 MHz between 10^h50^m and 11^h50^m UT.

Date	Uncorr. counts
July 21	21
22	8

Table 3 --- Observations of the author (Nazareth) at 88.40 MHz between 05^h20^m and 05^h30^m UT.

Date	Uncorr. counts
July 20	17
21	16

Table 4 --- Observations of Johan Smet (De Pinte) at 72.11 MHz (Wroclaw, Poland)

Date	Period (UT)	Corr. counts	Date	Period (UT)	Corr. counts
July 20	06^h55^m-07^h55^m	319	July 22	07^h07^m-08^h07^m	632 (!)
21	06 50 -07 50	715 (!)	23	07 32 -08 32	159

We also received observational data from the Danish observer Gotfred Møbjerg Kristensen. His results are:

Table 5 --- Observations of G.M. Kristensen between 4^h and 5^h UT.

Date	Uncorr. counts
July 19	13
20	Sporadic-E
21	6

If one looks at the observations of Johan Smet, which are very reliable, one would be inclined to make a positive conclusion (very high number on July 21). However, *not one* of the other observers registered a significant increase of meteor activity in this period. Some observers were not even able to observe on July 20, due to Sporadic-E. Till now, nobody (visual nor radio) confirmed the observation of Johan Smet. So the question still remains unanswered. However, if the high numbers in Table 4 are due to meteor activity from comet 1987*c*, it must have been caused by very faint meteors (magn. 7.0-8.0) since:

- the equipment of Johan Smet is the most sensitive one used in the Belgian Radio Section;
- the other observers did not notice anything with their (less sensitive) equipment.

Acknowledgment

The author thanks the observers for carrying out the above observations.

References

(1) D. Olsson-Steel, "Prospects for an Enhanced ε-Geminid Shower in 1987", *WGN 15:4*, 1987, pp. 109-111.

More Radio Observations of the Ursids 1986

Ingo Reimann

Some as yet unpublished radio observations of the Ursids in 1986 are presented. They support the time of maximum which can be deduced from the visual observations in Norway.

First I should explain why I present my observations so late. The reason is, that in September 1987, I first read about the unusual activity of the Ursids 1986 (1,2,3), because then I read *WGN* for the first time at all (more precisely *WGN 15:1* to *WGN 15:4*). While reading, I at once remembered my own radio-observations, which I had just begun at the end of 1986. The observation of the Ursids was one of my first observing-attempts, and therefore the result is not perfect, but under the given circumstances it might be interesting for some readers.

My observing location was at approximately 10°45' E and 53°54' N. I was using a commercial tuner and amplifier and a home-made 3-element-Yagi at a frequency of 100.50 MHz. The antenna was used with horizontal dipole. It pointed to South at an elevation of 60°. I was not able to identify the transmitter(s) whose radiation was (were) scattered by the meteor-trails and I do not know the sensitivity of my equipment. But as the position of the radiant of the Ursids did not change very much in the course of the day, I think that the observations are reflecting the changing activity sufficiently well. The table below gives the observed hourly rates (not reduced). From December 22 on I counted how many of the observed radio-reflections lasted 1 second or longer (last column of the table.

Table --- Radio observations of the Ursids 1986

Date	Period (UT)	Counts	C. more th. 1s
Dec 19	23^h30^m–24^h30^m	5	not recorded
20	00 30 -01 30	4	not recorded
20	01 30 -02 30	10	not recorded
20	12 00 -13 00	12	not recorded
20	13 00 -14 00	8	not recorded
20	14 00 -15 00	8	not recorded
21	00 00 -01 00	7	not recorded
21	01 00 -02 00	6	not recorded
21	02 00 -03 00	6	not recorded
21	13 00 -14 00	9	not recorded
21	14 00 -15 00	4	not recorded
21	15 00 -16 00	10	not recorded
22	00 00 -01 00	12	0
22	01 00 -02 00	5	0
22	02 00 -03 00	14	1
22	14 00 -15 00	14	0
22	15 00 -16 00	14	1
22	16 00 -17 00	12	0
22	19 30 -20 30	20	1
22	20 30 -21 30	26	0
22	21 30 -22 30	20	1
22	23 30 -24 30	5	0
23	00 30 -01 30	5	1
23	01 30 -02 30	12	0
23	17 00 -18 00	6	0
23	18 00 -19 00	6	0
23	19 00 -20 00	7	0

The small numbers around 1^h UT every night might be an effect of the radiant's changing position relative to the unidentified transmitter. From a private reduction of my observations I got the opinion that the maximum occurred on December 22 at about 21^h30^m UT, in good agreement with the visual observations made in Norway (4).

References

(1) P. Roggemans, C. Steyaert, "Again on the Ursids", *WGN 15:1*, February 1987, pp. 25-26.

(2) P. Roggemans, "On the Ursids once more", *WGN 15:2*, April 1987, pp. 50-53.

(3) "About the Ursids" (letters), *WGN 15:3*, June 1987, p. 94.

(4) T.E. Hillestad, "The 1986 Ursid Outburst in Norway", *WGN 15:2*, April 1987, pp. 59-60.

A Possible Meteor Shower in January

Jeroen Van Wassenhove

In an earlier issue, G.W. Kronk asked attention for a possible meteor shower in mid-January with a radiant at $\alpha = 233°$ and $\delta = +37°$. Radio observations from Belgium and Denmark in January 1987 are negative.

In (1), Gary W. Kronk asked attention for a possible meteor shower, active in mid-January. The radiant of this shower should be located at $\alpha = 233°$ and $\delta = +37°$. Only one Belgian radio observer (Luc Gobin) was able to carry out observations in that period. His results are:

Table 1 --- Reflection counts by Luc Gobin at 66.17 MHz. The counts are uncorrected. (All times in UT)

Date	05^h-06^h	14^h-15^h	21^h30^m-22^h30^m
1987 Jan 16	110	38	36
17	118	54	37
18	116	43	--

The high values in the morning are due to sporadic activity. The sporadic activity has much more influence on radio observations as the perception coefficient is almost 1. In this way, it is not abnormal that a radio observer has three times more meteor reflections in the morning than in the evening: the large amount of faint meteors that a visual observer will miss, will be heard almost all by the radio observer.

The Danish observer Gotfred Møbjerg Kristensen also carried out observations. His results are presented below.

Table 2 --- Reflection counts by G.M. Kristensen at 100.60 MHz. The counts are uncorrected. (All times in UT)

Date	04^h-05^h	05^h-06^h	06^h-07^h
1987 Jan 15	--	12	--
16	9	4	8
17	12	18	15

Table 2 (continued)

Date	04^h-05^h	05^h-06^h	06^h-07^h
1987 Jan 18	0	0	0
19	18	10	5
20	17	9	--

Remarkable are the observations on January 18. Not one reflection was registered that day during a three-hour interval. Perhaps the transmitter (a commercial radio station) had a breakdown.

Conclusion

The average counts for Luc Gobin for the three time intervals are 115 ± 4, 45 ± 8 and 36.5 ± 0.7 respectively; those for G.M. Kristensen are 11.2 ± 7.3, 8.8 ± 6.3 and 7.0 ± 6.3. Hence we may conclude from Tables 1 and 2 that no unusual high activity was registered during January 15-20.

