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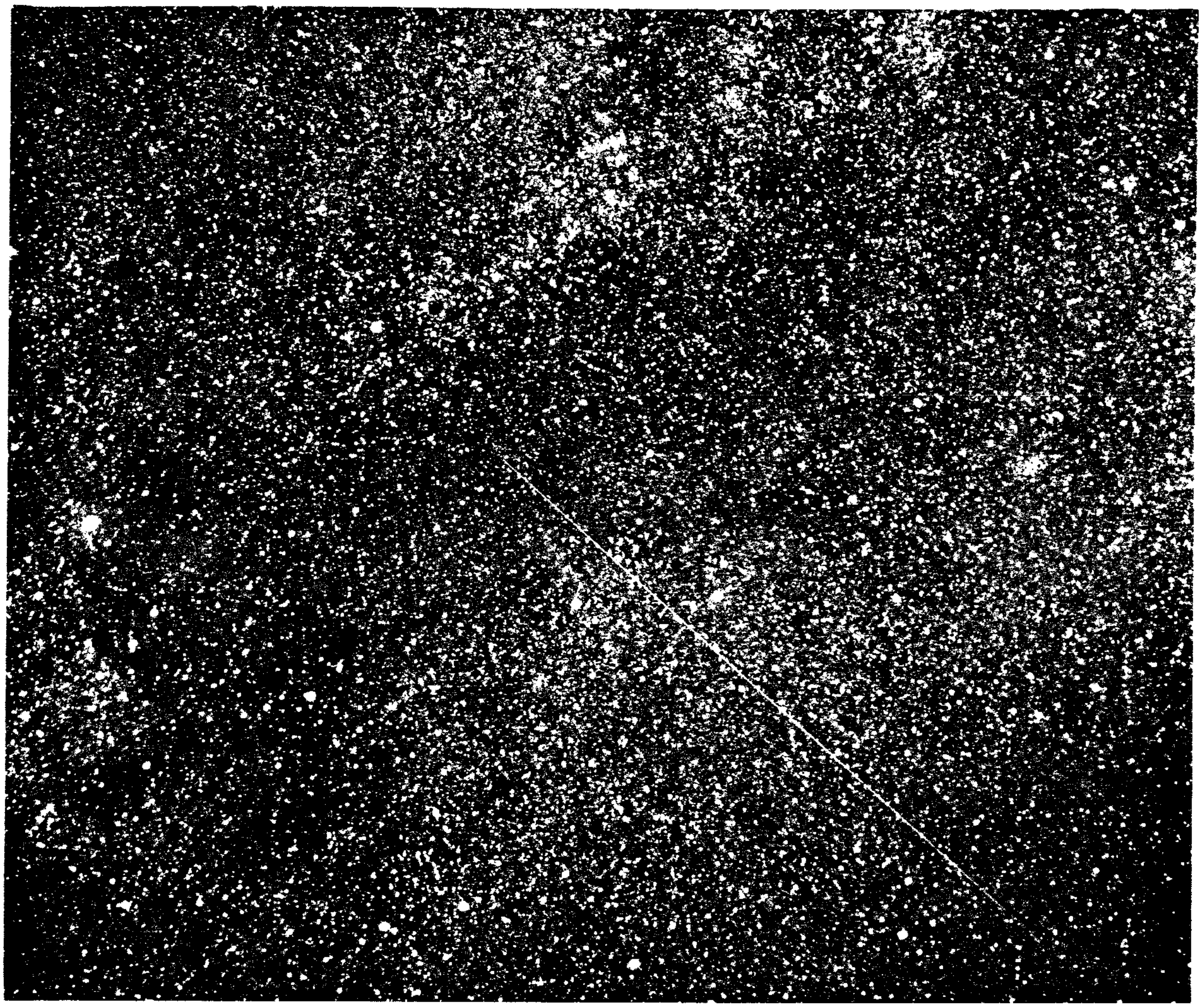
WGN The international circular for meteor observers

KONTAKTBLAD VAN METEOORWAARNEMERS IN DE BENELUX



O S M

F.E.M.A.

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COVER : This meteor trail has been photographed by Pekka Parviainen in Finland. The photographer didn't provide any data with the paperprint. The meteor appeared in a part of the Milky Way between Dzeta and Gamma Cygni.

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BELANGRIJK BERICHT AAN DE NEDERLANDSE ABONNEES !

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Op 1 maart 1986 werden nieuwe posttarieven ingevoerd door de belgische PTT . Hierdoor stijgen de verzendingskosten naar Nederland aanzienlijk. In 1986 komt dit erop neer dat elke abonnee in Nederland ons welgeteld 302 Bf kost, dit is de netto kostprijs van WGN met de verzendingskosten. Vele abonnees in Nederland betaalden slechts 250 Bf. Teneinde minstens de werkelijke kostprijs te dekken vragen we de Nederlandse abonnees om hun abonnementsgeld voor 1986 aan te vullen tot het bedrag van 300 Bf. Afhankelijk van het totaal voor 1986 betaalde abonnementsgeld zal voor elke nederlandse abonnee afzonderlijk bekeken het abonnement eindigen met het augustusnummer (voor wie slechts 200,-Bf betaalde), met het oktobernummer (voor wie slechts 250,-Bf betaalde) en zoals normaal met het decembernummer voor al wie 300 Bf of meer betaalde.

De werkgroep werkt zonder winstbejag, daarom proberen we alle publikaties ook aan minimum kostprijzen ter beschikking te stellen. Toen eind 1985 de kostprijs voor 1986 werd opgemaakt ontkende de PTT dat er grote prijsverschillen zouden voorkomen. Een normale verhoging van 6% werd aangekondigd. Tot eind februari 1986 kon de PTT nergens de nieuwe tarieven mededelen ... pas op 3 maart kon dat wel. Kort voordien had men op het kabinet van een of andere idiote politieker besloten tot een zeer drastische prijsaanpassing. Dat de PTT geen verlies mag maken is logisch , maar de manier waarop de tarieven worden aangepast zonder zich rekenschap te geven dat uitgevers zulks minstens zes maanden op voorhand zouden moeten weten, is nogmaals een bewijs van de bekwaamheid van de politieke kaffers die zichzelf verantwoordelijkheid toevertrouwen.

Uiteindelijk moeten we toch veel meer postzegels kopen voor de verzending naar Nederland. We kunnen niet anders dan deze onverwachte extra kosten door te verrekenen aan de abonnee. We rekenen dan ook op uw begrip . Indien U nog moet bijbetalen , doe dit dan op de belgische postgiro 000-0688050-29 van Paul Roggemans.

Bij de bestelprijs van handboeken moet ook 50,- Bf worden bijgeteld voor de extra verzendingskosten naar Nederland!

===

AKTIE OPROEP

APRIL — MEI 1986

Paul Roggemans

Tabel : maanlicht april en mei 1986

Datum	k	Datum	k
Vrijdag 04 April	0.27-	Vrijdag 02 Mei	0.41-
Vrijdag 11 April	0.03+	Vrijdag 09 Mei	0.00+
Vrijdag 18 April	0.56+	Vrijdag 16 Mei	0.40+
Vrijdag 25 April	1.00-	Vrijdag 23 Mei	0.99+
		Vrijdag 30 Mei	0.56-

L.K.	1 april ,	1 mei ,	30 mei
N.M.	9 april ,	8 mei ,	7 juni
E.K.	17 april ,	17 mei ,	15 juni
V.M.	24 april ,	23 mei ,	22 juni

1. Sporadische aktiviteit.

De maan is erg ongunstig tijdens de aktiviteit van de grote zwermen in april en in mei. Het zal dus nodig blijken om de aandacht wat te verleggen naar de sporadische aktiviteit. Herhaaldelijk worden de werkgroepleden opgeroepen om de sporadische aktiviteit te volgen. Deze oproep kent echter geen succes. Bijgevolg hebben we geen idee wat de aktiviteit was gedurende de voorbije maanden. Na een paar waarnemingsverslagen tijdens de Quadrantiden begin januari 1986 ontving de werkgroep geen enkel waarnemingsverslag meer. Deze trend om tussen de aktiviteitsperioden van de grote zwermen niet meer te observeren is begonnen in 1984. Het is een bijzonder slechte zaak voor de huidige groep waarnemers. Het gebrek aan praktijk wanneer men niet regelmatig waarneemt verhindert de kansen om een ervaren waarnemer te worden zeer drastisch. Het aantal uren waarnemingspraktijk is de laatste jaren al (te) gering voor de meeste waarnemers. Het gebrek aan ervaring komt tot uiting wanneer men dan per uitzondering toch nog eens gaat observeren tijdens de aktiviteit van een grote zwerm.

2. HOE WORDT MEN EEN GOEDE WAARNEMER MET ERVARING ?

Aansluitend op bovenstaande paragraaf lijkt het me nuttig om het enige 'wonder-'middel openbaar te maken hoe men de nodige ervaring kan verwerven. Indien er in de nabije toekomst niet meer werkgroepleden bereid zijn om regelmatiger te observeren dan zal de werkgroep in de nabije toekomst een nijpend gebrek aan ervaren waarnemers ondervinden. Van de groep ervaren trouwe waarnemers die de werkgroep jarenlang aan goede waarnemingen hielpen vallen af en toe medewerkers af die om diverse redenen minder aktief gaan meewerken. Hun plaats wordt niet ingenomen door nieuwe elementen. Uit de jongste geledederen der JVS komt een uiterst zwak respons, dit verschijnsel wordt door verschillende werkgroepleiders gerapporteerd. De J.V.S.-ers van vandaag schijnen het vuur van het enthousiasme slechts op een zeer laag pitje te kennen. Het is evident dat zulks op iets langere termijn fataal is voor de werking van de V.V.S. en van de werkgroepen. We hopen dat het uiteindelijk nog in orde komt.

Het geheim van de 'ervaren' waarnemer zit gewoon in het aantal nachten,de regelmaat en het totaal aantal uren praktijk dat hij er heeft opzitten. Wanneer men zijn eerste waarneming verricht dan stuit men op een heleboel problemen. De sterrenhemel, het waarnemen van meteoren is een geduld werkje; tussen twee meteoren mag men niet in slaap vallen. Het schatten van de helderheid van meteoren, het bepalen van de grensmagnitude ... het zijn allemaal doodsimpele dingen die aartsmoeilijk kunnen zijn voor wie het allemaal nooit eerder probeerde. Daarom is een J.V.S.'er eigenlijk het best geholpen in zijn eigen kern. Wanneer men deze problemen aanpakt met een groep vrienden dan zal het een stuk aangenamer zijn om deze drempel te overwinnen. Vooral tijdens de vakantiemaanden wordt het ideaal als men in kernverband kan afspreken om <u>elke</u> nacht samen te komen en te observeren wanneer het enigszins kan. Men kan dan rekenen op een vaste afspraak met de kern zodat men steeds in groep kan werken. Zo kan men regelmatig en vooral veel waarnemen. Als men dit enkele jaren volhoudt dan wordt men zeer ervaren. Uiteindelijk is men in staat om onder zelfs barre omstandigheden alleen lange tijd goede observaties te verrichten.

Probeer dit eens in uw kern . Het zal trouwens de werking van uw kern ten goede komen. Werk samen en moedig elkaar aan om zo vaak mogelijk te observeren. Als je met een groep gaat waarnemen zorg dan wel dat elke waarnemer z'n waarnemingen afzonderlijk noteert (gemengde groepswaarnemingen met alle gegevens van de waarnemers op één formulier zijn onverwerkbaar). Tenslotte,uit eigen ervaring kan ik nog toevoegen dat geplande vakanties in familieuverband of vakantiewerken voor de aspirant-waarnemer best worden vermeden. Houd uw vakantie dus vrij om er met de kern onbeperkt op los te observeren. Het is een kwestie van interesse en waarom zou jij met je kern dit jaar de stap niet zetten ? Er staat veel op spel voor uw kern en op langere termijn voor de V.V.S. De werkgroep meteoren is zeer benieuwd welke kern er dit jaar de beste wordt. Waar zit de beste kern ?

3. De Lyriden 1986.

Het maximum werd voor 1986 voorspeld op 22 April omstreeks 7h UT. De waarnemers op het amerikaanse continent zijn het best geplaatst om dit maximum te observeren. In Europa is de dag op dat ogenblik al aangebroken. In 1982 werden de Amerikaanse waarnemers tot hun grote vreugde verrast door abnormaal hoge uurfrequenties. Het werd een erg korte piek die alles samen minder dan een uur duurde. Nu net vier jaar later is de maan de grote spelbreker. Met een volle maan op 25 april zal de voor 93% verlichte maan sterk storen in de nacht van 21 op 22 april. Kort nadat de maan ondergaat zal de ochtendschemering het waarnemen onmogelijk maken. De Lyridenaktie 1986 zal zich daarom ook beperken tot de Lyridenaktiviteit vóór het maximum.In de nachten voor het maximum zijn er ook al flink wat Lyriden te zien. 's Ochtends staat de radiant het gunstigste (hoog aan de hemel) . Dat komt goed uit met de maan die 's avonds toch te erg stoort. Na maansondergang kan men de Lyriden dan in het tweede deel van de nacht observeren.

4. De Eta Aquariiden 1986.

Deze zwerm is niet waarneembaar in België tenzij met radio-apparatuur. De radiant komt 's ochtends pas 15° boven de horizon wanneer de schemering een einde maakt aan het waarnemen. In 1986 zijn de omstandigheden vrij gunstig om deze zwerm in zuidelijke streken te observeren. Het vage maximum, samengesteld uit een reeks sub-maxima verschijnt tussen 3 en 6 mei. Tijdens deze periode neemt de maanfaze af van Laatste Kwartier op 1 mei tot Nieuwe Maan op 8 mei. Men moet dus rekening houden met een geringe storing vanwege het maanlicht.

Waarnemingen van de Eta Aquariiden zijn zeer belangrijk om de struktuur van deze vrij complexe zwerm jaar na jaar te kunnen volgen. De Eta Aquariiden zijn net zoals de Orioniden geassocieerd met de komeet P/Halley. De Eta Aquariiden zijn meteoren die veroorzaakt worden door meteoroiden die vele eeuwen geleden door de komeet zijn uitgestoten. De opbouw van de zwerm en de veranderingen in de struktuur van jaar tot jaar leren ons meer over de geschiedenis van deze zwerm als achtergebleven puin van de komeet. De struktuur van de zwermen geassocieerd met Halley wijst er in elk geval op dat er een heel stuk geschiedenis van de komeet vastgelegd werd in de zwermen. Tijdens elke periheliumdoorgang werd de zwerm verrijkt met nieuwe gruisdeeltjes van de komeet. Tijdens de opeenvolgende eeuwen ontstond zo een ingewikkeld geheel, het gruis is verspreid over de gehele baan van de komeet en bovendien flink uitgesmeerd. Het stof blijkt binnen de zwerm nog geconcentreerd te zitten in opeenvolgende lagen die elk aanleiding geven tot sub-maxima wanneer de Aarde doorheen de zwerm trekt.

Voor waarnemers die op het noordelijk halfrond blijven is er van de Eta Aquariiden weinig te zien. Voor hen is het dan uitkijken naar de Orioniden in oktober. De komeet van Halley heeft zodanig veel stof uitgestoten langs zijn baan dat de Aarde de zwerm twee maal op haar baan ontmoet en dit niettegenstaande de vrij grote afstand tussen de aardbaan en de komeetbaan.

OPROEP : RADIOWAARNEMINGEN

Jeroen Van Wassenhove

1. Lyriden :

Na een relatief kalme periode komen de oude getrouwe zwermen weer aan bod . De eerste zwerm , de Lyriden , is zichtbaar van 19 april tot 24 april. Het maximum valt in de ochtend van 22 april om 7h U.T.,precies in de optimale periode (richting N - Z) voor radiowaarnemingen. Vorig jaar lagen de gemiddelde uurfrequenties laag : van 20 tot 8.8 meteoren per uur met relatief lage gevoeligheid. Radio-ontvangers met hogere gevoeligheid kunnen dit beeld totaal wijzigen.

Antennerichtingen (Lokale Tijd) $\alpha = 272°0$ $\delta = +32°0$

N - Z	6h - $\boxed{8h}$ - 10h	22h - $\boxed{0h}$ - 2h
NO - ZW	0h - 1h30 - 3h	8h - 9h - 10h
O - W	3h - 4h - 6h	
ZO - NW	5h - 7h - 9h	22h - 23h - 0h

2.Eta Aquariden:

De Eta Aquariden zijn waarneembaar van 21 april tot 12 mei met een maximum rond 4 mei. In onze streken behoren de Eta Aquariden tot de onbekende zwermen . Dit komt doordat deze zwerm slechts 's morgens zichtbaar wordt. Voor radiowaarnemingen stelt dit echter geen probleem . De optimale periode ligt 's morgens tussen 3h en 8h UT, richting O - W . De uurfrequenties kunnen oplopen tot 60 meteoren per uur en meer.

