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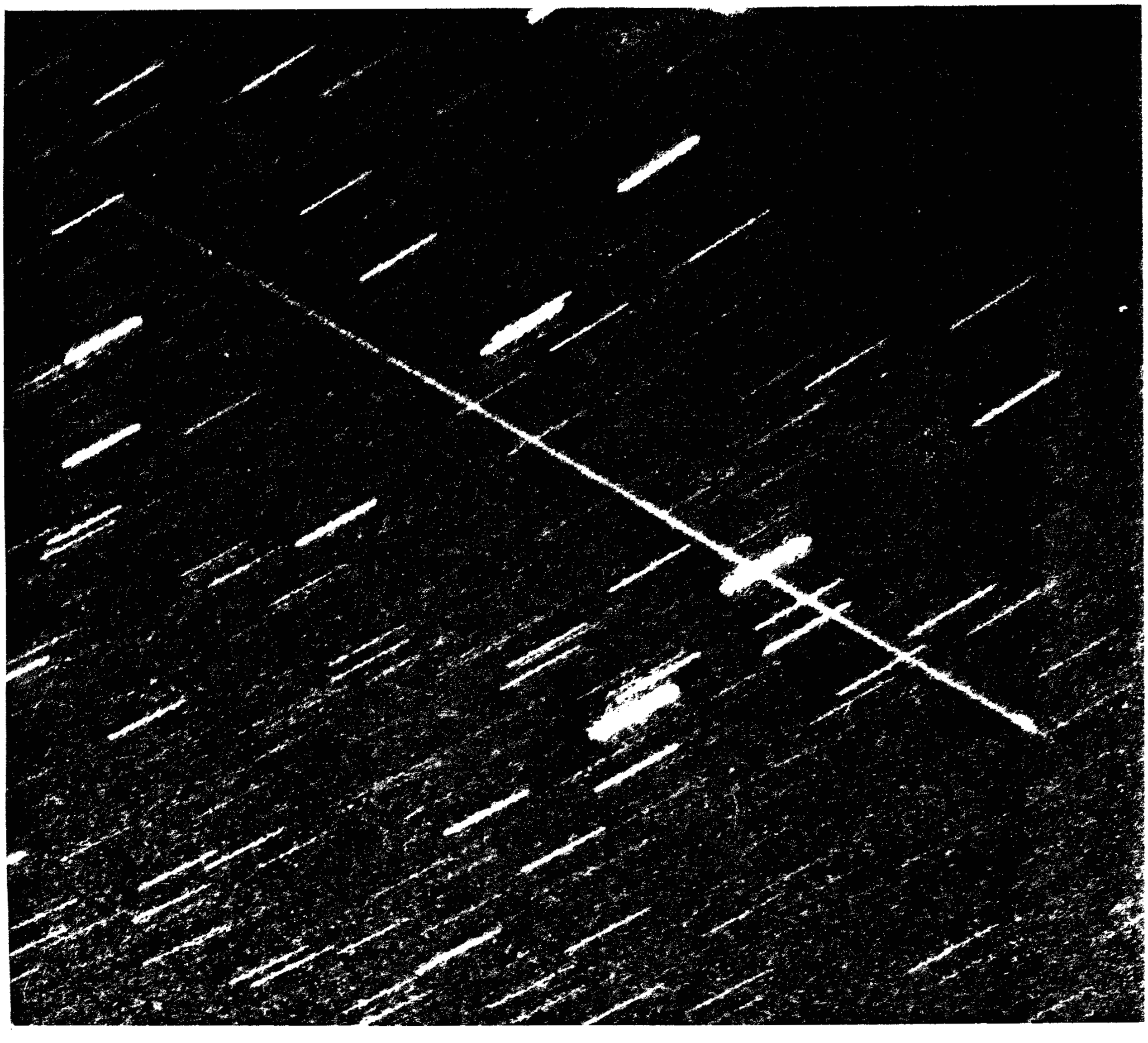
TWEEMAANDELIJKS TIJDSCHRIFT

WGN The international circular for meteor observers

KONTAKTBLAD VAN METEOORWAARNEMERS IN DE BENELUX



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ABONNEMENTSGELDEN VOOR 1987

Het abonnementsgeld voor WERKGROEPNIEUWS voor 1987 werd vastgesteld op 300 Bf . V.V.S.-leden die in België wonen en die hun lidgeld voor 1987 aan de V.V.S. betaald hebben , hoeven slechts 200 Bf te betalen. Vorig jaar zijn de onkosten flink gestegen , vooral de verzendingskosten namen sterk toe. We hopen echter dat u de kwaliteit en de hoeveelheid van de aangeboden informatie naar waarde zult beoordelen. Uw waardering mag best blijken uit een kleine extra bijdrage . De prijs die we vragen is werkelijk een strikt minimum , nl. de kostprijs van het drukwerk,de postzegels en fotocopieerwerk. De organisatiekosten,korrespondentie enz. worden tot de werkingskosten van de V.V.S. gerekend, vandaar dat V.V.S.-leden een korting krijgen. We houden de abonnementsprijs op een minimum om een maximaal aantal mensen de kans te geven het WGN te bekomen. Vindt u die prijs te laag en bent u bereid meer te spenderen , aarzel dan niet,stort iets extra , het komt WGN ten goede ! Dank !

Bezorg ons niet nodeloos extra werk in de loop van 1987 en hernieuw op tijd , dat kan vanaf nu door storting op postrekening 000-0688050-29 van P.Roggemans. Vermeld WGN 1987.

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AKTIE OPROEP

OKTOBER – NOVEMBER 1986

Paul Roggemans

Tabel : maanlicht oktober en november 1986

Datum	k	Datum	k
Vrijdag 3 oktober	0.01-	Vrijdag 7 november	0.29+
Vrijdag 10 oktober	0.44+	Vrijdag 14 november	0.94+
Vrijdag 17 oktober	0.99+	Vrijdag 21 november	0.83-
Vrijdag 24 oktober	0.68-	Vrijdag 28 november	0.18-
Vrijdag 31 oktober	0.07-	Vrijdag 5 december	0.16+

N.M.: 3 oktober, 2 november, 1 december
E.K.:10 oktober, 8 november, 8 december
V.M.:17 oktober,16 november,16 december
L.K.:25 oktober,24 november,24 december

1.Nog eens Draconiden ?

Ignacio Ferrin , een meteoorwaarnemer uit Venezuela, vestigt de aandacht op de mogelijkheid op Draconidenaktiviteit tussen 8 en 9 oktober dit jaar. Persoonlijk lijkt het me onwaarschijnlijk dat we dit jaar nog een echte Draconidenaktiviteit gaan krijgen. Het lijkt me onwaarschijnlijk dat deze kompakte zwerm reeds zover over de komeetbaan zou zijn uitgesmeerd. Toch moeten we waakzaam blijven . Vroegere verschijningen van andere "periodieke" of "tijdelijke" zwermen zorgden voor verrassingen. Daarom vraag ik iedereen om op post te zijn tijdens de nachten 7-8,8-9 en 9-10 oktober. Ook de beroepsastronomen zijn deze nachten in "verhoogde staat van paraatheid" ! Zij plannen vooral radarobservaties. Wees niet teleurgesteld als er geen Draconiden te zien zijn . Bij dit soort zwermen heeft een negatieve waarneming evenveel waarde als een andere. Het komt erop aan om met zekerheid vast te stellen dat er helemaal geen aktiviteit te bespeuren valt. Mocht er toch enige aktiviteit optreden , dan is dat aardig meegenomen. Het zou onze historiek van de Draconiden mooi aanvullen.

2. Orioniden ; stukjes komeet van Halley van dichtbij ...

De Orionidenzwerm is in de aktualiteit gekomen met de komeet van Halley. Iedereen herinnert zich ongetwijfeld de passage van de Giotto door de stofstromen uit de komeet. De intense stofregen heeft het ruimtetuig zowat doorzeeft. Dit bezoek aan de komeet was tevens een bezoek aan de geboorteplaats van de meteoorzwerm die met de komeet geassocieerd is. Op Aarde is deze zwerm tweemaal in een jaar te zien . Nu in oktober kunnen we de Orioniden observeren en hierdoor krijgen we een idee van de dichtheid en van de opbouw van de stofzwerm die in de loop van vele duizenden jaren werd gevormd tijdens de opeenvolgende periheliumpassages van de komeet Halley.

Uiteraard proberen we de Orionidenzwerm zo goed mogelijk te volgen. Tijdens deze periode van het jaar is het echter vaak moeilijk om waarnemers buiten te lokken , het enthousiasme is bij de meeste waarnemers in de laatste jaren op een onaanvaardbaar peil teruggevallen. Het weer is ook niet erg coöperatief in deze periode en de overdreven verlichting van het geval Belgenland doet de rest. We hebben dus echt nood aan meer waarnemingen van de Orioniden. In 1986 zal de maan aanzienlijk storen . Men kan enkel de vroege Orioniden observeren tussen 10 en 16 oktober in de laatste uurtjes van de nacht. In het begin van de nacht stoort de maan en bovendien staat de radiant pas gunstig aan de hemel in het tweede deel van de nacht. Na volle maan op 17 oktober stoort de maan in de nanacht net wanneer de radiant gunstig staat. 's Avonds kan men geen Orioniden zien. De maan zal blijven storen tot bij het einde van de Orionidenaktiviteit.

3. De Tauriden , dit jaar de beste herfstzwerm !

Deze periode van het jaar is gekenmerkt door een vrij hoge sporadische aktiviteit. De Tauridenaktiviteit is zeker niet denderend hoog , toch is deze zwerm de moeite. Wellicht een mooie troost bij de idee dat de overige herfstzwermen in het maanlicht verzwolgen worden ! Vooral tijdens de eerste twee weken van november vertonen de Tauriden het beste aan aktiviteit dat ze in petto hebben. In deze periode zal de maan slechts in de laatste nachten storen. Voor enkele meteorenwaarnemers is deze periode alvast voldoende aantrekkelijk om een waarnemingsverblijf in het sterrenland van Puimichel te plannen. Personen die zinnens zijn om de Tauriden waar te nemen in Zuid-Frankrijk kunnen altijd nog kontakt opnemen met de werkgroepleider.

4. De 'verloren' zwermen van 1986.

De Leoniden vallen dit jaar net samen met de volle maan. Die kan je dus vergeten. Ook de Geminiden zullen grotendeels in het maanlicht verloren gaan , alhoewel er in het begin van de periode tot net voor het maximum nog kan waargenomen worden ná maansondergang.

5. Verdere plannen ...

Nu de waarnemers geen x,y-coördinaten moeten invullen ontvingen we sneller de waarnemingsformulieren. Daarom vragen we om het bij die afspraak te houden : u mag nog x,y-coördinaten uitmeten het is niet verplicht.

De werkleider is zinnens om rond 24 december (of misschien al vanaf 20 december) naar Puimichel te gaan om er de Ursiden en de Quadrantiden te gaan observeren tot 5 januari 1987. Het zou interessant zijn mochten er nog waarnemers geïnteresseerd zijn. Wie wil de kerstvakantie in de Provence doorbrengen ?

RADIOWAARNEMINGEN AKTIE OPROEP

Jeroen Van Wassenhove

De Perseïden 1986 behoren alweer tot het verleden. De waarnemingen stromen binnen en de verwerking draait op volle toeren. Alle nog resterende waarnemingen worden verwacht voor uiterlijk 20 oktober. Zend ook uw technisch formulier in ! Vele waarnemers vergeten immers dit belangrijk formulier in te vullen.

In de herfstmaanden oktober en november kan men een aantal kleinere zwermen beluisteren. De eerste , de Orioniden, manifesteert zich in de periode van 16 tot 26 oktober met een vaag maximum rond 21 oktober. De radiant bevindt zich op $\alpha = 95°$ en $\delta = +16°$. Bijgevolg bedraagt de maximale hoogte van de radiant 55°. 's Avonds is de radiant niet waarneembaar. De beste waarnemingsperiode voor de O - W richting is van 3h tot 7h U.T. Personen die de gewone FM-band beluisteren kunnen kiezen tussen volgende mogelijkheden ; periode 23h-5h richtingen N-Z ; NO-ZW,periode 4h-10h richtingen ZO - NW. De Orioniden bestaan hoofdzakelijk uit zwakke meteoren. Het aantal sterke reflecties zal dan ook vrij beperkt blijven.

In dezelfde periode vindt men ook de Tauriden terug. De zichtbaarheidsperiode (of moeten we zeggen hoorbaarheidsperiode ?) strekt zich uit van 15 september tot 1 december. Er zijn twee vage maxima : rond 3 november (zuid) en rond 13 november (noord). In tegenstelling tot de Orioniden zijn de Tauriden wel hoorbaar in de vroege avond. Voor de O-W richting ligt de beste periode tussen 22h en 3h U.T. Voor de FM-band kan men kiezen tussen :

periode 20h-01h U.T. richtingen N-Z;NO-ZW
periode 01h-06h U.T. richtingen ZO-NW

De waarnemingen worden verwacht ten laatste op 19 december a.s. Hartelijk dank voor uw medewerking.

RADIOWAARNEMINGEN LYRIDEN 1986

Jeroen Van Wassenhove

> Four members observed the Lyrid Meteor Shower with radio equipment (forward scatter). The only conclusion we can make is that the maximum occurred before or on April 22th, but not later.

De Lyriden werden beluisterd door vier waarnemers: Maurice De Meyere (St.Martens-Latem),Johan Smet(De Pinte),Christian Steyaert(Bottelare) en Jeroen Van Wassenhove (Nazareth). Tabel 1 bevat de lijst van waarnemingen. De meerderheid van de waarnemers luisterde op onregelmatige tijdstippen zodat vergelijking moeilijk wordt. Slechts één waarnemer heeft enkele dagen waargenomen onder identieke omstandigheden (periode 4h00m-5h00m U.T.). Onderstaande grafiek toont de bekomen resultaten. Eén dag 21 april viel eruit wegens zware storingen. De stand antenne-radiant was zeer ongunstig. Om 4h30m stond de radiant op een hoogte van 71°. Voor visuele waarnemingen is dit ideaal, voor radiowaarnemingen katastrofaal. Eenmaal de radiant hoger dan ca 45° staat , daalt de aktiviteit (schijnbaar) spectaculair , soms tot 1/5 van de oorspronkelijke aktiviteit. Dit verklaart dan ook de lage uurfrequentie op de grafiek. Op de morgen van 22 april zien we dat er een vrij hoge aktiviteit is. (18 refl. per uur) . Ook Johan Smet constateerde dit. Tussen 6h40m-7h40m registreerde hij 89 reflecties. Doch we moeten zeer voorzichtig zijn bij de interpretatie van deze resultaten. Er werden immers geen vergelijkbare waarnemingen verricht op 21 april . We kunnen enkel besluiten dat het maximum vroeger of op 22 april is gevallen , echter niet later.

Hartelijk dank aan de waarnemers voor de waarnemingen!

