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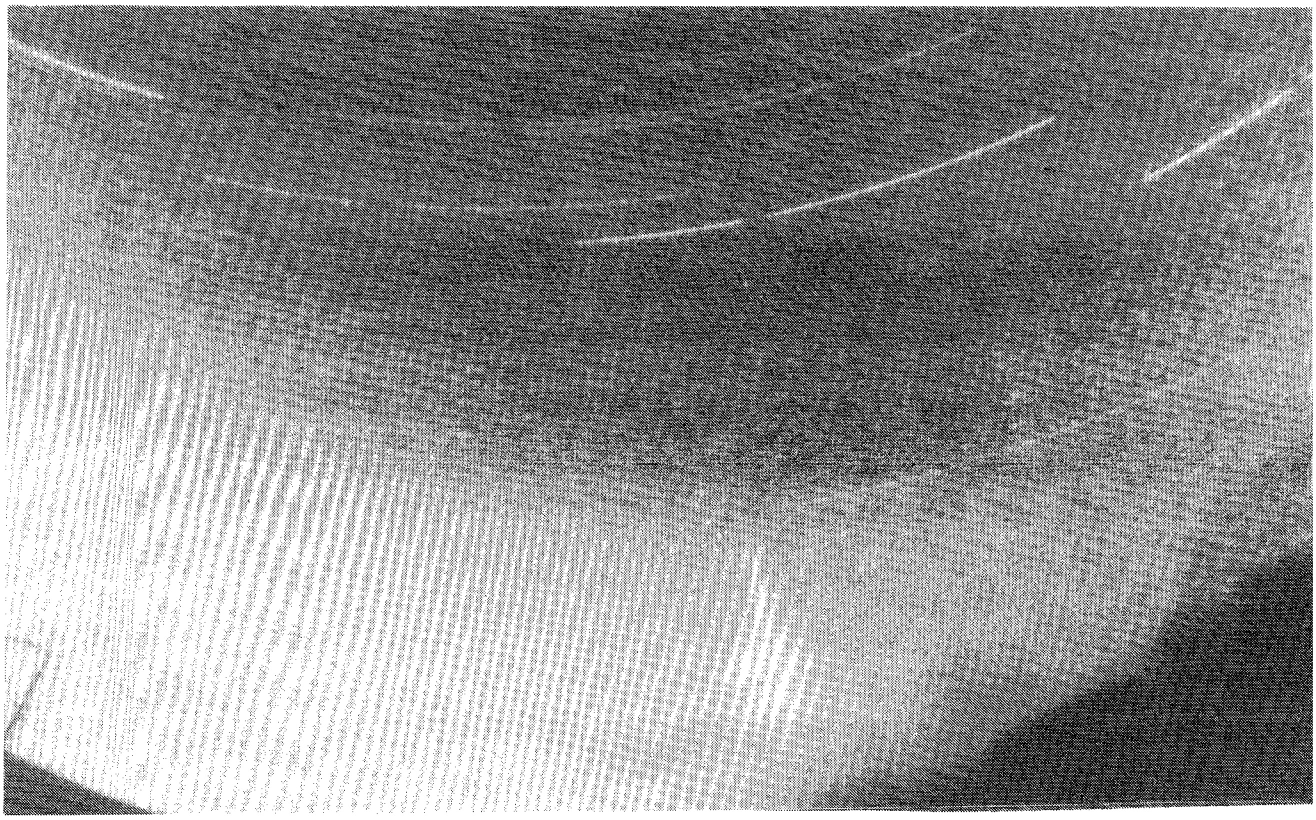
the international circular for meteor observers



A sporadic −10 fireball near Regulus, caught by Klaas Jobse on March 25, 1987 at $23^h13^m00^s$ UT with a 7.5 mm f:5.6 fisheye lens (EN 97). The exposure took place from $21^h30^m00^s$UT till $23^h41^m58^s$ UT. The exact time was obtained with a photo-multiplier tube. The film was TriX and was developed with Diafine (2 x 3.5 minutes).

werkgroepnieuws - meteoren

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The August Issue - Het augustusnummer *(WGN 15:4)*

This issue will appear in Belgium in the first week of August. Contributions are due by *June 20* at the latest and should be sent to *Marc Gyssens* (address on inside of back cover)

Bijdragen voor het augustusnummer moeten uiterlijk op *20 juni* toekomen bij *Marc Gyssens* (adres op binnenzijde achterkaft).

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Editoriaal

Het juni-nummer van WGN is traditioneel het nummer van het jaarverslag van de Werkgroep Meteoren; U vindt dit lijvige rapport op pagina 76 en volgende. Wat wel opvalt ondanks het grote aantal waargenomen meteoren, is het toch relatief gering aantal waarnemers en vooral het feit dat de meeste resultaten bekomen werden gedurende een vrij gering aantal nachten. Langs deze weg roepen we dan ook iedereen op ook wat meer aandacht te besteden aan de traditioneel kalmere periodes. Vergeet tenslotte niet dat er ook dan iets spectaculairs in de lucht kan zitten!

Op het ogenblik dat dit nummer verschijnt, zitten vele jongere waarnemers met examens, maar afgezien van deze tijdelijke ongemakken, zal toch iedereen wel al aan de vakantie denken. We hopen dan ook dat er tijdens de zomermaanden vele acties zullen georganiseerd worden, ook buiten de Perseïdenspits! Waar we echter vooral op willen aandringen, is dat de diverse waarnemersgroepen eens iets op papier zouden zetten over hun acties en hun resultaten. De Nederlandstalige sectie van WGN is immers vooral bedoeld als communicatiemiddel binnen de Werkgroep, maar communicatie is iets dat van (minstens) twee kanten moet komen! We rekenen er dus ten stelligste op dat de ploeg regelmatige auteurs van de eerste "katern" van WGN zeker na de zomeracties uitgebreid zal worden!

Buiten de traditionele actie-oproepen wordt er in het Nederlandstalige deel nog aandacht besteed aan de voorbije winter: Jeroen Van Wassenhove meldt een nagekomen radiowaarneming van de Geminiden en Klaas Jobse beschrijft zijn belangrijkste fotografische all-sky-treffers waarvoor hij gebruik heeft gemaakt van een fotomultiplier-systeem. Delphinus uit Harderwijk brengt verslag uit over het voorbije jaar. Na het jaarverslag van de VVS-Werkgroep Meteoren volgt dan nog een bijdrage van Glenn Ticket over de Quadrantiden van 1987 in België, die tussen de bewolking door net de kans hebben gekregen om te laten zien voor welk spectakel zij hadden kunnen zorgen bij helder weer!

Het hoofdartikel in dit nummer is van de hand van Christian Steyaert die een programma beschrijft dat correctiefactoren berekent om radiowaarnemingen te corrigeren voor diverse waarnemingsparameters, ten einde de bekomen resultaten beter onderling te kunnen vergelijken. Daarna beschrijft de zeer actieve Deense radio-amateur Gotfred Møbjerg Kristensen, die omzeggens dagelijks waarnemingen verricht, zijn resultaten van 1986. Vervolgens maken we nog melding van twee commentaren die we ontvingen over de recentste Ursidenverschijning, die een abnormaal hoge activiteit te zien gaf.

De periode waarin dit nummer van WGN getijpt wordt is ook de periode van de η-Aquariden: een actieve met de komeet van Halley geassocieerde zwerm die op onze breedten visueel omzeggens onwaarneembaar is door de ongunstige ligging van de radiant. We hebben in dit nummer dan ook aandacht willen besteden aan de activiteit van deze zwerm in 1986, en dit aan de hand van een Australische bijdrage van Jeff Wood en een Braziliaanse bijdrage van Gilberto Klar Renner.

Verder besteden we in dit nummer ook nog aandacht aan de herfst- en winterresultaten van acties in Finland en Canada.

De vakantie staat voor de deur; om iedereen de smaak te pakken te doen krijgen, publiceren we het relaas van het eerste Noorse Perseïdenkamp dat vorig jaar plaatsvond in Kristiansand. Tenslotte heeft Paul Roggemans het over meteorenwaarnemingen in de Haute-Provence. Hij beschrijft alternatieve mogelijkheden voor hen die de drukte van Puimichel willen vermijden, maar niet opzien tegen zelf een potje koken en het nodige waarnemingsmateriaal meebrengen.

Veel leesgenot en alvast succes voor de zomeracties!

Marc Gyssens

Actie-oproep: juni-juli

Paul Roggemans

Tabel --- Maanlicht juni-juli 1987

Datum	k	Datum	k
vrijdag 5 juni	0.52+	vrijdag 3 juli	0.37+
vrijdag 12 juni	1.00-	vrijdag 10 juli	0.98+
vrijdag 19 juni	0.44-	vrijdag 17 juli	0.59-
vrijdag 26 juni	0.00+	vrijdag 24 juli	0.03-
		vrijdag 31 juli	0.23+

Nieuwe Maan:	27 mei, 26 juni, 25 juli, 24 augustus
Eerste Kwartier:	4 juni, 4 juli, 2 augustus
Volle Maan:	11 juni, 11 juli, 9 augustus
Laatste Kwartier:	18 juni, 17 juli, 16 augustus

1. Juni-nachten, korte nachten

In juni is het slechts korte tijd voldoende donker voor meteoorwaarnemingen. De enige zwermactiviteit wordt geleverd door een diffuus radiantencomplex nabij de ecliptica in de sterrenbeelden Scorpius en Sagittarius. Helaas staan beide sterrenbeelden bij ons erg laag boven de horizon, zodat meteoren met een radiant in deze hemelstreek de atmosfeer onder een kleine hoek binnentreden. Hierdoor geven deze overigens weinig actieve zwermen heel weinig meteoren te zien. Er worden wel regelmatig heldere meteoren gemeld met een radiant in Scorpius en Sagittarius; men mag dit echter ook niet overdrijven door te stellen dat dit vuurbolradianten zijn. Verder zou rond 16 juni enige activiteit kunnen optreden van de juni-Lyriden. Deze zwerm werd uitsluitendin de jaren 1966 tot 1969 opgemerkt door een aantal amateurs. Nadien werd van de activiteit geen spoor meer vastgesteld! Bovendien bleef de de activiteit in 1966-69 zeer laag en is er altijd een controverse geweest tussen diegenen die beweerden dat de juni-Lyriden duidelijk actief waren en anderen die in dezelfde periode geen bijzondere activiteit vaststelden. In 1987 zal de maan erg storen rond 16 juni tijdens het tweede deel van de nacht. Concentreer uw aandacht dan ook op de eerste periode van de nacht tot de maan opkomt. Na 16 juni zal de maan veel minder storen.