Acknowledgment

The author wishes to thank Luc Gobin and Gotfred Møbjerg Kristensen for their observations.

References

G.W. Kronk, "Call for Observational Data", *WGN 14:6*, December 1986.

FORWARD: Extension for Multiple Stations

Christian Steyaert

The calculation of the Observability Function given earlier was implicitly for one transmitter. In this article, a generalization from multiple broadcasting stations is presented.

1. Introduction

The calculation of the Observability Function, as given in (1) was implicitly for one transmitter. However, on any frequency chosen by a radio observer, more than one broadcasting station is present. Before correcting observed numbers, the "total" Observability Function should be known.

2. Reflection rate in function of the transmitted power

For an underdense trail, the received power at the antenna P_R is proportional to the transmitted power P_T and the square of the electron density q (2):

$$P_R \sim q^2 P_T \tag{1}$$

A receiver set up has its minimum detectable power $P_{R,min}$ (the sensitivity by definition. This implies that the lowest detecable q_{min} is:

$$q_{min} \sim 1/\sqrt{P_T} \tag{2}$$

The relation between q_{min} and the limiting magnitude M is (2):

$$M = \mathrm{Cte} - 2.5 \log q_{min} \tag{3}$$

or, by substituting (2) in (3):

$$M = \mathrm{Cte} + 1.25 \log P_T \tag{4}$$

Furthermore, we require the relation between the observed number of meteors N and M to be:

$$N \sim r^{M} \qquad (5)$$

with r the population index (typically 2.5 for streams, up to 3.4 for sporadics). Combining (4) and (5) finally gives:

$$N \sim r^{1.25 \log P_T}$$

or:

$$\text{(underdense)} \qquad \boxed{N \sim P_T^{1.25 \log r}} \qquad (6)$$

The calculations can be repeated for overdense trails (2) for which:

$$P_R \sim \sqrt{q}\, P_T \qquad (1')$$

and hence:

$$\text{(overdense)} \qquad \boxed{N \sim P_T^{5 \log r}} \qquad (6')$$

The Total Observability Function is found by multiplying the previously found Observability Function (1) by the right hand side of (6) (or (6')) for the various transmitters and adding the values.

3. Example

At a given moment during the observation of the Perseids, three transmitters contributed to the reception (r of the Perseids = 2.5):

$$\mathrm{OF}_1 = 215 \qquad P_1 = 60 \text{ kW}$$
$$\mathrm{OF}_2 = 429 \qquad P_2 = 240 \text{ kW}$$
$$\mathrm{OF}_3 = 367 \qquad P_3 = 10 \text{ kW}$$

Here, OF stands for the Observability Function. The Total Observability Function (TOF) is then given by:

$$\mathrm{TOF} = 215 \times 7.75 + 429 \times 15.49 + 367 \times 3.16 = 9471$$

Station 3 contributes relatively more than expected (12%). Note that the units are still arbitrary.

4. Effects on observed rates

The following table gives the relative importance of the correction for transmitting power:

Table 1 --- Relative importance of the correction for transmitting power.

underdense				overdense			
streams (=2.5)		sporad. (=3.4)		streams (=2.5)		sporad. (=3.4)	
P_T	N ($\approx\sqrt{P_T}$)	P_T	N	P_T	N ($\approx P_T^2$)	P_T	N
1	1	1	1	1	1	1	1
2	1.4	2	1.6	2	4	2	6.3
10	3.1	10	4.6	10	98	10	454

Whilst the contribution of faint stations for overdense trails can be neglected, this is not the case for underdense trails (A moderately sensitive set up does already observe underdense trails.) For streams, the contribution of low power stations is even higher than for sporadics.

5. Conclusion

Backscatter reflection rates observed with sensitive equipment require correction with the Total Observability Function, and not just based upon the most powerful transmitter.

Acknowledgment

The author thanks Luc Gobin and Jeroen Van Wassenhove for their continuing interest in this subject.

References

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Taurids 1986

The Taurids 1986 by the Dutch Group "Delphinus"

Koen Miskotte and Bauke Rispens

In 1986, the authors observed the Taurids from Southern France. Together they recorded almost 3000 meteors. The authors also paid attention to the Lyncids.

In the period of October 26 to November 8 meteor activity was observed visually by two members of the Dutch meteor observing team "Delphinus", Koen Miskotte and Bauke Rispens. We had some automatic cameras installed, three Canon T70's, one with fish eye, the others with 1.4 standard lenses, mostly provided with color reversal film. During the night the cameras runned totally independent of any human interference.

In this period, several streams are active. We followed the activity of the Taurids North, the Taurids South, the Orionids, the Lyncids and the sporadic background.

The maximum activity of both Taurid substreams was covered, as well as the descending branch of the Orionid stream. The Lyncids are a recently discovered stream. They are fast meteors, many members having trains. The first evidence of an active radiant in the Lynx was found in 1983 by Koen Miskotte and some other Dutch observers. For the first time now, the activity of this stream has been covered in a decent way, that is, in a continuous period of 13 nights.

The Taurids themselves were very decently covered, as these simple numbers will show: Koen Miskotte recorded 433 Taurids out of 1713 meteors and Bauke Rispens had 340 Taurids out of 1158.

Again, the observations were done in the French Provence in the lovely village of Puimichel. Thanks to Dany Cardoen and Arlette Steenmans we had a very enjoyable stay. We had the pleasure to co-observe some nights with some Belgian amateurs like Paul Roggemans, Christian Steyaert and Maurice de Meyere. The latter two did radio observations (forward scatter) on the Taurids. On November 04-05 and November 05-06, we had a coordinated radio-visual action with them (1).

Of the 13 nights, only one was entirely spoiled by clouds. Most of the other nights were very clear. Temperature was about 0 °C to 5 °C at night, mostly with a strong northern wind. This made it difficult to stay warm. Nevertheless both observers managed to break their nocturnal time record on November 03-04. Koen Miskotte even observed nearly 11 hours! The zodiacal light was very prominent in the morning hours and during the whole night the "Gegenschein" was easily visible for all observers.

These nearly perfect conditions account for the high numbers of meteors, but few bright ones appeared. An exploding fireball of magnitude -8 or -10 was seen directly by Koen Miskotte and indirectly by Bauke Rispens on November 07 at $23^h27^m03^s$ UT. It was not recorded by any camera.

Table 1 --- Observations of Taurids, Orionids and Lyncids in October and November 1987 by Koen Miskotte and Bauke Rispens.