Antennerichtingen (Lokale Tijd) $\alpha = 336°0$ $\delta = 0°0$

N - Z	4h - 5h - 6h	10h - 11h - 12h
NO - ZW	4h - 6h - 8h	
O - W	5h - $\boxed{8h}$ - 10h	
ZO - NW	7h30 - 10h - 11h	

Verklaring : begin - gunstigst - einde

$\boxed{\text{optimaal}}$: de beste combinatie tussen antenne en richting.

Voor waarnemingsformulieren , het opzenden van waarnemingen , een lijst met alle FM-stations , problemen i.v.m. opstelling , informatie en vragen ... kunt u terecht op onderstaand adres . Veel SUCCES !!

Jeroen Van Wassenhove
's Gravenstraat 66
9730 Nazareth

MEDEDELING : Voor dit nummer is verder geen enkele nederlandstalige tekst ter publikatie beschikbaar. De volgende pagina's zijn dan ook allemaal in het engels. De werkgroepleden zijn niet alleen stil geworden op het gebied van de waarnemingen doch ook op het vlak van publikaties . Wie schrijft eens een eigen degelijk verslag ?

AUSTRALIA

THE ETA AQUARIIDS IN 1985

Jeff Wood

1985 has seen Australian Meteor Observers once again carry out an extensive observing programme of the Eta Aquariid Meteor Stream. This was despite much poor weather and the presence of the full moon around the time of maximum activity. All told , 53 people participicted in the 1985 Eta Aquariid Watch. Observing from April 17-18 to May 29-30 , they monitored 33 nights for 202 man hours of data. A total of 2872 Eta Aquariid Meteors were recorded making this a most succesful project. The observers who took part were as follows :

Craig Anderson,Kylie Tizzard,Aaron Shepherd, John Goldsmith,Hai Quan,Mark Gray,Jason Tame,Brian Macauley,David Simpson, Stephen Schutt,Jeff Wood,Chris Natoli,John Rutley, John Payne, Brendan Page, Shane Sullivan,Jacinta Beazley,Julie Rudd,Hung Lam,Robert McLoughlan,Martin Coroneos,Paul Rawlings,Joh-Ann Burrows,Megan Cley, Russell Mudge,Warren Raphael,Mick McMullen,Peter Brown,Victor Rodanovic,Stephen Olssen,Dennis Lowe,Darren Ferdinando,Maurice Clark, Vaughan Sheridan,David Singh,Robert Price,Jim Newman,Simon Evans, Nghia Trinh,Neil Avery,Bradley Wyatt,Gary Docking,Jeff Malone,Robert Purvinskis,Roger Vodika,Lee Matteo,Tim Hort,Candy Gibson,Marie Reid, Harold Reid,David Cake,Clem Foley, and Nicholas Harvey.

1. Eta Aquarid Activity.

The 1985 Eta Aquariid Meteor Stream produced a normal display. This was despite predictions in some quarters of a meteor storm with the approach of comet Halley. Maximum rates reached 53 meteors per hour on the night of May 03-04 which appears to be the true maximum. The table below lists the mean activity of the Eta Aquariid Meteor Stream on a day basis throughout the 1985 display.

Table : mean values of Z.H.R.'s for each night

Double date	E.A.ZHR	S.D.	n	Double Date	E.A.ZHR	S.D.	n
Apr.17-18	0.3	0.4	3	May 06-07	43.2	6.1	4
18 19	0.8	0.8	2	07 08	52.6	11.6	3
19 20	1.4	0.3	2	08 09	44.4	0.9	2
20 21	3.1	1.0	12	09 10	38.4	1.5	2
21 22	2.2	0.6	4	10 11	31.1	5.4	4
22 23	2.1	1.6	3	11 12	15.3	10.3	4
23 24	1.9	2.7	3	17 18	8.5	3.0	28
24 25	3.0	0.4	2	18 19	8.0	2.5	18
25 26	3.8	0.8	6	19 20	3.2	1.1	3
27 28	7.4	3.6	6	20 21	2.7	0.7	3
28 29	6.8	3.7	6	21 22	2.9	1.4	4
29 30	8.0	4.2	7	23 24	2.7	0.9	5
30 May 01	11.3	5.3	8	24 25	1.7	1.0	6
May 01 02	11.7.	2.1	4	25 26	0.9	0.5	4
02 03	28.7	5.0	3	28 29	0.6	0.8	3
03 04	52.9	14.1	3	29 30	No Eta Aquariids seen		
04 05	45.8	14.2	515				

2. Magnitude Distribution:

For greater accuracy only the magnitude estimates obtained by our experienced observers have been included in the following magnitude distribution.

Magnitude	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.	$\bar{m}$
Number	3	2	8	11	12	34	66	98	102	70	21	428	3.04

The following magnitude-number relationship was derived using the correction factors described by Kresáková (1966).

The ratio $r = 3.05$ (for $0 \leq m \leq +5$)

3. Trains and colours.

Eta Aquariid Meteors characteristically have trains. This year was no exception with 29.4 % of the Eta Aquariids seen producing a train. Apart from a magnificent -4 blue-green meteor seen on the morning of May 6-7 which had a train lasting for 37 seconds , all the Eta Aquariid Trains were of short duration persisting for no more than 5 seconds or so after the meteor itself disappeared from sight.

The colour distribution below was derived from 136 Eta Aquariid Meteors of magnitude +2 or brighter.

Red	1.47%	Orange	3.68%	Yellow	38.97%
Green	2.95%	Blue	2.20%	White	50.73%

AUTUMN 1985 OBSERVATIONS FROM FINLAND

Pekka Parviainen

Autumn weather since the Perseids has been exceptionally favourable for amateur astronomers in Finland. We have enjoyed good limiting magnitudes during many clear nights without moonlight . Even the humidity has been tolerable during these clear nights. The weather hasn't been ideal for the main autumn meteor showers. Both the maxima of the Giacobinids and of the Leonids were lost because of a cloudy sky. The Orionids were well covered during two maximum nights ; premaximum and postmaximum nights were not totally clear.

Here are our results in brief: After the Perseids we have observed 998 sporadic meteors , 16 Giacobinids,388 Orionids, 83 Taurids and 34 other meteors. This totals 1519 meteors , which is better than the total for last year (1984)(cloudy weather last year). The mean magnitude of all the sporadic meteors is 2.83 , this also reflects the good sky conditions compared with our earlier results.

The Giacobinids were lost due to clouds and some premaximumnights resulted in 16 Giacobinids only. The mean magnitude was 2.81 and the difference between the sporadics and the Giacobinids was $\Delta m = -0.64$.(so the Giacobinids were fainter than the sporadic meteors).

The Orionids were well observed during the nights of Oct.20-21 and 21-22. The observational effort covered the period from 14 October to 25 October and the mean magnitude of the Orionids was 2.47. During these nights the difference between the sporadic mean magnitude and the Orionid mean magnitude was 0.53. If we use only the observations with limiting magnitude 5.4 or better for these nights then the diffrence is 0.45. Considering the observations of the night of October 20-21 , the mean magnitude for the Orionids that night was 2.41 and the magnitude difference with the sporadic mean magnitude was 0.20. These figures may be compared with those obtained under good limiting magnitudes only: the $\bar{m}$ for Orionids then equals 2.37 and the diffrence $\Delta \bar{m} = 0.56$. We can repeat this for the night October 21-22 : the mean magnitude of the Orionids was 2.33 and the diffrence in magnitude $\Delta \bar{m} = 0.76$. The respective figures for observations under good limiting magnitudes only were 2.64 and 0.56. 31.4 % of the Orionids showed train phenomena ; mainly 1 seconds or less. 10.3 % of the Orionids had a colour different from white -

blue white ; most of these were yellow and quite many of them showed reddish tints. The brightnest Orionid was magnitude -8 , two of them were magnitude -3 and 8 of magnitude -2.

Taurids have been observed during autumn. The 83 Taurids resulted in a mean magnitude of 2.76 and the diffrence between sporadic mean magnitude and this equals 0.13. This means that it was a faint Taurid year. 6% of the Taurids showed a train and 4.8% of these meteors showed colour.

The following tables contain the magnitude distributions of this observing period. The following table shows some relevant data of the observing nights. Detailed observations have been mailed to the leader of the meteor section.

Table 1 : Magnitude Distributions Finland 1985

Shower $\bar{m}$	-4<	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.
Spor.2.83	1x-7	6	2	7	27	48	113	157	253	227	135	22	998
Giac.2.81		0	0	1	0	0	2	1	7	3	2	0	16
Ori. 2.47	1x-8	0	2	8	16	39	30	75	99	68	44	6	388
Tau. 2.76		0	1	2	2	4	1	22	26	12	11	2	83
Oth. 1.50		0	1	1	4	8	1	4	9	6	0	0	34

Table 2 : Hourly rate data Finland autumn 1985

Date	Start End UT UT	Dur. (min)	Lm	k%	Spor	Showers			Obs.
09/ 12-13	1830-1930	58	4.78	0	3	-	-	-	TH
13-14	1830-1945	61	4.18	0	7	-	-	-	TH
13-14	1917-0017	272	6.39	0	75	-	-	-	MR
20-21	1832-0040	358	6.40	10	73	-	-	-	MR
20-21	1915-2045	70	6.00	0	10	-	-	-	PP
10/ 05-06	2104-2248	86	5.50	10	10	0 G	0 T	-	MR
06-07	1727-1902	88	6.17	13	9	0 G	1 T	-	MR
06-07	1730-2300	276	5.76	9	18	6 G	1 T	-	LR
06-07	1920-2130	107	6.10	23	9	1 G	1 T	-	IL
06-07	1830-2045	121	4.70	0	7	1 G	-	-	PCW
06-07	1830-2045	125	5.57	0	11	1 G	-	-	VM
06-07	1831-2046	120	4.80	0	8	1 G	-	-	MH
06-07	1830-2045	130	4.77	0	10	3 G	-	-	PR
06-07	1830-2045	106	5.70	10	16	1 G	-	-	PV
06-07	1838-2046	118	5.40	0	13	2 G	-	-	RT
14-15	2130-0100	200	6.10	0	46	13 Ori.	3 T		LR
16-17	1915-2020	57	6.12	5	7	1 Ori.	2 T		IL
16-17	1912-0015	293	6.40	10	84	6 Ori.	2 T		MR
16-17	2100-0100	230	6.30	10	60	22 Ori.	5 T		LR
16-17	0130-0221	50	6.40	20	7	8 Ori.	-		PP
17-18	1900-2100	80	6.20	22	10	1 Ori.	2 T		IL
17-18	0100-0150	48	6.50	16	11	4 Ori.	1 T		LR
19-20	2245-2345	60	4.60	0	3	2 Ori.	-		PR
20-21	2000-2200	110	6.29	10	22	9 Ori.	5 T		IL
20-21	2053-2330	153	6.20	0	28	19 Ori.	1 T		MR
20-21	2100-2200	60	4.70	0	6	2 Ori.	-		PR
20-21	2100-0030	185	5.20	6	13	17 Ori.	-		PJ
20-21	2200-0115	185	6.37	3	54	43 Ori.	3 T		LR
20-21	2320-0035	70	5.40	31	11	9 Ori.	-		MP
20-21	2315-0200	155	5.58	3	20	19 Ori.	-		VM
20-21	2320-0200	150	5.30	0	21	16 Ori.	-		PCW
20-21	2320-0200	135	5.30	0	17	4 Ori.	-		MH
20-21	2320-0130	115	5.76	9	22	18 Ori.	-		PV
20-21	2330-0130	95	6.00	0	8	6 Ori.	-		MM
21-22	1830-1930	57	5.18	10	1	6 Ori.	-		TH

Date	UT	Dur.	Lm	k %	Spor.	Showers			Obs.
10/ 21-22	1912-2354	228	6.20	14	57	27 Ori.	3	T	MR
21-22	1930-2145	86	5.40	0	9	3 Ori.	-		PJ
21-22	2000-2130	82	6.36	10	14	5 Ori.	2	T	IL
21-22	2055-2155	60	5.00	0	4	0 Ori.	-		PR
21-22	2100-0100	228	6.48	10	73	35 Ori.	6	T	LR
21-22	2130-0300	296	6.40	10	24	57 Ori.	16	T	PP
21-22	2250-0115	120	4.77	5	20	7 Ori.	-		MH
21-22	2250-0115	138	5.49	5	21	12 Ori.	-		VM
21-22	2250-0115	123	5.05	20	18	11 Ori.	7	T	MN
21-22	2255-0116	123	5.06	19	16	14 Ori.	6	T	MP
21-22	2300-0000	50	5.10	0	6	2 Ori.	-		MM
24-25	2200-0000	116	5.94	0	20	5 Ori.	3	T	LR
11/ 08-09	2200-0000	113	6.30	0	31	0 Ori.	2	T	IR
18-19	1908-2233	175	6.00	11	10	0 Ori.	10	T	MR

Explanation : Dur. means the net duration of the observation, lm is the weighted average limiting magnitude. k shows the time weighted coverage of the sky (by clouds,trees,etc;)

Observers : TH Teemu Hankamäki,MH Markus Hotakainen,PJ Petri Jääskeläinen, IL Ismo Luukkonen,MM Matti Martikainen,VM Veikko Mäkelä, MN Markku Nousiainen,PP Pekka Parviainen,MP Marko Pekkola, LR Leo Rajala,PR Pertti Ramberg,MR Marko Riikonen,RT Roosa Toivonen,PV Petteri Valjus, PCW P-C Wirtanen.

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THE 1985 RESULTS FROM NORWAY

The following results were obtained by the Norwegian Meteor Section.The observers were : Birger Andresen,Kai Gaarder, Trond Erik Hillestad,Terje Larsen and Magne Svanemsli.