2. Juli en het begin van de zomeractie!

Met de maand juli begint voor velen de zomervakantie, hetgeen voor de echte amateur synoniem is voor waarnemingsvakantie. Begin juli kan men alvast ongestoord observeren tot de volle maan omstreeks 11 juli voor een tijdelijke rustpauze zal zorgen. Wanneer de maan nacht na nacht later opkomt en minder storend laag boven de horizon staat, zullen de eerste Perseïden van 1987 verschijnen. Vanaf midden juli hebt U ook kans om een trage α-Capricornide te zien, of om de iets sneller bewegende Aquariden te observeren. De maan zal helemaal niet meer storen vanaf ongeveer 20 juli tot en met begin augustus. Het Perseïdenmaximum zal helaas flink verstoord worden door de maan (volle maan vier dagen voor het maximum). Daarom zullen we onze aandacht verleggen naar de periode van eind juli wanneer er toch enkele zeer interessante zwermen waarneembaar zijn:

- *α-Capricorniden* met een radiant nabij α = 308° en δ = -10° zichtbaar vanaf 15 juli tot een eind in augustus. Het zijn opvallend trage meteoren (v_∞ = 25.6 km/s). Een eerste maximum zou rond 25 juli optreden net bij nieuwe maan!
- *Aquariden:* een verzamelnaam voor de noordelijke en zuidelijke takken van de

ι-Aquariden en de δ-Aquariden. Zoek de radiantposities op in het Visueel Handboek voor U gaat waarnemen! Aquariden zijn over het algemeen zwak en duidelijk sneller dan α-Capricorniden. De rijkste tak van deze Aquariden bereikt zijn maximum rond 28 juli; onder ideale omstandigheden zijn er dan tot 40 Aquariden per uur te zien. De maan zal helemaal niet storen. Tijdens deze periode kunt U overigens al flink wat Perseïden zien.

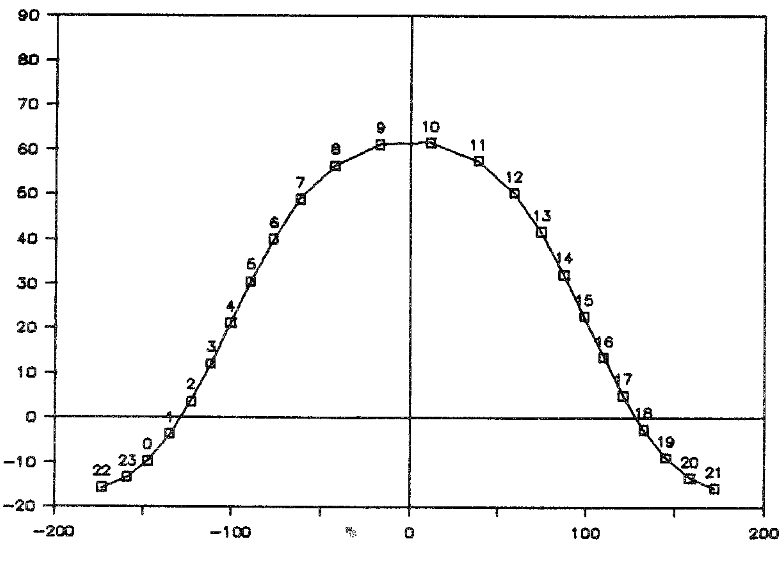
Laat in elk geval geen heldere nachten onbenut; veel succes!

Actie-oproep: radiowaarnemingen

Jeroen Van Wassenhove

In juni 1946 registreerde het team van Jodrell Bank negen nieuwe daglichtzwermen (1). Drie daarvan bleken ieder jaar opnieuw te verschijnen: de Ariëtiden[1], de ζ-Perseïden en de β-Tauriden.

In tegenstelling tot wat de meeste mensen denken, zijn *niet* de Geminiden, maar wel de Ariëtiden de sterkste zwerm van het jaar. Zij zijn hoorbaar van 30 mei tot 18 juni met een maximum rond 8 juni. Deze zwerm is vanaf 2^h UT 's ochtends tot 17^h UT 's namiddags observeerbaar. Onderstaande figuur toont U dit op een duidelijke manier. De radiant bereikt zijn hoogste stand om 9^h35^m UT en staat dan op 62° boven de horizon. Hieronder volgen de waarnemingsperiodes (UT):



Figuur --- De waarneembaarheid van de Ariëtiden. Verticaal is de hoogte van de radiant uitgezet in graden, en horizontaal het azimut. De cijfers langs de curve duiden de positie van de radiant aan op het overeenkomstige uur (UT).

Z:	3^h-$\overline{10^h}$-17^h
ZW:	3^h-$\overline{12^h}$-17^h
W:	9^h-13^h-17^h
NW:	11^h-$\overline{14^h}$-17^h
N:	3^h-$\overline{6^h}$-9^h en 13^h-16^h-18^h
NO:	4^h-6^h-10^h
O:	3^h-$\overline{7^h}$-12^h
ZO:	3^h-7^h-16^h

De omstandigheden zijn prima voor bijna alle richtingen, behalve voor Noord. De positie van de radiant is α = 44° en δ = 23°.

Dit jaar valt 8 juni op een maandag, net buiten het weekend. Voor sommige waarnemers zal dit een probleem scheppen. Mocht het U onmogelijk zijn waarnemingen te verrichten tijdens de weekdag, tracht dan in het weekend te luisteren. Vergeet immers niet dat de Ariëtiden actiever zijn dan de Geminiden. Hierdoor kan men reeds enkele dagen voor (of na) het maximum genieten van een flinke activiteit.

In dezelfde periode zijn ook de ζ-Perseïden actief. Ook zij hebben een maximum rond 8 juni en een radiant met α = 59° en δ = 22°. De waarnemingsomstandigheden zijn bijna identiek aan die van de Ariëtiden. Hierna volgen de waarnemingsperio-

[1]Niet te verwarren met de Ariëtiden die actief zijn in de herfst (redactie).

des. Richting Noord is hierbij terug minder gunstig.

Z:	$3^h-\underline{11}^h-18^h$	N:	$3^h-\underline{6}^h-8^h$ en $13^h-\underline{16}^h-18^h$
ZW:	$5^h-13^h-18^h$	NO:	$4^h-\underline{7}^h-10^h$
W:	$10^h-14^h-18^h$	O:	$3^h-\underline{7}^h-12^h$
NW:	3^h-6^h en $12^h-\underline{14}^h-18^h$	ZO:	$3^h-7^h-16^h$

De ζ-Perseïden worden gekenmerkt door hun trage geocentrische snelheid: 29 km/s. Hun activiteit is een flink stuk lager dan die van de Ariëtiden. Dit zult U niet merken wanneer U rond 8 juni waarnemingen verricht. Immers, beide radianten liggen veel te dicht bij elkaar, zodat ze niet afzonderlijk kunnen beluisterd worden. Met de huidige apparatuur in de Radio-sectie is het onmogelijk om beide radianten te scheiden. Dit belet U echter niet om zinvolle waarnemingen te verrichten.

Eind juni komen de β-Tauriden aan bod. Deze kleine daglichtzwerm, vergelijkbaar met de Lyriden, vertoont een maximum rond 29 juni. Deze jaarlijkse zwerm wordt geassocieerd met de komeet van Encke (2). De radiantposities zijn α = 85° en δ = 17°. De waarnemingperiodes (UT) zijn:

Z:	$4^h-\underline{11}^h-18^h$	N:	4^h-9^h en 13^h-18^h
ZW:	3^h-8^h en $10^h-14^h-18^h$	NO:	$4^h-\underline{7}^h-10^h$ en 15^h-18^h
W:	$10^h-\underline{14}^h-18^h$	O:	$4^h-\underline{8}^h-12^h$
NW:	4^h-7^h en $12^h-\underline{15}^h-18^h$	ZO:	$4^h-8^h-17^h$

Waarnemers die luisteren naar een station pal in het oosten kunnen slechts gedurende een beperkte periode waarnemen (4 uur). Richting Zuid daarentegen heeft de breedste waarnemingsperiode (14 uur).

De δ-Aquariden vormen ieder jaar de aanloop tot de Perseïden. De eerste exemplaren kan men reeds horen op 21 juli. Het maximum verschijnt rond 28 juli. Omstreeks 21^h35^m UT klimt de radiant boven de horizon, culmineert om 2^h en gaat onder om 6^h30^m. De maximale hoogte van de radiant bedraagt slechts 22°, zodat de omstandigheden nooit optimaal zullen zijn voor onze breedteligging. Hoge uurfrequenties moet men dan ook niet verwachten. Waarnemingsperiodes:

Z:	$22^h-\underline{2}^h-5^h$	N:	4^h-6^h
ZW:	22^h-5^h	NO:	22^h-3^h
W:	22^h-6^h	O:	22^h-5^h
NW:	1^h-6^h	ZO:	23^h-6^h

Luister ook al enkele dagen voor de δ-Aquariden actief worden. Met deze waarnemingen kunnen we dan uw sporadische achtergrond bepalen. Gelieve uw waarnemingsformulier volledig in te vullen, vooral met betrekking tot de reflectieduur. Alle waarneminsperiodes gelden voor een verticaal opgestelde antenne. Veel succes!

Referenties

(1) McKinley, "Meteor Science and Engineering"

(2) Lovell A.C.B., "Meteor Astronomy"

Bijdragen voor het augustusnummer dienen gestuurd te worden naar Marc Gyssens (adres op binnenzijde achterkaft) en dienen hem te bereiken vóór 20 juni (i.p.v. 1 juli, en dit wegens de zomervakantie).

Radiowaarneming Geminiden 1986

Jeroen Van Wassenhove

After the publication of the results of radio observations of the Geminids 1986 in reference (1), a late report was received which is discussed here.

Na de publicatie van de resultaten van de Geminiden in 1986 (1) rolden er nog waarnemingen binnen van Dirk Eeckhout. Hij luisterde van 20 00 tot 20 30 UT op 72.110 MHz (station Wroclaw, Polen, 120 kW). Onderstaande tabel toont zijn tellingen:

Tabel --- Geminidenwaarnemingen van Dirk Eeckhout in 1986

Datum	Reflecties	Datum	Reflecties
1986 Dec 08	22	1986 Dec 12	53
Dec 09	23	Dec 14	55
Dec 10	24	Dec 15	22
Dec 11	34	Dec 16	14
		Dec 17	9

Op 12 en 14 december werd er gebruik gemaakt van een andere bandbreedte (narrow) wat vergelijking met vorige dagen uitsluit.