Date	Obs	T_{eff}	Lm	F	Tau	Ori	Lyn	Spor	Tot
Oct 26-27	KM	3.15	6.60	1.00	9	0	0	43	52
26-27	BR	2.73	6.40	1.00	4	0	0	31	35
27-28	KM	2.10	6.37	1.00	5	0	0	32	37
28-29	KM	6.58	6.51	1.00	39	24	2	116	181
28-29	BR	1.45	6.33	1.00	4	5	3	31	43
29-30	KM	3.77	6.46	1.00	41	34	10	83	168
29-30	BR	2.53	6.27	0.97	31	9	4	33	77
30-31	KM	6.25	6.59	1.00	65	20	20	164	269
30-31	BR	5.73	6.37	1.00	65	12	15	147	239
31-32	KM	2.73	6.36	1.00	21	11	2	50	84
31-32	BR	2.52	6.30	1.00	31	6	3	58	151
Nov 01-02	BR	0.63	6.20	0.80	9	1	2	12	24
03-04	KM	10.60	6.51	1.00	72	8	13	189	282
03-04	BR	8.08	6.33	1.00	61	4	0	118	183
04-05	KM	2.93	6.48	1.00	41	3	2	96	142
04-05	BR	6.32	6.23	0.99	66	6	8	127	207
05-06	KM	2.00	6.20	1.00	13	0	0	39	52
05-06	BR	2.08	6.37	0.90	14	0	0	41	55
06-07	KM	7.45	6.51	1.00	67	5	14	170	256
06-07	BR	4.48	6.28	1.00	49	1	9	110	169
07-08	KM	5.40	6.48	1.00	60	1	3	126	190
07-08	BR	0.73	6.40	1.00	6	0	1	21	28

Table 2 --- Magnitude distribution for the Taurids 1987.

Obs	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
KM	0	2	0.5	1.5	4.5	7	37	91	202	79.5	8	433	3.69
BR	1	1	0.5	1.5	2	4.5	19.5	59.5	144	103	3.5	340	3.90

Table 3 --- Magnitude distribution for the Orionids 1987.

Obs	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
KM	0	0	0	0.5	2.5	3	5	25.5	43	24	2.5	110	3.74
BR	0	0	0	0	0.5	4.5	10	10.5	12.5	5.5	0.5	44	3.10

The following issue of WGN will appear in February 1988. Contributions are due by January 10. Please note that from the February issue onwards all articles will be in English (see also on page 175 of this issue).

Also, this is the last issue of volume 15, 1987. So, if you want to continue receiving WGN in the future, please renew your subscription promptly, if you did not already do this!

Table 4 --- Magnitude distribution of the Lyncids 1987.

Obs	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
KM	0	0	0	0.5	0.5	1.5	7	13	29	14.5	0	66	3.67
BR	0	0	0	1	1	3	3.5	11	19	6.5	0	45	3.33

Table 5 --- Magnitude distribution of the sporadics in October-November 1987.

Obs	-8	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
KM	1	0	1	2.5	3.5	18.5	40	184.5	562.5	280.5	13	1108	3.94
BR	0	0	0	2	5	13	40	122.5	263	265	17.5	729	4.03

The Taurids 1986 in Australia

Jeff Wood

In 1986, bad weather severely hampered the observation of the Taurids from Australia. Nevertheless, a total of 121 man hours of observations were made by 22 persons.

As the maximum for the Taurid meteor stream occurred under favorable moon conditions, a big effort was planned for the 1986 display. Unfortunately, the weather put paid to our ambitions and so our results were somewhat disappointing. From September 27-28 to November 28-29, Australian observers obtained data on only 21 nights, many of which were clear for only a short time. A total of 121 man hours of observations were made with 22 observers taking part. The names of the observers were as follows:

Fiona Cowie, Peta Fitzgerald, Gary Docking, Michelle Treasure, Jenny Ball, Joh-Ann Burrows, Meeghan Clay, Brian Macauley, Guy Harvey, Andrea Jahn, Nicholas Harvey, Louise Cockeram, Darren Ferdinando, Shane Smith, Tanya Gaitskell, Justin Whitney, David Cake, Neil Ingwood, Jeff Wood, Robert Purvinskis, Paul Lehman, George Downes.

Table 1 --- ZHR-values of the Taurids 1986 in Australia.

Date	Nr. Obs.	ZHR	Date	Nr. Obs.	ZHR
Sep 27-28	4	no T seen	Oct 21-22	2	6.5 ± 2.1
28-29	33	0.5 ± 0.6	22-23	2	13.7 4.4
29-30	7	0.8 0.4	25-26	2	2.9 2.9
Oct 03-04	4	2.4 1.8	27-28	2	6.1 1.8
04-05	2	2.2 0.7	31-32	9	5.1 2.0
07-08	3	4.4 1.2	Nov 01-02	2	3.1 0.2
08-09	1	no T seen	07-08	4	5.5 1.5
10-11	30	1.4 ± 1.1	19-20	1	no T seen
11-12	3	3.2 0.3	21-22	2	2.8 ± 2.8
12-13	4	3.1 1.8	28-29	2	no T seen
20-21	2	2.8 2.8			

Very few Taurids leave trains. This year, only 4.6% of the Taurid meteors seen had a train. All of these were of a short duration.

Table 2 --- Magnitude distribution of the Taurids 1986.

-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
2	0	1	4	6	11	18	29	26	9	2	108	2.60

The following color distribution was derived from 42 Taurid meteors of magnitude +2 or brighter:

Red	2.4%	Orange	9.5%	Yellow	42.9%
White	33.3%	Green	0.0%	Blue	11.9%

Figure --- The Australian observing team of Jeff Wood.

Observational Results from America

Observational Results 1986-87 from Florida, USA

Norman W. McLeod III

A short description is given of observations of the Perseids 1986, the Lyrids 1987 and the η-Aquarids 1987. Much attention is paid to the role played by the perception of the observer.

A large part of 1986-87 was wiped out by an El Nino condition weatherwise. Although not as severe as the one in 1982-83, El Nino gives about a year of very cloudy weather. From the 1986 Perseid maximum until right before the 1987 Lyrid maximum, I had only a handful of clear nights. Most of those concentrated perversely around the full moon; in fact, I have not had a cloudy full moon night in over a year! The balance of 1986 meteors was almost completely lost which was my worst run of bad luck since 1976.

The Orionids, Geminids and Ursids 1986 and the Quadrantids 1987 were almost completely lossed, due to either full moon or bad weather.

The 1987 Lyrids were the poorest ever. In skies with a limiting magnitude of 6.5 with smoke and haze present, I failed to top 5 Lyrids per hour. Ever since the big blowoff in 1982 the Lyrids have been weakening. In the 1970's I always got 13 to 16 Lyrids per hour as a very reliable maximum. George Spalding did no better in England. He suggests the Lyrids would not be very noticeable in a richer time of year; I recall Lovell also described this shower as "scarcely no-detectable"! I cannot go to that extreme, for excellent skies are needed to see the large number of faint Lyrids. I would find a rate of 5 per hour *very* noticeable at *any* time. (E.g. σ-Hydrids and Monocerotids show up well against a fantastic Geminid background.) 4 per hour qualifies as "major"; the IAU does not define "minor" and "major shower", but with my experience I am taking the liberty of doing so.