Table 1 : list of observations.

Date	Period U.T.	Freq.	N	$\bar{S}$	HR	Obs.
1986 Apr.07	21h19-22h19	72.110	32	-	32 ± 5.6	JS
19	04 00 05 00	88.30	12	1.25	12 3.4	JVW
19	20 15 21 15	72.110	32	-	32 5.6	JS
20	06 15 07 15	72.110	6	1.2	-	MDM
20	07 36 09 00	72.110	3	1.0	-	MDM
20	10 50 11 50	72.110	40	-	40 6.3	JS
20	20 55 21 55	72.110	43	-	43 6.5	JS
20	22 22 22 37	88.30	0	-	-	CS
20	22 37 23 07	88.40	3	1.0	-	CS
20	04 00 05 00	88.30	14	1.21	14 3.7	JVW
21	05 38 06 38	72.110	33	-	33 5.7	JS
21	20 30 21 30	72.110	42	-	42 6.4	JS
21	09 04 10 12	88.30	0	-	-	CS
21	04 00 05 00	88.30	11	-	-	JVW
22	04 00 05 45	72.110	9	1.2	-	MDM
22	05 55 07 55	72.110	11	1.5	-	MDM
22	06 40 07 40	72.110	89	-	89 9.4	JS
22	10 54 11 15	72.110	33	-	-	JS
22	04 00 05 00	88.30	18	1.8	18 4.2	JVW
23	04 00 05 00	88.30	13	1.9	13 3.6	JVW

Table 2 : S-distribution JVW

S	1	2	3	4	5	Total	$\bar{S}$
N	33	17	6	1	-	57	1.56

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RADIOWAARNEMINGEN : OVERZICHT 1985

Jeroen Van Wassenhove

Abstract : 1985 was a very successful year for the Radio Section. Four observers registrated 6441 reflections in 277.68 hours. Most attention was paid to the Perseids.

Schitterend ! Zo mogen we het voorbije jaar 1985 noemen . Er werden maar liefst 6441 reflecties geregistreerd door slechts vier waarnemers . Het hoogtepunt van 1985 was ongetwijfeld de Perseïdenaktie. Negentig procent van de waarnemingen werd dan verricht. Onderstaande tabel bevat de lijst van de waarnemers met de daarbij behorende totalen. Hartelijk dank aan elke waarnemer voor de inzet en bekomen resultaten !

Observer	Total of observed hours	Total number of reflec.
Maurice De Meyere	84h29m	1628 refl.
Johan Smet	52h32m	2602
Christian Steyaert	88h51m	1610
Jeroen Van Wassenhove	51h49m	601
Total	277h41m	6441 reflections

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GIACOBINIDEN 1985 :
JAPANSE FOTOGRAFISCHE WAARNEMINGEN

C.Steyaert

In Europa kon de Draconiden aktiviteit van 8 okt. 1985 slechts overdag met radio waargenomen worden (ref.1). Voor de Japanse waarnemers viel de aktiviteit in de vroege avond (13h U.T.) en gebeurden er visuele en fotografische waarnemingen. In ref.2 staan de posities van vier gefotografeerde meteoren vermeld. Ref.3 geeft nog een afdruk van een andere Giacobinide , die we zelf uitmaten en astrometrisch berekenden. Deze 5 meteoren gaven voor de radiantbepaling :

$$\alpha_R = 268^\circ\!.1 \qquad \delta_R = +56^\circ\!.5$$

De voorspelde radiantpositie was dus 4° fout ($\alpha_R = 260^\circ\!.6$, $\delta_R = +57^\circ\!.1$) vergeleken met deze nauwkeurige waarneming.

Referenties:

(1) Werkgroepnieuws Vol.13(1985) nr.6 pp.193-196.
(2) Nippon Meteor Society,Astronomical Circular N°526 p.526-10,12.
(3) The Heavens 1986.1 Seihino-Shinkoska Publ.Co p.106

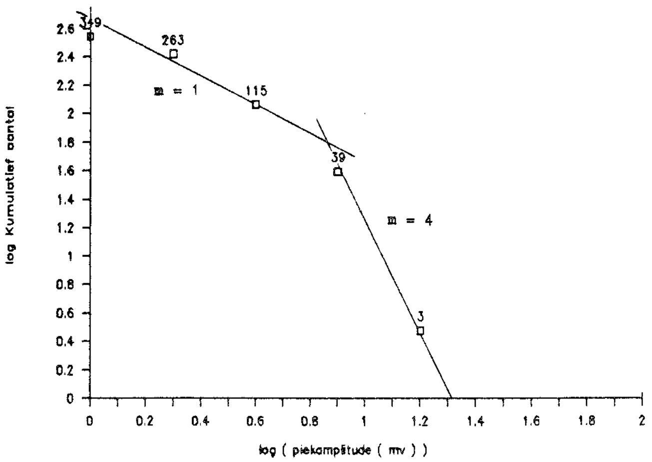
PIEKAMPLITUDE VERDELING GEMINIDEN 1985

C.Steyaert

Op het maximum van de Geminiden 1985 namen enkele Japanse waarnemers de sterkte van de radioreflekties op een penrecorder op. In een periode van 6 uur bekwamen ze 349 registraties. Met deze informatie is het mogelijk de piekamplitudeverdeling op te stellen , zoals vermeld in het Handboek Radiowaarnemingen, blz.5.7. De amplitudes worden verdeeld in een aantal klassen , waarvan de eindpunten telkens het dubbele zijn van de voorgaande . De kumulatieve verdeling ziet er als volgt uit :

Piekamplitude (mV)	Kumulatief aantal
16	3
8	39
4	115
2	263
1	349

Volgende grafiek toont de verdeling op dubbele logaritmische schaal. De rechte met m=1 komt overeen met underdense sporen , deze met m=4 met de overdense. Ongeveer 60 reflekties waren dus overdense. Ook de reflektieduren werden geregistreerd. Daar de schrijver niet erg snel liep , is de resolutie slechts van de grootte-orde van 1 sec. Er waren twee reflekties langer dan 8 s. Met een A/D konvertor aan een computer gekoppeld zou de tijdsduur veel nauwkeuriger kunnen bepaald worden. Ook in kombinatie met visuele waarnemingen kunnen interessante resultaten bekomen worden.



Bron : The Nippon Meteor Society , Astronomical Circular , May 1986, No. 526-6.

RADIOWAARNEMINGEN DE η-AQUARIDEN

Jeroen Van Wassenhove

Drie waarnemers namen de η-Aquariden waar : Maurice De Meyere (St.Martens-Latem),Dirk Eeckhaut(Eke) en Johan Smet (De Pinte). Spijtig genoeg luisterde iedereen tijdens vrij onregelmatige periodes zodat vergelijking onmogelijk werd. Waarnemingen van opeenvolgende dagen mogen we slechts vergelijken wanneer ze onder dezelfde omstandigheden zijn gemaakt (zelfde periode, frequentie en opstelling). Dit is ESSENTIEEL bij radiowerk ! Wij kunnen immers nog niet corrigeren voor de stand van de radiant. Maar waarnemen onder dezelfde omstandigheden schakelt dit uit. Het enige wat we kunnen besluiten is dat er aktiviteit is geweest.

Op 5,15 en 19 mei luisterden Johan Smet en Dirk Eeckhaut simultaan . Het totaal aantal simultanen bedraagt 24 . Voor een grondige evaluatie van deze waarnemingen verwijs ik u naar het uitstekende artikel "Forward Scatter , an interesting experiment " van Christian Steyaert (WGN 1986,nr.4).

Table : List of observations

Date 1986	Period U.T.	N	$\bar{\bar{S}}$	Frequency(MHz)	Observer
May 01	06h45m-08h00m	42	1.7	72.110 MHz	MDM
01	08 20 09 20	124		72.110	JS
02	20 20 21 20	34	2.7	72.110	DE
02	05 41 06 41	95		72.110	JS
03	06 45 08 00	36	1.9	72.110	MDM
03	08 08 09 19	153		72.110	JS
03	14 05 14 45	23		72.110	JS
04	06 45 08 00	60	1.7	72.110	MDM
04	18 09 18 36	9	1.8	72.110	DE
04	06 45 07 45	149		72.110	JS
04	08 00 09 00	146		72.110	JS
05	05 00 06 00	216		72.110	JS
05	19 34 20 08	20		72.110	JS
05	19 30 20 07	31	3.0	72.110	DE
06	05 23 06 50	15	1.3	72.110	MDM
06	06 20 07 20	168		72.110	JS
06	19 34 20 04	12		72.110	JS
06	19 30 20 04	22	2.6	72.110	DE
07	21 25 21 40	11		72.110	JS
07	07 15 08 03	56	2.9	72.110	DE
08	06 27 08 00	35	2.4	72.110	MDM
08	08 02 09 02	194		72.110	JS
09	06 15 06 45	76		72.110	JS
10	06 45 07 15	7	1.6	72.110	MDM
11	06 58 07 35	7	1.7	72.110	MDM
15	08 30 09 05	21	1.7	72.110	MDM
15	10 40 11 40	15	1.4	72.110	MDM
16	08 15 09 15	7	2.3	72.110	MDM

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RADIOWAARNEMINGEN :

DE ZOMERAKTIE 1986

Jeroen Van Wassenhove

Abstract : Radio observations were carried out from begin July untill the end of August. A lot of data were collected. The Perseidmaximum was found to occur at : Aug.13,3.0±2.6h U.T. .A very high activity was registrated on August 8, between 10h-13h U.T. at Puimichel. Amateurs who observed on the same day and period are invited to send their results to the coordinator of the Radio Section.

In de zomermaanden juli en augustus waren vijf waarnemers volledig operationeel. Drie luisterden op de 4 meter band , twee op de gewone FM-band. Er werd vrij regelmatig waargenomen. Onderstaande tabel toont de totalen van iedere waarnemer.

Waarnemer	Duur	Aantal refl.	Plaats
Maurice De Meyere MDM	41h58m	1359	St.Martens-Latem
Dirk Eeckhaut DE	21h00m	726	Eke
Johan Smet JS	18h46m	1505	De Pinte
Christian Steyaert CS	34h35m	814	Bottelare
Jeroen Van Wassenhove JVW	58h10m	3304	Puimichel (F)

Er werden ook akties op touw gezet door Luc Gobin, J.V.S. Io en Lieven Philips , doch hun resultaten waren nog niet beschikbaar bij het schrijven van dit verslag.

Begin juli luisterden MDM en JVW naar de sporadische aktiviteit. De uurfrequenties bleven aan de lage kant (21). Toch geven ze ons een vrij duidelijk idee over de sporadische aktiviteit. Op 2 augustus vond er een simultaanaktie plaats te St.Martens-Latem bij MDM . JS en MDM namen met hun radio waar , terwijl CS fotografisch en JVW visueel werkte. Het totaal aantal visuele-radio simultanen bedroeg twee (in Teff=0.75h). Dit was een boeiend experiment dat zeker voor herhaling vatbaar is.

Eind juli begonnen MDM,DE en JS de Perseiden te beluisteren. CS startte wat later. Intussen trok JVW naar Puimichel en verrichtte aldaar radiowaarnemingen van de Perseïden. Bijgaande grafieken tonen de bekomen resultaten. Het tijdstip van het maximum werd berekend door CS voor elke waarnemingsreeks. We bekomen :

DE	aug.12 ,	20.1h	± 5.2h U.T.
JS	aug.13 ,	2.8h	3.9
MDM	aug.13 ,	7.3h	4.3
CS	aug.13 ,	5.0h	2.1
JVW	aug.12 ,	9.9h	4.2

Vervolgens werden de tijdstippen van DE,JS en MDM gecombineerd (reden : zelfde frequentie en periode) en we krijgen :

$\boxed{\text{aug.13 , 3.0h} \pm \text{2.6 U.T.}}$

Opmerkelijk daarbij is de zonnelengte , die bedraagt 139°6 nagenoeg identiek als vorig jaar.

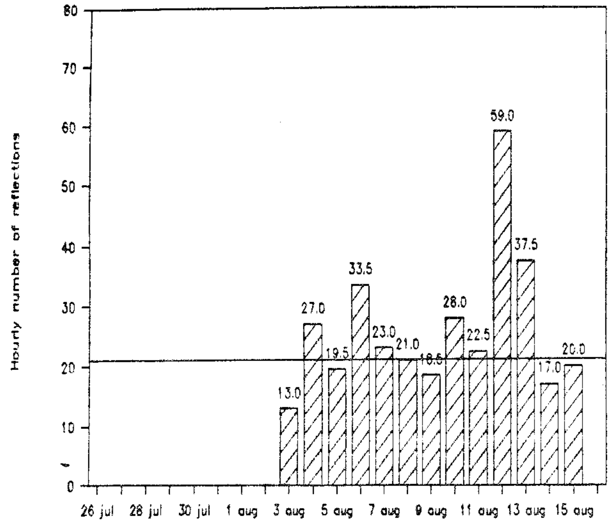
Op bijna iedere grafiek staat er een horizontale lijn getekend. Die lijn duidt de sporadische achtergrond aan.(Berekend volgens een statistische methode , die later in een volgend nummer van WGN zal worden behandeld). Nu kunnen we ook de verhouding tussen de HRspor en de Perseïden bepalen. We krijgen dan :

	DE	JS	MDM	CS	JVW
HR Spor (1)	25	82	36	21	32
Max Pers. (2)	44	61	33	43	78
(2)/(1)	1.76	0.74	0.90	2.00	2.50

DE,CS en JVW verkrijgen resultaten in dezelfde lijn. De verschillen zitten in de gevoeligheid van de opstelling. JS bekomt de kleinste waarde. Echter hij heeft , hoe gek het ook moge klinken , een te gevoelige opstelling. Immers zijn sporadische achtergrond is zo hoog (82) dat de Perseïden er gedeeltelijk in verdwijnen . Hierdoor komen de Perseïden er maar flauwtjes uit.MDM bekomt ook een kleine waarde die we echter niet kunnen verklaren.