Referentie

(1) Van Wassenhove J., "Radiowaarnemingen: herfst- en winteracties", *WGN 15:1*, 1986, pp. 10-13.

Wintervuurbollen in Nederland

Klaas Jobse

An overview is given of the photographic results of the all-sky camera of the meteor observatory *Cyclops* in Oostkapelle, the Netherlands which were obtained in combination with a photo multiplier tube.

De all-sky-camera van Cyclops te Oostkapelle (51°34'22" NB, 3°32'16" OL) scoorde de afgelopen wintermaanden een zevental fotografische treffers.

De eerste meteoor werd vereeuwigd tijdens de nacht van 2 op 3 oktober 1986. Ikzelf was die nacht niet thuis, want ergens in België was er toen een meteorenweekend... De all-sky en het foto-multiplier-systeem werden tijdens dat weekend bediend door W. Jobse. Toen ik op 4 oktober 's middags weer thuis kwam en het PMT (foto-multiplier-systeem)-beeldscherm raadpleegde, bleek er in de eerste nacht "iets helders" verschenen te zijn om $00^h16^m52^s$ UT. De PMT zag deze meteoor (want dat bleek het na het ontwikkelen van de film inderdaad te zijn) 0.23 sec. lang met een korte overschrijding van de hoge triggerdrempel van 0.1 sec. (flare). De camera "zag" deze meteoor ongeveer 0.5 seconde nabij de Poolster. Gezien de zwarting van de film zal de helderheid ongeveer -3 hebben bedragen met een felle flare.

De tweede vuurbol deed de PMT opschrikken tijdens de nacht van 8 op 9 november 1986, toen om $04^h25^m53^s$ UT een 1.15 seconden durende registratie via de computer op het beeldscherm werd getoverd. Aangezien het Tauridenseizoen was, had ik bij het zien van de registratie al een vermoeden. En jawel, na het ontwikkelen prijkte op 15° hoogte in het NNW een trage vuurbol die een Tauride van minstens -6 moet geweest zijn. De fotografische zichtbaarheidsduur bedroeg 2.4 seconden.

Een andere opvallende vuurbol verscheen in de avond van 31 januari 1987 om $18^h41^m21^s$ UT. Enkele minuten na het verschijningstijdstip kreeg ik een telefonische melding van de heer R. Reyers uit Terneuzen die deze heldere meteoor in de buurt van Orion zag. Toen ik even daarna mijn sterrenwacht binnenging en het beeldscherm bekeek, bleek ook nu het systeem goed gewerkt te hebben. Op een nogal zwaar gesluierd negatief prijkte op zo'n 10° hoogte in het ZZO een meteoor die zeker vanuit Zuid-Nederland en België door (schaatsend!) publiek gezien moet zijn. Spijtig dat er (nog) geen all-sky-camera in België staat. Van deze vuurbol ontving ik later ook nog een melding van de heer G. Taal uit Vrouwenpolder.

De laatste vuurbol die gefotografeerd werd, miste ik visueel op een paar seconden. Juist bezig zijnde met het openrollen van het sterrenwachtdak, hoorde ik de computer een registratiesignaal geven. Het bleek een zeer heldere vuurbol te zijn geweest (-8) waarvan het eindpunt vanuit Oostkapelle gezien werd op zo'n 8° hoogte in het NNW. Dit gebeurde op 1 februari 1987 en de PMT leverde weer het tijdstip: $21^h03^m12^s$ UT. Wellicht is deze meteoor ook nog door andere waarnemers gezien. Deze laatste meteoor werd vastgelegd op de nieuwe TMY-film van Kodak. Deze film zou bij 400 ASA een veel kleinere korrel hebben dan Tri-X. Mijn eerste ervaring met de combinatie TMY-Diafine is slecht. Het resultaat was zeker geen fijnere korrel dan met Tri-X. Misschien dat het met een andere ontwikkelaar beter gaat.

Het PMT-systeem dat door Marc De Lignie werd gebouwd werkt dus perfect. Het is als fotograaf een zeer aparte ervaring wanneer je 's morgens na een onbemande nacht all-sky-fotografie de sterrenwacht binnenkomt en dan al direct kunt zien of er die nacht iets moois is te zien geweest!

Delphinus - Nederland: Jaarverslag 1986

Koen Miskotte

In 1986, four observers of the Dutch team Delphinus saw 9518 meteors during 51 nights. Only three fireballs brighter than Venus were noticed. 97 meteors were photographed using three automatic Canon T-70 (1.4/50, 2.4/24 and 5.6/50), a Praktica LTL 3 with Sigma 2.8/16 fish-eye and an Olympus Om 1n (1.8/50).

1. Alweer een topjaar!

Het jaar 1986 staat bij ons te boek als alweer een topjaar. Het weer en de voorspellingen waren natuurlijk weer slecht. Maar de trips naar Puimichel (dit jaar twee keer) maakten weer een hoop goed. De volgende maanden konden redelijk tot goed voor meteorenwaarnemingen gebruikt worden: juni, juli, augustus en eind oktober-begin november.

Ook dit jaar werden op waarnemingsvlak verschillende records verbroken. Wat helaas niet verbroken werd, wat we al verwachtten, is het totaal aantal schattingen van ons absolute topjaar 1985. Toen zagen we er ruim 10 800 en dit jaar dus ruim 1000 minder. Voor het eerst in ons bestaan een kleine terugval dus. Op individueel gebied gingen vooral voor Koen en Bauke alle records aan gruzelementen. Helaas moeten we wel constateren dat enkele waarnemers die in 1985 nog actief waren, nu veel minder actief zijn. Dit zijn problemen die meerdere groepen schijnen te hebben.

2. Visueel

Visueel werden in 1986 gedurende 51 nachten meteoren waargenomen, dit zijn er 9 meer dan in 1985, maar 3 minder dan in 1984. In totaal werden er door Richard Buijs, Robert Haas, Koen Miskotte en Bauke Rispens 9519 meteoren gezien. Een bijzonder goed resultaat waarmee wij dan ook tevreden zijn. Het werkelijk aantal individueel waargenomen meteoren zal rond de 8000 liggen. Het grootste deel van de meteoren werd echter door Koen en Bauke gezien.

Tabel --- Overzicht van de resultaten van Delphinus - Harderwijk in 1986

Waarnemer	T_{eff}	Meteoren	Vuurbollen	Nachten
Richard Buijs	11.73	57	0	5
Robert Haas	2.95	16	0	1
Koen Miskotte	139.51	5000	3	35
Bauke Rispens	139.22	4446	2	48
Totaal	*293.41*	*9519*	*3*	*51*

Wat de vuurbollen betreft, was 1986 wel héél erg magertjes: we zagen er slechts drie helder dan Venus:

Aug 11 02^h00^m UT: een trage κ-Cygnide met flare van -4 in Aquarius. Geen nalichtend spoor;
Aug 14 02^h47^m UT: een Perseïde met flare van -4 in Ursa Minor. Nalichtend spoor duurde 15 seconden. Treffer fish-eye en 1.4/50 lens;
Nov 08 23^h27^m UT: korte sporadische meteoor met flare -6 à -8. Verscheen in Ursa Major, net naast cameraveld.

Voor de statistici vertellen we nog dat we sinds 1980 gedurende 252 verschillende nachten in totaal 30 392 meteoren zagen.

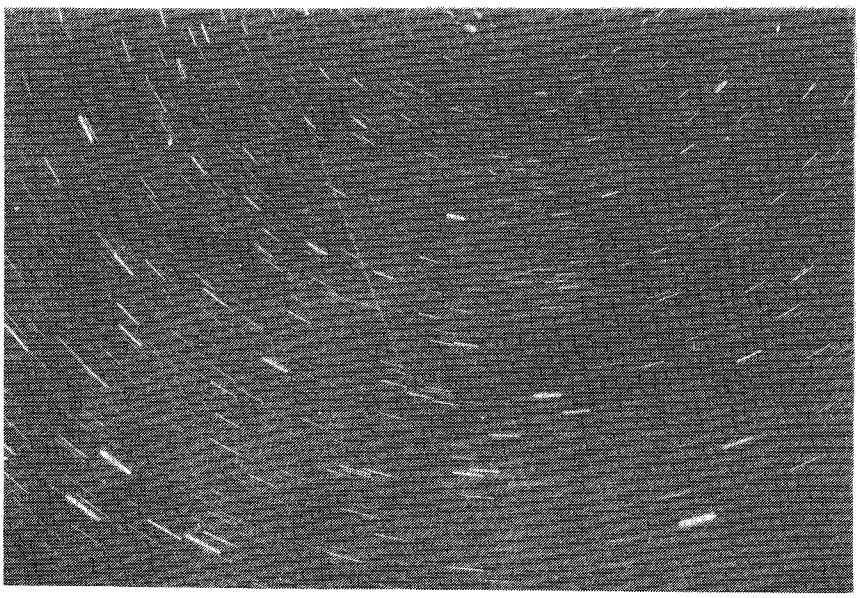
3. Fotografisch

Sinds juli 1986 beschikken we over drie Canon T-70 camera's welke kunnen voorzien worden van uiteenlopende soorten optiek: 1.4/50, 2.8/24, 2.8/200 of 5.6/7.5 mm fish-eye. Daarnaast is er ook nog een Praktica LTL 3 met 2.8/16 mm fish-eye en een Olympus om 1n met 1.8/50 optiek.

We fotografeerden in totaal 97 meteoren waarvan het grootste deel uitgemeten zal worden door onszelf ten behoeve van het "Photographic Meteor Data Base" experiment van Christian Steyaert. Dit zal het komende jaar gebeuren.

Het blijkt dat we met de 1.4/50 lens (uitgaande van een 400 ASA diafilm) meteoren van magnitude 1.5 fotograferen, met de 5.6/7.5 mm fish-eye pakt nog net -3 en de groothoek magnitude 0.

A Photographed Quadrantid



Een Quadrantide, die verscheen op 3-4 januari om $19^h57^m38^s$ UT werd gefotografeerd door Klaas Jobse te Oostkapelle met een 50 mm f 2.0 Nikkor op Tri-X ontwikkeld met Diafine.
De opname werd belicht van $19^h49^m00^s$ tot $20^h01^m20^s$ UT.