The η-Aquarids were good. May 06-07 had a spectacular hour when I saw 31! I could hardly believe what was happening! The second half of that hour had fewer than the first, but did have a simultaneous η-Aquarid pair. An extra quarter hour going into twilight got 8 more shower members. The average η-Aquarid magnitude for the big hour (limiting magnitude 7.0 only, 28 shower meteors) was a faint 3.32; for 99 η-Aquarids total, similar skies, I averaged 2.94 (long-term average 3.04). The brightest was only of magnitude -1; brighter ones are are exceedingly rare. For seven May mornings (01, 03, 04, 06, 07, 08 and 09) the final dark local hour in skies mostly having a limiting magnitude of 7.0, I had rates of 6, 9, 11, 19, 31, 16 and 4 respectively. With so little observing time daily (a little more than two dark hours here), a claim that the η-Aquarids "peaked three days late" is not valid. I have had my best single Eta-hour anywhere from May 03 to May 12 over the years.

The high υ-Pegasid rates from one observer in Germany last August can be dismissed for reasons covered in my *Sky and Telescope 1984* letter. I was out the same nights with superb skies and never saw more than 1 meteor of that stream per night. Around August 05-08 I get total hourly rates in the 20's-30's; if a υ-Pegasid rate of 18 added itself into that, I would be in the 40's total. That is the simplest indication that no such display took place.

Paul Roggemans reports that he had the second-lowest perception in his group Perseid watch in 1986. Thus I am impelled to change my evaluation of the shower strength to normal for Europe. The high rates there were due largely to perception; George Spalding's good rates contradict that, however.

A more complex situation is becoming evident in reference to perception. Originally I thought that a person with twice my perception would see twice my rates from any shower. In reality a large number of observers see far more Perseids than I do, but only moderately more Geminids and virtually no more Orionids! Perception at higher levels is thus based on magnitudes and train percentages. Perseids and Geminids are fairly bright but about even; the numerous trains of the former enable other observers to greatly exceed my rates. The Orionids are so faint, on the other hand, that I do as well as anyone on them. Among current active observers, Paul Roggemans, Robert Hays and Robert Lunsford all fit this description. Paul Jones did, too, as well as Brenda Branchett.

How did perception became a great issue to me? In my earliest observing group I personally saw the most meteors which led me to believe I have very good eyes for meteors. (Mark Adams reports an identical experience.) Then one individual joined us for a few sessions, and I was bewildered over his seeing half again my rates! Being beaten did not make any sense. No larger AMS totals were being submitted at the time either. The first case of AMS high perception was a doozy. Conger came along in 1966-68 with rates and totals that blew Olivier right out of his chair and me out of mine. Olivier could not explain it; Conger appears to have had about 4 to 5 times my perception.

In 1970 the legendary Bill Gates came along. He attributed his amazing rates to "excellent mountain skies" at first. Over the ensuing years we observed together a number of times. It took only ten minutes to find out that Gates had extraordinary perception, well documented at 3.8 times. One other thing was bizarre with Gates. He would see only twice my shower rates but ten times my sporadic rates. His big gains came in faint meteors, unlike any other observer I have ever known.

The first time with just slightly elevated perception came with Karl Simmons in 1971. I could not keep up with him, instead trailing a bit further each hour. That night, in July, I saw 58 meteors and he saw 72. Karl's perception is 1.2.

Beginning in the early 1970's I gradually fell further behind the active observers as higher perceptions just came out of the woodwork. From being the best in my earlier days, I have become one of the worst in the late 1980's! One rationale for this trend is that people with perception lower than mine will have less interest in observing much, which is understandable since they see less. Anyone's interest increases when more is seen.

Perception must not have been such a problem in earlier eras. The "official" shower rates handed down over the decades are in rather good agreement with what I see today. One "official" Perseid maximum rate, 68, is much too high; and a more common one, 50, is still too high. The Geminids are often quoted at 50 which is much too low today. I find 40 for the Perseids and 80 for Geminids to be realistic. The latter has evidently been strengthening rapidly, a trend evident just in my years of observing. The 50 must have been all right early in this century and is beginning to be supplanted by higher numbers. Why are the Perseids quoted so high? I surmise that the casual observing crowd, famous for August observing, has many undocumented high perceptions that have inflated the accepted Perseid rate.

There is some space left to fill. Do not be too optimistic about observing on a full moon night. Bill Katz saw up to 42 Perseids per hour in 1984; I had a very clear morning here as well but saw only 9 per hour for three hours! If your perception is high, your luck will be better. For the Orionids, however, your time is better spent sleeping. I have tried several hours of Taurid full-moon observing and came up with rates of 0 a couple of times. The highest moonlit rates come from the Geminids, understandably so since this is by far and away the year's best.

No Draconids were seen in October 1986 during a watch at the prime time. The closest I got the Geminid maximum was December 09-10, a fine night with Geminid rates to 8. November 06-07 and 07-08 had Taurid rates of mostly 5 or 6.

The η-Aquarids from California, USA

Robert Lunsford

Observations of the η-Aquarids 1987 from the San Diego region are presented and discussed.

All observations below were made from the Alpine site about 65 km east of San Diego, California, and at an elevation of 970 m. Observations were not possible beyond May 6 due to clouds. An average magnitude of 2.40 was found, which was the brightest I ever recorded. Previous values were 3.05 in 1982, 3.05 in 1984 and 2.68 in 1986. This year produced an average dispay of colored meteors (53%). Of these, 96% were blue and 5% were orange. (In 1984, 31.7% were colored and in 1986, 57%.) 54% of the meteors showed a train, compared to 67.3% in 1984 and 67.9% in 1986.

The most notable fact about this year's shower was that the meteors were seen in bunches (much like the Perseids). This was most noticeable during the first hour as gaps as long as 10 minutes went by with no activity. My comments about last year's shower must now be modified since observations were ceased before the actual maximum. I now agree with observers at last year's Texas star party that the maximum has shifted to May 6.

Table 1 --- Observations of η-Aquarids and α-Scorpiids in 1987 from the San Diego region.

Date	Period (UT)	T_{eff}	Lm	F	Aqr	Sco	Spor	Tot
May 02-03	$09^h47^m-10^h47^m$	1.00	6.5	1.00	0	0	6	6
02-03	10 47 -11 47	1.00	6.5	1.00	5	1	10	16
03-04	09 47 -10 47	1.00	6.5	1.00	8	0	12	20
03-04	10 47 -11 47	1.00	6.5	1.00	9	1	11	21
04-05	09 47 -10 47	1.00	6.5	1.00	9	0	3	12
04-05	10 47 -11 47	1.00	6.5	1.00	16	1	11	28
05-06	09 47 -10 47	1.00	6.5	1.00	12	0	14	26
05-06	10 47 -11 47	1.00	6.5	1.00	32	0	15	47
06-07	09 47 -10 17	0.50	6.5	3.33	1	0	2	3

Table 2 --- Magnitude distribution of the η-Aquarids 1987.

-2	-1	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
1	0	7	13	25	28	14	4	0	92	2.40

Canadian Summer 1987 Results

Peter Brown

During the summer 1987, the author observed both in Southern France and in Northern Alberta, Canada. His results are presented and discussed.