Table 1 : Magnitude Distributions Norway 1985

Shower	lm	-6	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.	$\bar{m}$
B.Andresen															
Spor.	5.94	0	0	0	0	0	1	1	2	10	16	10	1	41	3.78
Pers.	6.01	0	1	1	3	2	17	16	18	27	23	28	3	139	2.65
Giac.	5.82	0	0	0	0	0	0	1	3	3	1	1	0	7	2.78
K.Gaarder															
Spor.	5.33	0	0	0	0	1	2	5	7	7	6	2	0	30	2.43
Pers.	5.10	1	3	1	3	1	10	25	43	26	17	4	0	133	1.87
T.E.Hillestad															
Spor.	6.04	0	0	3	5	10	27	40	63	166	182	129	35	660	3.36
Pers.	6.00	1	1	4	4	18	30	17	22	21	17	31	4	170	1.90
α Cap.	5.83	0	0	0	0	1	2	0	2	0	2	1	0	8	2.00
Aqua.	5.83	0	0	0	0	0	0	1	0	1	1	1	0	4	3.25
κ Cyg.	6.08	0	0	1	0	0	2	4	9	9	19	20	5	69	3.65
Giac.	6.03	0	0	0	0	0	0	0	1	4	3	3	0	11	3.73
Taur.	6.10	0	0	0	0	0	0	1	4	23	15	7	0	50	3.46
Orio.	6.11	0	0	0	0	0	1	1	3	7	3	2	0	15	2.94
M.Svanemsli															
Spor.	5.42	0	0	1	0	1	3	1	13	30	19	0	0	29	2.78
Pers.	5.42	0	1	1	4	10	7	11	16	34	19	2	0	139	1.96

Table 2 : Hourly Rate data Norway 1985

Date	Period UT	Dur.	Lm	F	Spor.	Shower	Obs.
Aug.11-	2208-2225	15	5.90	1.00	2	6 P	BA
11-	2340 0043	54	6.20	1.00	9	24 P	BA
12-	2153 0040	135	5.94	1.00	16	109 P	BA
Oct.07	1835 1910	33	5.61	1.00	5	2 G 0 T	BA
08	1900 2030	86	5.90	1.00	9	5 G 0 T	BA

Date	Period UT	Dur.	Lm	F	Spor.	Shower	Obs.
Aug.12	0030-0130	55	5.04	1.22	2	17 P,	KG
12	2142 0100	176	5.16	1.04	1	95 P, 2 αC,	KG
16	2247 0100	128	5.05	1.01	1	21 P,	KG
Sept.20	2155 2300	62	6.00	1.00	8	7 other	KG
21	2028 2145	68	5.90	1.03	18	3 other	KG
July 27	2315 0015	57	5.46	1.04	3	2P,	TEH
31	2240 2350	66	5.80	1.05	3	2P,5αC,	TEH
Aug. 01	2245 0015	86	5.87	1.00	5	7P,1αC,	TEH
03	2250 0020	84	5.99	1.02	9	7P,1αC,2Aq,	TEH
04	2300 0000	55	5.93	1.02	7	3P,1αC,2Aq,	TEH
11	2155 0040	144	6.14	1.00	22	57P	TEH
12	2153 2223	25	5.65	1.00	10	10P	TEH
12	2340 0040	49	6.07	1.03	2	37P	TEH
13	2220 2255	30	5.49	1.27	8	8P	TEH
15	2130 0130	215	6.12	1.00	55	23P,18κCy.	TEH
16	2240 2305	22	6.00	1.00	3	2P, 3κCy.	TEH
21	2200 0100	165	6.20	1.03	34	12P, 4κCy.	TEH
25	2230 2330	54	6.20	1.45	13	3 κCyg.	TEH
26	2200 0000	109	6.16	1.00	35	5 κCyg.	TEH
29	2200 2300	57	5.48	1.00	9	1 κCyg.	TEH
Sept.02	2100 2200	57	5.13	1.07	3	4 κCyg.	TEH
04	2000 2130	84	5.96	1.05	15	5 κCyg.	TEH
08	2030 2110	37	6.10	1.16	6	1 κCyg.	TEH
09	2100 0100	221	6.13	1.02	62	6 κCyg.	TEH
10	2030 2115	42	6.20	1.36	9	1 κCyg.	TEH
11	2000 2100	54	6.20	1.00	18	3 κCyg.	TEH
12	2030 2130	54	5.86	1.18	15	3 κCyg.	TEH
13	2210 2310	53	6.23	1.07	21	2 κCyg.	TEH
14	2200 0000	106	6.20	1.18	42	2 κCyg.	TEH
15	2000 2100	55	6.20	1.00	17	1 κCyg.,1 T	TEH
16	2000 2100	54	6.20	1.00	18	1 κCyg.,2 T	TEH
17	1930 2030	54	6.16	1.00	19	2 κCyg.,1 T	TEH
18	2000 2100	54	6.20	1.00	22	2 κCyg.,0 T	TEH
Oct. 05	1815 2015	110	6.07	1.00	26	2 κCyg.,4 T	TEH
07	1830 1930	55	5.80	1.05	15	1 T	TEH
08	1850 2030	92	6.07	1.01	14	7 T,9 G	TEH
10	2100 2200	55	6.20	1.00	11	5 T,2 G,1 Ori	TEH
11	1955 2110	68	6.10	1.58	16	7 T,	TEH
12	0030 0430	206	6.08	1.01	93	22 T, 14 Ori.	TEH
Aug. 12	2127 2300	81	5.0	?	2	24 P	TL
11	2209 0024	119	5.49	1.04	14	42 P	MS
12	2136 0026	147	5.36	1.12	15	68 P	MS

Locations :

BA : Birger Andresen, Kongsberg ,Norway 59°42'20" N, 9°35'50" E
KG : Kai Gaarder , Roa ,Norway, 60°10' N,10°36' E
TEH: Trond Erik Hillestad,Kongsberg,Norway 59°42'20"N,9°35'50" E
TL : Terje Larsen , Grimstad , Norway 58°38' N, 8°35' E
MS : Magne Svanemsli,Heggedal, Norway 59°46'33" N,10°24'14" E

RECENT OBSERVATIONS FROM FLORIDA

Several members of the Northeast Florida Astronomical Society and the Callahan Astronomical Society summarized their observations. Richard Sweetsir commented ,"I saw the usual number of Perseids. The 1985 display was normal for me." Wanda Simmons noted "There were many bright meteors before and after maximum , most of them were sporadics, Aquarids or Alpha Capricornids." NEFAS members spotted one of these fireballs at 1313 UT August 10th at their Perseid meteor watch at the University of North Florida soccer field.

Terry Berkey , Mark Kaupas , Victor Manino and Richard Sweetsir along with the Simmons' recorded it as a -4 to -6 Alpha Capricornid streaking south to north with a green or blue path.

Table 1 Hourly rate data August 1985

Aug.	Period UT	Lm	Tot.	Per.	Obs.	Aug.	Period UT	Lm	Tot.	Per.	Obs.
10	0645-0745	5.7	20	10	WS	12	0600-0700	6	22	13	RS
10	0645 0745	5.7	19	9	KS	12	0652 0752	6	21	16	WS
10	0730 0830	6.0	13	3	RS	12	0652 0752	6	21	15	KS
10	0745 0830	5	10	7	WS	12	0700 0800	5.5	34	27	RS
10	0745 0830	5	5	2	KS	13	0500 0552	6	4	4	WLS
11	0333 0403	4	1	0	KS	13	0500 0600	6	16	14	WS
11	0333 0403	4	2	0	WS	13	0530 0630	6.5	27	13	RS
11	0605 0645	6	13	11	WS	13	0537 0637	6	15	12	KS
11	0605 0645	6	14	10	KS	13	0600 0700	6	27	19	WS
11	0615 0715	5	15	9	RS	13	0630 0730	5.5	29	19	RS
12	0400 0500	5.5	12	5	RS	13	0637 0737	6	38	30	KS
12	0452 0552	6	25	16	WS	13	0730 0800	6.5	17	6	RS
12	0452 0552	6	28	19	KS	13	0700 0730	5.5	11	10	WS
12	0500 0600	6	23	15	RS	13	0737 0807	6	15	12	KS
12	0552 0652	6	35	25	WS						
12	0552 0652	6	32	24	KS						

Totals and Key to observers :			% P	$\bar{m}$ Per.	Tot.Per.	$\bar{m}$ Sp.
WLS Wendy Simmons	27 met.	3h02m				
WS Wanda Simmons	187	8h45m	20.4%	2.53	121	2.72
KS Karl Simmons	197	8h45m	33.3%	2.49	132	2.76
RS Richard Sweetsir	216	10h00m	32.5%	1.93	105	2.58

A high percentage of Perseids left trains which is normal. Richard Sweetsir and the Simmons' saw a spectacular -4 Perseid at 0520 UT on the 13th leave a train that endured for 1,5 minutes in 7 x 50 binoculars about 5° east of Polaris. It formed a "V" shape pointing to Polaris.

FURTHER COMMENTS ON THE LIMITING MAGNITUDE

C.Steyaert

In the excellent article of Jeff Wood about the limiting magnitude correction based on independently carried out observations (1) , some further simplifications are possible. The constant C in the formula :

$$L = C \exp(-K.M)$$

is not independent , as mentioned under 4. on p. 26:

$$C = \exp(6.5\ K)$$

Hence , the general formula can be written as :

$$L = \exp((6.5-M)K)$$

in which 6.5 is the reference limiting magnitude. For the first formula (p.20) , the reference seems to be 7.0 :

$$L = \exp((7.0-M)0.925)$$

We tried to reduce the correction factors in table 12 to the same model , in using a linear regression on (ln L,M) . The regressions are not perfect , but are very close. We obtain the following equivalent r-values.

B.A.A.	r = 2.84
A.M.S.spor	1.66
Czech Spor	3.78
Czech Show.	2.75

Our interpretation of these values is as follows.

- The B.A.A. value seems to be a good average based on sporadic and stream meteors together.
- The A.M.S. value for sporadics seems extremely low. This value might be biased by one observer with many observations , and being able to detect very faint stars , also under less good sky conditions.
- In principle , we agree with having different r-values for stream- and sporadic values. The Czech value for sporadics is very high , and the one for streams is also rather high.

The eternal discussion is about the difference between the stellar limiting magnitude , and the limiting magnitude for meteors. We prefer to derive the meteor limiting magnitude and the r-value from the complete magnitude distribution : see the formulas on p.33 (2). For sporadics , the r-value of 3.0 is in use.

References :

(1) Limiting Magnitude Correction , Jeff Wood , WGN 14,1,pp 20-33.
(2) Comment on lm , Paul Roggemans , WGN 14,1, pp 33-34 .

THE PHOTOGRAPHIC METEOR DATABASE (PMDB)

C.Steyaert

The number of meteor photographs collected by the V.V.S. Meteor Section has steadily been growing over the years. By end 1985 , some 870 meteor prints and/or negatives were available , and all data have been entered on computer file. Most photographs have been made by observers in Belgium and Holland, but also from Finland , Spain , U.K. , U.S.S.R. , Norway , Denmark and Australia there are results available.

The number of entries per year is :

1968	2	1970	2	1972	3
1974	1	1975	2	1976	9
1977	4	1978	37	1979	10
1980	113	1981	87	1982	163
1983	169	1984	33	1985	234

Another interesting table is the number of meteors per month:

Jan.	3	Febr.	2	Mar.	2
Apr.	19	May	2	June	1
July	46	Aug.	762	Sep.	0
Oct.	9	Nov.	6	Dec.	19

It is clearly seen that the efforts are concentrated around the major streams (Perseids , Aquariids and Capricornids , κ Cygnids , Lyrids and Geminids).

The Meteor Section welcomes all photographic meteors especially those helping to fill up the "gaps" in the above mentioned tables. For each properly identified photograph , the observer receives the astrometric calculations. For those interested we have available the guidelines for measuring the prints themselves.

The Photographic Meteor Database will be available in printed form at the occasion of the next International Meteor Weekend in Belgium. It will contain the full detail of :

- the photographs
- the observing places
- (α, δ) of the starting and ending positions of the meteor trails.

Several sequences will be printed :

- time sequence
- sorted per stream
- ....

We hope this work will become a basis for :

- radiant search
- simultaneous trajectory calculations
- heliocentric and orbit calculations.

THE PHOTOGRAPHIC LYRID RADIANT

C.Steyaert

The Lyrids are the first stream of moderate intensity after three months of low activity following the January Quadrantids. The maximum being rather short , the observational results differ largely from year to year. In the PMDB (Photographic Meteor Database Database) , we found following Lyrids :

Vol.	Rec.	Date	Time(U.T.)	Exposure (U.T.)	Observer
1	104	22 Apr.82		23h21m00 - 23h40m00s	Klaas Jobse
1	103	22 Apr.82	02h07m33s	02h01m00 - 02h20m00s	Klaas Jobse
1	106	23 Apr.82	01h54m34s	01h41m00 - 02h00m00s	Klaas Jobse
1	108	24 Apr.82	00h59m48s	00h58m30s- 01h00m54s	Luc Bossaert
1	109	24 Apr.82	00h59m48s	00h41m20s- 01h10m10s	Klaas Jobse
E	33	21 Apr.84	22h54m38s	22h50m - 23h03m	Ghislain Plesier
F	33	21 Apr.85	01h40m	25 minutes	C.ter Kuile

These are not many meteors , but also the radiant position obtained in ref.(1) was based upon 7 (double station) meteors only. Hence , it is worth while trying the method of ref. (2) , which gave already good results for not many meteors ref(3). Strictly speaking , meteors 1.104 and F.33 could not be used , as the exact timing is not known. The radiant based on these 5 meteors only is:

$$\alpha = 271^\circ\!.4 \qquad \delta = +33^\circ\!.4 \qquad \text{radius} = 0^\circ\!.54$$

For comparison , the radiant in ref.(4) is :

$$\alpha = 272^\circ \qquad \delta = +33^\circ \qquad {}^*\text{radius} = 1^\circ\!.5$$

(It can be proven that the first radius is $1/\sqrt{8}$ of the second * radius , corresponding to 2 standarddeviations).

Following an idea of Luc Gobin , the unknown timings can be tried to be found by minimizing the radius. Although this method is not very sensitive in this case (due to the small number of data), it allows to demonstrate that meteor 1.104 should have appeared at the end of the exposure , while F.33 appeared rather to the beginning. The radiant based upon the 7 meteors is :

$\alpha = 269^{\circ}.9 \qquad \delta = +31^{\circ}.5 \qquad \text{radius} = 1^{\circ}.0$

This last radius value is not very reliable.

Even with this small number of Lyrids , the radiant position found comes very close to the one in the literature.

References.

(1) The dispersions of meteors in meteor streams , L.Kresak , V.Porubčan , Bull.Astr.Czech. Vol.21 (1970) No 3.
(2) A rigorous method for radiant determination , C.Steyaert, Bull.Astr.Inst.Czech. Vol.35 (1984)
(3) Photographic radiant positions , C.Steyaert, WGN , Vol.14,1.
(4) Handboek Visuele Waarnemingen , Deel I , V.V.S.

I.M.W.-STATUS ON 15/03/1986

Over one hundred invitation were sent to the major astronomical societies in Europe with the request to announce the Meteor Weekend to their members. The response is very small indeed for it was known that none of these societies included meteor groups as far as known.Also in December 1985 invitations were sent to organisations with active meteor workers. The response came in from correspondents and co-operators with who we were in contact for several years. Meteor workers from Belgium, the Netherlands, Great Britain , Germany , Denmark , Hungary , France and Italy wrote that they were interested to participate. Some already paid the reservation. The I.A.U. secretary in Paris asked the chairman of the commission 22 (meteors) to consider the possibility to participate in some way. Detlef Koschny (Germany) would like to discuss the possibilities of standard observing techniques. Luc Vanhoeck (director V.V.S.Section Astrophotography) is interested to edit the proceedings of the weekend in a report format. Dr.L.G.Taff of the M.I.T.(Massachusetts-U.S.A.) wrote that he would like to talk about One centimeter space debris search at Lincoln Laboratory's. At the current stage of the organisation around the weekend it is not certain that we will have a professional astronomer on the programme. Several professional meteor astronomers showed their interest to participate but no registrations were received so far.

Participants of the Violau event will receive a registration form in April. Please arrange your reservations ! More about the prospects for the Meteor Weekend,next time !

INTERNATIONAL METEOR OBSERVATORY ?

Leaders of meteor groups are invited to communicate their opinion about the possibility to found an international meteor observatory in the South of France.The observatory in Puimichel is a perfect place for meteor observations.The residence can give the necessary accommodation to 20 people (30 after 1987 ?) Poor weather and poor observing circumstances disorganize the meteor work of amateurs. How can we escape these problems ? Where to go ? A meteor observatory in Puimichel would be the solution for all of us. Observers from everywhere would be able to co-observe and to learn from each other. It would be good for the benefit of all the meteor workers in Europe !

ON THE GEMINID METEOR STREAM IN 1985

Paul Roggemans

Observing the Geminids seems to be extremely difficult since very few observations are available each year. For 1985 the predictions were most promising : New Moon with the maximum at Dec.14.0 U.T. Europeans could benefit from the maximum rates with the radiant near the zenith. Although meteor observers were urged to observe , little response came in after the observational period. A call to travel with a team of observers to the observing station Puimichel in the South East of France was unsuccesful. Observers weren't probably convinced by the predictions for exceptional circumstances with impressive hourly rates ! Most of them stayed at home expecting to run a limited observing program to have something to talk about 'Geminids',the majority of the so called meteor observers succesfully continued their wintersleep. After decades of meteor work , meteor observers in North Western Europe still don't know that the climate on this part of the world hasn't to offer anything good at all ! Besides , light pollution and the dirted atmosphere are not of any help for good observing! Considering the Geminid results 1985 I would like to say well done fellows ! You missed something that cannot be witnessed again from Europe in the next few years! I hope that future projects can attract more observers to the areas where weather circumstances are much more favourable. It is a matter of interests from the involved amateurs to spend time and finances to undertake serious observing efforts. This can be achieved for the future if we would use the observatory in Puimichel as an international meteor observatory where observers from everywhere can meet each other and co-observe. The costs to stay in Puimichel are very small. The organizational set-up is most attractive for amateur astronomers. If these ideas could be realized ...

Readers will remember the announcement of the results of the Geminid observations in France, published in WGN 1986,page 7-page 10. Additional observations were received from Belgium,Canada, Finland,Norway,the Netherlands and from the U.S.A. Alltogether 8220 meteors were reported of which 2239 were non-Geminid and 5981 were counted as Geminid. About 171 hours (man hours) of netto observing time were possible under a sky with an average limiting magnitude better than 6.5 ! This is beyond any doubt the most succesful Geminid report since 1980 (see also the report of George Spalding in "JBAA,Vol.92,p.227-233"on the Geminid Meteor Stream in 1980).

1.Some historical notes.