VVS Meteor Section: Annual Report

compiled by Paul Roggemans

In this report, the raw data of all the observations of 1986 made by members of the Meteor Section of the "Vereniging voor Sterrenkunde" are given.

General information on observers and sites of observations

Table 1 --- Participating groups

Andromeda (AN)	Dendermonde	Perseus (PE)	Westouter
Auriga (AU)	Koksijde	Quasar (Q)	Oostende
Icarus (I)	Beernem	Urania (U)	Hove
Io (IO)	Gent	Vigilia (VI)	Brugge
Pallas (P)	Mechelen		

Individual observers are listed in Table 2, below.

Table 2 --- Listing of meteor observers (visual work)

Observer	Init.	Group	Number of reports	T_{eff} (tot)	Number of meteors
Artoos Dirk	AD	P	1	5.00	137
Calis Geert	GC	AN	1	3.39	42
Canceil Philippe	CP	-	1	1.85	38
Cluyse Ludwig	LC	-	17	42.69	1114
Declercq Erwin	DE	VI	6	11.36	94
Degreef Filip	DGF	P	8	22.57	1005
Delagaye Piet	DP	IO	1	1.63	43
Deman Kris	DK	AU	3	9.75	340
de Pontieu Bart	DPB	Q	1	4.00	91
Dequick Kurt	DQK	Q	1	4.43	59
Deschaumes Tim	TD	U	2	2.68	30
Deweerdt Jean	JD	Q	1	4.62	50
Dhoedt Bart	BD	VI	2	5.50	85
Geukens Koen	GK	-	2	4.35	48
Gevaert Dirk	DG	AU	8	23.60	930
Laenen Paul	PL	-	5	5.44	57
Laurent Dirk	DL	P	6	22.27	414
Morel John	JM	I	2	7.20	156
Neyts Kristiaan	KN	AU	2	5.20	261
Osaer Kurt	KO	Q	1	4.40	61
Pelgrims Peter	PP	P	8	25.21	907
Plesier Ghislain	GP	PE	32	122.50	1538
Plesier Francis	FP	PE	8	24.93	479
Philips Lieven	LP	AN	8	12.57	105
Philips Renaat	RP	AN	5	9.77	105
Roggemans Paul	PR	-	30	120.49	3123
Ruysschaert Maarten	MR	VI	6	14.34	133
Schroyens Ann	AS	P	11	36.63	1906
Scurbecq René	RS	IO	3	9.38	154
Segal Tom	TS	U	1	1.30	7
Spalding George	GS	-	9	25.77	928
Steen Octaaf	OS	-	14	28.92	278

Table 2 (continued)

Observer	Init.	Group	Number of reports	T_{eff} (tot)	Number of meteors
Tamsin Frank	FT	VI	6	10.91	148
Ticket Glenn	GT	AU	24	75.22	2397
Vandenbruaere Hendrik	HV	I	5	11.47	237
Vandenbruaene Jos	VJ	I	2	3.20	27
Van den Eijnde Peter	PVE	U	1	1.49	14
Van de Walle Bartel	BVW	I	3	12.10	174
Vangierdegom Tom	VT	VI	4	10.74	113
Van Speybroeck Michel	MVS	VI	2	5.25	83
Van Wassenhove Jeroen	JVW	-	2	2.53	128
Viaene Davy	DV	AU	8	32.97	600
Wouters Ilse	IW	P	4	13.09	684

The five leading observers for 1986 (according to effective observing time) are Ghislain Plesier (122.50 h), Paul Roggemans (120.49 h), Glenn Ticket (75.22 h), Ludwig Cluyse (42.69 h) and Ann Schroyens (36.63 h).

Table 3 --- Geographic locations of meteor observing sites

Loc.	Observing site	λ(E)	ϕ(N)	Loc.	Observing site	λ(E)	ϕ(N)
1	Wondelgem	034232	514548	12	Bailleul (F)	024412	504506
2	Puimichel (F)[1]	060123	435841	13	Essen	042808	512722
3	Dranouter	024600	504529	14	La Cornette	050952	494945
4	Ardooie	031303	505834	15	Noorderwijk	045100	510736
5	Westouter	024618	504716	16	Ανωγια (GR)	25	3517
6	Puimichel (F)[2]	060123	435842	17	Oostende	025447	511131
7	Damme	031622	511425	18	Oostduinkerke	024240	510814
8	Dendermonde	040737	510127	19	Montana (CH)[3]	0732	4621
9	Lubbeek	045131	505423	20	Eeklo	033441	510939
10	Beernem	031931	510749	21	Hamont-Achel	053230	511500
11	St.-Martens-L.	033700	505955	22	De Panne	023555	510608

The following table gives a global idea of the 1986 results of the VVS Meteor Section:

Number of participants	43
Number of meteors	19 323
Number of observations	267
Number of nights covered	56
Total man hours	$33^{d}11^{h}$

In Table 4, on the following pages, the list of all visual observations obtained from VVS-observing campaigns is given. No preselection has been made. Observers are identified by their initials as listed in Table 2 and observing locations are referred to by their number in Table 3. As usual, all indications of time are in UT. The various meteor streams that were observed in 1986 are indicated using the following abbreviations:

[1]height = 688 m
[2]height = 695 m
[3]height = 1850 m

Q = Quadrantids	O = Orionids
C = α-Capricornids	T = Taurids and Arietids
A = δ and ι-Aquarids	L = Leonids
P = Perseids	G = Geminids
K = κ-Cygnids	U = Ursids

Table 4 --- Visual observations of the VVS-Meteor Section in 1986

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Jan 03-04	RS	1	00^h25^m-02^h25^m	1.65	5.59	1.06	3Q	5
11-12	GP	2	20 15 -01 00	4.00	7.13	1.00		35
12-13	GP	2	22 30 -01 40	2.67	6.98	1.00		28
Apr 30-31	GP	3	22 30 -02 00	3.02	6.73	1.00		14
May 01-02	GP	3	21 30 -00 00	2.40	6.37	1.00		6
05-06	GP	3	21 45 -01 30	2.60	6.99	1.00		14
Jun 13-14	OS	4	22 57 -01 10	2.00	5.86	1.00		13
14-15	OS	4	23 00 -00 32	1.50	5.83	1.00		2
28-29	OS	4	23 12 -01 00	1.66	5.55	1.00		8
Jul 11-12	GP	5	22 00 -01 20	2.65	6.75	1.00	2C	26
13-14	OS	4	23 19 -01 26	1.00	5.49	1.12		7
14-15	OS	4	22 49 -00 15	1.32	5.50	1.06		7
27-28	PR	6	23 00 -00 00	1.00	6.30	1.00	1C,3A	10
27-28	PR	6	00 00 -00 35	0.50	6.20	1.00	1P,2A	1
28-29	PR	6	21 00 -22 00	1.00	6.30	1.00	2P,3A	9
28-29	PR	6	22 00 -23 00	1.00	6.30	1.00	5P,8A,2C	11
28-29	PR	6	23 00 -00 00	0.75	6.20	1.00	2P,3A	1
28-29	PR	6	00 00 -01 00	0.86	6.00	1.00	4P,1A	12
28-29	DL	6	21 00 -22 00	0.83	6.25	1.00	1P,2A,2C	6
28-29	DL	6	22 00 -23 00	0.28	6.25	1.00	1P,2A,1C	2
28-29	DL	6	23 00 -00 00	0.78	6.15	1.00	2P,6A	5
28-29	DL	6	00 00 -01 00	0.87	6.05	1.00	3P,4A	8
29-30	BVW	6	21 13 -01 20	3.76	?	1.00	15P,17A	18
29-30	PR	6	21 00 -22 00	1.00	6.40	1.00	2P,	9
29-30	PR	6	22 00 -23 00	1.00	6.30	1.00	3P,7A,1C	6
29-30	PR	6	23 00 -00 00	0.85	6.30	1.00	4P,8A	6
29-30	PR	6	00 00 -00 20	0.33	6.20	1.00	1P,2P,1C	2
29-30	LC	6	21 00 -22 00	1.00	5.60	1.00	3P,4A	3
29-30	LC	6	23 00 -00 00	0.30	5.70	1.00	1P,1A	3
29-30	LC	6	00 00 -01 00	1.00	5.10	1.00	2P,5A	9
29-30	DL	6	23 00 -00 00	0.75	6.25	1.00	6P,4A	3
29-30	DL	6	00 00 -01 00	1.00	6.25	1.00	10P,6A,1C	10
29-30	DL	6	01 00 -02 00	0.33	6.10	1.00	3P,1A	5
29-30	GP	5	21 30 -23 20	1.78	6.71	1.07	6P,5C	9
29-30	RP	8	21 38 -22 49	0.90	5.35	1.17		6
29-30	LP	8	21 46 -22 48	0.80	5.10	1.16		5
29-30	DE	7	22 20 -23 45	1.33	5.20	1.00	1A	2
29-30	MR	7	22 20 -23 45	1.33	5.37	1.00	1A	6
29-30	FT	7	22 20 -23 45	1.33	5.30	1.00	2A,1P	4
30-31	DL	6	21 00 -22 00	0.08	6.25	1.00	1C	0
30-31	DL	6	22 00 -23 00	0.25	6.25	1.00	1P,1A,1C	2
30-31	DL	6	23 00 -00 00	0.85	6.25	1.00	3P,9A,	5
30-31	BVW	6	20 00 -00 00	2.43	5.60	1.00	10P,7A,4C	8
30-31	PR	6	20 00 -22 15	1.75	6.30	1.00	4P,1A,4C	9
30-31	PR	6	23 00 -00 00	0.87	6.20	1.00	3P,5A	3
30-31	OS	4	21 25 -00 33	2.33	5.85	1.39	5P,2A,2C	15