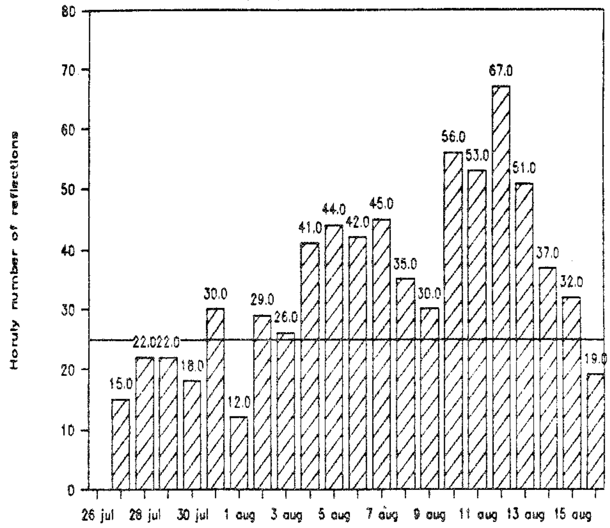
Perseids 86

CSt Bottelare 87.65 MHz 22 - 0 h UT



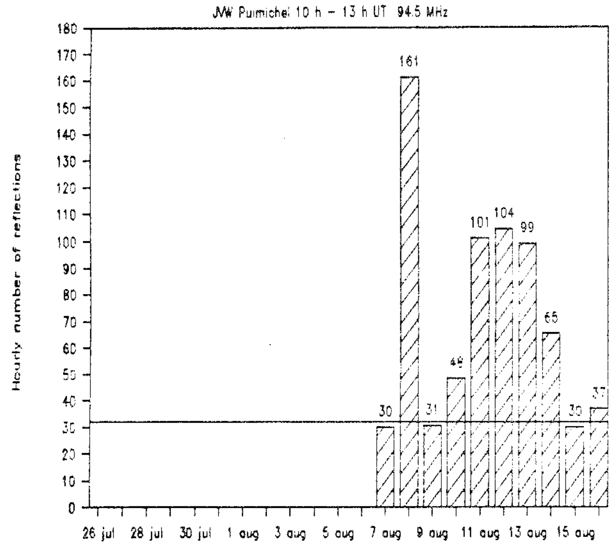
Perseids 1986

DE Eke 21 - 22 h UT 72.11 MHz



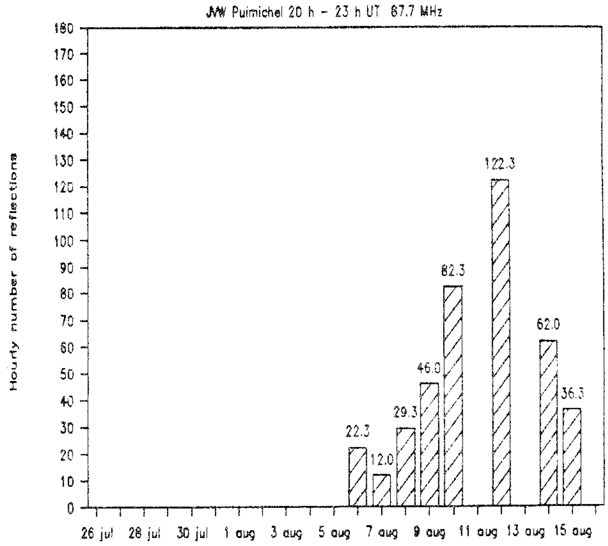
Perseids 86

JVW Puimichel 10 h - 13 h UT 94.5 MHz



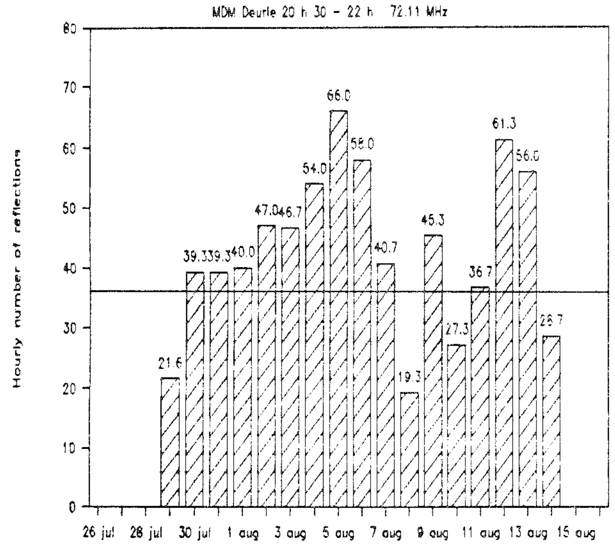
Perseids 86

JVW Puimichel 20 h - 23 h UT 87.7 MHz



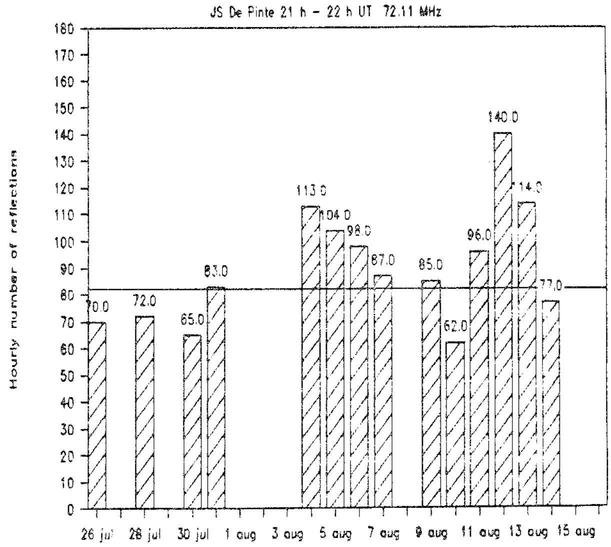
Perseids 1986

MDM Deurle 20 h 30 - 22 h 72.11 MHz



Perseids 1986

JS De Pinte 21 h - 22 h UT 72.11 MHz



Op 8 augustus, tussen 10h-13h U.T. registreerde JVW een uurfrequentie van 161 ! Deze waarde overtreft de Perseïden glansrijk. We kunnen enkel gissen wat het zou kunnen geweest zijn. (Bv. lokale sporadische verdichting ...). Zou het mogelijk zijn dat personen die waarnemingen hebben verricht op die dag (visuele- of radio), hun resultaten zouden willen opsturen naar de coördinator van de Radio Sektie ? Hartelijk dank voor uw medewerking !

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Meteoren-Observatorium Cyclops

ZOMERAKTIE 1986

De Perseïden van dit jaar werden alweer voor de achste keer waargenomen vanuit Oostkapelle. Tijdens de eerste nacht 25-26/7 werden reeds enkele Perseïden gezien. En gedurende een paar heldere nachten begin augustus steeg het aantal gestaag. Ook een aantal andere zwermen lieten zich zien zoals de α-Capricorniden, de Aquariden en een enkele Kappa-Cygnide. Het maximum van de Perseiden was voorspeld in de avond van de 13de augustus. Het was die nacht , op een paar cumulus wolken na , goed helder zodat er een fraai schouwspel te zien was. Visueel werden tijdens de aktie zo'n 900 meteoren waargenomen door Marc de Lignie en ondergetekende. Fotografisch werden 37 meteoren vereeuwigd , de meeste treffers kwamen uit de nacht 12-13/8. Eén heldere Perseïde werd ook op video vastgelegd. Zoals u elders kunt lezen was Marc de grote "running man" van Cyclops dit jaar. Tijdens de aktie werd het door hem gebouwde photomultiplier-systeem (PMT) in de kastenwand van Cyclops ingebouwd.

Dit fraaie apparaat kan het licht van heldere meteoren (Mv -2 of meer) herkennen en dit via een signaal doorgeven aan een kleine computer (S harp MZOO) dewelke dan direct het verschijningstijdstip noteert evenals de helderheid en de duur van de meteoor. Vooral het verschijningstijdstip is belangrijk voor de onbemande all-sky fotografie. Het apparaat werkte perfect en registreerde verschillende heldere meteoren die later terug te vinden waren op de film. Het is de bedoeling om een grootbeeld fish-eye camera om te bouwen en deze dan aan de computer te koppelen , zodat bij het verschijnen van meteoren die helderder zijn dan -2 , de sluiter van de camera binnen 1/100 seconde open springt. Op deze manier wordt er geen film meer verspild en zeker bij deze camera is dat belangrijk . Dit toestel is een Asahi Pentax Takumar die 180 graden afbeeldt op een beeldcirkel van 90 mm (f=35mm,F 4.5) en derhalve een dure brede filmsoort gebruikt.

Ondanks het feit dat ikzelf weinig tijd aan het meteorengebeuren kon besteden is het toch een geslaagde aktie te noemen , vooral door de heldere nacht 12-13 augustus.

Table 1 Hourly Rates Klaas Jobse(Oostkapelle)

Date	Period UT	Lm	Teff	P	Cap.	Aq	Cyg.	Spor.
Jul.24-25	2130-2215	6.25	0.75	2	-	-	-	7
30-31	2115 2215	6.30	0.95	5	2	-	-	15
	2226 2326	6.35	0.85	3	2	3	-	11
	2326 0030	6.40	1.07	5	6	5	-	12
Aug.11-12	0045 0015	5.85	0.72	16	-	1	1	6
	0015 0115	6.00	0.90	21	1	1	1	7
Aug.12-13	2100 2200	6.45	0.82	29	3	-	1	9
	2200 2300	6.40	0.95	36	-	1	1	4
	2307 2357	6.45	0.63	26	-	2	1	7
	0008 0044	6.45	0.50	17	-	1	1	5
	0100 0200	6.40	1.00	51	2	4	1	9
	0200 0255	6.20	0.92	52	1	-	1	5

Table 2 Magnitude Distributions K.Jobse

Magn.	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.	$\bar{m}$
Perseids	2	1	1	5	15	22	40	69	70	31		256	2.84
Sporadics	0	0	0	1	2	4	10	21	31	28		97	3.61

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J.V.S.ANDROMEDA: PERSEIDENAKTIE 1986

J.V.S.Andromeda

Zoals vorige jaren hebben we ook dit jaar met onze groep een Perseïdenaktie op touw gezet. Omwille van het storend maanlicht de dagen na het maximum , namen we ons voor begin augustus zoveel mogelijk te observeren. Dit resulteerde in negen waarnemingen van Renaat en Lieven onder vrij goede omstandigheden. De sporadische aktiviteit lag vrij hoog (HR rond de 30 gemiddeld) , ook enkele α-Capricorniden en δ-Aquariden lieten zich opmerken. Er waren enkele vermeldenswaardige exemplaren bij. In de nacht 30-31/7 zagen Renaat en Lieven een -2 α-Capricornide met een -4 Mv heldere explosie gedurende zijn traject. Een gelijkaardige sporadische werd door Renaat opgemerkt in de nacht 2-3/8 . De twee nachten voor het maximum was het té nevelig om zinvolle waarnemingen te doen , de nacht van het maximum was het iets beter , alhoewel niet schitterend (lm niet veel boven 5.0). Rond 21h04m zag Jan een spectaculaire vuurbol (met een helgroene magn.-6 explosie) , die de hemel en de omgeving even verlichtte. Deze meteoor is beslist ook door andere waarnemers gezien ! Geert, Renaat en Lieven vonden de Perseïden-uurfrequenties voor 12-13/8 niet erg hoog (ZHR om en bij de 60), doch de minder goede waarnemingsomstandigheden kunnen misschien een vertekend beeld van de werkelijke aktiviteit gegeven hebben .

Koen werkte gedurende enkele nachten fotografisch, op resultaten wachten we nog. Verder experimenteerde Lieven met radiowaarnemingen , in de toekomst gaan we zeker proberen dit te combineren met het visuele werk.

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DENEKAMP : PERSEIDENAKTIE 1986

Carl Johannink

De Perseïden verschenen dit jaar onder betere omstandigheden dan verleden jaar : toen stoorde de maan in de periode 30 juli tot 11 augustus in meer of mindere mate , nu ontbrak ze in de periode 1 augustus tot en met 15 augustus, afgezien van wat lichte storing in de vooravond van 14-15.

Hoe zat het dan met de waarnemingen ? Hieronder staan eerst wat conclusies :

- een record aantal waarnemingsnachten
- een record aantal waarnemingsnachten die vroegtijdig vanwege bewolking werden afgebroken.
- tussen 8 en 14 augustus werden alleen hoge uurfrequenties gehaald : de luchtvochtigheid bedroeg elke nacht 95%
- enkele heldere Perseïden rond 30 juli , evenals in de jaren 1979,1981,1983 en 1984.
- wat meer heldere Perseïden na het maximum (zet het beeld van 1985 op z'n kop), dit werd ook in 1983 opgemerkt.
- periode 8-14 augustus het slechtst sinds 1979
- totale aktie na 1983 en 1985 het best (vooral begin augustus).

Het leek zo goed te gaan : precies rond volle maan vielen vier bewolkte nachten. Daarna kon er voluit worden waargenomen, maar we werden wel vaak in de loop van de nacht verjaagd door wolkenvelden. Als 80% van de hemel bedekt was werd dan veelvuldig de volgende kreet gehoord : "we kunnen nu drie dingen doen." Hiermee werd bedoeld : naar huis gaan , blijven liggen of naar "de Hiel" gaan. Vooral André muntte uit in opmerkelijke opmerkingen , zoals in de nacht van 24-25 juli bijvoorbeeld :

"ja" (Ralf)
"hoeveel magnituden had die meteoor ?"(notulant André)
"eh,twee"(Ralf)
"o ja , noem ze dan" '(André)

Misschien wel de mooiste waarnemingsnacht was 30-31 juli : dik 40 meteoren per uur werden door drie waarnemers gezien, waaronder vele heldere meteoren. In die nacht werden meer Perseïden gezien die nul of helderder waren dan in de nachten 7-8,8-9 en 9-10 augustus samen ! Hoezo , meer heldere Perseïden voor het maximum ?

Ook de nachten 1-2,2-3,3-4 en 5-6 augustus waren zeer de moeite waard : op 1 augustus moet er een zeer heldere meteoor gevallen zijn laag in het zuidoosten. De hemel lichtte twee maal paarsachtig op : volgens waarnemingen uit Bussloo minstens -8. Geleidelijk werd het aantal heldere Perseïden minder , hoewel 5-6 een prettige , zij het kleine , toename te zien gaf. 3-4 augustus is de warmste waarnemingsnacht uit onze akties überhaupt: Peter las om 22h30m U.T. nog ruim 26 graden af en had de volgende ochtend een minimum van 20.1 op de officiele thermometer. Tijdens het waarnemen zagen we in het westen een aards vuurwerk en hoorden we zelfs af en toe de donder: boven ons was het goed helder en werden zo'n 45 meteoren per uur gezien door vier waarnemers en een heen en weer rennende weeramateur.

Ook 6-7 augustus was nog redelijk, alhoewel de uurfrequenties per persoon wat minder waren. 7-8 augustus werd geheel onverwacht helder : Robert , Ralf en Carl werden van het biljart gesleurd door André die uit het bekende kroegje komend de heldere hemel had gezien. Die nacht zagen ze 186 meteoren , maar het aantal heldere Perseïden bleef achteruit "kachelen". Ja, toen begon de grote ellende : het KNMI sprak in opperste euforie over "zonnig in de komende dagen",alleen het blokje "zonnig" werd elke dag op teletekst achteruit geschoven. Een zeer bekend tafereel in augustus. Overdag viel het wel mee: de toeristen waren zeer tevreden , maar wij werden 's nachts getracteerd op een lucht die niet te harden was. Zes nachten lang konden we twee uur waarnemen onder slechte omstandigheden, om vervolgens te moeten concluderen dat UMa weg was en de melkweg ook ...