Observing this past summer has been the most concentrated, and as can be seen from Table 1, by far the most successful. The beginning of the period sees the full onset of summer twilight for our lattitude, and therefore only two sessions, both with bad interference from twilight. However, in mid July my luck took a turn for the better as I travelled to Europe for some intense meteor observing from the South of France, concentrating on the δ-Aquarids in particular, with an added lookout for the startup of the Perseids. I had the special pleasure of staying with Paul Roggemans, Europe's most notable meteor worker, and his very kind family, on the intermediate leg of the journey to the South of France. I was given the opportunity to experience some wonderful European hospitality from Paul and his family and offer a sincere thanks to them.

After a 20 hour drive with Christian Steyaert and Dirk Laurent through Belgium, Luxemburg and most of France, we finally arrived in St.-Michel-l'Observatoire, a small village in the Haute-Provence. After arriving, we met Paul and Glenn Ticket who had come by train from Belgium.

The first night was limited to observing from within the village limits, since we had arrived too late to make the necessary arrangements at the "Observatoire the Haute-Provence", where the majority of our observing was to be done. I decided to more or less pass up the first night in exchange for some much needed rest, and devote my energies to observing in the next few nights. After having found a suitable location for observing on the observatory grounds the next day (which turned out to be a couple of cement pillars on a hill where the village reservoir was located) we once again found time to rest and rejuvenate ourselves for the upcoming night of observing.

Early in the evening we arrived at our site and set up for observing in the black skies of Southern France. I was surprised to find the limiting magnitude as good as that found at my regular site at Maqua lake; although lights from surrounding towns were visible on the horizon, they did not create any light domes. The only light dome visible was that of Nice directly to our South, and it too was also quite faint.

After having set up we were somewhat surprised to notice some artificial celestial pyrotechnics slicing through several constellations in the West in the form of a green vertical beam. This turned out to be a laser used for determining the height of the ozone layer from the observatory. The building housing the laser was only a few hundred meters away through the forest, and we could often hear voices in the general direction of the building. In the ensuing 10 nights of observing the same general routine was followed. The laser was visible 2 or 3 other nights, although it was usually off because of technical problems or high cloud. The skies turned out to be as dark as those found at Maqua lake on those rare evenings when the aurora is not visible. All in all, I would definitely have to say the St.-Michel site was much superior to my own due to its excellent weather (we missed only 2 nights out of 13) and the fact that the aurora is not visible.

Many useful discussions on many topics in meteor astronomy were enjoyed and I learned a great deal in the area from the meteor workers I was with. I must also say that the meetings often took on a very international flavor. For example, one evening when the skies remained covered by a blanket of cloud that simply would not disappear we found ourselves in a discussion with one of the visiting astronomers. At about 4 am I came to the realization that I was a Canadian at a French observatory with four Belgians, drinking English tea and sampling Danish cookies, listening to an astronomer from Greece tell us stories about his adventures at school in Italy, and listening to the Belgians counter with interesting facts about their journeys in Switzerland. I really needed a program to keep up at times!

Needless to say the meteor observing in France was great. All told, I caught about 935 meteors in just over 50 man-hours of observing. Though the Perseid maximum was not covered by the period, a few fireballs were noticed. The most noteworthy occurred on July 30-31 as we were walking up to our site on the hill. A bright blue flash lit the landscape for a fraction of a second and I immediately tried to shield my eyes by looking at the ground. I had been conditioned to doing this over the past week or so, since we had been getting a great deal of interference from lightning in the Alps only a few hundred kilometer to the East. Before I could mumble any words of thanks for having my night vision ruined, Glenn started yelling in Dutch and pointing up. After I finally coaxed him into translating I realized that the flash was not lightning but a beautiful α-Capricornid fireball high overhead in the SSW. Paul indicated that he thought the light had been car headlights hitting us from behind, showing how bright the flash was. We placed the fireball conservatively at about -8, though it was quite difficult to tell its true brightness.

The Aquarids turned out to be normal this year, but much stronger than I am used to from my normal twilight-ridden, mosquito-infested latitude. The α-Capricornids turned out to be surprisingly strong, with several hours of their activity being unusually strong. Paul too had not seen α-Capricornids in such relative numbers, even from Southern France, in past years. The Perseids showed up in their usual numbers, but with many fewer bright ones than usual. However, it should be kept in mind that this was only the start of the activity curve, and the real show at maximum, although ruined by the moon, would have to wait until I was back in McMurray.

After having returned to Belgium through the heaviest traffic of the year in France (there were 40 million people on the roads on the weekend we decided to come back) I had enough time to rest up and do a little sightseeing before heading for London, and eventually back to my takeoff point in Montreal.

Upon returning to the New World, I raced a 5000 km drive to McMurray which we accomplished in 6 days. My arrival in McMurray was met with rain, drizzle, and cloud. I thought about how clear the skies were in Southern France, and realized what a huge mistake I had made by coming back to "cloud city". From August 11 to August 14, I spent every night up at Maqua lake, managing on every night to get some observing in between the clouds. Rates were good only on August 12-13, when the aurora subsided and the clouds dissipated enough to allow some decent viewing. The show was good, but still my worst Perseid maximum in terms of conditions ever. In past years, even with the moon in the way, at least the aurora and the cloud let up enough for some real observing to take place around the maximum.

As in some form of reparation, my next night at the lake on August 22-23 was the best in the last six months in terms of darkness. With no moon, no clouds, and no aurora the skies were as good as or perhaps a little better than those in the South of France. The rates were about as good as some I had had around Perseid maximum with all its cloud and light from various sources.

My next few sessions at the lake were destroyed either by moon, cloud, or aurora, and I have as yet to see a really decent night since August 22-23. I also managed to acquire a certain jeep vehicle over the summer which will permit me acces to the site during those months in winter when most vehicles are not up to the ascent. Already twice this year we have had to go in search for alternate sites, as the road was not navigatable by truck or car. I bought the jeep with an eye on the Geminid maximum this year, knowing full well what road conditions are like in Northern Alberta at that time of the year.

Table 1 --- Summer observations 1987 of Peter Brown.