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Jul 30-31	DE	7	23^h50^m-01^h15^m	1.25	5.45	1.17	3P,3A	3
30-31	MR	7	23 50 -01 15	1.25	5.70	1.17	3P,3A,1C	5
30-31	FT	7	23 50 -01 15	1.25	5.45	1.17	4P,2A,2C	2
30-31	LP	8	21 33 -00 09	2.07	5.39	1.11	1A,2C	11
30-31	RP	8	21 35 -00 09	2.10	5.55	1.11	1A,2C	14
31-32	LC	6	20 00 -21 00	0.50	6.00	1.00	3P,1A	0
31-32	LC	6	21 00 -22 00	1.00	6.00	1.00	1P,3A	2
31-32	LC	6	22 00 -23 00	0.73	6.00	1.00	2P,6A	5
31-32	LC	6	23 00 -00 00	1.00	6.30	1.00	3P,2A,1C,1K	9
31-32	LC	6	00 00 -01 00	0.95	6.30	1.00	6P,2A,1K	10
31-32	LC	6	01 00 -02 00	0.98	5.60	1.00	1P,3A	12
31-32	LC	6	02 00 -03 00	0.66	5.50	1.00	2P,2A	4
31-32	PR	6	20 00 -21 00	0.50	6.20	1.00	3P,1A	0
31-32	PR	6	21 00 -22 00	0.97	6.30	1.00	3P,1C	9
31-32	PR	6	22 00 -23 00	0.99	6.30	1.00	4P,8A	10
31-32	PR	6	23 00 -00 00	1.00	6.20	1.00	8P,5A,1C,1K	8
31-32	PR	6	00 00 -01 00	1.00	6.20	1.00	9P,6A,1K	12
31-32	PR	6	01 00 -02 00	1.00	6.00	1.00	4P,5A,2K	5
31-32	PR	6	02 00 -03 00	0.66	6.00	1.00	3P,3A	2
31-32	BVW	6	20 00 -03 00	5.91	5.90	1.00	28P,21A,3K	43
31-32	DL	6	20 00 -21 00	0.50	6.15	1.00	3P,1A	4
31-32	DL	6	21 00 -22 00	0.97	6.30	1.00	4P,1A,1C	9
31-32	DL	6	22 00 -23 00	1.00	6.30	1.00	4P,7A,2C	7
31-32	DL	6	23 00 -00 00	1.00	6.30	1.00	5P,2A,1C,1K	13
31-32	DL	6	00 00 -01 00	0.97	6.30	1.00	7P,3A,1K	11
31-32	DL	6	01 00 -02 00	0.95	6.20	1.00	7P,7A	4
31-32	DL	6	02 00 -03 00	0.48	6.20	1.00	1P,1A	2
Aug 01-02	PR	6	20 00 -21 00	0.50	6.20	1.00	4P,3A	4
01-02	PR	6	21 00 -22 00	1.00	6.30	1.00	4P,1A,1C	4
01-02	PR	6	22 00 -23 00	1.00	6.40	1.00	3P,7A	9
01-02	PR	6	23 00 -00 00	1.00	6.40	1.00	5P,6A,1K	3
01-02	PR	6	00 00 -01 00	0.95	6.30	1.00	6P,4A,2C	3
01-02	PR	6	01 00 -02 00	1.00	6.20	1.00	15P,5A,1K	5
01-02	PR	6	02 00 -03 00	0.91	6.00	1.00	5P,5A	5
01-02	LC	6	22 00 -23 00	0.50	6.10	1.00	2P,1A	2
01-02	LC	6	23 00 -00 00	1.00	6.10	1.00	7P,5A,1C,1K	6
01-02	LC	6	00 00 -01 00	1.00	6.10	1.00	7P,4A,2C	2
01-02	LC	6	01 00 -02 00	0.85	6.10	1.00	5P,3A	3
01-02	LC	6	02 00 -03 00	0.90	6.05	1.00	4P,3A	5
01-02	DL	6	20 00 -21 00	0.50		1.00	1P,2A	5
01-02	DL	6	21 00 -22 00	1.00		1.00	4P,2C	7
01-02	DL	6	23 00 -00 00	0.50		1.00	2P	2
01-02	DL	6	00 00 -01 00	1.00		1.00	7P,4A	11
01-02	DL	6	01 00 -02 00	0.92		1.00	8P,6A,1K	11
01-02	DL	6	02 00 -03 00	0.17		1.00	1A	1
01-02	OS	4	21 40 -00 24	2.73	5.98	1.05	3P,7A,1C	21
01-02	PL	9	21 15 -23 20	1.41	6.05	1.25	20	
01-02	GP	5	21 30 -00 00	2.43	6.87	1.03	5P,5C,2A	17
Aug 02-03	JVW	11	21 25 -22 10	0.75	5.48	1.00	3P,1C	0
02-03	GT	6	21 00 -22 00	1.00	6.20	1.00	1P,5A	2
02-03	GT	6	22 00 -23 00	0.67	6.20	1.00	3P,5A	1
02-03	GT	6	23 00 -00 00	0.96	6.20	1.00	6P,7A	2
02-03	GT	6	00 00 -01 00	1.00	6.30	1.00	9P,5A,1K	2
02-03	PR	6	20 00 -21 00	0.50	6.30	1.00	1P,1A	4
02-03	PR	6	21 00 -22 00	1.00	6.30	1.00	2P,4A	6
02-03	PR	6	22 00 -23 00	0.97	6.30	1.00	6P,2A,1C	6
02-03	PR	6	23 00 -00 00	1.00	6.30	1.00	2P,4A	3

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Aug 02-03	PR	6	00^h00^m-01^h00^m	1.00	6.40	1.00	8P,10A	3
02-03	PR	6	01 00 -02 00	0.96	6.50	1.00	5P,5A	9
02-03	PR	6	02 00 -03 00	0.92	6.30	1.00	4P,4A,1K	8
02-03	LC	6	20 00 -21 00	0.50	6.00	1.00	1A	2
02-03	LC	6	21 00 -22 00	0.66	6.20	1.00	1P,5A	4
02-03	LC	6	22 00 -23 00	0.66	6.10	1.00	3P,1A	0
02-03	DL	6	20 00 -21 00	0.50	6.00	1.00	1P	3
02-03	DL	6	21 00 -22 00	1.00	6.20	1.00	1P,4A	5
02-03	DL	6	22 00 -23 00	1.00	6.30	1.00	8P,4A,1C,1K	6
02-03	DL	6	23 00 -01 00	1.99	6.30	1.00	11P,11A,1C	16
02-03	DL	6	01 00 -02 00	1.00	6.30	1.00	8P,4A	10
02-03	DL	6	02 00 -03 00	0.81	6.40	1.00	5P,4A,1K	8
02-03	HV	10	21 25 -22 25	0.93	5.35	1.00	5P	0
02-03	OS	4	21 40 -23 56	2.27	5.94	1.12	5P,2A,3C	20
02-03	PL	9	21 15 -22 19	0.87	6.15	1.25	8	
02-03	GP	5	21 30 -23 30	1.93	6.69	1.02	10P,2C,3A	11
02-03	LP	8	23 52 -01 22	1.38	5.25	1.18	5P,1A,1C	7
02-03	RP	8	22 05 -01 24	3.02	5.46	1.18	8P,1C	15
02-03	FP	12	21 20 -00 00	2.12	6.47	1.00	6P	21
02-03	DE	7	21 30 -00 11	2.50	5.35	1.00	1P,3C	11
02-03	TD	13	22 15 -23 51	1.43	5.97	1.00	3P	8
02-03	MR	7	21 30 -00 11	2.43	5.64	1.00	2P,1A,2C	10
02-03	FT	13	22 15 -23 51	1.43	5.84	1.00	4P	7
02-03	VT	7	21 30 -00 11	2.50	5.43	1.00	2C	9
Aug 03-04	DG	6	20 35 -21 00	0.42	6.10	1.00	1P,1A	1
03-04	DG	6	21 00 -22 00	0.95	6.15	1.00	8P,2A	12
03-04	DG	6	22 00 -23 00	0.82	6.20	1.00	5P,2A,2C	8
03-04	DG	6	23 00 -00 00	0.93	6.35	1.00	6P,2A,1C	5
03-04	DG	6	00 00 -01 00	0.67	6.35	1.00	3P,1A	8
03-04	DG	6	01 00 -02 00	1.00	6.50	1.00	4P,2A,2C	11
03-04	DV	6	20 30 -01 30	4.85	5.40	1.00	14P,13A,1C	17
03-04	GT	6	20 30 -21 00	0.50	6.10	1.00	3P	5
03-04	GT	6	21 00 -22 00	1.00	6.30	1.00	6P,3A,1C	7
03-04	GT	6	22 00 -23 00	1.00	6.30	1.00	5P,6A,1C,1K	13
03-04	GT	6	23 00 -00 00	1.00	6.50	1.00	8P,7A,1C	11
03-04	GT	6	00 00 -01 00	0.53	6.30	1.00	4P,3A	11
03-04	GT	6	01 00 -02 00	1.00	6.20	1.00	13P,8A	15
03-04	GT	6	02 00 -03 00	0.45	6.20	1.33	2P,4A	9
03-04	PR	6	20 00 -21 00	0.67	6.30	1.00	2P	3
03-04	PR	6	21 00 -22 00	1.00	6.30	1.00	9P,3A,2C	8
03-04	PR	6	22 00 -23 00	1.00	6.30	1.00	7P,6A,1C	7
03-04	PR	6	23 00 -00 00	0.93	6.30	1.00	5P,6A,1K	6
03-04	PR	6	00 00 -01 00	1.00	6.30	1.00	11P,5A,2C,3K	13
03-04	PR	6	01 00 -02 00	0.78	6.40	1.00	4P,4A,3C	11
03-04	PR	6	02 00 -03 00	0.40	6.30	1.00	4P,2A	5
Aug 04-05	PR	6	22 00 -23 00	1.00	6.30	1.00	5P,3A,1C	6
04-05	PR	6	23 00 -00 00	0.95	6.30	1.00	4P,3A,1K	7
04-05	PR	6	00 00 -01 00	0.98	6.30	1.00	10P,3A,1C,1K	11
04-05	PR	6	01 00 -02 00	0.98	6.30	1.00	10P,4A	9
04-05	PR	6	02 00 -03 00	1.00	6.30	1.00	8P,8A,1C	8
04-05	LC	6	22 00 -23 00	1.00	6.10	1.00	5P,3A,1C	5
04-05	LC	6	23 00 -00 00	0.95	6.20	1.00	3P,2A,1K	4
04-05	LC	6	00 00 -01 00	0.98	6.30	1.00	6P,1A,1C,1K	12
04-05	LC	6	01 00 -02 00	1.00	6.30	1.00	10P,3A	8
04-05	LC	6	02 00 -03 00	1.00	6.30	1.00	4P,5A,1C	8
04-05	CP	6	23 00 -00 00	0.17	6.30	1.00	1P	1