Wellicht dat 9-10 augustus een tikkeltje beter was, maar toen werd tevens een dieptepunt bereikt in het aantal "leuke" meteoren. Er viel niets wat helderder dan +1 was ! Ook 10-11 was droevig : "vreselijk , en we zitten twee nachten voor het maximum" (Romke).

11-12 werd geheel gemist. De nacht van het maximum was weliswaar helder , maar de vochtigheid was ook gigantisch : om 20h00m UT al grondmist. Om 21h03m34s UT verscheen een helder geval net boven de staart van UMa : het bleek na overleg met andere posten geen Perseïde te zijn. Op het geschreeuw van Carl en Ralf draaiden de anderen zich korte tijd later (om eens een eufemisme te gebruiken) om , en zagen nog juist het laatste stukje plus een nalichtend spoor gedurende 2 seconden. Dat de lucht bij ons slechter was dan bijvoorbeeld in Buurse blijkt al uit het feit dat Buurse het spoor pas na 8 seconden kwijt was. Om 22h30m UT is het hopeloos : alleen een stukje hoog in het zuiden bleef nog even open. Aan de horizon was de grensmagnitude al langer -"tig" , en al snel waren er meer leuke opmerkingen dan meteoren op de band. Deze zijn echter dermate grof dat ze niet in het openbaar kunnen.

13-14 augustus leek iets beter te worden. Echter om 22h45m trok het vanuit het zuidwesten volkomen dicht. Wel waren wat meer helderen gezien. 14-15 was compleet waardeloos en ook 15-16 ging de mist in vanwege bewolking. Na 23h45m schijnt het goed helder geweest te zijn in Buurssе , maar hier was het om 23h30m niets en ging iedereen daarna slapen. O, ja in de nacht van het maximum kwam er iemand bij ons die de weg kwijt was. Hij moest naar Denekamp , dat was zelfs voor ons een niet zo moeilijke opdracht om dat te vertellen. Toen het hem duidelijk was zei hij "bedankt en welterusten" (!) ... het was bij ons vijf seconden stil maar toen brak een behoorlijk gebulder uit : dat zal een raar gezicht geweest zijn zes man in slaapzakken op bedden ....

SHORT STORY

TWILIGHT ZONE

Paul Roggemans

Er was eens in een ver land,waar het nog erg donker is met zeer veel prachtig heldere nachten,een huis waarin twee maal zeven meteoorwaarnemers vertoefden ... Tussen 26 juli 1986 en 16 augustus beleefden ze allen iets heel bijzonders... Vanaf de eerste nacht aanschouwden de waarnemers een prachtige sterrenhemel , elke nacht opnieuw stond de melkweg prachtig aan de hemel. Naarmate de maan minder stoorde werd de hemel steeds mooier , donkerder tot verbluffend mooi op de meest optimale momenten. Nacht na nacht steeg het aantal meteoren . Aanvankelijk waren de Aquaridenradianten het meest aktief , maar stilaan namen de Perseïden in intensiteit toe. Vanaf 7 augustus drongen elke dag onschuldige cirrusslierten door tot in de hemel boven het sterrenrijk. 's Avonds ,bij het begin van de waarnemingen vervoegden deze vage wolken elkaar en koesterden ze het boze plan om het waarnemen onmogelijk te maken... Onze waarnemers lieten zich niet afschrikken ! Onversaagd vatten ze post en in een feestelijke stemming hield men de wacht. Elke nacht trok het open, maar op 11-12 augustus beraamden de wolken een heel zwaar offensief. Met versterking uit het noorden ontketenden de weerelementen een indrukwekkend onweer , bliksem,donder, zware regen ... de waarnemers zaten , verscholen in het huis, op de loer om bij de eerste opklaring toe te slaan. Een of andere goede fee (ingehuurd uit een ander verhaal) zond de mistral om de waarnemers bij te staan. Onder de gierende mistralwind genoten allen van de kraakheldere hemel.De melkweg,Jupiter en het Zodiakaal Licht stoorden !De volgende nachten waren helder. Het maximum 12-13 aug.liet elke waarnemer tussen de 400 en de 900 meteoren tellen ! In totaal werden er meer dan 19500 visuele meteoren genoteerd.Helaas... het programma aan de kijker werd zwaar verstoord door gepopulaxeerde astro-toeristen,wellicht gestuurd door de boze tovenaar Titulaer uit het noorden. Er kwam aan deze droom een einde :op 16 augustus werden allen gedeporteerd naar het akelige land (van de boze tovenaar) in het noorden. Meer nieuws volgt !

PERSEIDS 1985

AND THE ZENITH DISTANCE CORRECTION

Paul Roggemans

Abstract : The Z.H.R.-profile obtained for the 1985 Perseids has been reconsidered assuming that the zenith distance correction by sec Z undercorrects. This article explains why the zenith distance correction by sec Z undercorrects. A better correction by $\sec^{\varepsilon} Z$ with $\varepsilon = 1.5$ is proposed for further use.

The analysis of the 1985 Perseid activity resulted in a hourly rate profile with remarkable short duration features. These peculiar features can be considered as artifacts assuming that the zenith distance correction by sec Z undercorrects. The Z.H.R.-curve has roughly the shape of the schematic profile of Fig.1. The depressions A,B and C occur in the consecutive sets of data from Europe , from the U.S.A. and from Japan , each time when the observers derived the hourly rate with the radiant at a large distance from the zenith. If we consider only the Z.H.R.'s obtained for a small zenith distance (excluding a large influence of sec Z) we can interpolate using the maxima only. This yields the Theoretical Z.H.R. F_T . The theoretical Z.H.R. F_T involves a much stronger correction for the zenith distance than the observed Z.H.R. F_O . If F is the corrected Hourly Rate;we find the Zenithal Hourly Rate from :

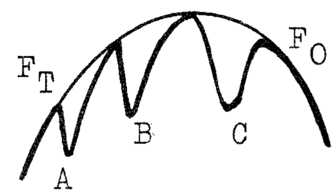

Fig.1 Observed and theoretical Z.H.R.-profile.

$$F_T = \frac{F}{\cos^{\varepsilon} Z} \quad \text{and} \quad F_O = \frac{F}{\cos Z}$$

Or :

$$\frac{F_O}{F_T} = \frac{\cos^{\varepsilon} Z}{\cos Z} = \cos^{\varepsilon - 1} Z$$

Or :

$$\varepsilon = \frac{\log \cos Z + \log F_O - \log F_T}{\log \cos Z}$$

Using the mean values from table 3 p.123(WGN4,1986) and the interpolated theoretical values of F_T we find a series of values for ε, ranging from 1.1 to 1.5 , averaging 1.3. This is the immediate result of a rough comparison between Z.H.R.'s computed from observations with sec Z being 1.2 or less and Z.H.R.'s obtained with sec Z being much larger than 1.2 (large Z), both assuming $\varepsilon=1$. $\varepsilon = 1.3$ therefore is certainly a lower estimate of the probable ε. A more detailed study of the zenith exponent was published by J.Zvolánková (see ref.2). She found $\varepsilon = 1.47 \pm 0.11$ from combined Z.H.R.-curves from successive Perseid returns. Applying the new correction to the 1985 averages yields a new Z.H.R.-profile with less distinct depressions around times with a large average zenith distance. The final result , however , is not yet a smooth curve . It would therefore be worthwhile to recompute the individual Z.H.R.'s instead of the averages, in order to reconsider the averaged Z.H.R. with respect to the weight of each datapoint. This hasn't been done so far.

Zvolánková wasn't the first meteor worker to find that sec Z undercorrects. For very simple geometric reasons we can refer the shower intensity always to a plane perpendicular to the radiant direction for any plane of the horizon. Then we have to use:

$$Fz = F \sec Z \qquad \text{with } Z = \text{zenith distance}$$

We also know that the gradient of atmospheric density along the path of the meteor varies with the zenith distance of the radiant. There is no exact theory to explain how the meteor brightness will vary with the length of the luminous path for different zenith distances. Schiaparelli (1871) already found $Fz = F \sec^{1.6} Z$ using several years of Perseid observations. Then , in 1939 , Öpik found $\mathcal{E} = 1.34$ from observational results of the famous Arizona meteor expedition in 1934. Later on in 1958 , Öpik arrived again at $\mathcal{E} = 1$. The zenith correction has been used almost by every meteor worker in its simpliest form , assuming $\mathcal{E} = 1$. From the 1985 results it is clearly shown that it is necessary to use a stronger zenith distance correction. The value for the zenith exponent $\mathcal{E} = 1.47$ found by Zvolánková may do fine even rounded to $\mathcal{E} = 1.5$.

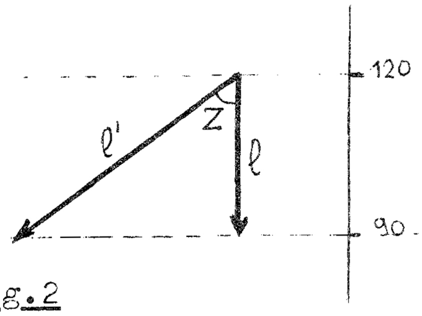

Fig.2

The reason why $\mathcal{E} > 1$ is to be prefered above $\mathcal{E} = 1$ can be understood from the physical processes of the meteor phenomena. A meteor entering the atmosphere at $Z = 0°$ will produce a meteor trail with pathlength l , the luminous intensity being I . The same particle with a zenith distance of the radiant Z will produce a longer trail l' because of different interactions in less dense layers of the atmosphere. The luminous intensity I' will be less than I.

The luminous intensity of a meteor will be a function of the mass , the velocity and of the cosine of the zenith distance. Levin (1956) wrote this relationship as follows :

$$I_m \approx m_\infty^\alpha v_\infty^\beta \cos^\gamma Z_R$$

(It is to be expected that the exponents α, β, and γ will differ from 1) . Jacchia (1948) introduced the visual magnitude using a 0 magnitude star as a reference , then :

$$M_v = -2.5 \log I_v$$

or :

$$M_m \approx -2.5(\alpha \log m_\infty + \beta \log v_\infty + \gamma \log \cos Z_R)$$

The problem to find the coefficients α, β and γ couldn't be solved untill accurate photographic observations were made. Jacchia,Verniaini and Brigs (ref.3) derived a large number of photographic magnitudes . They obtained empirical the dependence of M_{pm} (photographic magnitude) , on mass , velocity and the zenith angle.

$$M_{pm} = 55.34 - 8.75 \log v_\infty - 2.25 \log m_\infty - 1.5 \log \cos Z_R$$

Using this relationship we calculated the photographic magnitude M_{pm} and the corresponding visual magnitude for a meteoroid with $m_\infty = 0.3$g and $V_\infty = 60$km/s .The calculation was repeated for $V_\infty = 30$ km/s. The results are listed in table 1. The relationship between Mp and Mv was introduced according to the definition of Jacchia. He defined the color index C as the difference between the photographic magnitude Mp and the visual magnitude Mv (ref.4).So:

$$C = -2.5 \log \frac{Ip}{Iv} \qquad \text{or} \qquad C = Mp - Mv$$

Jacchia found empirical :

$$C = 0.28\, Mp - 1.34 \qquad (\text{valid for } -2 < Mp < +1.5)$$

(For more information on this subject see ref.3,4 and 5)

Table 1 : Dependence of the magnitude on the Zenith distance Z.

Z_R	V_∞ = 60 km/s, m_∞ = 0.3g		V_∞ = 30 km/s , m_∞ = 0.3g	
0°	Mp = −2.79	Mv = −0.67	Mp = −0.16	Mv = 1.22
30°	−2.69	−0.59	−0.06	1.30
40°	−2.62	−0.55	+0.02	1.36
50°	−2.50	−0.46	+0.13	1.43
60°	−2.34	−0.34	+0.29	1.55
70°	−2.09	−0.16	+0.54	1.73
75°	−1.91	−0.03	+0.72	1.86
80°	−1.65	+0.15	+0.98	2.04
85°	−1.20	+0.47	+1.43	2.37
88°	−0.61	+0.90	+2.03	2.80

We learn that the magnitude of a meteor decreases with $\Delta m = -1.5 \log \cos Z_R$. This loss in brightness will cause a decrease in hourly rate and can be taken into account in the correction for the limiting magnitude. The number of meteors seen with $Z_R = 0°$ for a meteor limiting magnitude lm will be proportional to a powerlaw :

$$N_{Z=0°} \approx n.r^{6.5-lm}$$

For a different zenith angle $Z_R = z$ we get :

$$N_{Z=z} \approx n.\frac{r^{6.5-(lm-\Delta m)}}{\cos Z} \quad \text{or} \quad n.\frac{r^{6.5-lm+\Delta m}}{\cos Z}$$

$$\text{or : } \log N_{Z=z} \approx -\log \cos Z + (6.5-lm+\Delta m).\log r + \log n$$

$$\approx -\log \cos Z + (6.5-lm).\log r + (-1.5 \log \cos Z).\log r + \log n$$

$$\approx (6.5-lm).\log r - \log \cos Z\ (1.5 \log r + 1) + \log n$$

$$N_{Z=z} \approx n.\frac{r^{6.5-lm}}{\cos^{(1.5 \log r + 1)} Z} \quad \text{or} \quad n.\frac{r^{6.5-lm}}{\cos^{\varepsilon} Z}$$

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

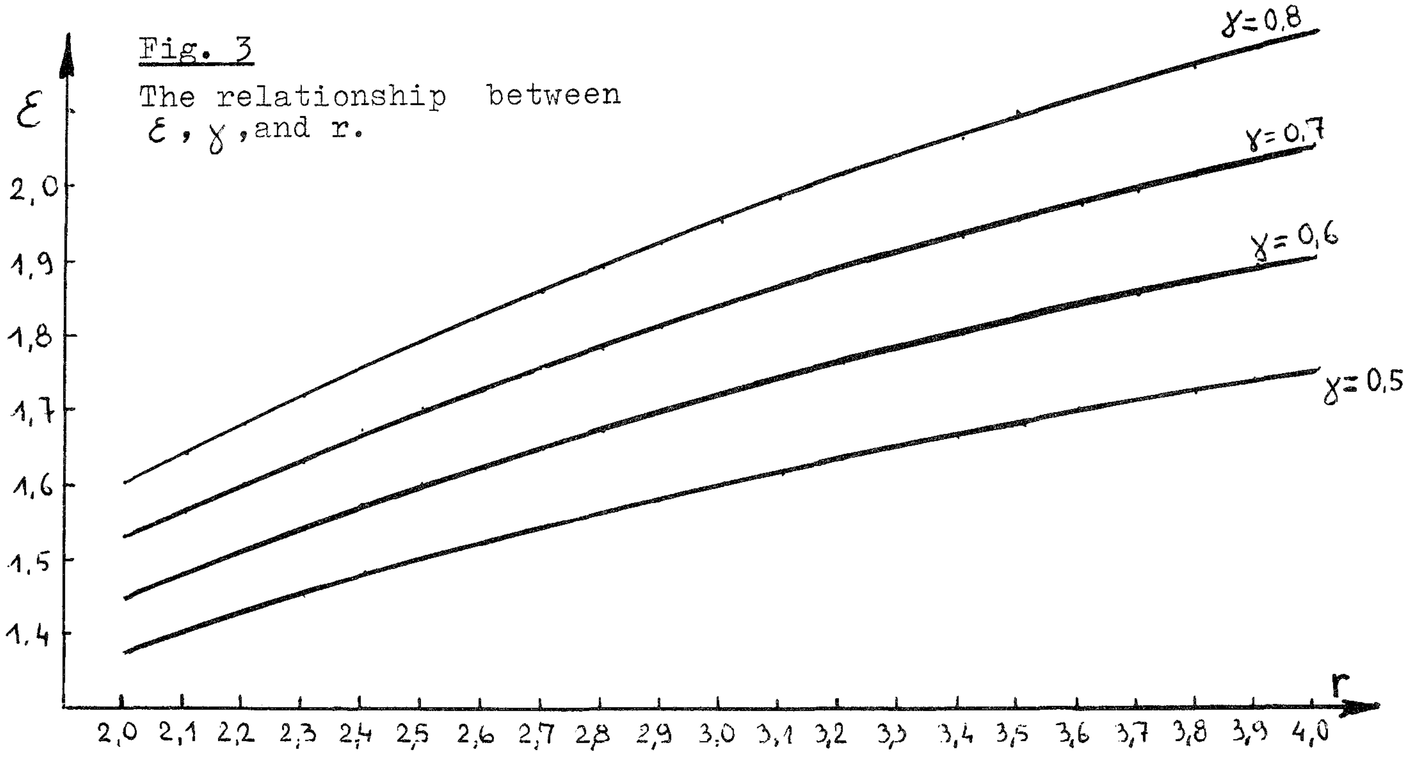

Fig. 3

The relationship between ε, γ, and r.