Date	Loc	Period (UT)	T_{eff}	Lm	F	Showers	Spor
May 23-24	MQL	05^h25^m-06^h25^m	0.99	5.4	1.0		2
23-24	MQL	06 25 -07 25	0.98	5.9	1.0		3
23-24	MQL	07 25 -08 25	0.96	5.6	1.0		4
July 19-20	SMO	21 00 -22 00	0.97	6.4	1.0	2A,1C	9
19-20	SMO	22 00 -23 00	0.97	6.4	1.0	1P,2C	5
19-20	SMO	23 00 -00 00	0.74	6.2	1.1	2P,1A,3C	4
19-20	SMO	00 35 -01 35	0.97	6.3	1.1	1P,3C	9
20-21	SMO	20 45 -21 45	0.97	6.1	1.0	1A	12
20-21	SMO	21 45 -22 45	0.97	6.2	1.0	2P,1A,3C	8
20-21	SMO	22 45 -23 45	0.97	6.2	1.0	4P,5A,1C	7
20-21	SMO	23 45 -00 45	0.48	6.2	1.0	1A,2C	2
20-21	SMO	00 45 -01 45	0.97	6.2	1.0	4P,1A,1C	10
21-22	SMO	20 45 -21 45	0.98	6.1	1.0	1A	9
21-22	SMO	21 45 -22 45	0.94	6.2	1.0	3A,3C	14
21-22	SMO	22 45 -23 45	0.68	6.2	1.0	6P,2A,1C	6
21-22	SMO	23 45 -00 45	0.97	6.1	1.0	3P,1A	9
23-24	SMO	22 15 -23 15	0.98	6.1	1.0	7P,1A,2C	8
23-24	SMO	23 15 -00 15	0.96	6.2	1.0	4P,4A,3C	6
23-24	SMO	00 15 -01 15	0.81	6.3	1.0	5P,3C	10
23-24	SMO	01 15 -02 15	0.98	6.2	1.0	5P,3A,2C	9
23-24	SMO	02 15 -03 15	0.25	6.2	1.0		5
24-25	SMO	20 45 -21 45	0.97	6.1	1.0	2A,2C	8
24-25	SMO	21 45 -22 45	0.95	6.2	1.0	3A	11
24-25	SMO	22 45 -23 45	0.96	6.2	1.0	2P,4A,2C	9
24-25	SMO	23 45 -00 45	0.79	6.3	1.0	2P,1A	8
24-25	SMO	00 45 -01 45	0.92	6.3	1.0	6P,3A,2C	10
24-25	SMO	01 45 -02 45	0.97	6.2	1.0	9P,2A,1C	5

Table 2 (continued)

Date	Loc	Period (UT)	T_{eff}	Lm	F	Showers	Spor
Jul 25-26	SMO	$23^h40^m-00^h40^m$	0.97	6.2	1.0	8P,5A	16
25-26	SMO	00 40 -01 40	0.59	6.2	1.0	4A,2C	5
25-26	SMO	01 40 -02 40	0.96	6.1	1.0	3P,3A,3C	9
26-27	SMO	20 45 -21 45	0.96	6.3	1.0	1P,2A,2C,1K	6
26-27	SMO	21 45 -22 45	0.94	6.4	1.0	2P,3A,3C	13
26-27	SMO	22 45 -23 45	0.94	6.4	1.0	2P,5A,1C	8
26-27	SMO	23 45 -00 45	0.94	6.4	1.0	2P,4A,1C	17
26-27	SMO	00 45 -01 45	0.82	6.4	1.0	4P,3A,3C	18
26-27	SMO	01 45 -02 45	0.81	6.3	1.0	6P,13A,4C	17
27-28	SMO	21 05 -22 05	0.93	6.2	1.0	2P,1A,2C	13
27-28	SMO	22 05 -23 05	0.98	6.3	1.0	3P,1A,4C	13
27-28	SMO	23 05 -00 05	0.92	6.3	1.0	4P,8A,4C,1K	12
27-28	SMO	00 05 -01 05	0.98	6.2	1.0	8P,9A,3C	8
27-28	SMO	01 05 -02 05	0.98	6.2	1.0	9P,3A,1C	13
27-28	SMO	02 05 -03 05	0.45	6.1	1.0	5P,5A	2
28-29	SMO	21 45 -22 45	0.85	6.2	1.0	7P,2A,8C	9
28-29	SMO	22 45 -23 45	0.95	6.3	1.0	6P,4A,4C	15
28-29	SMO	23 45 -00 45	0.92	6.3	1.0	2P,6A	13
28-29	SMO	00 45 -01 45	0.75	6.3	1.0	5P,9A,2C	16
28-29	SMO	01 45 -02 45	0.95	6.2	1.0	9P,8A	22
29-30	SMO	21 00 -22 00	0.93	6.2	1.0	2P,2A,1C	8
29-30	SMO	22 00 -23 00	0.65	6.2	1.1	3A,1C	6
29-30	SMO	23 00 -00 00	0.75	6.2	1.2	7A,2C	10
30-31	SMO	20 55 -21 55	0.93	6.0	1.1	4A,2C	4
30-31	SMO	21 55 -22 55	0.93	6.1	1.0	1P,3A,3C	7
30-31	SMO	22 55 -23 55	0.87	6.2	1.0	5P,6A,5C,1K	12
30-31	SMO	23 55 -00 55	0.86	6.2	1.0	7P,10A,2C	15
30-31	SMO	00 55 -01 55	0.79	6.3	1.0	13P,12A,3C	9
Aug 11-12	MQL	06 25 -07 25	0.90	5.3	2.8	4P,1K	3
12-13	MQL	07 35 -08 35	1.00	5.1	1.2	9P	0
12-13	MQL	08 35 -09 35	1.00	5.1	1.5	25P	4
12-13	MQL	09 35 -10 35	0.32	4.7	1.0	4P	1
13-14	MQL	08 40 -09 40	1.00	5.7	1.1	13P,2C	4
14-15	MQL	05 00 -06 00	0.99	6.0	1.0	6P	3
14-15	MQL	06 00 -07 00	0.91	5.7	1.3	1P	2
14-15	MQL	07 00 -08 00	0.82	5.3	1.4	4P	2
22-23	MQL	05 20 -06 20	0.96	6.4	1.0	1P,1K	9
22-23	MQL	06 20 -07 20	0.97	6.5	1.0	3P,1A,2K	7
22-23	MQL	07 20 -08 20	0.37	6.5	1.0	3P,1A,3K	9
22-23	MQL	08 20 -09 20	0.76	6.5	1.0	1P,1C,1K	14
23-24	MQL	07 10 -08 10	0.95	6.2	1.0	6P,1K	11
23-24	MQL	08 10 -09 10	0.94	6.2	1.0	3P,1C,3K	5
29-30	MQL	05 50 -06 50	0.91	6.2	1.0	1A	5
Sep 12-13	MQL	04 15 -05 15	0.96	6.0	1.0	1P ? (ed.)	2
12-13	MQL	05 15 -06 15	0.48	5.7	1.0		3

The streams covered in the above observations, are the Perseids (P), the δ-Aquarids (A), the α-Capricornids (C) and the κ-Cygnids (K)

The observations were done at:

Maqua lake (56°23' N, 111°16' W) (MQL)
Saint-Michel-l'Observatoire (43°55' N, 5°55' E) (SMO)

On the following page, a magnitude distribution is given.