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Aug 04-05	CP	6	00^h00^m-01^h00^m	1.00	6.30	1.00	7P,2A,1C	13
04-05	CP	6	01 00 -02 00	0.66	6.30	1.00	4P,2A	7
04-05	DG	6	22 00 -23 00	1.00	6.15	1.00	6P,1A,3C	6
04-05	GT	6	22 02 -23 00	0.97	6.10	1.00	3P,4A,2C	6
04-05	GT	6	23 00 -00 00	0.90	6.10	1.00	4P,4A,1C	2
04-05	GT	6	00 00 -01 00	1.00	6.00	1.00	14P,8A,1K	8
04-05	GT	6	01 00 -02 00	1.00	5.90	1.00	9P,5A	7
04-05	GT	6	02 00 -02 15	0.25	6.00	1.00	3P,1A	4
04-05	FP	12	22 15 -02 15	3.20	6.55	1.00	24P,1C	20
04-05	GP	5	21 25 -02 00	4.42	6.70	1.02	28P,2A,10C	22
Aug 05-06	GT	6	20 30 -21 00	0.50	6.30	1.00	2P,2A	5
05-06	GT	6	21 00 -22 00	1.00	6.30	1.00	4P,1C	12
05-06	GT	6	22 00 -23 00	0.97	6.30	1.00	3P,4A,2C	15
05-06	GT	6	23 00 -00 00	0.88	6.30	1.00	16P,4A,1C,1K	7
05-06	GT	6	00 00 -01 00	0.92	6.40	1.00	7P,5A,2C,2K	3
05-06	GT	6	01 00 -02 00	0.80	6.30	1.00	7P,6A	9
05-06	DG	6	20 33 -21 00	0.45	6.10	1.00	9P,4A	5
05-06	DG	6	21 00 -22 00	1.00	6.10	1.00	5P,2A,1C	6
05-06	DG	6	22 00 -23 00	1.00	6.20	1.00	2P,4A,5C	17
05-06	DG	6	23 00 -00 00	0.77	6.30	1.00	4P,4A,1C,1K	6
05-06	DG	6	00 00 -01 00	0.95	6.40	1.00	6P,3A,3C,1K	17
05-06	DG	6	01 00 -02 00	0.85	6.45	1.00	11P,9A	11
05-06	DV	6	20 40 -02 00	5.17	6.05	1.00	19P,20A,7C,1K	24
05-06	LC	6	01 00 -02 00	0.17	6.30	1.00	4P,1A	2
05-06	LC	6	02 00 -03 00	1.00	6.30	1.00	11P,4A,1C	9
05-06	LC	6	03 00 -03 08	0.13	6.20	1.00		0
05-06	PR	6	20 00 -21 00	0.55	6.30	1.00	7P,1A,1K	3
05-06	PR	6	21 00 -22 00	1.00	6.40	1.00	4P,1A	8
05-06	PR	6	22 00 -23 00	1.00	6.40	1.00	5P,5A,2C	12
05-06	PR	6	23 00 -00 00	1.00	6.40	1.00	13P,5A,1K	7
05-06	PR	6	00 00 -01 00	0.95	6.40	1.00	4P,3A,2C,1K	11
05-06	PR	6	01 00 -02 00	0.68	6.40	1.00	7P,4A	10
05-06	PR	6	02 00 -03 08	1.12	6.40	1.00	19P,6A	10
05-06	AS	6	21 00 -22 00	1.00	6.50	1.00	6P,1C	8
05-06	AS	6	22 00 -23 00	0.62	6.45	1.00	3P,2A,1C	17
05-06	AS	6	23 00 -23 45	0.75	6.40	1.00	7P,3A,1K	9
05-06	GS	6	20 15 -21 00	0.75	5.30	1.00	2P,1A	6
05-06	GS	6	21 04 -22 00	0.93	5.60	1.00	3P,1A,1K	0
05-06	GS	6	22 05 -23 00	0.92	5.70	1.00	3P,2A,1C,1K	4
05-06	OS	4	22 06 -23 41	1.58	6.00	1.01	5P,2A	11
05-06	PL	9	21 12 -22 30	1.00	5.59	1.25	10	
05-06	DE	7	22 00 -00 10	2.00	5.97	1.00	3P	9
05-06	TD	13	01 10 -02 45	1.25	5.97	1.00	12P	7
05-06	MR	7	22 00 -02 45	4.00	5.79	1.00	13P,1A	16
05-06	TS	13	01 10 -02 34	1.30	6.15	1.00	2P	5
05-06	FT	13	01 10 -02 30	1.25	5.83	1.00	4P	2
05-06	PVE	13	01 10 -02 50	1.49	5.97	1.00	8P	6
05-06	VT	7	22 00 -02 45	4.00	5.67	1.00	13P	16
05-06	GP	12	21 30 -02 30	4.55	6.76	1.03	36P,7C,1A	31
05-06	FP	12	21 30 -02 30	4.57	6.47	1.03	39P,5C	22
05-06	LP	8	23 52 -01 22	1.03	5.35	1.11	4P,1A,1C	5
Aug 06-07	PP	6	21 00 -22 00	1.00	5.80	1.00	3P,1A	1
06-07	PP	6	22 00 -23 00	0.90	5.80	1.00	3P,1A,1C,1K	1
06-07	PP	6	23 00 -00 00	1.00	5.80	1.00	5P,5A,1C,1K	2
06-07	PP	6	00 00 -01 00	0.50	5.80	1.00	4P,1K	3
06-07	PP	6	01 00 -02 00	1.00	5.80	1.00	6P,6A	4
06-07	PP	6	02 00 -03 06	1.10	6.15	1.00	10P,6A,1C	13

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Aug 06-07	GT	6	20^h26^m-21^h00^m	0.57	6.20	1.00	4P,1A	6
06-07	GT	6	21 00 -22 00	1.00	6.20	1.00	6P,1A	9
06-07	GT	6	22 00 -23 00	1.00	6.20	1.00	4P,7A,2C,1K	7
06-07	GT	6	23 00 -00 00	1.00	6.40	1.00	7P,7A,3C	14
06-07	GT	6	00 00 -01 00	0.40	6.40	1.00	5P,1A,1K	6
06-07	GT	6	01 00 -02 00	0.78	6.40	1.00	10P,7A,1C,1K	8
06-07	GT	6	02 00 -03 06	1.10	6.20	1.00	12P,10A	17
06-07	DV	6	20 45 -02 00	4.58	6.03	1.00	13P,3A,1C	9
06-07	DGF	6	20 47 -22 00	1.22	6.75	1.00	7P,2A,1C	4
06-07	DGF	6	22 00 -23 00	0.79	6.75	1.00	5P,1A,1C	3
06-07	DGF	6	23 00 -01 00	1.47	6.60	1.00	8P,8A,2C,1K	7
06-07	DGF	6	01 00 -03 00	1.88	6.45	1.00	25P,12A,2C,1K	20
06-07	AS	6	20 20 -21 00	0.66	5.85	1.00	6P,1A,1C,1K	9
06-07	AS	6	21 00 -22 00	1.00	6.20	1.00	5P,5A	11
06-07	AS	6	22 00 -23 00	1.00	6.30	1.00	4P,3A,4C,2K	10
06-07	AS	6	23 00 -00 00	1.00	6.35	1.00	6P,8A,3C,1K	13
06-07	IW	6	20 20 -22 00	1.67	6.75	1.00	5P,1A	13
06-07	IW	6	22 00 -23 00	1.00	6.75	1.00	5P,3C	5
06-07	IW	6	23 00 -00 00	1.00	6.60	1.00	4P,5A,2C	6
06-07	PR	6	20 00 -21 00	0.67	6.20	1.00	4P,2A,1C	14
06-07	PR	6	21 00 -22 00	1.00	6.30	1.00	7P,6A,1K	9
06-07	PR	6	22 00 -23 00	1.00	6.20	1.00	6P,3A,1C,1K	10
06-07	PR	6	23 00 -00 00	1.00	6.30	1.00	7P,5A,2C	17
06-07	PR	6	00 00 -01 00	0.53	6.40	1.00	8P,5A,2K	6
06-07	PR	6	01 00 -02 00	1.00	6.40	1.00	12P,8A,2K	7
06-07	PR	6	02 00 -03 06	1.10	6.30	1.00	16P,6A,1C	11
06-07	AS	6	00 30 -02 00	1.50	6.45	1.00	15P,6A,1K	23
06-07	GS	6	20 15 -21 00	0.67	5.40	1.00	4P,1K	5
06-07	GS	6	21 05 -22 00	0.83	5.50	1.00	4P,1A,1C	4
06-07	GS	6	22 11 -23 00	0.73	5.50	1.00	5P,2A,1K	3
06-07	GS	6	23 08 -00 00	0.78	5.60	1.00	3P,4A	3
06-07	GS	6	00 08 -01 00	0.78	5.70	1.00	6P,3A,1C	5
Aug 07-08	DG	6	21 35 -00 30	1.87	6.10	1.33	19P,10A,3C,3K	23
07-08	DV	6	21 35 -00 36	2.22	6.00	2.00	7P,4A,1K	5
07-08	GT	6	21 35 -00 36	2.05	6.20	1.33	20P,2A,2C,1K	27
07-08	PP	6	22 00 -00 10	1.15	5.95	1.00	7P,5A,3C,2K	4
07-08	DGF	6	23 20 -00 11	0.85	6.38	1.00	6P,5A,1K	5
07-08	AS	6	22 00 -00 13	1.16	6.24	1.22	13P,5A,1K	27
07-08	PR	6	20 35 -00 30	1.97	6.30	1.14	16P,9A,1K	11
07-08	LC	6	21 35 -00 30	1.20	5.90	1.14	18P,3A	13
07-08	GS	6	22 00 -00 10	1.03	5.50	1.10	10P,3A	3
07-08	LP	8	21 26 -23 25	1.58	5.16	1.06	6P,1A	6
07-08	FP	5	21 25 -02 20	4.35	6.62	1.08	67P,9C	33
07-08	GP	5	21 25 -02 20	4.55	6.76	1.08	27P,12C,1A	36
Aug 08-09	GT	6	23 00 -00 54	1.70	6.10	1.00	18P,6A,2C,1K	15
08-09	PP	6	23 00 -02 40	1.93	5.83	1.00	18P,2A,1K	7
08-09	DV	6	23 00 -00 30	1.50	5.50	1.00	7P,5A	1
08-09	DG	6	23 00 -00 30	1.50	6.30	1.00	14P,6A,1C	17
08-09	DGF	6	23 00 -02 40	2.33	6.17	1.10	22P,10A,2C,1K	15
08-09	AS	6	23 00 -02 40	2.45	5.99	1.04	29P,5A,1C,1K	27
08-09	LC	6	23 00 -02 40	2.65	6.20	1.03	21P,5A,1C	13
08-09	PR	6	23 00 -02 40	2.65	6.20	1.03	27P,6A,1C	14
08-09	GS	6	23 00 -00 55	1.83	5.45	1.02	9P,6A	9
08-09	HV	10	21 40 -22 50	1.02	5.01	1.03	7P,1A,1C	1
08-09	GP	12	21 20 -02 00	3.62	6.55	1.12	24P,1A,5C	21