If we take a closer look at the exponent ε and introduce the coefficient χ and the differential mass index s which are related to r by :

$$2.5 \log r = \chi = s - 1$$

$$\gamma\, 2.5 \log r = \gamma . \chi = \gamma(s-1)$$

For $\gamma = 0.6$ $$1.5 \log r = 0.6\,\chi = 0.6(s-1)$$

Or : $$\varepsilon = \gamma . \chi + 1 = \gamma\, 2.5 \log r + 1$$

The value of 0.6 found by Jacchia et.al is valid for photographical observations of a mixture of shower meteors and sporadics. If we consider the Perseids for which we know $\varepsilon = 1.5$ and r = 2.5 , the corresponding value for γ would be $\gamma = 0.5$ .Other researchers such as J.Lewin (ref.6) found values for γ which are in the range of 0.33 to 0.46. The coefficient γ defines the dependence of the meteor trail length on the zenith distance. If the length wouldn't depend at all on the zenith distance then γ would be equal to 0 .The other extreme is $\gamma = 1$. The composition , strength and other physical characteristics of the meteoroid therefore will cause different values of γ for different streams. It is not known to the author that the dependence of γ on shower characteristics has been checked so far. Assuming r = 2.5 and using $\gamma = 0.6$ as given by Jacchia we find $\varepsilon = 1.6$; exactly the result found by Schiaparelli.

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POPULATION INDICES RELATIVE TO THE PERSEIDS

by C.Steyaert

Abstract : The discussed method gives accurate and unbiased estimates of the r of a smaller stream compared to the more active one at the same time . It avoids the use of the perception function.

The vast amount of visual magnitude estimates obtained the summer of 1985 (ref.1,2) allows to test a different method to find the population indices r of other streams observed at the same time as the Perseids. We assume that the real number of meteors in a stream is proportional to r^m. The observed number of meteors is :

$$\boxed{N = C\, r^m\, p(m)} \qquad (1)$$

in which C = constant

$p(m)$: perception function (equal to 1 for very bright meteors, decreasing to zero at the limiting magnitude).

This equation is :

for the Perseids $N_p = C_p\, r_p^m\, p(m)$

for another stream : $N_z = C_z\, r_z^m\, p(m)$

Consequently : $$\left(\frac{Nz}{Np}\right) = \left(\frac{Cz}{Cp}\right)\left(\frac{rz}{rp}\right)^m \qquad (2)$$

or the ratio of the number of meteors of a given magnitude (or magnitude class) is independent of the perception function. Hence, in principle it is possible to estimate the ratio r_z/r_p from the observed N_z/N_p. Taking the logarithm of (2) :

$$\log\left(\frac{N_z}{N_p}\right) = \log\left(\frac{C_z}{C_p}\right) + m \log\left(\frac{r_z}{r_p}\right) \qquad (3)$$

looks even more promising, as the relation is now linear in the unknown $\log(r_z/r_p)$. However, the ratio N_z/N_p is not assigned the proper weight, and it is very sensitive to small changes in both N_z and N_p for low values. We prefer to keep working with the non-linear relationship :

$$N_z = N_p\left(\frac{C_z}{C_p}\right)\left(\frac{r_z}{r_p}\right)^m \qquad (4)$$

N_z and N_p are known at several m_i (midpoints of one magnitude interval).

We put : $\left(\frac{r_z}{r_p}\right) = R$, $\left(\frac{C_z}{C_p}\right) = k$

or (4) becomes $N_{zi} = N_{pi}\; k\; R^{mi}$

We determine k (linear) and R (non-linear) by means of the least square method :

$$\text{Min}\ \frac{1}{2}\sum (N_{zi} - N_{pi}\; k\; R^{mi})^2 \qquad (5)$$

We apply the method on the sporadic background observed during the Perseids 1985. The minimum of (5) is reached for $R = 1.46$

Table 1.

m_i	Spor.1985	Pers.1985	1.46^{m_i}	Calc.	Diff=Spor-Calc.
-7	0.0	1.0	0.1	0.0	0.0
-6	0.0	3.0	0.3	0.0	0.0
-5	1.0	7.5	1.1	0.1	0.9
-4	4.5	36.5	8.0	0.9	3.6
-3	4.5	75.5	24.3	2.6	1.9
-2	14.0	191.0	89.6	9.7	4.3
-1	43.0	522.5	357.9	38.7	4.3
0	139.5	979.5	979.5	105.9	33.6
+1	306.5	2016.5	2944.1	318.4	-11.9
+2	823.5	3922.5	8361.2	904.2	-80.7
+3	1603.5	4739.5	14750.0	1595.1	8.4
+4	1833.0	3547.5	16118.8	1743.2	89.8
+5	1024.5	1511.5	10027.0	1084.4	-59.9
+6	130.5	244.0	2363.2	255.6	-125.1

Regression Output : s, Std Err of Y Est. 52.04

ρ^2 = R squared 0.99

k = X Coefficient(s) 0.108145 ± 0.002020

(Computed with Lotus rel.2)

The curve fit is very successful , as indicated by the high ρ^2 value . All differences in the last column are within limits , except the one for $m_i = +6$. The number of Perseids of $m = +6$ might be too high. The R value is very important . By adopting a value of r_p (which is not found here) , we find the corresponding r_z value :

r_{pers}	r_{spor}
2.4	3.5
2.5	3.65
2.6	3.8

The r-value for the Perseids obtained under perfect conditions mentioned in ref.1 is 2.68 : this is a very high value , which would lead to an unacceptable r_{spor}.

The values given by Kresáková (ref.3) $r_{pers} = 2.4$ and $r_{spor} = 3.4$ are more in line with the r_{spor}/r_{pers} value found here. The r-values obtained in ref.1 are based on the use of the perception function p(m) and the limiting magnitude.

Similarly , we obtained :

$r_{\alpha Cap}/r_{pers} = 1.12$ $\quad (\rho^2 = 0.9889)$

$r_{\delta Aqr}/r_{pers} = 1.73$ $\quad (\rho^2 = 0.9199)$

(These calculations are based on less data and become accordingly less reliable). The low $r_{\alpha Cap}$ obtained in ref.1 is not confirmed here . Ref.4 gives also a slightly higher $r_{\alpha Cap}$ than r_{pers} .

Conclussion.

The discussed method gives accurate and unbiased estimates of the r of a smaller stream compared to the more active one at the same time. It avoids the use of the perception function.

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THE ALBERTA METEOR GROUP 1985 ANNUAL REPORT

Peter Brown

The year of 1985 marked the first co-ordinated efforts of members of the Alberta Meteor Group in serious meteor work. Our group was formed out of an interest of several key observers who have done meteor work for many years and decided to join together with other interested observers in Alberta to carry out meaningful scientific analysis of our observational results. The result was to plan to monitor several showers throughout the year with as many observers as possible participating. Unfortunately the first quarter of 1985 was largely cloudy in Alberta and only a few minor showers were monitored to some degree.

The second quarter started off with the Lyrids but unfortunately were monitored by only one observer MZ who observed a total of 13 Lyrids. The Eta Aquarids , which are unfavorable to start with from this latitude due to their low radiant declination turned out to be completely clouded out allowing no observing to be carried out.

The third quarter was by far the most productive, with all observers participating on one or more nights. The N and S Delta Aquarids were monitored with fair success as were the α Caps, and to a lesser degree the N and S Iota Aquarids. However the most monitored shower of the year was, by far, the 1985 Perseids. Altogether about 400 Perseids were noted in almost 50 man hours of observing. Two members MZ and PB ventured into Southern Saskatchewan in hopes of experiencing the clear skies noted in this area. Unfortunately the nights of Aug.11 and Aug.12 were completely cloudy and were therefore missed by all observers, both in Saskatchewan and Alberta. On Aug.13-14 both PB and MZ noted a drop in Perseid rates after 0515 UT, with no change in local sky conditions. PB managed to catch 26 Perseids from 0415-0515 UT while in the same time interval MZ caught 14. In the following hour, although the radiant was climbing, PB saw only 9 Perseids and MZ only 8. The Perseid rates then gradually recovered as the radiant rose, until cloud halted further observations. These observations may suggest that the Earth passed out of the densest region of the Perseid stream sometime between 0415-0515 UT or it might be accounted for more probably by the well-known filimentary nature of the Perseid stream. Observations in 1986 made near the same solar longitude will hopefully clarify this. Also the brightest fireball of 1985 was witnessed by YK,MZ and PB on the night of Jul 27-28 at 0826 UT. The -7 meteor had a terminal burst of -9 to -10 lighting up a large part of the sky near the Pegasus-Andromeda region. The fireball was found to be sporadic.

In the last quarter of 1985 the spectacular Geminid display as well as the Orionid shower were marked for special scrutiny by our group, but again bad weather and cold temperatures near the Geminid peak,(roughly -30 to -40 C), prevented a large observing campaign from materializing. In all only 4 Orionids were seen and no outburst of any kind was noted. The S.Taurids were also monitored by two observers MZ and PB, with a total of 8 being seen in 7 man hours. No Taurid fireballs were seen this year. The same two observers monitored the Leonids seeing a total of 22 Leonids in 4 man hours. Surprisingly only 4 Leonids showed trains, rather low for their 72 km/s. The Geminids were monitored again by MZ and PB with a total of 36 being seen in 9 man hours. None of the Geminids showed trains. The top observers in 1985 were PB with a total 944 meteors seen in 68 hours of observing, and MZ with a total of 661 meteors in 56 hours and 20 min. Our group recorded a total of 1797 meteors in a total 142 hours in 1985.

U.S.A. FLORIDA :

LYRIDS AND η-AQUARIDS 1986

Norman McLeod

The Lyrids did nothing unusual in 1986. I covered the predicted max time for nearly an hour on each side, and saw only 2-3 Lyrids/hour with a very bright moon. Then I fell asleep from boredom until nearly moonset. There was 10 minutes of fully dark sky available, during which I saw 3 Lyrids. For the Eta Aquarid week we had planned on going down to the Keys. Staying in Miami a day, the weather looked so hazy and cloudy that we waited another day, then another. After 3 days we returned to Fort Myers. Now Jeff Corder from this area went on down anyway, and he tells us that after the first night , the sky cleared each evening . I find this incredulous. Observing back here starting May 7-8 I got in several nights along with a fairly complete comet hunt of the May morning sky. May 7-8 produced a pair of fine Eta rates 10 and 21 final dark hours in sky 7.3 . That beat my previous record of 20 seen in 1981. Some really fluke hours are possible out of this shower. Mark Adams saw almost nothing 2 hours after my 1981 record. A matching second-best rate of 10 came the final hour of May 14-15. Other mornings had much lower rates.

Looking back at December , the strong minor showers Sigma Hydrids and Monocerotids did well again. The former gave a rate of 3 six different times , and the latter four times plus one rate of 4 . A shower dubbed "December Leonids" by Florida observers in 1972 did exceptionally well. It hit a top rate of 6 once. Swift Leonid-like meteors come from the top of the Sickle concurrently with the Geminids.

There was a lot of simultaneous Geminid activity. On Dec.12-13 I had 3 pairs of true simultaneous Geminids, plus a fourth pair with partial overlap. The next night had one more pair plus two cases of triples. One triple had only partial overlap of meteors. The second was a rare perfect triple in Canis Minor. I was looking at a blank spot in the midst of the group when one appeared 5 degrees right and the others 5 and 10 degrees left . Magnitudes were 0,3,3 and path lenths and altitudes were all identical. This is my third such case ever , the earlier ones being furnished by the Orionids in 1979 and 1969 . Casual observers always say "several were visible at once" when they meant "several were visible in quick succession". Meteors are not simultaneous if any time break is detected between them.

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U.S.A.CALIFORNIA : η-AQUARIDS 1986

Robert Lunsford

Despite the return of Halley's comet the 1986 Eta Aquarids were the weakest since 1979. The average magnitude was the brightest yet (crescent moon may be responsible). Average magnitude was 3.05 in 1984 and 3.05 in 1982 . The 1986 Eta Aquarids were more colorful than 1984 when only 31.7% exhibited any color. Two Eta's of mag. 0 and +1 produced a brilliant white color with long lasting trains that were very memorable. The 1986 return also produced a first for me , the combination of the train being one distinct color and the head of the meteor being another. Two notable examples were a blue train with a distinct orange meteor and a blue and yellow combination. I had suspected this phenomena in the past , but never had seen it as vividly as with this year's shower. Train phenomena was very similar to the 1984 return when 67.3% of the Eta's produced trains.

Table 1 ; 1986 Eta Aquarids

May 2-3	11	Eta Aquarids	in	3	hours	lm	6.5	Avg.Mag.	2.64
May 3-4	12	"	"	2	"	"	6.5	" "	2.83
May 4-5	30	"	"	2	"	"	6.5	" "	2.63

Table 2 ; Magnitude and color distribution

Magnitude	0	+1	+2	+3	+4	+5	+6	Tot.	
Eta Aquarids	2	6	14	19	11	3	0	55	2.68
Color : blue	0	4	11	9	1			25	83%
Yellow	0	0	2	0	0			2	7%
Trains	2	6	11	12	5			36	67.9%

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HARDERWIJK :

SUMMER OBSERVATIONS JUNE-JULY 1986

Bauke Rispens

Summary : The observational results obtained by the meteor observing team Harderwijk (the Netherlands) for the period June-July 1986. The sporadic background activity was monitored for several nights.