A detailed paper on the history of the Geminids has been published in WGN Vol.12 (1984),p.114-130. The shower is remarkable for its absence in ancient records. The first notes on a rather minor activity of the Geminids occur around 1830. Rates increased step by step until it was recognized as a relative strong annual shower in 1862 by Gregg. Observational reports published in Popular Astronomy show a gradual increment of the maximum hourly rates throughout the first decades of the 20th century until the end of the fifties. Since then Geminids provided a rich annual display. There is no noticeable increase or decrease in the maximum hourly rates from year to year on a long term. The maximum hourly rates vary from year to year depending upon the observational circumstances. However the maximum rates since 1980 were inferior to the best rates recorded in the 70thies.1985 equals the famous Geminid records of the previous decades ! This is important since Hughes et al expect a gradual decrement of the maximum rates from about 1960 onwards. The theoretical model of the Geminid shower which is based on the evolution of a large quantity of test particles predicts a progressive disappearing of the Geminids from our night sky. The Geminid shower would finally cease to encounter the Earth orbit. The observed rates are in very good agreement with the computer simulation as far as activity is considered until the mid of the 20th century . Since then , rates remained quite stable, leaving the usual statistical fluctuations. The apparent decrement in maximum rates, recorded between 1980 and 1984, thought to be consistent with the theoretical prospects for the shower strength , has not continued throughout 1985. The 1985 display was remarkable strong. We cannot conclude that there is any indication for the decline of the shower intensity. At this point the actual evolution doesn't fit the theoretical profile. However there is no guarantee for continuous rich displays during future years. If the Geminids have to disappear, the activity can cease quite quickly from one year to another.

2. The 1985 observations.

All told , 15 observers participated in the observational effort to produce this paper. The observers were :

Observer + Location	Dur.	Gem.	Tot.
Brown Peter, Lessard Lake, Canada, +53°54'N, +114°40'W	6.00	29	88
Hillestad Erik, Kongsberg, Norway, +59°42'N, -009°35'E	15.84	817	1154
Jobse Klaas , Puimichel , France, +43°59'N, -006°01'E	32.98	1303	1847
Lunsford Bob, Alpine CA , U.S.A., +33° N, +116° W	23.00	1104	1266
Luukkonen Ismo, Finland , +64°8 N, -025°4 E	3.21	4	25
McLeod Norman , Florida , U.S.A., +27° N, +083° W	24.51	986	1289
Miskotte Koen, the Netherlands , +52° N, -004° E	1.33	15	28
Parviainen Pekka , Finland , +60°5 N, -021°3 E	4.10	50	70
Plesier Ghislain, Dranout. Belgium +50°45'N, -002°46'E	1.52	6	25
Rajala Leo , Finland , +61°9 N, -025°1 E	4.78	6	62
Ramberg Pertti , Finland , +60°5 N, -022° E	0.92	6	9
Rispens Bauke, the Netherlands , +52° N, -004° E	7.08	48	120
Roggemans Paul, Puimichel, France +43°59'N, -006°01'E	43.49	1606	2229
Rukonen Marko Finland , +62°7 N, -29°4 E	1.11	0	4
Wikholm Leo Finland , +60°2 N, -025°1 E	1.00	1	4
	170.87h	5981	8220

Some correspondents mentioned even more Geminid observations in recent letters. Unfortunately several collaegues didn't got the time to write a detailed report. With sufficient additional data it is worthwhile to repeat this analysis.

3. The Magnitude Distribution of the Geminids 1985.

Magnitude estimates provide the most valuable data from visual meteor observations. Most of the observers report a total magnitude distribution for the entire period. Magnitude Distributions for each night were only available from the author and from Klaas Jobse. Norman McLeod sent rate data only. Accumulating the different magnitude distributions in a general distribution we find a mean magnitude of 2.87 for the Geminids and 3.50 for the sporadic meteors. The difference of 0.63 indicates that the1985 Geminid display was rather deficient in bright meteors. Indeed, there was a remarkable lack of fireballs and bright Geminids. The majority of the Geminids used in the magnitude distribution were observed during the peak hours when the bulk of the shower meteors are relative faint.

Table 1 Magnitude distributions - Geminids 1985

Observer	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.
P.Brown	0	0	0	0	0	0	3	2	4	5	8	3	2		27
France	0	2	2	5	7	16.5	53	87.5	175	436	934	840	342	9	2909
R.Lunsford	1	1	1	4	9	26	43	66	108	232	269	171	99	47	1077
Hillestad	1	0	1	1	3	7	22	43	69	111	265	201	91	2	817
Finland	0	0	0	0	0	1	1	3	9	12	17	10	10	4	67
Holland	0	0	0	1	0	1.5	2	2.5	3	8	16	22	7	0	63

Magnitude distributions - Sporadics

Source	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.	$\bar{m}$
Finland	0	1	3	1	10	18	31	40	24	4	132	2.61
France	1	3.5	4.5	19.5	34.5	114	315	417	243	14	1166	3.57
Norway	0	0	3	3	27	48	118	109	28	1	337	3.13
Holland	0	0	1	0	3	6	11	29	19	0	69	3.74
Total	1	4.5	11	24	75	186	475	595	314	19	1684	3.50

Table 2 Calculation of the magnitude function

m	N(m)	p(m)	$\varphi(m)$	$\Phi(m)$	$\log(\Phi(m))$	T(m)
-7	1	1.00	1.00	1.00	0.0000	1
-6	3	1.00	3.00	4.00	0.6021	2
-5	4	0.98	4.08	8.08	0.9075	4
-4	11	0.95	11.58	19.66	1.2936	11
-3	19	0.87	21.84	41.50	1.6180	24
-2	52	0.76	68.42	109.92	2.0411	53
-1	124	0.64	193.75	303.67	2.4824	112
0	204	0.53	384.91	688.58	2.8380	231
+1	367.5	0.42	875.00	1563.58	3.1941	458
+2	804	0.31	2593.55	4157.12	3.6188	843
+3	1509	0.19	7942.11	12099.23	4.0828	1290
+4	1246.5	0.08	15581.25	27680.48	4.4422	1357
+5	551.5	0.01	55150	82830	4.9182	424
+6	62.5	0.0001				11
Tot.	4959					4876
$\bar{m}$	2.87					2.72

The differences in mean magnitudes of sporadics for different observers are probably due to varying limiting magnitudes. The average magnitude of 3.5 seems reasonable for 6.5 sky.

The next step describes the calculation of the population index r of the 1985 Geminids. On request of several readers we explain the computational technique in great detail. Table 2 (above) lists all the numerical quantities which are used in the following procedure. The observed magnitude distribution is represented by N(m), the number of meteors observed with magnitude m . The perception function p(m) shows the probability to perceive a meteor of magnitude m. $\varphi(m)$ is the theoretical number of meteors of magnitude m . $\varphi(m)$ is the magnitude function.

$$N(m) = p(m).\varphi(m) \qquad (1)$$

and

$$\varphi(m) = c \;.\; r^{m} \qquad (2)$$

Where ; $c = \varphi(0)$; a constant value
r is the population index

Expression (2) can be written as a linear function:

$$\log(\varphi(m)) = m.\log r \;+\; \log\varphi(0) \qquad (3)$$

A numerical example will clarify the meaning of the formulae. The values $\psi(m)$ are easy to compute:

$$\psi(+2) = \frac{N(+2)}{p(+2)} = \frac{804}{0.31} = 2593.55$$

The magnitude function is an exponential function as confirmed by radar observations . In order to smooth the fluctuations on $\psi(m)$,the function is rewritten in a cumulative version as $\Phi(m)$. Using expression (3) the problem can be solved with linear regression. Indeed,both $\Phi(0)$ and r are easely defined:

$$\log(\Phi(m)) = m.\log r + \log(\Phi(m))$$

or

$$Y = x.b + a$$

Within the magnitude range $-7 \leqslant m \leqslant +5$ we find

$$Y = 0.3974\ X + 2.862$$

$\log r = 0.3974$ or $r = 2.5 \pm 0.1$

$\log(\Phi(m))=2.862$ or $\Phi(m)= 728$

The magnitude function becomes :

$$\Phi(m) = 728\ .\ 2.5^{m}$$

The calculation of $\Phi(m)$ for the different magnitudes, reduced to $\psi(m)$ can be used to find a theoretical 'observed' magnitude distribution T(m). It is a trivial application of formulae (1). This technique could lead to artificial magnitude distributions which look real, r therefore is an important value for computer simulations of shower activity to study the effect of statistical fluctuations. A quick comparison between T(m) and N(m) yields some noticeable differences.

- N(m) appears to be deficient in meteors of magnitude 0 especialy in +1's and +4's.
- N(m) has an impressive number of +3's compared with T(m).
- N(m) is richer in +5's and +6's than T(m)

Of course , the p(m)-values aren't known precisely. These p(m)'s are mean values for series of experimental double count observations. The p(m)-distribution is not strictly valid for every observer. p(+1) = 0.42 means that the observer probably sees 42% of all +1 meteors. These p(m)'s also explain why visual observers miss relative much bright meteors during joined photographic observations. p(+5) = 0.01 means that 1% of all +5 meteors are probably observed. Especially for the fainter magnitudes the p(m)-probabilities are rather uncertain and may be quite different from one observer to another.

Another explanation for the irregularities of N(m) may be that some observers introduce a bias against some magnitudes. Systematic errors due to over or underestimation can create a shortage or a surplus in some N(m)'s.

A statistical sample such as a rate per magnitude will will vary because of random fluctuations. The importance of such variations cannot be ignored. To smooth these uncertainties, the r-value has to be derived over the entire range of magnitudes. The magnitude function then represents the best fit through the observed function. However the magnitude range has to be limited to magnitude classes with sufficient meteors. Isolated appearances, for instances a fireball of -10,have to be ignored. Even magnitude

-2 or so has to be dropped when no meteors are counted in the intermediate magnitude classes. Fainter magnitudes (+5,+6,...) often yield unreliable $\varphi(m)$'s. Unreasonable ratio's of $\varphi(m+1)/\varphi(m)$ near the limits of the magnitude range under investigation have to be avoided. In such case the unlikely value(-s) have to be neglected. The analyst has to decide on the range limitations for the application of linear regression. The choice to drop or to append magnitude classes may introduce significant variations of r.

The grand-total distributions correspond to a population index of r = 2.5 for the Geminids and r = 3.57 for the sporadics. These quantities enable an attempt to find averaged corrections for limiting magnitudes with Z.H.R.-calculations. The limiting magnitude corrections are listed in table 3. An hourly rate of 120 would be reduced to about 26 meteors an hour for an observer who faces a +5 sky, a frequent observing condition in urban regions. Isn't it a good reason to escape the lightpollution ?

Table 3 : Limiting magnitude corrections

Lm	Cor_G	Cor_S	Lm	Cor_G	Cor_S	Lm	Cor_G	Cor_S
7.0	0.63	0.53	6.2	1.32	1.47	5.5	2.50	3.57
6.9	0.69	0.60	6.1	1.44	1.67	5.4	2.74	4.05
6.8	0.76	0.68	6.0	1.58	1.89	5.3	3.00	4.60
6.7	0.83	0.78	5.9	1.73	2.15	5.2	3.29	5.23
6.6	0.91	0.88	5.8	1.90	2.44	5.1	3.61	5.92
6.5	1.00	1.00	5.7	2.08	2.77	5.0	3.95	6.75
6.4	1.10	1.14	5.6	2.28	3.14	4.5	6.25	12.74
6.3	1.20	1.29						

Several studies of the Geminids proved that the mass population changed considerably throughout the stream. As a consequence of these variations the observed magnitude distributions show some differences from night to night. Detailed magnitude observations were available from the author and from Klaas Jobse who both observed in Puimichel (France). Here, the observations could benefit from the most stable weather and perfect sky conditions. The author and Klaas Jobse observed completely independant. The observational data have been processed for both observers separately. No significant differences between both observers occur from these comparisons. Therefore the magnitude distributions from both observers were combined . These joined magnitude distributions are listed in table 4 and can be compared with the original distributions published in reference 3.

Table 4 : Magnitude Distributions accumulated distributions of P.Roggemans and K.Jobse.

Night	C	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.	$\bar{m}$
10-11	S	0	0	0	1	1	2	6	9	37	83	93	64	5	301	3.48
10-11	G	0	0	0	0	2	2	4	9	37	80	77	31	1	243	3.23
11-12	S	0	0	0	0	0	1	7	9	27	71	92	66	4	277	3.60
11-12	G	0	0	0	0	3	3	7	15	52	102	83	54	4	323	3.22
12-13	S	0	0	0	0	1	0	2	10	15	53	76	37	3	197	3.58
12-13	G	0	0	0	0	2	7	12	41	96	206	186	67	3	620	3.12
13-14	S	0	0	0	0	1	2	3	6	24	78	117	48	1	280	3.56
13-14	G	2	2	4	7	9	38	58	99	228	501	447	164	3	1562	2.92

Table 4: continued from page

Night	C	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.	$\bar{m}$
14-15	S	0	0	0	0	0	0	1	0	8	19	31	27	1	87	3.87
14-15	G	0	0	1	0	0	3	7	10	22	40	45	26	1	155	3.10
Tot.	S	0	0	0	1	3	5	19	35	114	314	418	243	14	1166	3.56
Tot.	G	2	2	5	7	16	53	88	174	437	933	840	342	10	2909	3.03

For all these magnitude distributions we calculated the population index r, using the method with the p(m)'s which was explained in this paper. The final results are listed in table 5. The mean magnitude of the Geminids substracted from the mean magnitude of the sporadics ,$\Delta\bar{m}$, increases towards the end of the shower activity. This means that the Geminids are richer in fainter meteors during the pre-maximum nights than during and after the maximum. The r-values differ from night to night. As a consequence the corrections for the limiting magnitude would require a revision each time that another mass distribution is considered. However the probable error on r will be reflected on the lim.magn.corrections. These factors therefore are nothing more than an approach of the probable correction. There are no significant changes on r for 10-11,11-12 and 12-13 December. 13-14 December produced a different mass distribution. The mean r for the Geminids is almost entirely based upon observations of 13-14 December.Using this r for pre-maximum nights for Z.H.R.computations will undercorrect.