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Aug 08-09	OS	4	$21^h22^m-22^h43^m$	1.35	5.73	1.15	3P,1A,1K	8
08-09	RP	8	21 34 -22 46	1.13	5.10	1.11	3P	5
08-09	FT	13	21 55 -23 11	1.12	5.70	1.00	7P	2
09-10	GT	6	21 05 -22 00	0.92	6.10	1.00	5P,2C,2K	5
09-10	GT	6	22 00 -22 40	0.67	5.80	1.00	4P,2C,2K	8
09-10	GT	6	23 05 -00 00	0.80	6.00	1.00	10P,4A,1K	6
09-10	GT	6	00 00 -01 00	0.30	6.10	1.00	1P,1C,1K	1
09-10	GT	6	01 18 -01 39	0.35	6.10	1.00	1P	6
09-10	GT	6	02 33 -02 53	0.33	6.30	1.00	4P,2A	1
09-10	PP	6	21 00 -22 00	0.95	6.25	1.00	5P,1C	2
09-10	PP	6	23 00 -00 00	0.68	5.60	1.00	6P	4
09-10	PP	6	00 00 -01 00	0.27	5.60	1.00	3P,1K	1
09-10	PP	6	01 00 -02 00	0.45	5.60	1.00	5P,2A	1
09-10	PP	6	02 00 -03 00	0.32	6.35	1.00	1P	0
09-10	DV	6	21 10 -22 00	0.83	5.90	1.00	4P,3A	1
09-10	DV	6	22 00 -23 00	1.00	6.00	1.00	4A,1C	1
09-10	DV	6	23 00 -00 00	1.00	5.90	1.00	7P,1A,1C	3
09-10	DV	6	00 00 -01 00	0.80	5.90	1.00	2P,1A	2
09-10	DV	6	01 00 -01 47	0.50	5.90	1.00	3P,1A	2
09-10	DG	6	21 03 -22 00	0.95	5.90	1.00	3P,2A,1C,1K	4
09-10	DG	6	22 00 -23 00	0.68	6.00	1.00	4P,3A,1K	5
09-10	DG	6	23 00 -00 00	0.75	6.30	1.00	6P,2A,2C,1K	3
09-10	DG	6	00 00 -01 38	0.45	6.30	1.00	5P,1A	1
09-10	IW	6	21 10 -22 10	1.00	6.10	1.00	7P,2A,1K	12
09-10	PR	6	21 01 -02 52	2.75	6.20	1.04	14P,7A,3K	15
09-10	LC	6	21 00 -00 00	0.81	6.00	1.02	8P,2A	3
09-10	LC	6	00 00 -01 00	0.40	6.00	1.02	3P	0
09-10	LC	6	01 00 -02 00	0.40	6.00	1.02	2P,1C	2
09-10	LC	6	02 00 -03 00	0.30	6.30	1.02	3P	1
09-10	DGF	6	21 08 -22 00	0.87	6.55	1.00	3P,3A,2C,1K	0
09-10	DGF	6	22 00 -23 00	0.35	6.28	1.00	2P,1A,1C,1K	2
09-10	DGF	6	23 00 -00 00	1.00	6.46	1.00	9P,5A,2C,1K	5
09-10	DGF	6	00 00 -02 00	0.43	6.45	1.00	8P,1A,1C,1K	5
09-10	DGF	6	02 00 -03 00	0.32	6.45	1.00	2P,2A	1
09-10	AS	6	21 10 -22 10	1.00	6.20	1.00	7P,1A	13
09-10	AS	6	23 15 -00 58	1.03	6.37	1.00	13P,4A	11
09-10	AS	6	01 19 -01 37	0.33	6.45	1.42	5P	3
09-10	HV	10	21 20 -02 04	4.10	4.82	1.00	23P,3A,3C	7
09-10	HV	10	02 04 -02 45	0.68	5.05	1.00	4P,1A	0
09-10	JM	10	21 36 -00 56	2.20	4.85	1.00	17P,1A	0
09-10	VJ	10	21 20 -02 12	2.20	4.79	1.00	19P,1A	0
09-10	GS	6	21 00 -22 00	1.00	5.40	1.00	4P,1A	6
09-10	GS	6	22 02 -22 35	0.53	5.30	1.00	1P,1A,1K	5
09-10	GS	6	23 03 -23 37	0.55	5.40	1.00	5P,2A	1
09-10	DE	14	23 30 -01 32	1.78	6.16	1.00	12P	11
09-10	OS	4	21 26 -01 20	3.73	5.72	1.05	21P,2A	13
09-10	BD	14	22 50 -01 30	2.33	6.26	1.00	21P	11
09-10	MR	14	22 50 -01 30	2.08	6.13	1.00	19P	4
09-10	VT	14	22 50 -00 15	1.16	6.12	1.00	8P	7
09-10	MVS	14	22 50 -01 30	2.00	6.19	1.00	23P	10
09-10	FP	12	21 25 -00 15	2.55	6.62	1.00	47P,3C	50
09-10	GP	12	21 25 -00 55	3.33	6.68	1.00	34P,1A,5C	19
10-11	GT	6	21 15 -21 22	0.12	6.30	1.43	1P	3
10-11	GT	6	00 50 -01 00	0.17	6.20	1.25	1P	0
10-11	GT	6	01 00 -02 00	1.00	6.20	1.05	35P,4A,1C	18
10-11	GT	6	02 00 -03 12	1.20	6.15	1.00	26P,3A,1K	8

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Aug 10-11	DV	6	$21^h13^m-23^h00^m$	0.55	5.90	?	2P	2
10-11	DV	6	23 00 -00 00	1.00	5.90	1.00	1P,1C	1
10-11	DV	6	00 00 -01 00	1.00	5.90	1.00	3P,2A,1C	4
10-11	DV	6	01 00 -01 31	0.52	5.90	1.00	1P,1A,1C	1
10-11	DG	6	23 21 -01 30	0.73	6.30	1.00	16P,3A,1C,1K	4
10-11	AS	6	00 50 -02 00	1.23	6.45	1.00	32P,3A,2C,1K	21
10-11	AS	6	02 00 -03 15	1.25	6.43	1.00	39P,5A	14
10-11	GS	6	01 00 -02 00	0.95	5.50	1.00	24P,1A	11
10-11	GS	6	02 00 -03 00	0.98	5.60	1.00	14P,3A,1K	12
10-11	LC	6	20 00 -21 00	0.60	6.30	1.00	2P,1K	1
10-11	LC	6	01 00 -02 00	1.00	6.30	1.00	33P,3A,2C,1K	17
10-11	LC	6	02 00 -04 00	1.20	6.30	1.00	31P,3A	8
10-11	PR	6	20 25 -20 50	0.42	6.30	1.00	2P,1K	1
10-11	PR	6	01 00 -02 00	1.00	6.30	1.00	33P,2A,2C	21
10-11	PR	6	02 00 -03 12	1.20	6.30	1.00	25P,5A	9
10-11	HV	10	21 25 -23 40	1.10	4.79	1.44	8P	3
10-11	VJ	10	21 30 -23 40	1.00	4.75	1.50	5P	2
10-11	PL	9	21 22 -22 54	1.23	5.90	2.25	4P	5
10-11	GK	15	23 00 -00 50	1.53	5	?	7P	4
10-11	RS	18	23 12 -02 35	3.28	5.20	1.53	5P	12
10-11	DE	14	22 15 -01 05	2.50	6.11	1.00	25P	7
10-11	BD	14	22 15 -02 00	3.17	6.10	1.00	40P	13
10-11	MR	14	22 15 -02 00	3.25	6.17	1.00	26P	20
10-11	VT	14	22 15 -02 00	3.08	5.91	1.00	33P	25
10-11	MVS	14	22 15 -02 00	3.25	6.15	1.00	34P	16
Aug 11-12	KN	16	01 30 -02 45	1.20	5.30	1.00	24P,3A,1C	9
11-12	GS	6	01 15 -02 15	1.00	5.64	1.00	45P	4
11-12	GS	6	02 15 -03 15	1.00	5.66	1.00	39P	11
11-12	GT	6	01 05 -02 00	0.92	6.50	1.00	50P,4A	9
11-12	GT	6	02 00 -03 25	1.25	6.35	1.00	60P,3A,1C	18
11-12	PP	6	01 00 -02 00	0.75	6.25	1.00	39P,6A	0
11-12	PP	6	02 00 -03 00	0.75	6.25	1.00	32P,2A,2K	3
11-12	AS	6	01 03 -02 00	0.95	6.55	1.00	49P,3A,1K	25
11-12	AS	6	02 00 -03 15	1.25	6.45	1.00	77P,6A,2C	25
11-12	LC	6	01 00 -02 00	0.90	6.40	1.00	53P,3A	12
11-12	LC	6	02 00 -03 00	0.80	6.40	1.00	33P,4A	6
11-12	PR	6	01 00 -02 00	0.95	6.30	1.00	41P,2A,1K	7
11-12	PR	6	02 00 -03 15	1.25	6.30	1.00	49P,5A,1C	16
11-12	FDG	6	01 03 -02 00	0.95	6.24	1.00	50P,5A,2C,2K	9
11-12	FDG	6	02 00 -03 00	1.00	6.15	1.00	54P,6A,1K	8
Aug 12-13	GT	6	20 00 -21 00	1.00	6.10	1.00	23P,1A,1C,2K	5
12-13	GT	6	21 00 -22 00	0.95	6.30	1.00	38P,1C,1K	6
12-13	GT	6	22 00 -23 00	1.00	6.40	1.00	61P,5A,1C,2K	9
12-13	GT	6	23 00 -00 00	1.00	6.50	1.00	76P,3A,1C	9
12-13	GT	6	00 00 -01 00	0.85	6.50	1.00	80P,9A,2K	7
12-13	GT	6	01 00 -02 00	1.00	6.50	1.00	97P,2A,1C,1K	20
12-13	GT	6	02 00 -03 12	1.20	6.35	1.00	108P,1A	19
12-13	DV	6	20 00 -21 00	1.00	5.40	1.00	18P,1C	2
12-13	DV	6	21 00 -22 00	1.00	6.00	1.00	28P,1A,1C,1K	7
12-13	DV	6	22 00 -23 00	0.97	6.20	1.00	35P,3A	4
12-13	DV	6	23 00 -00 00	0.89	6.20	1.00	45P,1A,1K	6
12-13	DV	6	00 00 -01 00	1.00	6.20	1.00	47P,6A,1C,1K	2
12-13	DV	6	01 00 -02 00	1.00	6.20	1.00	48P,11A	9
12-13	DV	6	02 00 -03 05	1.08	6.20	1.00	58P,7A	3
12-13	JVW	6	23 13 -01 00	1.78	6.01	1.00	99P,3A	22