Table 1 Hourly Rate data June-July 1986

Date 1986	Period UT	Obs.	Nsp	N (Showers)	Teff	Lm	k	remarks
June 12-13	2200-2300	BR	7		60m	5.6	1.0	Moon
	2300 0035	BR	12		93	6.2	1.0	Moon
14-15	2145 2300	KM	5	1L	75	5.4	1.0	Moon
	2145 2300	BR	5		75	5.2	1.0	Moon
	2300 0000	KM	4	3L	60	6.0	1.0	Moon
	2300 0000	BR	6	1L	58	5.9	1.0	Moon
	0000 0040	KM	9		40	5.6	1.0	
	0000 0040	BR	3		40	5.7	1.0	
28-29	2140 2300	RB	3		80	5.5	1.0	tired
	2140 2300	KM	7		80	5.6	1.0	
	2140 2300	BR	5		80	5.5	1.0	
	2300 0000	RB	4		60	5.8	1.0	Moon
	2300 0000	KM	9		60	5.8	1.0	Moon
	2300 0000	BR	6		58	5.7	1.0	Moon
	0000 0030	RB	2		30	5.5	1.0	Moon
	0000 0030	KM	1		30	5.5	1.0	Moon
	0000 0030	BR	3		30	5.5	1.0	Moon
29-30	2145 2300	RB	2		75	5.6	1.0	
	2145 2300	KM	6		75	5.7	1.0	
	2145 2300	BR	5		75	5.7	1.0	
	2300 0000	RB	5	1P	60	6.1	1.0	
	2300 0000	KM	6	2P	60	6.2	1.0	
	2300 0000	BR	5	2P	54	6.2	1.0	
	0000 0030	RB	3	1P	30	6.0	1.0	
	0000 0030	KM	5	1P	30	6.1	1.0	
	0000 0030	BR	3	1P	30	6.1	1.0	
July 01-02	2150 2300	BR	1	1P	70	5.0	1.0	very hazy
	2300 2330	BR	3		30	5.4	1.0	hazy
06-07	2145 2300	BR	6	4Cy	64	5.6	0.8	clouds
	2300 2340	RB	3		40	5.6	0.85	"
07-08	2145 2300	BR	5	3Cy	75	5.7	0.9	"
	2300 0020	BR	8	4Cy,1P,1Ca	78	6.1	0.95	"
10-11	2140 2210	BR	3		30	5.2	0.5	"
11-12	2125 2300	KM	5	1Cy	95	5.7	0.5	"
	2125 2300	BR	5		95	5.7	0.5	"
	2300 0000	KM	7	2P,2Cy,1Sa	60	6.3	0.85	"
	2300 0000	BR	7	3Cy,1Sa	58	6.3	0.85	"
	0000 0110	KM	9	1P,1Aq	70	6.2	0.9	"
	0000 0110	BR	6	5P	68	6.2	0.9	"
12-13	2130 2155	KM	2		25	4.9	0.8	"
13-14	2200 2310	KM	8	1Aq	69	5.8	1.0	hazy
	2200 2310	BR	6		56	5.8	1.0	"

Notes : RB: Richard Buys,KM:Koen Miskotte,BR:Bauke Rispens;
L= June Lyrids,P= Perseids,Ca= Capricornids,Cy=Delta Cygnids
Sa=Sagittarid, Aq = Aquarid.

Trains : Out of the 224 sporadics (which is the total of the 4th column) only 6 had a train. Percentage : 3%.

As you see, some stream activity has started again. The rates of the streams are very low , and the existence of some streams can be questioned , for example the June-Lyrids and the Perseids . However the meteors that we marked 'P' were typically Perseid-like in their appearance and came from a region between Andromeda and Cassiopeia , which is close to the extrapolated radiant position of the great August stream.

Of greater importance seems the discovery (on 6-7/7 and 7-8/7 , 1986) of an apparently active radiant near the star Delta Cygni . As far as I know this radiant is mentioned nowhere in literature. Attention was drawn to it by the observation of two very short , rather fast meteors within one minute in the western wing of Cygnus , their tracks in a right angle to each other. In the hour that followed , two other meteors were seen , both coming from the same radiant and of short length and very short duration. The night after gave some confirmation because seven meteors of similar appearance were seen . The rates are just a bit lower than the sporadic background. The magnitudes were ; 3,2,3,1.5,4,3,4,4.5,5,5 and 4.5 , the first four on 6-7/7 , the last seven on 7-8/7/86.Some Delta Cygnids have been seen on several nights after this date , as you can see in the table. It's very interesting to hear from other observers whether they have seen this radiant active. In the years to come , meteor observers should keep an eye on this stream.

ASTROMETRY . USEFUL AMATEUR WORK !

Paul Roggemans

Original title : Astrometrie , nuttig werk voor amateurs . Published in Heelal Vol.31,n°9(1986),p.213-220. Translated by Ann Schroyens.

Summary : This article explains the basic principles of astrometry. The use of astrometry for meteor photography has been developed by the Meteor Section and resulted in a computerized database administration. Meteor photographers worldwide are invited to contribute to the database on photographic meteor positions . Astrometric results will be returned to the owner of the meteor photo.

1. Introduction.

Photography is widely applied to astronomy. A professional photograph is seldom made for esthetical reasons , but always for scientifical use. Photographing the sky systematically, regularly leads to new discoveries. Most new minor planets , comets and novae are discovered in this way. Such newly discovered objects are then photographed several times because science is interested in accurate positional data and the determination of light curves. The importance of such photographic work is certainly undisputed if we keep in mind the positional data necessary for calculation of orbital elements. Measuring photographic plates for very accurate positions belongs to the field of astrometry; magnitude measurements of an object belongs to photometry.

Amateurs apparently get discouraged by the professional looks of astrometry and photometry. There are indeed only a very few who dare enter this field. Perhaps most photographers are ignorant of how to make further use of their pictures in astrometry. In the September issue of Sky & Telescope 1982 , the renowned professional astronomer B.Marsden , appealed to amateurs to make themselves useful in this - for amateur - still unexplored field. Yet there seems to be a lot of hesitation even though it is a simple and inexpensive work . For several years now the Meteor Section has run an astrometry project in which very simply the prints of small frame negatives are measured. It has provided us with hundreds of accurate positional data of meteors which in their turn led to interesting statistical results.

In a new effort to bring this very important and interesting work to the attention of our V.V.S.-members , we will explain in this article how meteor photographs are to be treated astrometrically.

2.Astrometry in general.

When the astrophotographer exposes a photographic plate with his camera , part of the celestial sphere is projected onto the two-dimensional film plate. The optical axis is aimed at the plate's center . The celestial sphere is distorted on the film. This projection is easy to define mathematically. Positions in the celestial sphere defined by their celestial coordinates can in this way be projected on the photographic plate. In a very simplified way the plate can be compared with a meteor plotting chart where we have a right-handed coordinate system centered in the middle . Every star position given in the celestial coordinates of R.A. and dec. can be converted into x- and y-coordinates on the photographic plate. We can also reverse the procedure and measure the x- and y-coordinates and then determine R.A. and dec. It allows us to find the exact positions in the sky starting from unidentified positions (e.g. those of meteors,asteroids,comets,...) Comparing the plates with the meteor plotting charts gives us insight in the nature of astrometry though actually the photographs pose problems which make astrometry mathematically more complicated. Yet the basic principle remains unchanged.

On the meteor charts the X- and Y-axis are indicated which means that for manual meteor plotting the accuracy aimed at is far smaller than for photographical work. An astrophotograph shows us the difference . We have to determine our own right-handed coordinate system. Measuring the x- and y-coordinates unavoidably poses problems:

- it is impossible to find the exact center of the plate - which is also the center of our cartesian system - without using another system and without having to make estimates. The second system will show a translation with respect to the reference system.
- we do not know the scale of the print (focus).
- there is also a series of small inaccuracies :
  - the axes are not exactly perpendicular
  - the optical projection on the plate is not perfect because the optical axis is not perpendicular to the plate. The optics are never perfect. The plate is never perfectly level, etc.

Astrometry may begin to seem quite hopeless at the sight of all these problems. But you have of course guessed that solutions were found , or this article would not exist. The photographer alias measurer , can rest assured : he need not worry about mathematical problems. He estimates the plate's center , makes a free choice of a right-handed coordinate system on the print. He measures the x- and y-coordinates of at least 3 reference stars in this system . The rest is worked out by a computer program.

Converting measured coordinates (x,y) into standard coordinates (X,Y) is done with plate constants a , b , c , d , e , f

General formula : $\boxed{\begin{array}{l} X - x = ax + by + c \\ Y - y = dx + ey + f \end{array}}$

Once we know the precise coordinates of the reference stars , we can calculate the (X,Y) standard coordinates. Subtracting the (x,y) measured coordinates of the reference stars from their standard coordinates allows us to find the plate constants. It means that the translation and rotation of the measuring frame is settled with respect to the standard frame. The plate constants mathematically determine all elements of the photographic plate. The computer program will give a better estimate of the plate's center. If you choose more than 3 reference stars you get an idea of the accuracy of the results obtained. The final result almost always indicates a position in R.A. and dec. of an unidentified point on the photograph which was measured in (x,y)-coordinates.

The photographer need not worry about the fairly complicated computations necessary for obtaining final results from original measurements. For those who are interested , the Meteor Section has a brochure called "Astrometry" . It contains 40 pages and thoroughly treats the mathematical theory of astrometry. For the calculators among you this is an exquisite brochure. We are not going to explain the arithmetics here any further , but wish to stress the practical side of astrometry.

3. Astrometry at your desk.

The measuring used to be done on the negative itself by use of a microscope on a measuring table in an astrophysical institute. Such expensive equipment is of course very accurate, an accuracy which is far higher than actually necessary for small frame negatives . On top of that not everyone has access to this measuring equipment and they that have must sometimes give way to other projects. Yet special exposures still do have priority. Those who are interested should contact their Section. The next chapter will treat of meteor photography. For small frame film you do not need a measuring table. A table at your place , a good measuring staff , a good picture and a magnifying glass are adequate for the accuracy aimed at for meteor photographs. It goes for any amateur astronomer who is not too lazy - so no excuses !

To start with , we need a picture of a meteor. This photographical work is a basic outside job in which you need to take into account the data you wish to obtain in astrometry. So here follows a short introduction to meteor photography.

3.1 Meteor photography and what to do when photographing.

Photographing meteors is rather simple. An ordinary small frame camera with a standard lens , a tripod , a cable release and a Tri-X film will do . With the lens fully opened we can expose the film for only 5 minutes in our light- and air polluted country. The unusual humidity of the air will require a lens warmer to keep the dew away. In order to better distinguish airplanes and satellites from meteors , some use a rotating shutter. This covers the lens e.g. 25 times per second. Meteor trails will be chopped up whereas the airplane- and satellite trails will not. A lot more can be said about all this , but we assume that the meteor photographer can now begin.

He does not remain idle while photographing. There is a whole administration to be dealt with , certainly with several cameras working at once. The experienced astrophotographer can try guided exposures. The beginning meteor photographer though will often keep to fixed ones. Time data are very important and per exposure the time of opening and closure of the shutter should be noted in U.T. , hours , minutes and seconds ! You must try to keep count in this nightly job because later you have to be certain about those time data for every exposure. Some photographers tend to be inaccurate so that afterwards they are unable to determine the exact times of exposure.

The photographer need not worry about falling asleep , considering the notes he has to make every 5 minutes or so. He also has to guard the areas in the sky covered by his cameras. Every meteor brighter than +2 , airplanes and satellites possibly photographed should be mentioned in his report. Time in U.T. and position (constellation) are essential for the astrometry afterwards. He needs a complete set of data for every fully exposed film, because a failing administration leads to problems of identification of the photographed meteors. The astrometrical value drops at the sight of any uncertainty in necessary time data. The Meteor Section can provide special forms for meteor photography.

3.2 Investigating the negatives.

After developing the film each negative should be carefully examined. Black and White films are easier to examine than colour negatives , which are a lot more expensive and without additional use. Tracing meteors on the negatives is not easy. They usually are short and unobtrusive weak lines on a negative full of star trails. Very bright meteors that quickly catch your eye on a negative are rare. A quick examination of your film will therefore provide no meteors whatsoever. You should carefully look at each negative , strongly magnifying it and holding it against the light. This is a time consuming job and requires a lot of patience. It goes without saying that the notes made during the night come in very handy here. They tell you when to expect a negative with a meteor , satellite or airplane trail. Additional meteors will be found too , since the visual observer misses rather a lot of meteors while watching.

3.3 Processing the meteor pictures.

The negatives with meteors on them have to be printed : first a general print of the entire negative , then an enlargement (of 10 to maximally 20 times) of the area around the meteor. We will not deal with the work in the dark room here , but advise you to contact the Astrophotographical Section. We assume you know how to produce good prints. For each print you fill in a photo form which is to be obtained from the Meteor Section. This form collects data concerning the photographer in first instance , the print , the camera and the film used , as well as the developer. These data are not essential for astrometry , but they are useful.

Most important to astrometry are date , times of exposure , exact time of appearance of the meteor . All times must be correct to the second and given in U.T. In case the print should get separated from the corresponding photo-form we strongly recommend you to also note these data on the back of the print. Most important here are the photographer's name , date and exact times! Specifically for astrometry the photographer has to determine and measure reference stars.

First problem is star-identification. With the help of a good star atlas you should be able to name 5 to 7 of them . The Meteor Section has published a small Catalogue of Named Stars , which provides you with the names and reference numbers of the stars per constellation . Bad prints like mirrored prints, unclear prints or prints with too few reference stars will give you trouble at this stage. Unfortunately it is usually someone else who has to measure the work of a careless photographer. Members of our Section measuring most of the incoming prints have lost lots of valuable time because of the carelessness of photographers who did not know or just ignored the requirements set by astrometry.

How does one choose reference stars ? These stars should be situated in the neighbourhood of the meteor and should not be sought all over the negative . Reference stars should not be collinear which means they should not be on or close to a straight line. They should be well distributed over the area bordering the meteor but not too far away from it , since it is the plate constants for the meteor area you wish to determine. Figure 1 illustrates what is meant by "a good choice".