Table 5 : mean magnitude per night

Date	Nature	n	$\bar{m}$	range	r	$\Delta\bar{m}$
10-11	Spor.	301	3.48±0.20	$-3\leq m\leq+5$	3.06±0.26	0.25
10-11	Gem.	243	3.23 0.21	$-2\leq m\leq+5$	3.05 0.28	
11-12	Spor.	277	3.60 0.22	$-1\leq m\leq+5$	3.86 0.27	0.38
11-12	Gem.	323	3.22 0.18	$-2\leq m\leq+5$	2.97 0.25	
12-13	Spor.	197	3.58 0.26	$0\leq m\leq+5$	4.09 0.29	0.40
12-13	Gem.	620	3.12 0.13	$-2\leq m\leq+5$	3.18 0.21	
13-14	Spor.	280	3.56 0.21	$-1\leq m\leq+6$	3.33 0.27	0.64
13-14	Gem.	1562	2.92 0.07	$-4\leq m\leq+6$	2.60 0.16	
13-14	Gem.	1562	2.92 0.07	$-6\leq m\leq+6$	2.47 0.16	
14-15	Spor.	87	3.87 0.41	$+2\leq m\leq+6$	4.27 0.38	0.77
14-15	Gem.	155	3.10 0.25	$-1\leq m\leq+6$	2.85 0.32	
06-16	Spor.	1166	3.56 0.10	$-3\leq m\leq+5$	3.50 0.17	0.53
06-16	Gem.	2909	3.03 0.06	$-6\leq m\leq+6$	2.58 0.13	

Table 6: relationship between r and $\bar{m}$

$\bar{m}$	r
2.00	1.96
2.25	2.07
2.50	2.21
2.75	2.40
3.00	2.64
3.25	2.98
3.50	3.48
3.75	4.28
4.00	5.7

For preliminary Z.H.R.-calculations it might be of interest to have an estimate of r before the r-values can be calculated. The mean magnitude $\bar{m}$ can be derived very quickly. From the r and $\bar{m}$ values in table 5 we find the following relationship:

$$\bar{m} = 5.3 - \frac{(2.2)}{\ln r}$$

or

$$\bar{m} = LM_m - \frac{(1+p)}{\ln r}$$

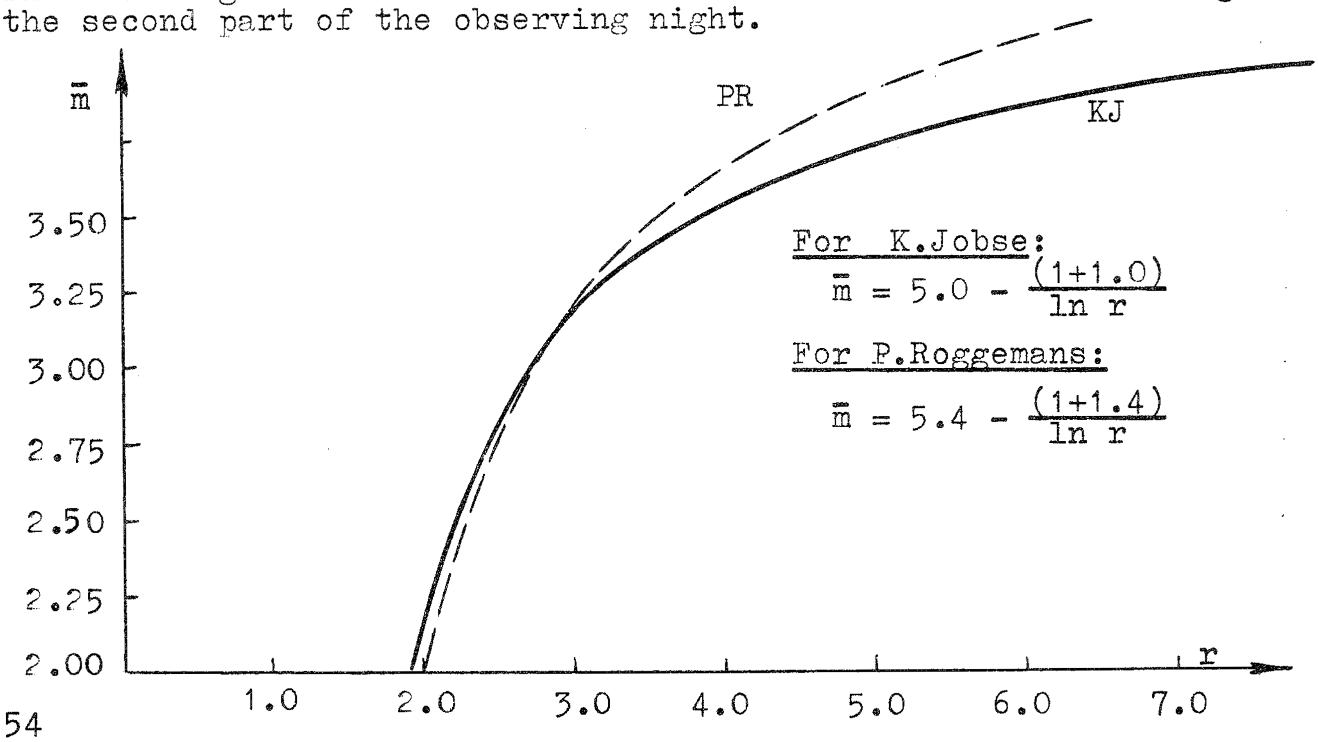
LM_m and p are two parameters which differ for different observers and observing circumstances. LM_m is the meteor limiting magnitude, p a perception coefficient of the observer. The standard relation between $\bar{m}$ and r is normally found with $LM_m = 5.0$ and p = 1 . The results in table 5 and table 6 are obtained with the accumulated magnitude distributions. It is possible that the observers have a slightly higher perception than a standard perception while the excellent sky conditions often exceeded the the standard perfect sky of 6.5 .

The investigation of the magnitude distributions for the different nights leads to the conclusion that Dec.13-14 is particular of interest. During this night the activity could be observed during several hours. Both the author and Klaas Jobse got the impression that the Geminids were deficient in bright meteors before 0h UT. After 0h the appearance of some bright Geminids suddenly changed the impression drastic. In less than one hour the shower changed its appearance completely. The accumulated magnitude distributions for Paul Roggemans and for Klaas Jobse for five periods of the night of Dec.13-14 are listed under table 7.

Table 7 Details of the Geminid Magnitude Distribution during the night Dec.13-14.

Period	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.	$\bar{m}$
20h-24h	0	0	0	0	1	13	21	45.5	100	192	181	70	1.5	625	3.03±0.12
0h-2h	0	0	0	1	3	10	10	14	37	91	59	24		249	2.80 0.17
2h-3h	0	0	3	2	2	3	10	12	30	69	60	18	1	210	2.80 0.19
3h-4h	2	1	0	2	0	5	7	10	30	70	67	27		223	2.93 0.20
4h-5h30m		1	1	2	2	8	9	18	32	80	80	22		255	2.86 0.18

During the first part of this night (20h-24h) there was no significant difference from one hour to another for the mean magnitude, there was a remakable absence of bright Geminids. Most of the fireballs and bright Geminids appeared during the second part of the night. The difference between the appearance before 0h and after 0h was noticeable in a relative short time. There was no gradual increase in brightness but a sudden change. The mean magnitude doesn't differ much from hour to hour during the second part of the observing night.



4. The hourly rates of the Geminids 1985.

On the second place, well behind the magnitude distributions , the hourly rates of a meteor shower provide valuable informations about the density , the internal structure and the shape of a meteor stream. However meteor totals per unit of time are subject to several variables. Therefore observations of different observers will often show varying values for the same shower observed during the same unit of time. The reasons for the rate variations are :

- A meteor count is an extremely small statistical sample (a fraction of the meteors that appear in a small part of the atmosphere) out of an extremely large quantity ; the dust distributions in a meteor shower, dispersed over a large area in space. The result of the sample will vary around some mean value in a random way . The reliability of the sampling result can be improved by averaging as much as possible independant meteor counts. Preferably , counts at different parts of the atmosphere should be used. The weight of an hourly rate can be enhanced , for longer units of time.

- Different observing conditions may produce a strongly disturbed picture of the actual rates. Most of the factors which define the observing conditions can be estimated andtaken into account with corrections.

- The observer himself isn't a high accuracy measuring device, but a rather subjective character who interpretes his observations into estimates which are subject to uncertainties and personal errors. Perception is one of the most important factors, the different ability of people to perceive sudden appearances of very short duration .

If we want to study the shape and the density of the Geminid meteor shower we will have to minimize the effects of the mentioned error resources. To avoid the variable sky conditions we were favoured with a large number of observational reports obtained under perfect sky conditions. Only a few observations required corrections. Personal errors and systematic differences in the observed magnitudes enabled to neglect some unreliable reports. A considerable difference in perception between the different observers was noticed as well. After a first selection , the following corrections were introduced :

- <u>Obstruction</u> : obstacles or clouds within the field of view of the observer were estimated in % of the entire field of view. The weighed mean % (with the duration of the obstruction as weighing factor) was entered as a correction

$$\text{Clo.} = \frac{1}{1 - k} \quad \text{with } k = \text{weighed coefficient of obscured sky.}$$

- <u>Unit of time :</u> the observed rates were reduced to hourly rates , preferably periods of one or more hours were used to calculate the hourly mean.

- <u>Limiting Magnitude :</u> Only a few observations required a correction for the limiting magnitude. These corrections were based on the finding of the population index r.(See above in this article). The observed stellar limiting magnitude differs strongly from the observed (computed) meteor limiting magnitude. Trond Erik Hillestad reported SLm = 6.2 , less than Klaas Jobses' SLm= 6.54, Erik Hillestad has a much better MLm than Klaas !

Date	Period UT		Dur.	Lm	Clo.	G	ZHR	±	Spor.	HR	±	Observer.
Dec.05	1900-	2000	1.00	5.80	1.11	0	–	–	4	9	± 4	(IL-SF)
05	2100	2400	2.80	6.26	1.00	3	2	1	33	16	3	(IR-SF)
06	2112	2312	2.00	6.4	1.0	4	2	1	20	10	3	(PR-F)
07	1900	2000	0.97	5.8*	1.0	4	8	4	16	16	4	(TEH-N)
08	0000	0100	0.99	6.0*	1.0	7	8	3	16	16	4	(TEH-N)
08	0000	0140	1.52	6.9	1.25	6	4	2	25	16	3	(GP-B)
08	0500	0600	1.00	6.0	1.0	1	2	2	10	18	6	(PB-Can.)
08	0600	0700	1.00	6.0	1.0	3	6	4	6	11	5	(PB-Can.)
08	0700	0800	1.00	6.0	1.0	1	2	2	11	26	8	(PB-Can.)
08	0800	0900	1.00	6.0	1.0	4	7	3	21	39	8	(PB-Can.)
08	1900	2000	1.00	6.0*	1.0	7	14	5	14	14	4	(TEH-N)
08	2000	2100	0.97	6.1*	1.0	9	15	5	22	20	4	(TEH-N)
09	0000	0100	0.97	6.1*	1.0	12	13	4	19	19	4	(TEH-N)
09	0100	0200	0.97	6.2	1.0	15	17	4	18	18	4	(TEH-N)
09	0739	0826	0.78	6.8	1.0	2	3	2	14	19	5	(NM-USA)
09	0826	0926	1.00	6.8	1.0	1	1	1	14	14	4	(NM-USA)
09	1900	2130	1.90	6.3	1.1	1	2	2	7	10	3	(IL-SF)
09	2235	2300	0.42	5.6	1.0	5			5			(BR-NL)
09	2300	2400	0.87	5.9	1.0	8	19	8	10	25	8	(BR-NL)
10	0000	0100	0.98	6.3	1.7	2	9	6	8	17	6	(BR-NL)
10	0100	0155	0.25	6.3	3.3	0	–	–	2	–	–	(BR-NL)
10	0652	0740	0.80	7.2	1.0	16	20	5	31	39	7	(NM-USA)
10	1800	1904	1.08	6.4	1.0	2	9	6	7	7	3	(PR-F)
10	2100	2200	1.00	6.5	1.0	6	9	4	9	9	3	(PR-F)
10	2105	2200	0.92	6.5	1.0	6	11	4	12	13	4	(KJ-F)
10	2100	2200	0.95	6.1	1.0	34	49	8	17	17	4	(TEH-N)
10	2200	2300	0.95	6.2	1.0	26	33	6	27	27	5	(TEH-N)
10	2200	2400	2.00	6.4	1.0	24	15	3	27	15	3	(PR-F)
10	2200	2400	1.88	6.6	1.0	21	13	3	27	13	2	(KJ-F)
10	2300	2400	0.95	6.2	1.0	32	38	7	23	23	5	(TEH-N)
11	0035	0300	2.25	6.45	1.1	26	13	3	10	5	2	(PP-SF)
11	0000	0100	1.00	6.4	1.0	18	21	5	16	18	4	(PR-F)
11	0000	0100	0.98	6.6	1.0	10	11	3	22	20	4	(KJ-F)
11	0100	0200	1.00	6.4	1.0	10	11	4	18	20	5	(PR-F)
11	0105	0200	0.92	6.65	1.1	13	14	4	20	18	4	(KJ-F)
11	0200	0300	0.78	6.2	1.0	17	30	7	20	37	8	(PR-F)
11	0200	0300	1.00	6.7	1.1	17	14	4	19	15	3	(KJ-F)
11	0300	0400	1.00	6.4	1.0	26	32	6	23	25	5	(PR-F)
11	0305	0400	0.92	6.7	1.1	28	28	5	30	26	5	(KJ-F)
11	0400	0512	1.20	6.2	1.0	23	32	7	25	30	6	(PR-F)
11	0400	0513	1.22	6.65	1.1	22	20	4	26	21	4	(KJ-F)
11	0534	0626	0.87	7.3	1.0	11	14	4	13	15	4	(NM-USA)
11	0626	0726	1.00	7.3	1.0	16	16	4	11	11	3	(NM-USA)
11	0726	0826	1.00	7.3	1.0	14	14	4	23	23	5	(NM-USA)
11	2000	2100	0.97	5.8	1.0	37	61	10	15	15	4	(TEH-N)
11	2020	2100	0.66	6.5	1.0	9	24	8	10	15	5	(PR-F)
11	2030	2100	0.50	6.5	1.2	8	36	13	8	20	6	(KJ-F)
11	2100	2200	1.00	6.5	1.0	16	23	6	19	19	4	(PR-F)
11	2100	2200	0.83	6.5	1.2	13	29	6	12	18	4	(KJ-F)
11	2200	2300	1.00	6.5	1.0	19	23	5	8	8	3	(PR-F)
11	2200	2300	0.83	6.5	1.2	17	31	6	10	15	4	(KJ-F)
11	2300	2400	1.00	6.5	1.0	23	26	5	17	17	4	(PR-F)
11	2300	2400	0.70	6.5	1.2	8	16	5	10	18	5	(KJ-F)
12	0000	0100	1.00	6.5	1.0	21	22	5	5	5	2	(PR-F)
12	0000	0100	0.83	6.5	1.2	16	25	5	8	13	3	(KJ-F)
12	0100	0200	1.00	6.5	1.0	39	40	6	27	27	5	(PR-F)
12	0100	0200	0.80	6.5	1.2	12	19	4	15	24	5	(KJ-F)
12	0200	0300	0.90	6.3	1.0	30	35	6	22	28	6	(PR-F)
12	0209	0300	0.85	6.5	1.2	18	27	5	24	35	6	(KJ-F)
12	0300	0400	1.00	6.5	1.0	29	32	6	30	30	5	(PR-F)
12	0300	0400	0.92	6.55	1.2	24	36	6	23	31	5	(KJ-F)
12	0400	0504	1.08	6.5	1.0	21	24	5	29	29	5	(PR-F)

Date	Period UT		Dur.	Lm	Clo.	G	ZHR	+	Spor.HR		+	Observer
Dec.12	0526-	0626	1.00	7.3	1.0	35	37	6	18	18	4	(NM-USA)
12	0626	0726	1.00	7.3	1.0	41	42	7	9	9	3	(NM-USA)
12	0726	0826	1.00	7.3	1.0	44	45	7	20	20	4	(NM-USA)
12	0826	0926	1.00	7.3	1.0	33	35	6	18	18	4	(NM-USA)
12	0926	1026	1.00	7.3	1.0	20	26	6	14	14	4	(NM-USA)
12	1048	1148	1.00	6.0	1.0	5	9	4	3	6	4	(RL-USA)
12	1148	1248	1.00	6.0	1.0	9	18	6	3	6	4	(RL-USA)
12	1248	1348	1.00	6.0v	1.0	13	32	9	8	15	5	(RL-USA)
12	1800	1853	0.75	5.8*	1.1	34	87	15	15	15	4	(TEH-N)
12	2032	2100	0.47	6.5	1.0	17	65	16	8	17	6	(PR-F)
12	2100	2200	1.00	6.4	1.0	35	51	9	5	5	2	(PR-F)
12	2200	2300	1.00	6.4	1.0	49	61	9	13	13	4	(PR-F)
13	2352	0100	1.13	6.5	1.0	49	45	7	16	14	4	(PR-F)
13	0000	0100	1.00	6.5	1.0	54	56	8	17	17	4	(KJ-F)
13	0100	0200	1.00	6.5	1.0	50	51	7	11	11	3	(PR-F)
13	0100	0200	1.00	6.5	1.0	60	61	8	13	13	4	(KJ-F)
13	0200	0300	0.60	6.5	1.0	26	45	9	9	15	5	(PR-F)
13	0205	0300	0.92	6.5	1.0	49	55	8	11	12	4	(KJ-F)
13	0300	0400	1.00	6.4	1.0	59	66	9	22	22	5	(PR-F)
13	0300	0400	0.93	6.55	1.0	24	29	6	11	12	4	(KJ-F)
13	0255	0326	0.52	7.3	1.0	15	53	13	1	2	2	(NM-USA)
13	0315	0415	1.00	5.0	1.0	12	-	-	4	-	-	(PB-Can.)
13	0326	0426	1.00	7.2	1.0	32	46	8	5	5	2	(NM-USA)
13	0400	0500	1.00	6.4	1.0	62	77	10	24	24	5	(PR-F)
13	0405	0500	0.92	6.6	1.0	48	60	9	21	21	5	(KJ-F)
13	0415	0515	1.00	5.5	1.0	8	35	12	4	14	7	(PB-Can.)
13	0456	0526	0.50	7.2	1.0	30	69	13	4	4	2	(NM-USA)
13	0500	0530	0.50	6.4	1.0	20	56	12	8	16	6	(PR-F)
13	0500	0530	0.50	6.6	1.0	18	50	12	9	18	4	(KJ-F)
13	0526	0626	1.00	7.3	1.0	77	82	9	9	9	3	(NM-USA)
13	0626	0726	1.00	7.0	1.0	73	74	9	18	18	4	(NM-USA)
13	0726	0826	1.00	7.3	1.0	96	97	10	14	14	4	(NM-USA)
13	0826	0926	1.00	7.3	1.0	90	96	10	18	18	4	(NM-USA)
13	0847	0947	1.00	7.0	1.0	52	52	7	13	13	4	(RL-USA)
13	0926	1026	1.00	7.3	1.00	62	74	9	20	20	4	(NM-USA)
13	0947	1047	1.00	7.0	1.0	87	87	9	11	11	3	(RL-USA)
13	1026	1056	0.50	7.0	1.0	30	82	15	5	10	4	(NM-USA)
13	1047	1147	1.00	7.0	1.0	66	70	9	18	18	5	(RL-USA)
13	1147	1247	1.00	7.0	1.0	66	78	10	14	14	4	(RL-USA)
13	1247	1347	1.00	6.5	1.0	57	79	10	5	5	2	(RL-USA)
13	1740	1800	0.33	6.5	1.0	2	50	35	5	15	7	(PR-F)
13	1740	1900	1.33	6.5	1.0	16	69	17	14	11	3	(KJ-F)
13	1800	1900	1.00	6.5	1.0	14	62	17	12	12	3	(PR-F)
13	2020	2100	0.66	6.4	1.0	34	92	16	5	8	3	(PR-F)
13	2042	2200	1.30	6.5	1.0	103	123	12	17	13	3	(KJ-F)
13	2100	2200	1.00	6.4	1.0	76	111	13	9	9	3	(PR-F)
13	2200	2300	1.00	6.4	1.0	96	119	12	11	11	3	(PR-F)
13	2200	2300	1.00	6.5	1.0	100	124	12	11	11	3	(KJ-F)
13	2217	2300	0.70	6.2*	1.0	75	125	14	12	12	3	(TEH-N)
13	2300	2400	0.98	6.2*	1.0	113	133	13	22	22	5	(TEH-N)
13	2300	2400	1.00	6.3	1.0	104	127	12	9	10	3	(PR-F)
13	2305	2400	0.92	6.4	1.0	80	106	12	10	12	3	(KJ-F)
14	0000	0100	0.97	6.2*	1.0	101	113	11	26	26	5	(TEH-N)
14	0000	0100	1.00	6.2	1.0	62	84	11	7	10	4	(PR-F)
14	0000	0100	1.00	6.3	1.0	73	91	11	12	15	4	(KJ-F)
14	0100	0200	0.88	6.2	1.0	101	112	11	29	29	5	(TEH-N)
14	0100	0200	0.80	6.3	1.0	52	83	11	8	13	5	(PR-F)
14	0114	0200	0.77	6.45	1.0	62	86	11	13	19	5	(KJ-F)
14	0200	0300	0.97	6.2	1.0	113	127	12	23	23	5	(TEH-N)
14	0200	0300	1.00	6.2	1.0	107	139	13	20	25	6	(PR-F)
14	0200	0300	1.00	6.65	1.0	103	93	9	11	10	3	(KJ-F)
14	0300	0400	0.97	6.2	1.0	97	117	12	25	25	5	(TEH-N)