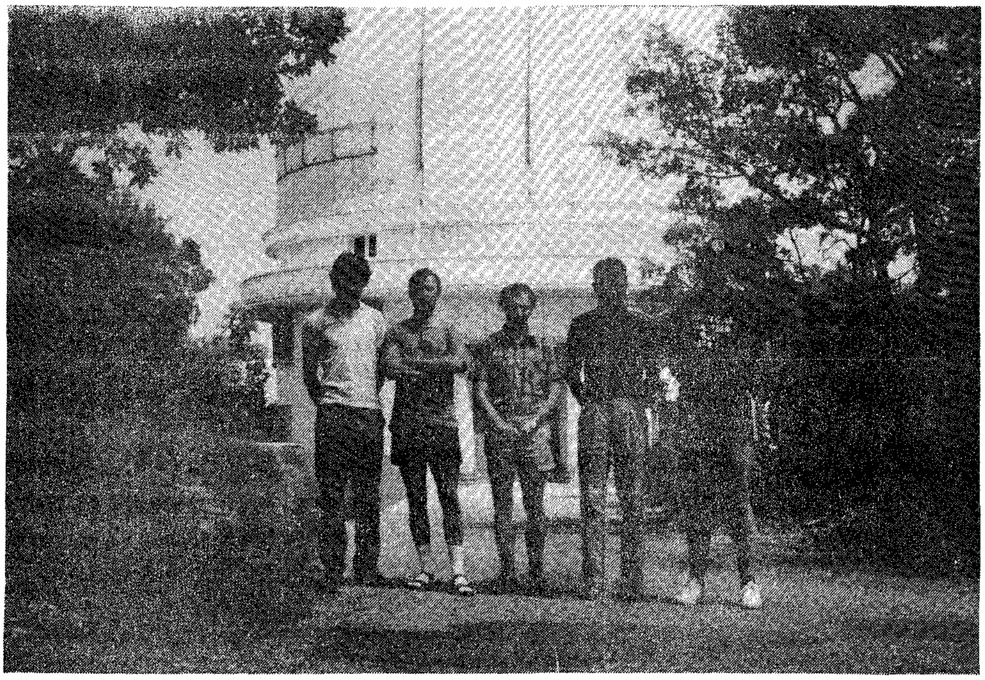

Figure --- The observing team at Saint-Michel-l'Observatoire, Haute-Provence, France. From left to right: Paul Roggemans, Dirk Laurent, Christian Steyaert, Glenn Ticket and Peter Brown.

Table 2 --- Magnitude distribution of the showers covered in Table 1. Sporadic magnitudes are up to July 30-31 only.

Stream	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	Tot	$\bar{m}$
Pers.	0	0	0	1	2	8	22	45	92	81	15	266	2.71
δ-Aqr.	0	0	0	1	1	3	2	35	60	55	14	171	2.64
α-Cap.	0	0	0	1	3	3	9	20	31	31	9	107	2.83
κ-Cyg.	0	0	0	0	0	0	1	3	6	3	2	15	3.13
Spor.	1	0	1	2	2	2	16	49	197	226	80	575	3.47

Short Notes

Subscriptions to "Meteor News"

American Meteor Society

We would like to extend to you our invitation to subscribe to *Meteor News*. Annual rates are 3.95 USD per year in the United States. Foreign subscriptions are 6.00 USD per year by surface mail (including Canada) and 9.00 USD per year by airmail. Make all checks and money orders payable to Meteor News and mail to *Meteor News, Route 3, Box 1062, Callahan, FL 32011, USA*.

Photographs for WGN

Marc Gyssens

As you can see yourself, we intend to publish photo's regularly in *WGN*. Therefore we invite authors to send us relevant black and white photographs (prints) for publication. Also, if you should have a nice picture for the cover, please send it to us; we are running out of stock!

International Meteor Weekend

Oldenzaal, March 25-27, 1987

Casper ter Kuile

1. Objectives and history

Most of those who receive this announcement probably know about the International Meteor Weekends. To those who do not, we shall briefly explain the purpose of these weekends.

The main purpose of this meetings of meteor workers from all over Europe is the exchange of results, experiences, methods of reduction and so on. Also the meetings are intended to get in touch with other meteor workers. On the official program are, among other things, lectures by participants, poster presentations, a braintank-discussion and presentations by some observer-groups.

In the past, meteor weekends were held at the following locations:

June	1979:	Bonn	(F.R.G.)
November	1980:	München	(F.R.G.)
February	1982:	Hasselt	(Belgium)
May	1983:	Denekamp	(the Netherlands)
February	1985:	Violau	(F.R.G.)
October	1986:	Hingene	(Belgium)

The 1988 event is the seventh international meeting that will be organized since the first meteor weekend in Bonn. The response to the weekends has been growing ever since, reaching a climax at Hingene, which was organized by the Meteor Section of the VVS. Some 50 people attended this highly successful weekend.

2. The organizers of the 1988 Meteor Weekend

The International Meteor Weekend 1988 will be organized by HASA. The organization was given to them at the previous weekend in Hingene. "HASA" stands for "Astronomical Society of the city of Hengelo". HASA is a well known group of young amateur astronomers. Many HASA members are dedicating of lot of their time to meteor observing. Most observations take place at the meteor observatory "Buurse". Buurse is a little village near the German border in the South of Twente. The organizing committee consists of Frank Witte, Mark van Rossum, Jan Lanzing and Casper ter Kuile.

3. Date and place of the International Meteor Weekend 1988

The meteor weekend starts on Friday March 25, 1988. Arrival of participants is expected between 14^h and 18^h. The conference will be closed on Sunday March 27 after lunchtime.

The meteor weekend will take place in "Erve het Hulsbeek" near Oldenzaal about 20 km from the German border. "Erve Het Hulsbeek" is part of a large recreation area. It is located in one of the finest parts of the Netherlands, called Twente. So, if the weather is fine, it is possible to go for a walk in the woods.

"Erve het Hulsbeek" was formerly a farmhouse, but has been reconstructed into a conference place. The restaurant, located at ground level, is decorated in an oldfashioned style while the conference room, which is at the first floor, is pretty modern. The sleeping facilities are in the former stable.

Please do not forget to pay your dues if you want to receive the more than 200 pages of meteor news in WGN each year in 1988 as well! Note that, as explained on p. 175, WGN will be entirely in English from the next issue onwards!

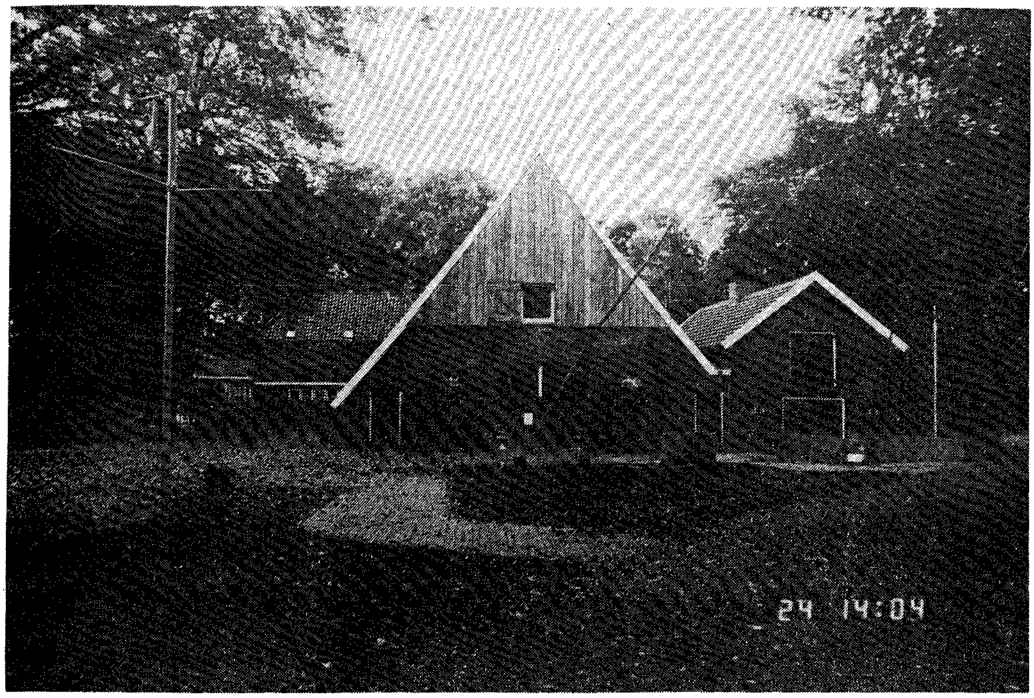

Figure 1 --- The site of the 1988 International Meteor Weekend.