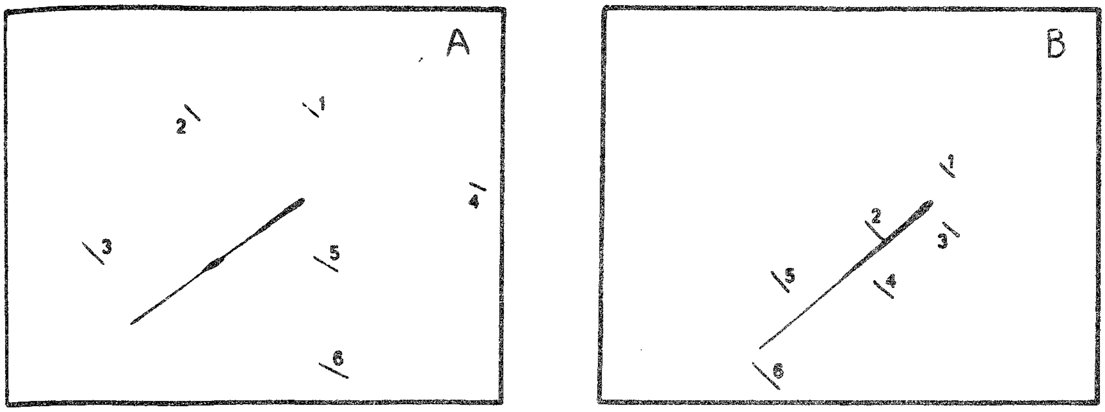


Fig 1

Fig.1 A: a good choice of reference stars
B: a bad choice

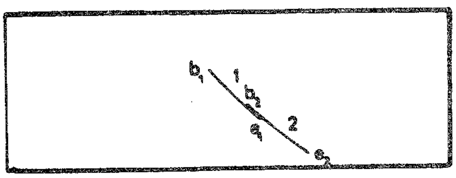


Fig.2 Never use such star trails !

You should also avoid fat star trails (bright stars) and never choose double stars or overlapping trails (see fig.2).

Once you have your reference stars , the measuring work can begin. The left edge of the picture becomes y-axis , the bottom edge x-axis. With a good measuring staff you should now measure the distance of beginning and end of each reference star and of the meteor , to the y-axis (x) and to the x-axis (y). These (x,y) values are expressed in millimeters and tenths of millimeters, so do use a see-through measuring staff with clear millimeter indications from which you can estimate the tenths. Also use a magnifying glass for this and take into account the possible parallax when reading your measuring staff. Good light over the investigated part of your picture is equally important !

On the photograph which is used as example for this article you see how the stars are marked on the print itself. In this case it is a guided exposure , but the same goes for non-guided photographs. A small cross marks the estimated center of the plate as the center of the picture. The example is a wide-angle photo made by Pekka Parviainen in Finland , a faithful member in

Fig.3 Meteorphoto with star identifications ready to be measured. (P.Parviainen,1982,Aug.13-14,22h11m U.T. Perseid -5)

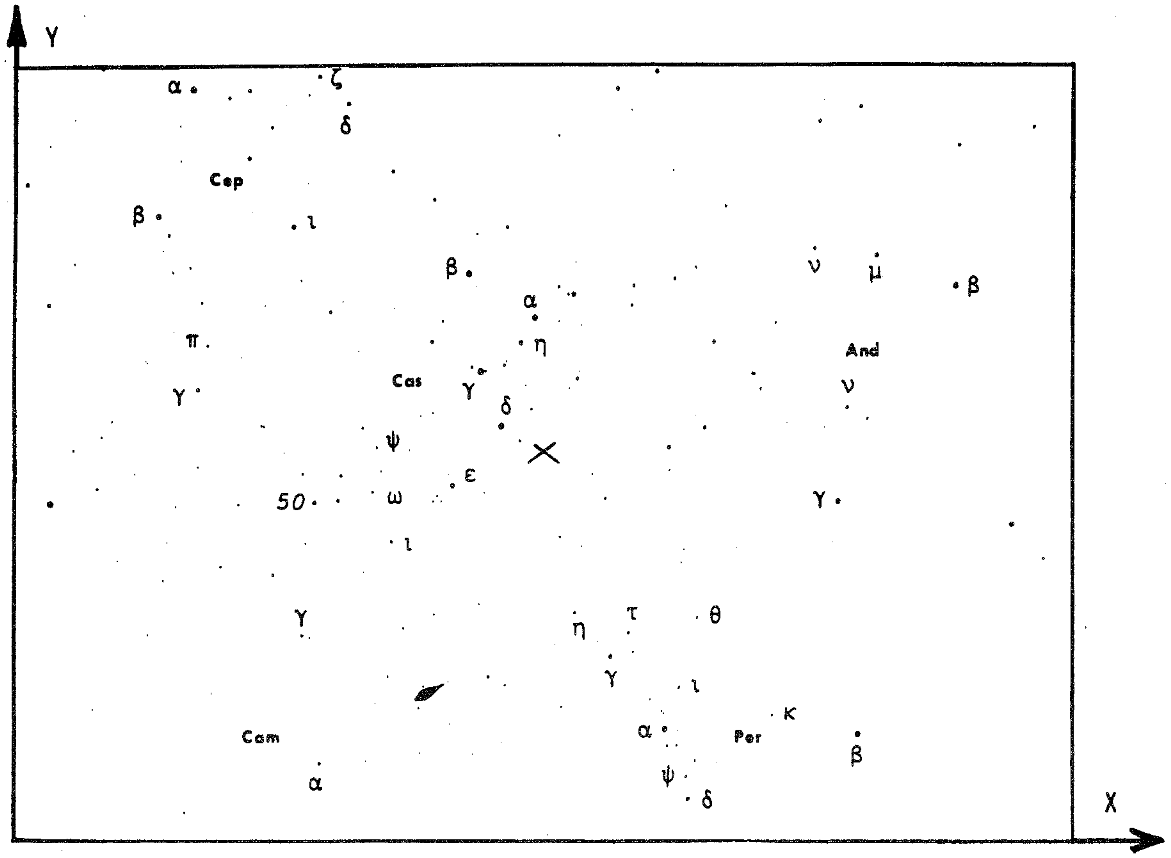


Fig.4 Extract from the Astrometry form (to be obtained from the VVS)

Reference Stars

Name	GC	Xbeg.	Ybeg.	Xend	Yend
ε Cas	2289	59,7	108,7		
ι Cas	2952	51,7	117,2		
η Per	3390	42,4	90,9		
γ Cam	4557	38,3	129,3		
	4113	33,0	103,0		
λ Per	4924	10,3	84,4		
α Cam	5924	20,7	126,5		

Center of the plate ; α = ..26°.... δ = ...+58°..
(estimated position)

Points on the meteor	X	Y	
Beginning	31,8	109,3	
end	29,8	113,1	

the Far North. Wide-angle exposures make it difficult to estimate the center of the plate when a negative is not entirely printed. In this example calculations proved the real center to be quite away from the estimated one.

The astrometry- and photoforms are combined. Figure 4 gives an example of a filled-in astrometry form. Some reference stars were chosen on the original print (a copy of the one shown here). The name of the star appears in the first column. The GC (General Catalogue) number comes from the Meteor Section's star catalogue. Then we find the measured (x,y)-coordinates of the stars. In case of a non-guided exposure both beginning and end of each star trail is measured , and the coordinates are correct to a tenth of a millimeter. The scale of the print in this article differs from the original print on which the measuring was carried out , so please do not try to check !

Following the list of data concerning the reference stars you should note the estimate of the position of the small cross marking the plate's center. Use an atlas for this ; the estimate does not need to be too precise.

Finally you should measure at least two points on the meteor trail - usually beginning and end , but not necessarily. You can pick other points if your meteor is only partly on the picture.

This ends the work of the photographer - measurer. The photo-form and all its data should be sent to the Meteor Section together with the enlarged print on which you did your measuring and with the general view on which you determined the plate's center. The Meteor Section appreciates fully filled in forms and data on each piece , this to ease identification !

3.4 Astrometrical results.

People who hand in a measured photograph with a photo-form after a while receive a computer print with astrometrical calculations. This elaborate work is done by Christian Steyaert who runs the computation subsection of the Meteor Section. It is also here that the computer data are processed and kept. The results are as in the following example (see fig.5)

(1)

Alfa	Delta	K	c	f	ro	J
15.200	74.800	125.297	64.952	135.215	16.040	6.61763E-03
15.436	74.746	125.395	64.863	135.069	15.809	6.59822E-03

Gekorrig plaatmid 15.333 74.791

r gem = 24.1825

Fig. 5

(2)

x	Y	Alfa	Delta				(min)	(')	(')
59.700	108.700	1 50 36	63 24 7	45	eps	Cas	-0.16	-1.37	1.76
51.700	117.200	2 24 59	67 12 10		iot	Cas	-0.15	1.42	1.68
42.400	90.900	2 46 55	55 43 0	15	eta	Per	-0.11	1.63	1.87
38.300	129.300	3 45 11	71 8 33		gam	Cam	0.16	-2.31	2.43
33.000	103.000	3 25 24	59 44 51				0.41	-1.23	3.36
10.300	84.400	4 2 48	50 12 47	47	lmb	Per	-0.03	-0.26	0.41
20.700	126.500	4 48 57	66 17 10	9	alf	Cam	-0.11	1.53	1.66
							Std dev (')		2.054

59.700	108.700	1 50 36	63 24 7	45	eps	Cas	0.16
51.700	117.200	2 24 59	67 12 10		iot	Cas	0.15
42.400	90.900	2 46 55	55 43 0	15	eta	Per	0.11
38.300	129.300	3 45 11	71 8 33		gam	Cam	-0.16
33.000	103.000	3 25 24	59 44 51				-0.41
10.300	84.400	4 2 48	50 12 47	47	lmb	Per	0.03
20.700	126.500	4 48 57	66 17 10	9	alf	Cam	0.11

(3)

31.800	109.300	3 37 7	62 4 35	begin
29.800	113.100	3 49 36	63 15 50	eind

(4)

Part (1) shows the parameters that result from the astrometrical calculations. The plate's center is first optimally estimated and after a few iterations correctly determined.

Part (2) provides us with the conversion of the measured coordinates (x,y) of the reference stars into the celestial coordinates Alpha and Delta. The difference between the computed star positions and the positions found in the catalogue gives us an idea of the accuracy , but this is only possible when more than three reference stars were chosen.

Part (3) does the same as (2) , but where part (2) gives the data for the beginning of the stars , part (3) gives them for the ending. From both parts follows the time of exposure as the difference in Right Ascension between both points.

Part (4) then gives Right Ascension and declination of the "unidentified" measured point . This is the final astronomical result.

3.5 Further applications of astrometrical results.

One single photograph on its own is of no use at all. All pictures received at the Meteor Section are measured and computed . Untill 1983 almost no one measured his pictures himself. After 1983 and a campaign held by the Meteor Section to promote astrometry , there was a slight improvement , but the majority of the pictures received still were not measured and many of them required a lot of detective work to identify them . It delayed the astrometry project enormously ; because of its chaotic outlook , the work disheartened some and challenged others. Finally some thousand meteor photographs were measured and computed. These data are kept in a computer database , which was named within the Meteor Section "Photographic Meteor Database" (PMDB). It contains records of photograph-data from various countries , and makes the V.V.S. Meteor Section unique in the world for centralization of amateur meteor photographs. It also accounts for a steady increase of cooperation from all over the world. To keep ahead of this growing quantity of work , it is most desirable that more people start working with us on this astrometry project , especially with the routine job of measuring . Who is willing to help us out when the next wave of meterial comes in ?

The use and aim of such a database is made clear in the following applications which have now become possible :

- statistic research for radiant positions , diameters and radiant drift.
- several simulations and computations of individual meteor trails. Prognoses concerning double station meteors ; graphical applications.
- search for double station photographs of meteors
- computation of the path of the meteors through the atmosphere,the atmospheric trajectories.
- heliocentric orbital calculations.

4. Other areas of application.

It goes without saying that the Meteor Section specializes in meteor photographs. Yet tele- and astrophotographs can be used instead of small frame pictures. It allows for the very exact determination of comet-,minor planet-,nova- and variable star positions , which means other sections have to do with astrometry too.

Take e.g. comet Hartley-Good , photographed on 1985 Oct.15,20h45m00s by Dany Cardoen and Christian Steyaert at Puimichel in France . There were only 3 reference stars , which undermines the accuracy. This should be sought in the order of seconds of arc due to high magnification of the exposure , which makes it hard to find enough reference stars , though . The rest of the measurements are analogous to those of meteor photographs. Results for comet Hartley-Good are as follows :

$$\alpha = 20h36m35s \qquad \delta = -10°59'02"$$

5. Literature.

The mathematical background of astrometry is described in the brochure Astrometrie (in dutch) while a catalogue with recommended reference stars will help you to name stars on your photo. Both publications can be obtained for 200 Bf if ordered at once or for 125 Bf if ordered separately (post paid).

The results of the photographic work have been published recently (October 1986). This new publication "The Photographic Meteor Database " can be obtained for 400 Bf, post paid. This report contains 115 pages with all the information on 988 meteor photo's. This catalogue lists general information on the photographers , the camera's, the films , the meteors that were photographed and the astrometric data. With this publication you would have all the essential results obtained from the 988 photographed meteors. The production of this report consummed many hundreds of working hours , we hope that many meteor workers are interested to obtain a copy !

AUSTRALIA :

GEMINID METEOR STREAM 1985

Jeff Wood

1985 has seen Australian meteor observers carry out yet another extensive program to observe the Geminid meteor stream. The warm dark , clear moonless nights together with the fact that the date of maximum occurred on a weekend saw records tumble . 41 people took part in the 1985 Geminid Watch. Observing for a total of 267 man hours over 14 nights from December 2-3 to 19-20 , approximately 5000 Geminids were recorded. Many of these were seen during the Western Australian Meteor Camp at Cunderdin some 180 km East of Perth under extremely dark skies.

The observers who took part in the 1985 Geminid Watch were as follows :

Aaron Shepherd,Darren Ferdinando,Hai Quan,Hung Lam,Simon Evans, David Cake,Russell Hoyle,Brian Macauley,Paul Rawlings,Neil Herzog, Jeff Wood,Stephen Kerr,Peta Fitzgerald,Neil Inwood,John-Ann Burrows,Katrina Mitchell,Michelle Treasure,Maria Ingram,Michelle Cockeram,Guy Harvey,John Goldsmith,Shane Sullivan,Louise Cockeram Megan Clay,Lisa Wooldridge,Darren Anthony,Daryl Martin,Lance Taylor,Eve Hambleton,Nicholas Harvey,Alan Prictor,Colin Legg, Jim Trainor,Robert McLaughlin,Bob Newman,Robert Smith,Liam Egan, Sharon Smith,Robert Price,Jim Sarandis and Robert Purvinskis.