Date	Period UT		Dur.	Lm	Clo.	G	ZHR	±	Spor.HR		±	Observer
Dec.14	0300	0400	1.00	6.4	1.0	122	135	12	18	18	4	(PR-F)
14	0304	0400	0.93	6.7	1.0	101	106	11	22	19	4	(KJ-F)
14	0326	0426	1.00	7.3	1.0	53	76	10	4	4	2	(NM-USA)
14	0400	0545	1.61	6.6	1.0	114	92	9	40	22	4	(KJ-F)
14	0400	0548	1.80	6.25	1.0	141	136	12	26	20	4	(PR-F)
14	0426	0526	1.00	7.3	1.0	72	86	10	10	10	3	(NM-USA)
14	0526	0626	1.00	7.3	1.3	70	100	12	4	4	2	(NM-USA)
14	0647	0747	1.00	7.0	1.0	92	107	11	4	4	2	(RL-USA)
14	0747	0847	1.00	7.0	1.3	70	106	13	2	3	2	(RL-USA)
14	0847	0947	1.00	7.0	1.2	79	99	11	6	8	3	(RL-USA)
14	0947	1047	1.00	7.0	1.0	141	141	12	10	10	3	(RL-USA)
14	1047	1147	1.00	7.0	1.0	85	90	10	9	9	3	(RL-USA)
14	1147	1247	1.00	7.0	1.0	48	57	8	14	14	4	(RL-USA)
14	1247	1347	1.00	6.5v	1.0	32	45	8	10	10	3	(RL-USA)
14	2035	2140	0.96	4.8	1.0	6	-	-	3	-	-	(PR-SF)
14	2052	2200	1.12	6.2	1.0	19	37	8	13	17	5	(PR-F)
14	2050	2200	1.17	6.3	1.0	28	43	8	17	18	4	(KJ-F)
14	2200	2300	1.00	6.3	1.0	14	21	6	11	14	4	(PR-F)
14	2200	2300	0.88	6.5	1.0	12	17	5	11	13	4	(KJ-F)
14	2215	0002	1.68	6.3	1.0	24	24	5	10	8	2	(PP-SF)
14	2300	2400	1.00	6.3	1.0	27	36	7	8	10	4	(PR-F)
14	2300	2420	1.17	6.55	1.0	18	16	4	7	7	4	(KJ-F)
15	0000	0114	1.08	6.3	1.0	30	35	6	9	11	4	(PR-F)
15	0214	0246	0.53	6.6	1.0	7	14	5	11	20	6	(KJ-F)
15	0238	0326	0.70	7.2	1.0	5	13	6	1	1	1	(NM-USA)
15	0326	0426	1.00	7.2	1.0	10	14	5	7	7	2	(NM-USA)
15	0547	0647	1.00	7.0	1.0	30	42	8	4	4	2	(RL-USA)
15	0647	0747	1.00	7.0	1.0	33	39	7	6	6	2	(RL-USA)
15	0747	0847	1.00	7.0	1.0	42	44	7	3	3	2	(RL-USA)
15	0847	0947	1.00	7.0	1.0	45	45	7	4	4	2	(RL-USA)
15	0947	1047	1.00	7.0	1.0	52	52	7	2	2	2	(RL-USA)
15	1635	1750	1.00	5.2	1.2	1	9	9	3	12	8	(LW-SF)
15	2112	2220	1.11	6.46	1.1	3	12	7	10	10	3	(IL-SF)
15	2250	2308	1.30	6.2	1.6	2	4	2	4	7	4	(PR-F)
16	1645	1800	1.10	6.2	1.0	0	-	-	4	4	2	(MR-SF)
16	2300	0100	2.00	6.54	1.2	3	2	1	23	11	3	(LR-SF)

The observed rates for both sporadics and Geminids suggest that Trond Erik Hillestad is a very high perceptive observer. His uncorrected rate for sporadics equals (averaged) sporadic rates obtained under perfect sky conditions. This means that an additional correction for his stellar limiting magnitude would yield too high rates. His reduced limiting magnitude is compensated by his high perception. Another observer , Norman McLeod always mentions very good limiting magnitudes (+7.0 and even better). His observed rates are equal or smaller than rates obtained by other observers under +6.5 sky. During the observations of July 1984 when the author observed simultaneously with Norman McLeod at the same place in Florida, it turned out that Norman got easely up to Lm +7.0 while the author or other observers observe almost identical rates but with a much poorer limiting magnitude. From these comparisons we prefered not to correct the observed rates of Norman McLeod assuming that a +7.0 sky for him equals a +6.5 sky for most other observers. The sporadic rates of Robert Lunsford are rather small, the magnitude distribution results indicate that a Lm of 6.5 is to be prefered above the mentioned +7.0 . All these points leave only some cases where limiting magnitude corrections are inevitable when both the magnitude distribution and the observed sporadic rates justify the application of the corrections.

The final correction which is inevitable for all observations , is the <u>zenith distance correction.</u> When the observers are scattered over a wide geographical area , the difference in zenith distance for the radiant causes significant differences in observed hourly rates. Some observers watched under perfect sky conditions with the radiant near the zenith! In order to compute the zenith distance we need the following data:

- local sidereal time (θ)
- geographical position of the observer (φ,λ)
- radiant position (α,δ)

The zenith distance is found from :

$$\sin h = \cos Z = \sin\delta . \sin\varphi + \cos\delta . \cos\varphi . \cos(\theta - \alpha)$$

To facilitate the calculation of the zenith distance it would be appreciated if each observer would report the geographical position of his observing site and the observing time in U.T. instead of all kind of local or temporary time references.

The observed Geminid hourly rates used in this paper were all corrected for the zenith distance:

$$Cz = \frac{1}{\cos Z} = \frac{1}{\sin h}$$ (with Cz the correcting factor)

The probable error on the Z.H.R. was found from :

$$Z.H.R. \times \frac{1}{\sqrt{n}}$$ (n the number of Geminids)

The rate data have been listed in the table on pages 56-58 . The time sequence (U.T.) shows some overlapping intervals with noticeable differences on the Z.H.R.'s and on the H.R.'s. The reason for such deviations has been explained in this article. A first impression about the corrected rate from the Z.H.R.-list may be confusing. Perhaps one would overreact and conclude that the strong variations from one hour to another and from one observer to another , don't allow any realistic interpretation. The strong variations are due to the rate fluctuations which are introduced with the use of very small time intervals (about one hour). To increase the weight of a statistical sample such as the Z.H.R.-value , we'll consider a much longer period with Z.H.R.-values obtained by different observers. The mean Z.H.R.-value with the associated standard deviation is a meaningfull approach of the probable shower intensity. Strong disagreements among the observers will manifest the uncertainty on the mean value with the large standard deviation. If a limited period of time has got a mean value with a small standard deviation,then the strong agreement among the observers indicates that the mean value is very consistent with all the observations.

The relative small number of observers who contributed their observations to this study is a disadvantage for some periods may still be biased by one single observers'perception. The input from observations for the period between 12h and 20h U.T. would be desirable. Therefore we need data from observers in Japan, Australia and Central Asia.

The available observations were averaged for limited periods of time , the period was choosen depending upon the number of observations available. The mean Z.H.R.'s were listed in table 8. In general a period of 6 hours was considered. Some longer periods were required as well because of a lack of Z.H.R.-values. For instance the mean Z.H.R.-value of 12.50 Dec. was based on the Z.H.R.'s obtained in 9 hours before and 9 hours after 12h U.T. on Dec.12.

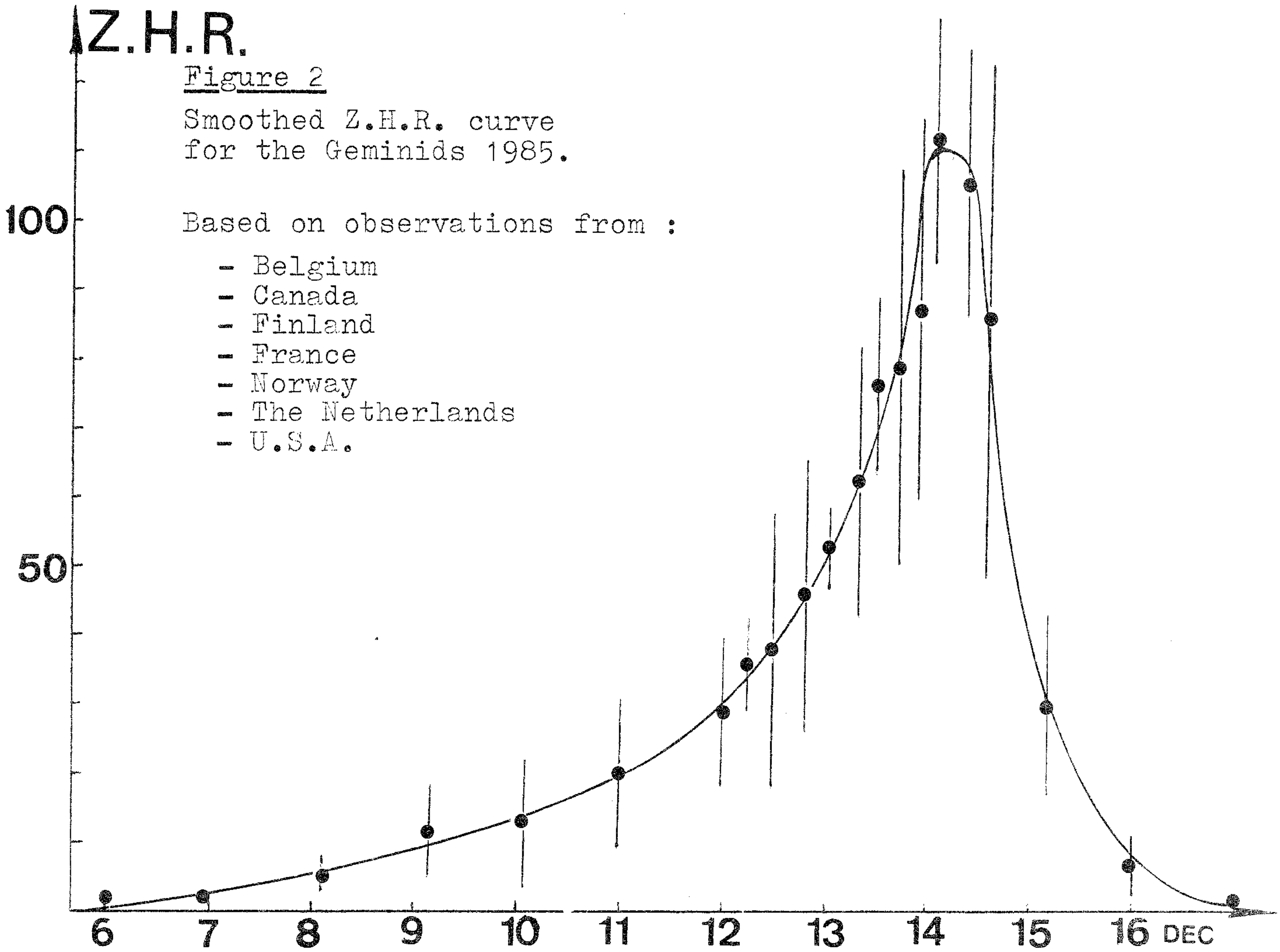


Figure 2

Smoothed Z.H.R. curve for the Geminids 1985.

Based on observations from :

- Belgium
- Canada
- Finland
- France
- Norway
- The Netherlands
- U.S.A.

As can be seen from the mean Z.H.R.-values ,the strong fluctuations have disappeared. The S.D. represents the variations which occur within the considered period among the different observers and samples. Meteor observers should not argue about differences in rates for a given hour when they compare their observed rate with other observers. The fact that someone sees much less meteors doesn't necessary mean that he was falling asleep. If someone saw unusual many meteors more than you did, it doesn't mean that someone has much fantasy ... These fluctuations cannot be avoided in visual meteor work. Therefore it is necessary to have many observations from as much as possible different observers. Never think that there is no need for your observations ! We really need your work ! Alltogether we can obtain a fine picture of a meteor shower activity.

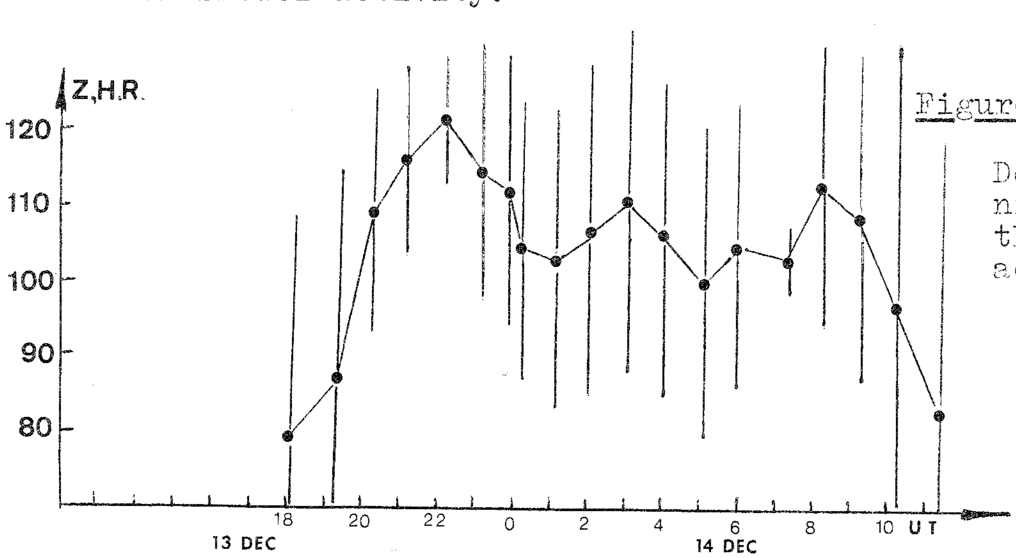


Figure 3

Detail of the Geminid activity during the night of maximum activity 13-14 Dec.