Per November 8, some 30 people have already expressed their interest to attend the International Meteor Weekend in 1988. The number of participants staying overnight at "Erve het Hulsbeek" is limited to 52. However, when more than 52 people register for the 1988 event, we will take care of other accomodation for them. At maximum the conference roon can accomodate 60 people. If more than 60 people register, we shall have to move to an alternative conference room about 1 km away from "Erve het Hulsbeek".

3. Program

The official language of the conference is English. We hope this will not be a problem for the participants.

The program has not yet been determined in full detail. The headlines of it are roughly as follows: Friday evening, we shall move to the nearby cafe annex conference room to relax after the stress of your journey. Saturday will be filled with lectures, slide set demonstrations and all other activities. On Saturday evening, the braintank discussion will take place in the same cafe where we spend Friday evening. It is possible here to have a drink at moderate prices; these refreshments are not covered by the subscription fee.

A certain number of participants have already offered to present a lecture. You can participate in one of the following activities: lecture presentations, slide presentations, poster presentations, video presentations, computer program demonstrations, expositions and sale stands.

If you plan one of the above mentioned activities, you can give detailed information on the subscription form which will be send to you when you make your reservation.

When you have any ideas to make this international meeting still more successful, please do not hesitate and inform the organizing committee!

A few months after the Meteor Weekend, a booklet will be published including the text of the lectures held there. If you are not able to attend the I.M.W. 1988, you can write an article for the proceedings. Just inform the organizing committee about your plans!

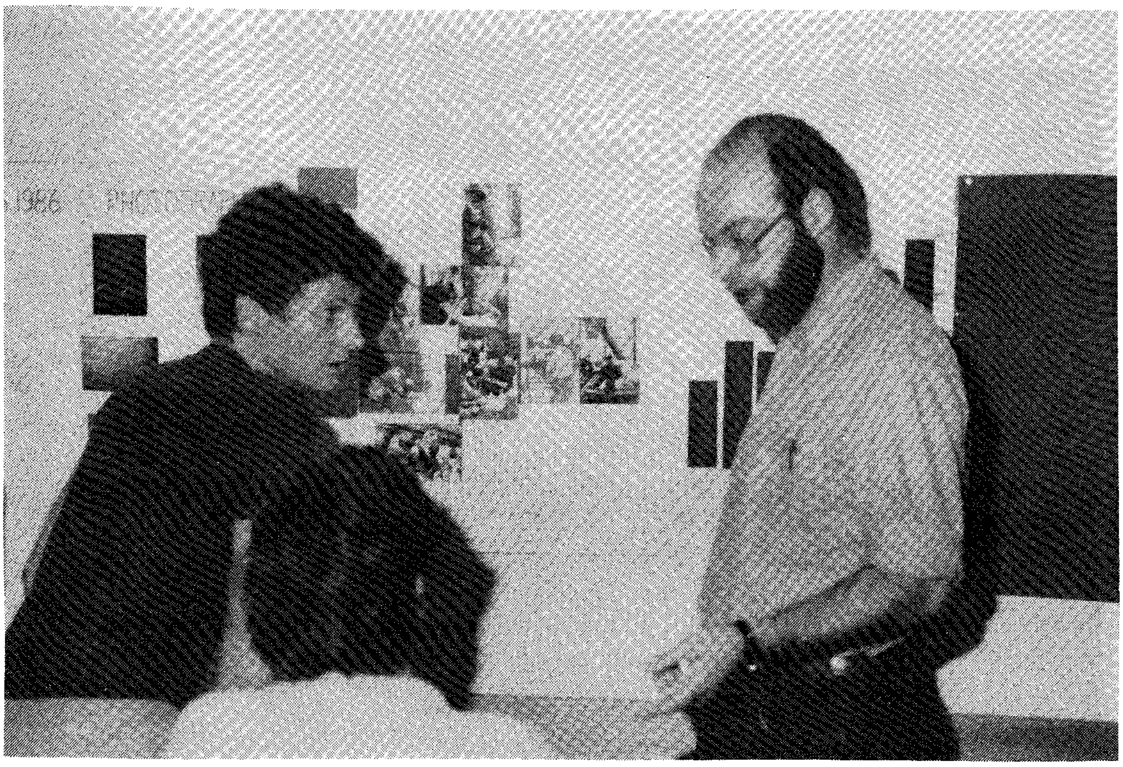

Figure 2 --- Detlef Koshny in discussion with Carl Johanninck at the International Meteor Weekend 1986, at Hingene (Belgium).

4. Practical information

We have managed to keep the subscription fee very low: for the whole weekend, you pay only 70,- NLG (Dutch guilder). For this bottom-level price, you get: dinner on Friday and Saturday, breakfast and lunch on Saturday and Sunday and a bed for two nights. It is also possible to arrange sleeping facilities yourself, in which case the price for the weekend will be only 50,- NLG.

Reservations can be made now. Please write a reservation letter and send it to Mark Van Rossum (address below). Be sure to include your full address. In return you will receive a subscription form, which you have to complete and then send back to Mark van Rossum. Anyone who has registered for the weekend will also receive detailed information on how to reach "Erve het Hulsbeek".

We request participants from Eastern Europe to contact Frank Witte as soon as possible (address below). We shall then send you an official invitation for the weekend. All your expenses in the Netherlands, including the Saturday night drinks, will be paid for by the organizing committee.

5. Sponsoring

We are grateful to Elsevier Science Publishers for their financial support. Of course, modest donations to help cover expenses will be appreciated.If you would like to sponsor this event, or, if you know someone who wishes to do so, please contact the organizing committee.

6. More information about the International Meteor Weekend 1988

Send all your correspondence, including your reservation letter to:

- for Eastern Europe only: *Frank Witte, Enschedesestraat 105, NL-7551 EK Hengelo, the Netherlands*;
- for all other countries: *Mark van Rossum, Pierre Monteuxstraat 76, NL-7558 EB Hengelo, the Netherlands*.

Every person having attended one of the previous weekends, will receive a newsletter with more detailed information. Also, we shall be able to tell you more in the next issue of *WGN*. HASA wishes you a wonderful, bright New Year!

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