Geminid Rates :

All of the following rates have been corrected to the standardised zenith hour rate format of :

$$\boxed{Z = \frac{N}{T} * L * \frac{1}{C} * R * D * S * W}$$

where : Z : Zenith Hour Rate (Z.H.R.)
N : Observed rate

T : observed time in hours
L : limiting magnitude correction factor
C : observer coefficient of perception
R : radiant altitude correction (Shepherd's Formula)
D : Dead time
S : correction for obstruction due to trees,buildings
W : cloud cover correction

Table 1; Geminids 1985 (Australia)

Date U.T.	Z.H.R.	S.D.	N°
Dec. 02.70 d	No Geminids were seen		
03.67	1	1	6
06.73	3	1	9
07.71	5	3	8
08.69	6	2	5
10.71	12	3	10
11.71	21	3	7
12.64	21	4	25
12.69	26	6	9
12.73	30	6	19
12.77	32	3	9
13.63	35	13	24
13.69	54	9	28
13.73	81	17	23
14.69	27	6	17
14.74	31	11	16
14.79	25	5	3
15.71	10	2	10
16.71	3	1	9
17.73	1	1	6
19.69	No Geminds were seen		

As can be seen from the table , the true maximum of the Geminids occurred sometime around 14.00 days U.T. which was in daylight hours for Western Australian observers. It would appear from extrapolation that the maximum zenith hour rate was around 100 meteors per hour which means that the stream provided a normal display in 1985.

Geminid Magnitude Distribution :

Just under 4600 magnitude estimates were received by the N.A.P.O.Meteor Section. The following table is a summary of the most reliable of these.

Magnitude	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.	$\bar{m}$
numbers	4	7	16	43	112	237	490	961	1046	928	473	84	4401	2.69

Colour and train data :

Colour	Percentage
Red	2 %
Orange	6 %
Yellow	33 %
Green	3 %
Blue	5 %
White	51 %

The colour distribution is for Geminids of magnitude +2 or brighter. Geminid meteors rarely produce a train. In 1985 the Geminid meteor stream was no exception with only 4.9 % of the meteors seen having a train/. All of the trains recorded were of short duration with none lasting more than 6-7 seconds after the meteor itself having disappeared from view.

The ratio of the increase of Geminid meteors per magnitude (population index r) was equal to 2.58 (for $-5 \leq m \leq +5$)

AUSTRALIA : THE BETA HYDRUSID METEOR STREAM

Jeff Wood

On the evening of August 16-17 ,1985 , Western Australians were treated to a brief but spectacular display of meteors coming from a radiant located near the star Beta Hydrus.

The meteors which were very bright and yellow/orange in colour as they slowly streaked their way from out of the southern part of the sky in long paths were very noticeable judging by the many reports received by the media, police,Bureau Of Meteorology and airport authorities from the general public. It is most unfortunate that the information contained in these reports is rather scanty and so they can only be used to give a general overall picture of what occurred . However , besides general public , there happened to be several experienced meteor observers out watching the sky at the time the event occurred and so a good set of results have been obtained. The remainder of this report deals with their findings.

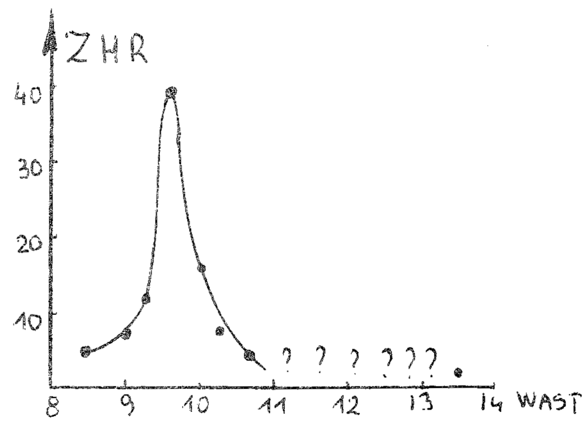
Observers Details : Brian Macauley (Bickley),Jason Tame(Kalamunda) Simon Evans (Kalamunda),Paul Rawlings(Belmont),Joh-Ann Burrows (Byford),Megan Clay (Byford) - All in Western Australia.

Table 1 Raw stream rates

Time Interval (W.A.S.T.)	Lim. Mag.	No	Z.H.R.	Obs.
8h50- 9h10 pm	6.5	1	5	BM
9h10 9h30	6.5	2	10	BM
9h10 6h30	6.5	4	13	JT
9 h10 9h30	6.5	5	13	SE
9h30 9h50	6.5	6	31	BM
9h30 9h50	6.5	12	40	JT
9h30 9h50	6.5	19	49	SE
9h30 9h50	6.3	7	55	PR
9h30 9h50	6.8	11	33	JB
9h30 9h50	6.8	13	28	MCl
9h50 10h10	6.5	4	13	JT
9h50 10h10	6.5	8	20	SE
9h50 10h10	6.3	2	16	PR
9h50 10h10	6.8	5	15	JB
9h50 10h10	6.8	7	15	MCl
10h10 10h30	6.3	1	8	PR
10h10 10h30	6.8	2	6	JB
10h10 10h30	6.8	3	6	MCl
10h30 10h45	6.8	1	4	JB
10h30 10h45	6.8	1	3	MCl
1h10 2h10 am	6.6	2	2	JT
3h20 4h20	6.6	No Beta Hydrusids		
4h20 5h20	6.6	No Beta Hydrusids		

Table 2 : Averaged Z.H.R.'s

Time Interval (W.A.S.T.)	Z.H.R. mean	S.D.	N°
8h50- 9h10 pm	5	-	1
9h10 9h30	12	1	3
9h30 9h50	40	10	6
9h50 10h10	16	2	5
10h10 10h30	7	1	3
10h30 10h45	4	1	2
1h10 2h10 am	2	-	1
3h20 4h20	None seen		
4h20 5h20	None seen		



Magnitude Distributions :

Magnitude	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.	$\bar{m}$
Numbers	0	2	1	5	8	12	23	26	21	14	4	0	116	1.6

Other characteristics :

Colours : Red........1.3 % Orange:14.3 % Yellow:....55.8%

Trains : Very few of the Beta Hydrusids left a train. Of the 116 meteors recorded only 5 (4.3 %) produced a train.

Radiant Position : A graphical solution of the apparent radiant position via plotting reveals the following coordinates :

R.A. 023°	Dec. -76°

Geocentric velocity : Without proper means , it was impossible to evaluate accurately the geocentric velocity of the Beta Hydrusid Meteors . However , the observers record the meteors were noticeably slower than the Taurids , but not as slow as the slowest meteors they have ever seen. Therefore , we can conclude that the geocentric velocity lies somewhere in the range 14 km/s to 22 km/s.

NEW PUBLICATIONS

DIE METEORE

(Reviewed by N.Nelson)

Prof. H.Mucke (ed.), 14 Sternfreunde Seminar 1986, Planetarium der Stadt Wien und Osterreichischer Astronomischer Verein, Hasenwartgasse 32 , A 1238 Wien ,tel.: ..-432228816703.
170 sides , leaf , German text , Price ; 200 OSh without mailingfees.

A summary of an annual series of lectures held at the planetarium of Vienna. In 1986 the subject was meteors and meteorites. The aim of these lecture series is to activate the amateur astronomer to observe and to digest the data from certain astronomical subjects. In these annual series of lectures you will find many subjects in which amateurs can do more observational work but where they don't find much literature about. A very extended list of literature is enclosed in the summary (it counts 12 sides). The following subjects are described in this work :

- history of meteorresearch
- meteorresearch done by one of the famous Austrian popularisators of meteor observations ,Prof.Dr.O.Thomas.
- describing of the phenomena 'meteor' with 12 gnomonic starmaps and methods of visual data treatment.
- the theory of meteor orbits
- photographic meteor observations and analysis from meteor photos.
- radio observations of meteors.
- physical processes of meteor phenomena.
- fireballs and their classification.
- extended chapter about the classification and chemical composition of meteorites.

About 52 figures and many tables complete this work. These figures and tables are excellent and useful to get the idea of the important quantities in the research on meteors and meteorites. I like to say that this work edited by Prof.Mucke is warm recommended for all serious meteor amateurs !

J.Jones : The effect of gravitational perturbations on the evolution of the Taurid meteor stream complex.
Mon.Not.R.Astr.Soc.(1986) Vol.221, p.257-267

Calculations of the development of a hypothetical meteor stream with an orbit similar to that of comet P/Encke under the action of purely gravitational perturbations by Jupiter are described. It is found that if the initial orbit is well defined and the spreading resulting from the ejection velocities of the meteoroids from the comet are ignored , the time-scale needed to account for the present duration of the Taurid meteor shower and the difference in tilts between the northern and southern branches of the shower is of the order of 0.1 Myr.Comparison of observations with P/Encke suggests that the inclusion of the initial distribution of orbits would lead to a more comfortable fit of theory to observation. Examination of the motion of the orbital tilt indicates any separation of the Apollo asteroid Hephaistos and P/Encke must have occurred in the remote past.

M.Šimek,B.A.McIntosh: Perseid Meteor Stream: Mean Flux Curve From Radar Observations.
B.A.C. Vol.37 (1986) No.3 p.146-155

Sixteen years of observations of the Perseid meteor shower by the Ottawa (Canada) patrol radar have been used to determine the relative flux of the shower in particle size ranges producing radar meteor echoes having durations <1s and <8s . A sharp flux peak occurs at solar longitude 139°20 ± 0°026 (echo duration < 1s) but there is also a broader structure producing activity over many days. No small particles were observed , but it is not known whether this is a real lack of small meteoroids or due to a combination of selection effects which makes them unobservable.

G.G.Novikov,P.Pecina,A.V.Blokhin: On the scattering of radio waves from underdense meteor trains.
B.A.C. Vol.37 (1986) No.4 p.189-195

The paper deals with some problems of radio-wave scattering from underdense meteor trains. The diffusion equation is solved under the assumption that the ionization source terminates its action after the meteor is fully burnt out , which has not been taken into account so far. The finite train initial radius is also considered. The formulas for the electron volume density obtained in this way are compared with those found by Dokuchaev and are further applied to the construction of the Fresnel characteristics. The model case is also considered bearing in mind the possible presence of negative ions within the train.

M.Šimek : Radar observations of the Giacobinid Meteor Shower 1985
B.A.C. Vol.37 (1986) No.4 p.246-249

The activity of the Giacobinids 1985 is analysed. A maximum shower rate of about 70 meteors from 9h55m to 10h05m UT at a solar longitude of 194°575 ± 0.003(equinox 1950.0) down to +8m was observed. This time is very close to that predicted by Yeomans. The mass distribution index s = 1.99 was found for overdense echoes in the magnitude range $-0.7 \leqslant M_r \leqslant +3.8$.

B.Yu.Levin,V.A.Bronshten:"The Tunguska event and the meteors with terminal flares. Meteoritics,Vol.21,No.2,(1986) p.199-215

The comparison of the Tunguska body explosion with the effect of terminal flares of meteors and fireballs leads us to the conclusion that these events are of a similar nature but differ only by their scale. We consider that the dynamics of progressive breaking and evaporation of meteoric bodies during their entry into the terrestrial atmosphere could explain the terminal burst. An extremely porous body model for the Tunguska meteorite was analysed and rejected as unsatisfactory. The realistic values of the initial velocity (30km/sec) and of the inclination angle for the Tunguska's trajectory (5°-15°) give orbital elements not in contradiction with the cometary origin of the Tunguska body.

B.A.Lindblad : Structure and activity of the Perseid meteor stream from visual observations 1953-1981.
Asteroids,Comets,Meteors II (1986) p.531-535

Visual observations of Perseid meteors 1953-81 indicate that the Perseid stream cross section consists of two components : a long duration rather flat component and a sharp spike-like feature which defines the Perseid maximum. Shower maximum for visual meteors occurs at solar longitude 139°4 (Equinox 1950.0). The Perseid shower shows large variations in activity from year to year , with more than a factor two variation in hourly rates at maximum.

==

Useful addresses - V.V.S. Meteor Section

Radio Sektie - Radio Sub-section.

Jeroen Van Wassenhove , 's Gravenstraat 66 , B-9730 Nazareth
Tel.:091/85 61 09

Reken Sektie - Computational sub-section + photographic DB

Christian Steyaert , Poelstraat 319 , B-9240 Bottelare
Tel.: 091/62 75 03

Visuele Sektie - Visual Sub-section

Paul Roggemans , Dellingstraat 25 , B-2800 Mechelen
Tel.: 015/41 04 43

Redaktie Werkgroepnieuws - Edition Werkgroepnieuws (editor)

Paul Roggemans

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Tel.: 03/775 13 29 (verwittigen wanneer WGN niet werd ontvangen)

Please report delays or irregularities that may occur in the mail !
Take note that WGN is sent through surface mail only !

NOTES

The DECEMBER ISSUE : The last number of volume 14 (1986) will appear in Belgium in the first week of December. Contributions , articles and communications for this issue have to arrive before 10 November at last !

The 1987 SUBSCRIPTIONS : To save costs we appeal to all our subscribers to renew promptly . See elsewhere for more information on the 1987 subscriptions. In 1986 WGN has subscribers and readers in 26 countries . We intend to continue to provide as much information as possible in english . Our only limitation on the amount of texts in WGN in english is the fact that we don't have any more contributions in english . So , please send us your report , results and news in the format of an article for WGN !

APPEAL TO VARIABLE STAR OBSERVERS : The V.V.S.Variable Star Section would like to establish regular correspondence with variable star observers in other countries . If you know any variable star observer(-s) in your country , would you please assist in contacting the variable star observers ? We would be grateful to you if you could get the addresses and communicate these to :

Ludwig Cluyse
Groeneweg 5
B-8898 Dentergem Belgium

Variable star observers may write to Ludwig Cluyse directly of course.

INTERNATIONAL METEOR WEEKEND : This issue will be mailed after the meteor weekend . 50 participants were registrated from 9 countries. We hope to publish a complete report on this International Meeting in the next issue of WGN . It is also planned to have the proceedings of this weekend ready early in 1987.

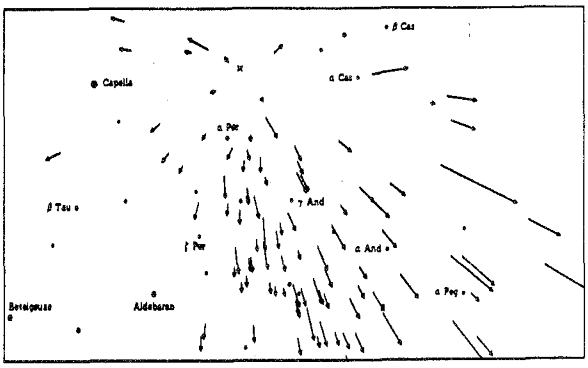
NEW PUBLICATION

COMPLETE INFORMATION ON NEARLY 1000 PHOTOGRAPHED METEORS

VERENIGING VOOR STERRENKUNDE

WERKGROEP METEOREN

THE PHOTOGRAPHIC METEOR DATABASE



1986

Have you ever seen nearly thousand meteors on photo's ? Have you ever been able to use hundreds of high precision positions of meteors ?

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It is possible ! The new publication contains all the data on each photo that ever reached the headquarter ! Yes data on photographers, camera's used, films , exposures,developers, astrometric data and of course the high precision positions of all these meteors. Order your copy now !

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