Table 8 ; Smoothed Z.H.R.-distribution

Date (U.T.)	Z.H.R.	S.D.	N°	H.R.	S.D.	N°	Period
Dec. 5.94	2	1	(1)	16	3	(1)	(3 hours)
6.93	2	1	(1)	10	3	(1)	(2 hours)
8.08	5	3	(7)	20	9	(7)	(14 hours)
9.10	11	7	(6)	17	3	(6)	(14 hours)
10.06	13	9	(4)	22	12	(4)	(12 hours)
11.04	20	11	(22)	19	8	(22)	(14 hours)
12.00	29	11	(15)	18	8	(15)	(6 hours)
12.25	36	7	(7)	22	8	(7)	(6 hours)
12.50	38	20	(13)	18	8	(13)	(18 hours)
12.75	46	20	(15)	13	4	(15)	(9 hours)
13.00	53	6	(8)	13	4	(8)	(6 hours)
13.25	63	20	(15)	14	7	(15)	(6 hours)
13.50	77	13	(8)	14	5	(8)	(6 hours)
13.75	79	29	(5)	12	3	(5)	(6 hours)
14.00	112	18	(17)	16	7	(17)	(6 hours)
14.25	105	19	(11)	12	8	(11)	(6 hours)
14.50	86	38	(5)	10	2	(5)	(6 hours)
14.75	?	?	0	?	?	0	
15.13	31	13	(16)	9	6	(16)	(14 hours)
15.83	8	4	(3)	10	3	(3)	(8 hours)
17.00	2	2	(1)	11	3	(1)	(2 hours)

Table 9 ; Smoothed Z.H.R.-distribution 13-14 Dec.

Date	Period	Z.H.R.	S.D.	N°	Date	Period	Z.H.R.	S.D.	N°
13.77	17-20h	60	10	(3)	14.19	03-06h	106	22	(8)
13.81	18-21h	87	28	(4)	14.23	04-07h	100	21	(6)
13.85	19-22h	109	16	(3)	14.27	05-08h	105	17	(8)
13.90	20-23h	116	13	(6)	14.31	06-09h	103	4	(4)
13.94	21-24h	121	9	(8)	14.35	07-10h	113	19	(4)
13.98	22-01h	114	17	(9)	14.40	08-11h	109	22	(4)
14.02	23-02h	104	19	(9)	14.44	09-12h	97	35	(4)
14.06	00-03h	103	20	(9)	14.48	10-13h	83	43	(4)
14.10	01-04h	107	22	(10)	14.52	11-14h	64	23	(3)
14.15	02-05h	111	23	(10)					

All the observers were intensively watching during the night of maximum activity 13-14 Dec. The data in table 8 results in a shower maximum on Dec.14.0 (U.T.) exactly the predicted time of maximum activity (see ref.5). However several observers reported very good rates between 20h and 24h U.T. followed by a disappointing period with much lower rates. After 3h UT the observers continued to record high Geminid rates. It might be interesting to look at the rate distribution during this night. The large amount of data enables to increase the resolution of the picture of the shower intensity. The observed period was divided into periods of 3 hours , advancing one hour with each step. The results are listed in table 9. The shower activity has been drawn in figure 2 and the detailed activity of Dec.13-14 has been drawn in figure 3. Considering the entire range of the time slots with the S.D. on the mean ZHR, we can conclude that the Geminids produced very good rates between Dec.13, 20h and Dec.14, 10h U.T. For the time of maximum activity Dec.14.0 doesn't correspond neither with the best hour which was rather 22h-23h,nor with the median of the period with constant over 100 Geminids per hour. The median of the period of maximum activity was Dec.14 3h U.T. There is certainly no sharp peak of short duration but a long period of maximum rates. This illustrates how misleading single reports can be when the determination of a shower maximum leads to contradiction on the time of the maximum.

5. Colour and train data.

Very few Geminids produced trains. The average train percentage for five observers is 4% for the Geminids and 8% for the sporadic meteors. The different observers agree very well on this point. Only Robert Lunsford and Trond Erik Hillestad reported colour data. Both found 14% of the total number of Geminids being yellow in colour. The other colours weren't consistently reported by both observers.

6. General conclusion and remarks.

The 1985 Geminid display has been watched and a complete picture of the shower activity was derived. The shower proved to be rich in faint meteors with a sudden increment in bright meteors during the period of maximum activity. The maximum activity occured as a strong display lasting 14 hours, between Dec.13 20h and Dec.14 10h U.T. The shape of the ZHR-curve is remarkable for its skewness. 75% of the activity period elapsed before the maximum. After Dec.14 11h U.T. there is a very steep decline in the Geminid activity. Within 70 hours after the maximum the activity had ceased.

This article has been published to show the need for more observational reports from observers worldwide. The observations used in this paper were reported in a format that allows a rational management of observational data. However a lot remains to be done to standardize the international meteor work further. General remarks to improve the report format used by some observers can be summarized as follows :

- Use U.T. instead of anything else.
- Spend more attention to the magnitude data.
- Report magnitude distributions per night.
- Mention the geographical position of the observing site, and give the radiant elevation if possible.
- Be correct with the sky conditions.

For some groups we stress once again that group rates with corrections for the number of observers are unacceptable. Use a report format per observer except when averaged rates are given with the S.D. Finally we wish that more observers would contribute to these observational events. Reports from Japan, Australia and Central Asia are urgently desired. Some more observers on the American longitudes (Canada, U.S.A., Southern America ...) would be very welcome. European meteor observers are numerous. The only problem within Europe is to co-ordinate the many observational efforts.

Our next target is the Perseid Meteor Shower. Please take our suggestions into account and report your results in the right format. We are very grateful to all observers who contribute with their observations to enable us to analyze the activity of a shower in great detail. Good luck with the Perseids and keep in mind : "your work is useful ".

7. References.

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(FLORIDA , U.S.A.)

THE 1985 RESULTS OF NORMAN MCLEOD

Norman McLeod

Almost no observing was possible from mid-August to early October. Observing for Draconids Oct.7-8 and 9-10 for 13h41m gave virtually negative results . None of the 3 Draconids I recorded were excellent candidates in projection , for they all barely missed Draco's head.

The Orionids were fully normal to start. By Oct.12 I was getting rates of 4 , and by Oct.15 above 10. But two nights of the max period broke records. Oct.21-22 local daylight hour 3-4 had 40 Orionids and 19 others, a phenomenal show. The next hour had 29 more Orionids. I have seen 28 several times in the past as a solid ceiling. The next night hour 5-6 gave 31 Orionids; the two prior hours both 25. So there was a very good 1985 Orionid display, visible only in superb skies , however. Oct. 21-22 averaged 3.23m for 96 Orionids , rather bright for this shower ; Oct.22-23 only 3.55 m for 97 Orionids. I saw 329 Orionids in 7.0 skies in October averaging 3.29m , slightly brighter than average . The only fireball was on Oct.14-15 , a yellow -5m with train 40 seconds.

The Taurids were good throughout October with rates 5-10/hour common. Their only fireball was Oct.17-18 , a South green -6m . The Taurids were rather poor in November with the Norths dominant for a change. In recent years this shower has become much more prominent through October competing very well with the Orionids. The highest Taurid rate was 9 in November ; most typical were rates of 4-6 . Two more bright ones were seen , the best being a -6 N/S on Leonid max morning.

The Leonids were very dull with mostly faint ones. The only fireball I did not see directly , on max morning. A few minutes after I stopped watching a faint blue strobe flash lit the ground. Looking up I saw a short train very close to the Leonid radiant overhead. Brian Risley did see it ; he called it -5m which was the impression I got from the flash. I can give the magnitude and color of any fireball not seen directly without any hesitation. The best Leonid rates came both before and after the official maximum , but rates of 13 and under do not carry any statistical significance. I have seen similar rates several times previously.

The year's super event , as in most years , was the Geminids. The 1985 display was the most massive I have yet seen for any shower apparition. The strengthening trend which began in 1979 and broke down in 1982-83 definitely resumed this year in spectacular fashion. High rates expanded to three nights. Mark Adams predicted a mid-day Dec.13 max for his longitude,and relative observed rates and magnitudes fit perfectly. I did not get a record hourly rate or nightly total , but for the first time I saw more than a thousand shower members in one apparition.

Excellent skies took up 934 Geminids with an average magnitude of 2.64. This is rather bright for them despite a lack of fireballs. Exotic colors were also absent as in 1971. I have a curious lack of 3m Geminids , also noted in previous years but much more pronounced in 1985. But I am not willing to say this deficiency is real as I might have some bias against 3m meteors. Other showers have not shown a similar tendency , but I have to leave the question open for the present.

Geminid rates began unaccustomed levels on Dec.11-12 breaking 40/hour a couple of times. The next night was like a light snowfall with very high rates approaching 100. It didn't end there , for Dec.13-14 still put out a couple of 70's before some deterioration became evident. This last night had brighter meteors in the best half-day right after maximum. The 193 Geminids seen then averaged 2.05m which is brilliant. There still was a distinct lack of the brightest members.

Perseids get all the attention because of the time of year they appear , but I am much more interested in watching the Geminids evolve rapidly at levels the Perseids cannot match. Now we have 3 nights of heavy Geminid activity to enjoy. The moon will be quite bad in 1986 and 1987 , sadly , so we will have to wait until 1988 for a repeat of 1985.

Table : 1985 meteor rates Norman McLeod - U.S.A.

Date U.T.	Shower	Spor.	Tot.	Lm.	Date U.T.	Shower	Spor.	Tot.	Lm
Aug.10					Oct.8-9				
0322-0422	5P,1A,1K	8	15	7.0	2341-0026		1	2	7.3
0422-0522	8P,1A,	15	24	7.0	0026-0126	1G	3	4	7.3
0522-0552	7P,3A,2C	2	14	7.0	0126-0226	1T	3	4	7.3
0552-0622	1P,1C,	2	4	6.0	0226-0326	2T	5	7	7.3
Aug.11					0326-0426	1T	5	6	7.3
0821-0921	12P,1C,1K	10	24	6.0	0426-0526	1o,4T	9	14	7.3
0921-1050	10P,	0	10	6.0	0526-0626	3T	6	9	7.3
Aug.12					Oct.10				
0322-0422	17P,2A,1C,2K	8	31	7.3	0026-0126		1	1	5.7
0422-0522	19P,4A,2C,	8	33	7.3	0526-0626	1o,2T	10	13	7.3
0522-0622	35P,1A,1C,3K	8	48	7.3	0626-0726	3o,2T	8	13	7.3
Aug.12					0726-0808	2o,5T	7	14	7.1
0622-0722	49P,4A,2K	15	70	7.3	Oct.11				
0722-0822	43P,5A,	11	59	6.5	0526-0626	2o,6T	8	16	7.3
0822-0922	59P,2A,	12	73	6.0	0626-0726	6T	9	15	7.3
0922-0945	15P,	3	18	6.0	Oct.12				
Aug.13					0526-0626	9T	9	18	7.0
0532-0622	27P,3A,1C	9	40	7.3	0626-0726	4o,3T	14	21	7.1
0622-0722	51P,1C,1K	13	66	7.3	0726-0826	2o,2T	12	16	7.2
0722-0822	60P,3A,1K	16	82	7.3	0826-0926	7o,5T	17	29	7.3
0822-0922	31P,5A,1K	10	47	5.7	0926-0956	4o,5T	4	13	7.3
Aug.15					Oct.13				
0444-0526	3P,1A,1C,2K	6	13	7.2	0726-0826	4o,9T	8	21	7.3
0526-0626	3P,3A,1K	11	18	7.2	0826-0911	3o,2T	5	10	7.3
0626-0726	7P,4A,2C,2K	8	23	7.2	Oct.14				
0726-0826	6P,4A,1K	24	35	7.3	0632-0726	7o,7T	9	23	7.3
Sept.08					0726-0826	7o,3T	14	24	7.3
0635-0726	2T	7	9	7.0	0826-0926	4o,4T	19	27	7.3
0726-0826		11	11	7.0	0926-1026	4o,2T	8	14	7.3
Oct.7-8					Oct.15				
2356-0026	1G	0	1	7.0	0427-0526	2o,4T	9	15	7.3
0056-0126	1G,1T	1	3	7.0	0526-0626	7o,8T	7	22	7.3
0156-0220	1T	2	3	6.7	0626-0726	14o,10T	8	32	7.3
0518-0556		2	2	5.5	0726-0826	13o,3T	14	30	7.3

Table : 1985 meteor rates Norman McLeod - U.S.A.
continued

Date U.T.	Shower	Spor.	Tot.	Lm
Oct.15				
0826-0926	6o,2T	10	18	7.3
Oct.18				
0626-0726	13o,3T	12	28	7.3
0726-0826	10o,5T	8	23	7.3
Oct.22				
0626-0726	17o,9T	7	33	7.3
0726-0826	40o,7T	12	59	7.3
0826-0926	29o,1T	10	40	7.3
Oct.23				
0626-0654	4o,4T	3	11	6.2
0654-0726	16o,2T	3	21	7.0
0726-0826	25o,6T	13	44	7.3
0826-0926	25o,3T	7	35	7.3
0926-1026	31o,3T	14	48	7.3
Oct.25				
0831-0849	2o	2	4	6.0
0849-0926	10o,1T	2	13	7.0
0938-1007	5o,3T	3	11	7.0
Nov.07				
0226-0326	8T	3	11	6.8
0326-0426	5T,1o	2	8	7.0
0426-0526	9T,1o	0	10	7.0
0526-0626	6T	2	8	7.0
Nov.09				
0538-0626	7T,1o	5	13	7.0
0726-0826	3T,3L	7	13	7.0
Nov.12				
0326-0426	2T	3	5	7.2
0426-0526	5T,1L	6	12	7.2
0526-0626	3T,1L	4	8	7.3
0626-0726	5T	5	10	7.3
Nov.13				
0527-0627	10T,1L	9	20	7.0
0627-0727	3T ,2L	5	10	7.0
0727-0827	4T ,	7	11	7.0
0827-0927	2T ,2L	12	16	7.0
0927-1027	2T ,1L	6	9	7.0
Nov.14				
0434-0526	9T,	3	10	7.5
0526-0626	5T,1L	3	9	7.5
0626-0726	2T,1L	13	16	7.5
0726-0826	4T,1L	7	12	7.5
0826-0926	6T,4L	7	17	7.5
0926-1026	4T,11L	16	31	7.5

Date U.T.	Shower	Spor.	Tot.	Lm
Nov.16				
0528-0626	7T	5	12	7.3
0626-0726	3T,3L	8	14	7.3
Nov.17				
0626-0726	6T,2L	4	12	7.3
0837-0926	8T,8L	4	20	7.3
0926-1026	5L	10	15	7.3
Nov.19				
0916-1016	13L	10	23	7.0
0927-1016	10L	8	18	7.0
Dec.09				
0739-0826	2G,1T	13	16	6.8
0826-0926	1G,2T	12	15	6.8
Dec.10				
0652-0740	16G	31	47	7.2
Dec.11				
0534-0626	11G	13	24	7.3
0626-0726	16G	11	27	7.3
0726-0826	14G	23	35	7.3
Dec.12				
0526-0626	35G	18	53	7.3
0626-0726	41G	9	50	7.3
0726-0826	44G	20	64	7.3
0826-0926	33G	18	51	7.3
0926-1026	20G	14	34	7.3
Dec.13				
0255-0326	15G	1	16	7.3
0326-0426	32G	5	37	7.2
0456-0526	30G	4	34	7.2
0526-0626	77G	8	86	7.3
0626-0726	73G	18	91	7.0
0726-0826	96G	14	110	7.3
0826-0926	90G	18	108	7.3
0926-1026	62G	20	82	7.3
1026-1056	30G	5	35	7.0
Dec.14				
0326-0426	53G	4	57	7.3
0426-0526	72G	10	82	7.3
0526-0626	70G	4	74	7.3
0626-0711	38G	0	38	7.3
	cirrus to 100%			
Dec.15				
0238-0326	5G	1	6	7.2
0326-0426	10G	7	17	7.2
Dec.22				
0827-0927	1Ur.	16	18	7.0
0927-1027	1Ur.	22	23	7.0

<u>Explanation of the shower abbreviations :</u>

P = Perseids
A = Aquarids (Delta's+ Iota's)
C = Alpha Capricornids
K = Kappa Cygnids
G = Giacobinids
T = Taurids (North+South)
o = Orionids
L = Leonids
G = Geminids
Ur.= Ursids

Sporadics = all the meteors not belonging to any of the above mentioned showers.

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THE 1985 RESULTS OF ROBERT LUNSFORD

Robert Lunsford

July : Meteor observations were made from home on three nights in the middle of the month producing very little excitement. From the 20th on it was completely clear so I managed to travel to the mountains three times during this period. On the morning of the 20th Keith Ewald and I were at the summit of Mount Laguna watching the early Delta Aquarids.

August : I managed some form of observation on 15 of the clear days . Conditions for the Perseids were ideal but the show was a letdown. On the 10-11 the moon didn't seem bothersome as rates peaked at 48/hour . On the predicted morning of maximum the moon was not a factor. An unusual drop in rates occurred at 9h U.T. , an hour when the 67 should have increased to past 80. The following morning had a similar dip at exact the same hour . The rates quickly recovered though and nearly matched those of the previous morning. If I were reading this I would say the observer had a drop of acuity in the middle portion of the session . This is a possibility but I feel certain I did stay alert during the entire morning of the session due to its importance and the fact I had at least 6 hours of sleep prior to the start. It was much more enjoyable to watch on the morning of 12-13 . Though less were seen , they were brighter and several had peculiar colors and trails. An additional factor was the absense of long intervals when no activity was seen.

December : The first 10 days of the month had very bad weather , but as in years past it cleared in time to allow me a good look at the Geminid maximum. Rates were very low as seen from San Diego on the 11-12. From Alpine the following night rates nearly 90/hour , my best ever seen on the 12-13 . This display led me to believe the following night would be another one for the record books and I was not disappointed. Rick Young, Keith Ewald, and I arrived early to watch both the radiant and the rates climb toward the 2 AM maximum . Unfortunately cirrostratus clouds were present during the 2nd and 3rd hour of our watch diminishing the display. It was so bad around midnight that Rick fell asleep. He was quite astonished to wake up at 1h30 under perfectly clear skies. Even through the interference I managed rates of 70 and 90 per hour. After the clouds left a strong display soon became an intense rain of celestial fireworks. There were no peaks and valleys during the next hour , just a steady stream of meteors unequaled except for the 155/hour I saw during the 1977 Perseids. I hope you find the 5 minute table on the next page interesting. I was facing south during this period. Rick , refreshened by his nap was facing east and counted 202 Geminids during this interval. He is an experienced observer but not able to observe on as many nights as I. He also had the luxury of just lying back and counting while I was reading details into the cassette recorder and advancing the film on three cameras 4 times an hour. Keith is a newcomer to meteor observing and faced west during the night. His top rates were only 40-50/hour while facing far away from the radiant , and remained roughly the same as the radiant went west and tiredness set in.

Magnitude Distributions 1985,Robert Lunsford

Shower	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot.
Gem.2.49	1	0	1	1	4	9	26	43	66	108	232	269	171	99	47	1077
Perseids	1	1	0	0	4	7	5	11	32	72	197	171	150	61	22	734

Table 1985 Hourly Rates Robert Lunsford

Period UT	Shower	Spor.	Tot.	Lm
June 18				
0848-0948		4	4	5.5
June 22				
1048-1148		6	6	6.0
June 23				
0848-0948		4	4	5.5
0948-1048		5	5	5.5
1048-1148		4	4	5.5
June 29				
0948-1048		7	7	5.5
1048-1148		4	4	5.5
June 30				
0948-1048		1	1	5.5
1048-1148		3	3	5.5
July 11				
0948-1048		1	1	5.5
1048-1148		4	4	5.5
July 20				
0847-0947	2A,1C	14	17	7.0
0947-1047	8A,2C	15	25	7.0
July 28				
0847-0947	12A,3C,5P	13	33	Var.
0947-1047	17A,5P	24	46	7.0
1047-1147	19A,7P,	21	47	Var.
July 29				
0947-1047	8A,1C,4P	13	26	Var.
1047-1147	12A,1C,7P	16	36	Var.
August 10				
0747-0847	12P,1A,2K	11	26	7.0
0847-0947	6P,1C(-30m)	7	14	6.5
0947-1047	8P,	6	14	6.5
1047-1147	3P		3	6.5
August 11				
0702-0747	11P,	8	19	7.5
0747-0847	16P,	9	25	7.5
0847-0947	26P	15	41	7.0
0947-1047	48P	16	64	7.0
1047-1147	42P	18	60	6.5
August 12				
0647-0747	41P,1K	17	59	7.5
0747-0847	67P,	20	87	7.5
0847-0947	62P,2A	19	83	7.5
0947-1047	69P	18	87	7.0
1047-1147	79P	14	93	7.0

Period UT	Shower	Spor.	Tot.	Lm
August 13				
0717-0747	21P,1A	4	26	7.5
0747-0847	41P,4A	7	52	7.5
0847-0947	34P,1A,1C	7	43	7.5
0947-1047	63P,1K	14	78	7.5
1047-1147	77P,	24	101	7.0
1147-1217	8P	3	11	Var.
October 16				
0848-0948		4	4	6.0
0948-1048	2 Or.	5	7	6.0
1048-1148		4	4	6.0
December 12				
1048-1148	5G	3	8	6.0
1148-1248	9G	3	12	6.0
1248-1348	13G	8	21	Var.
December 13				
0847-0947	52G	13	65	7.0
0947-1047	87G	11	98	7.0
1047-1147	66G	18	84	7.0
1147-1247	66G	14	80	7.0
1247-1347	57G	5	62	Var.
December 14				
0647-0747	92G	4	96	7.0
0747-0847	70G 30%cloud	2	72	7.0
0847-0947	79G 20%cloud	6	85	7.0
0947-1047	141G	10	151	7.0
1047-1147	85G	12	97	7.0
1147-1247	48G	16	64	7.0
1247-1347	32G	10	42	Var.
December 15				
0547-0647	30G	4	34	7.0
0647-0747	33G	6	39	7.0
0747-0847	42G	10	52	7.0
0847-0947	45G	4	49	7.0
0947-1047	52G	3	55	7.0
December 22				
1048-1148	2 Ur.	2	4	6.0
1148-1248	5 Ur.	3	8	6.0
1248-1348	2 Ur.	2	4	6.0

Table : train and color data - Robert Lunsford

	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot	%
Perseids																		
Yellow		1				2	4	5	7	18	24	30	4	1			96	59.6%
Blue						1	1		2	3	17	29	8				61	37.9
Green			1			1											2	-
Blue-green												1					1	-
Yellow-orange										1							1	-
% colored		100	100	100		100	71	100	82	69	57	30	7	-			161	21.9
Trains		1	1			4	6	5	6	22	35	66	18	3			167	
Total seen		1	1			4	7	5	11	32	72	197	171	150	61	22	734	
% Trains		100	100			100	86	100	55	69	49	34	11	2			22.8%	

FROM RECENT PUBLICATIONS ...

T.M.Searle : Pairing in the incidence of shower meteors.
B.A.C. Vol.36 (1985) N°6 p.375-377

Observers of random phenomena such as the incidence of meteors during meteor showers often report a large fraction of paired events. A definition of pairing is given , which enables the probability of such events to be calculated in spaces of any dimensions. For events dependent on one parameter only , time for example , this probability is 2/3 , explaining the observer's impression of above random pairing.

Ken Fox ,Iwan P.Williams: A possible origin for some ancient December fireballs.
Mon.Not.R.astr.Soc.(1985) Vol.217, p.407-411

Between the years AD 1038 and AD 1099 there were reports of 14 impressive fireballs all of which occurred between December 6 and 18 . All these fireballs emanated from a single radiant close to RA103°,+26°,indicating a common origin in some stream . In the past some authors have attempted to associate these ancient fireball observations with the present day Geminid meteor shower , as this is currently seen between the same dates during December. This connection is shown to be impossible on dynamical grounds and an alternative source of the ancient fireballs , from the Monocerotid stream , is proposed.

J.Jones : The structure of the Geminid meteor stream -I. The effect of planetary perturbations.
Mon.Not.R.astr.Soc.(1985) Vol.217, p.523-532

The gravitational perturbations of the Geminid stream have been studied using a very simplified model in which Jupiter causes the only perturbation of an initially very well defined stream. In this way the effects of the gravitational perturbations are not obscured by the many other factors that influence the real stream. The results of extensive calculations of the evolution of the orbits of 71 meteoroids in Geminid-like orbits over a period of 5000yr are presented. The complex of orbits so produced was found to lie on the surface of a torus flattened approximately parallel with the plane of the ecliptic. Visual observations of the shower show a strong suggestion of a secondary peak in the meteor activity curve at about 0°8 in solar longitude after the main shower maximum which would imply a probable age of about 6000yr for the stream. The hollow stream resulting from planetary perturbations seems to provide an attractive explanation for the twin branches of the Taurid,delta - Aquarid and Piscid showers.

J.Hunt,Iwan P.Williams and Ken Fox: Planetary perturbations on the Geminid meteor stream.
Mon.Not.R.astr.Soc.(1985) Vol.217, p.533-538

The behaviour of the Geminid meteor stream is affected by gravitational perturbations. The evolution over 5000yr , 500yr forward and 4500 yr back has been determined. The investigations prove that the Geminid stream could not be intersecting the orbit of the Earth around 900yr ago and so another explanation for the fireballs seen in the 11th century must be sought.

V.V.S.WERKGROEP METEOREN - METEOR SECTION

Reken Sektie : Astrometrie , Baanberekeningen , enz ...

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

Visuele Sektie ; Waarnemingen , Publikaties , Werkgroepnieuws ...

Paul Roggemans , Dellingstraat 25 , B-2800 Mechelen

Tel.: 015/41 04 43

Radio Sektie : Waarnemingen

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

Verzending WERKGROEPNIEUWS :

Pierre en Tilly Vingerhoets, Blokmakerstraat 20,B-2758 Haasdonk
Tel.: 03/775 13 29 (verwittigen wanneer WGN niet werd ontvangen)

Zend uw waarnemingen , foto's,artikels altijd onmiddellijk in naar de verantwoordelijke persoon.

ABONNEMENTSPRIJS : WERKGROEPNIEUWS verschijnt zes maal per jaar. In België bedraagt de abonnementsprijs voor 1986,250 Bf , personen die effektief lid zijn van de V.V.S. en die in België wonen hebben een gunstprijs van 200 Bf. Voor het buitenland bedraagt de abonnementsprijs 300 Bf , omwille van de hoge verzendingskosten kan er geen korting worden toegepast. Nederlandse abonnees worden verzocht hun bijdrage voor 1986 aan te vullen tot 300 Bf . Abonneren kan door middel van storting op postrekening 000-0688050-29 van Paul Roggemans , ook vanuit Nederland kan men kosteloos overschrijven van een Nederlandse postgiro naar een belgische postgiro.

USEFUL INFORMATION

Visual Observations : send your visual reports to Paul Roggemans. Teams are requested to give individual rate data and magnitude distributions for each observer separately. Combined group observations are USELESS. Use only Universal Time to avoid confusion.

Radio observations : Radio meteor workers are invited to write to Jeroen Van Wassenhove (address above)

Photographic results : meteor photographs have to be measured on a paper print . This print has to be sent with the astrometric data to Christian Steyaert for Astrometric calculations. The listing with the astrometric results will be sent to you.

Articles for publication in WGN: Articles for WGN have to be readable written or typewritten. Figures , graphs and tables have to be copy-ready. Drawings of insufficient quality will not be printed.

Subscriptions to WGN in 1986 : The subscription for 1 year with 6 issues costs 300 BF (bare price of costs),the equivalent of 7 US $ can be paid as well. Pay by International postal money order.

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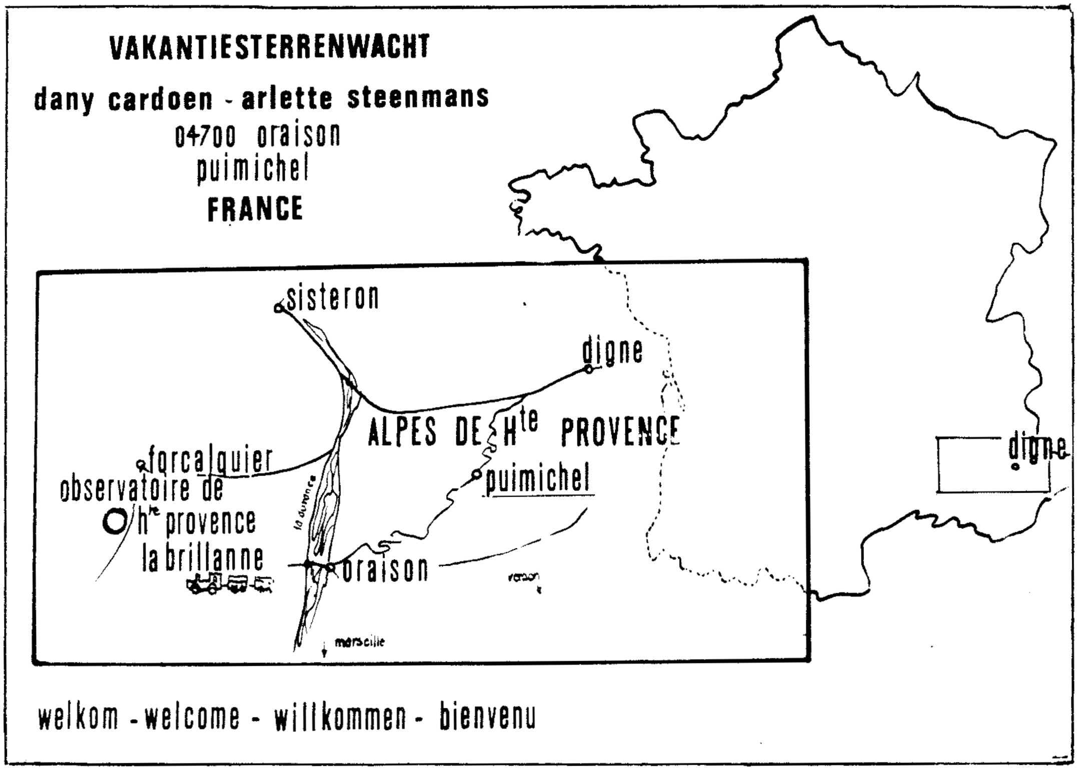

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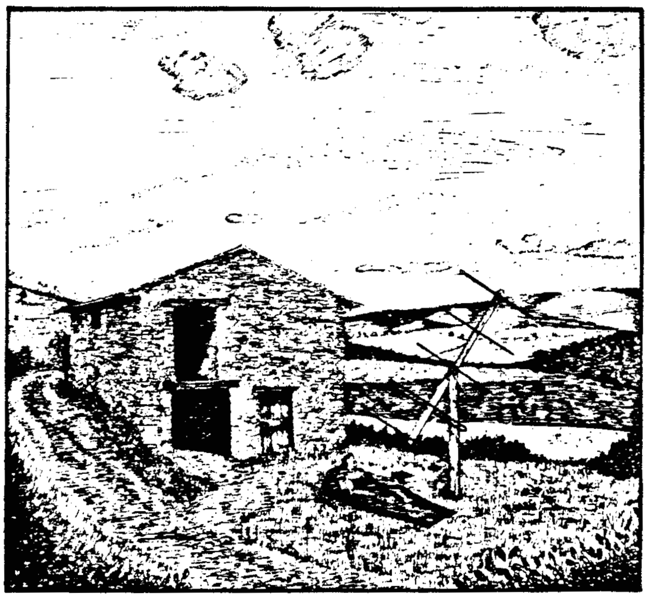

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NIEUW

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Bewolking , zonlicht, maanlicht... er is geen enkel excuus meer om niet waar te nemen. Deze nieuwe publikatie van de werkgroep meteoren leert u hoe u op een zeer eenvoudige wijze meteoren kunt observeren met behulp van een radio.

Deze publikatie laat de werkgroepleden toe om deel te nemen aan de ontginning van een nieuw werkterrein. Sedert 1983 wordt er druk geexperimenteerd, de resultaten zijn veelbelovend. De eerste successen werden reeds geboekt. U mag deze nieuwe ontwikkeling niet missen, radiowaarnemingen liggen in ieders bereik, ook U kunt radiowaarnemer worden. Koop snel dit handboek!

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