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Aug 12-13	DG	6	20^h00^m-21^h00^m	0.90	6.10	1.00	21P,2C,2K	6
12-13	DG	6	21 00 -22 00	0.97	6.30	1.00	36P,1A,1C,2K	15
12-13	DG	6	22 00 -23 00	0.85	6.20	1.00	54P,3A,3C,1K	7
12-13	DG	6	23 00 -00 00	0.83	6.50	1.00	60P,1A,1K	12
12-13	DG	6	00 00 -01 00	0.53	6.40	1.00	53P,3A,3C,1K	10
12-13	DG	6	01 00 -02 00	0.87	6.50	1.00	85P,3A,2C,4K	14
12-13	DG	6	02 00 -03 05	0.93	6.50	1.00	75P,11A,1C,5K	24
12-13	PP	6	21 00 -22 00	0.47	6.00	1.00	19P	3
12-13	PP	6	22 00 -23 00	0.92	6.12	1.00	46P,3A,1C,1K	5
12-13	PP	6	23 00 -00 00	0.50	6.12	1.00	22P	1
12-13	PP	6	00 00 -01 00	0.67	6.12	1.00	58P,5A,2K	4
12-13	PP	6	01 00 -02 00	0.92	6.12	1.00	73P,1A,1C	10
12-13	PP	6	02 00 -04 00	1.08	6.12	1.00	80P,9A,2C	18
12-13	IW	6	20 10 -21 00	0.83	6.29	1.00	22P,1C,1K	8
12-13	IW	6	21 00 -22 00	1.00	6.87	1.00	32P,2A,1C,2K	7
12-13	IW	6	22 00 -23 00	1.00	6.92	1.00	61P,1A,2C,1K	9
12-13	IW	6	23 10 -00 00	0.83	6.95	1.00	66P	7
12-13	IW	6	01 00 -02 15	1.25	6.95	1.00	148P,6A,3C	27
12-13	LC	6	01 00 -04 00	1.50	6.35	1.00	147P,9A	26
12-13	PR	6	20 00 -21 00	1.00	6.00	1.00	23P,1C,3K	6
12-13	PR	6	21 00 -22 00	1.00	6.30	1.00	31P,1A,1C,3K	11
12-13	PR	6	22 00 -23 00	1.00	6.30	1.00	49P,5A,2C,2K	11
12-13	PR	6	23 00 -00 00	0.90	6.40	1.00	56P,1A,2K	7
12-13	PR	6	00 00 -01 00	1.00	6.40	1.00	74P,6A,1C,1K	11
12-13	PR	6	01 00 -02 00	1.00	6.30	1.00	87P,6A	13
12-13	PR	6	02 00 -03 15	1.25	6.30	1.00	92P,6A,1C,1K	17
12-13	AS	6	20 05 -21 00	0.90	5.90	1.00	23P,1C,3K	15
12-13	AS	6	21 00 -22 00	1.00	6.08	1.00	28P,3A,1C,5K	16
12-13	AS	6	22 00 -23 00	1.00	6.33	1.00	69P,7A,1C,3K	19
12-13	AS	6	23 00 -00 00	0.95	6.50	1.00	63P,5A,3K	6
12-13	AS	6	00 00 -01 00	1.00	6.55	1.00	73P,17A,2K	11
12-13	AS	6	01 00 -02 00	1.00	6.50	1.00	95P,5A,1C,2K	21
12-13	AS	6	02 00 -03 15	1.25	6.45	1.00	115P,12A,1C	34
12-13	AS	6	21 30 -22 00	0.50	6.35	1.00	18P,2K	5
12-13	AS	6	22 00 -23 00	0.95	6.35	1.00	47P,4A	9
12-13	AS	6	23 00 -00 00	0.50	6.35	1.00	23P,3A,1C	2
12-13	AS	6	00 00 -01 00	0.77	6.35	1.00	66P,4A,1K	4
12-13	AS	6	01 00 -02 00	0.83	6.35	1.00	80P,4A,1C,1K	14
12-13	AS	6	02 00 -03 00	1.00	6.55	1.00	98P,8A,1C,2K	19
12-13	HV	10	21 00 -22 09	1.15	5.49	1.00	31P,3C	3
12-13	HV	10	22 09 -23 37	1.47	5.78	1.00	33P,1A	3
12-13	HV	10	23 37 -00 31	0.90	5.95	1.00	32P,1A,1C	3
12-13	HV	10	00 31 -02 30	1.80	5.76	1.23	56P	3
12-13	JM	10	21 00 -22 14	1.23	5.75	1.00	31P,3C	4
12-13	JM	10	22 14 -23 47	1.55	6.03	1.00	34P	3
12-13	JM	10	23 47 -01 15	1.07	5.94	1.00	28P,1A	3
12-13	JM	10	01 15 -02 30	1.05	5.75	1.28	24P	2
12-13	GS	6	20 00 -21 00	1.00	5.25	1.00	19P,1A,1C	4
12-13	GS	6	21 06 -22 05	0.93	5.60	1.00	29P,3A,1C	9
12-13	GS	6	22 06 -23 05	0.93	5.73	1.00	48P,3A,1K	6
12-13	GS	6	23 12 -00 12	0.95	5.80	1.00	58P	9
12-13	GS	6	00 18 -01 18	0.95	5.90	1.00	63P,2A	16
12-13	GS	6	01 24 -02 24	0.95	5.90	1.00	69P,1A	20
12-13	GS	6	02 31 -03 06	0.53	5.75	1.00	37P	15
12-13	KN	16	22 15 -23 15	1.00	5.90	1.00	42P,6A,1C	7
12-13	KN	16	23 15 -00 15	1.00	5.90	1.00	45P,1A	2
12-13	KN	16	00 15 -01 30	1.25	5.90	1.00	54P,2A,1C	11

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Aug 12-13	KN	6	$01^h30^m-02^h30^m$	1.00	5.90	1.00	43P	9
12-13	KO	17	21 00 -03 00	4.40	6.05	1.13	54P	7
12-13	JD	17	21 00 -03 00	4.62	4.50	1.13	48P,2A	0
12-13	DQK	17	21 00 -03 00	4.43	6.27	1.13	53P	6
12-13	DPB	17	21 00 -03 00	4.00	6.46	1.13	80P,1A	10
12-13	OS	4	21 08 -23 30	2.37	5.48	1.89	25P,1A,4K	3
12-13	RS	18	22 17 -03 02	4.45	5.37	1.47	106P,1K	22
12-13	PL	9	21 06 -22 25	1.06	5.70	1.25	8P	2
12-13	GK	15	23 10 -02 41	2.83	5	?	30P	7
12-13	DK	19	19 55 -21 00	1.08	5.70	1.00	19P,1A	3
12-13	DK	19	21 00 -22 00	1.00	6.20	1.00	29P,2C	8
12-13	DK	19	22 00 -23 00	0.83	6.20	1.00	37P,1C	5
12-13	DK	19	23 00 -00 15	1.03	6.20	1.00	69P,2A	23
12-13	DP	20	21 08 -23 40	1.63	5.00	1.00	30P,6K	7
12-13	AD	21	20 30 -02 30	5.00	5.84	1.00	115P	22
12-13	FT	7	21 02 -02 34	4.53	5.25	1.02	80P	25
12-13	RP	8	21 05 -01 15	2.62	5.13	1.11	30P	12
12-13	LP	8	21 13 -01 47	2.90	5.03	1.16	25P,1A	12
12-13	GC	8	21 00 -01 47	3.34	5.01	1.12	28P	14
Aug 13-14	FP	12	21 15 -00 20	2.63	6.35	1.00	24P,1K	46
13-14	OS	4	23 23 -01 43	2.33	5.35	1.00	25P	9
13-14	GP	5	21 00 -03 00	5.38	6.39	1.00	69P,1A,3C,3K	21
13-14	GS	6	22 30 -23 33	1.00	5.70	1.00	21P,1K	9
13-14	GS	6	23 50 -00 50	1.00	5.70	1.00	32P,2A	10
13-14	GS	6	00 54 -01 54	1.00	5.80	1.00	36P,1A	17
13-14	GS	6	01 56 -03 14	1.25	5.80	1.00	57P	13
13-14	GT	6	20 20 -21 00	0.67	6.00	1.00	13P,1A	3
13-14	GT	6	21 00 -22 00	1.00	6.10	1.00	19P,1A,3C,2K	8
13-14	GT	6	22 00 -23 00	0.75	6.30	1.00	31P,1A,1C,1K	3
13-14	GT	6	23 00 -00 00	1.00	6.40	1.00	48P,5A,1C,2K	11
13-14	GT	6	00 00 -01 00	1.00	6.50	1.00	36P,5A,1K	9
13-14	GT	6	01 00 -02 00	1.00	6.50	1.00	48P,6A	15
13-14	GT	6	02 00 -03 20	1.33	6.35	1.00	75P,4A,1C	16
13-14	PP	6	22 00 -00 00	1.22	6.15	1.00	38P,6A,1C,1K	5
13-14	PP	6	00 00 -01 00	0.72	6.15	1.00	11P,1A,1C,2K	6
13-14	PP	6	01 00 -02 00	1.00	6.25	1.00	34P,2A,1K	6
13-14	PP	6	02 00 -04 00	1.25	6.25	1.00	47P,3A,2C,1K	10
13-14	AS	6	21 00 -22 00	1.00	5.80	1.00	17P,4A,5K	5
13-14	AS	6	22 05 -23 00	0.96	5.80	1.00	28P,4A,3C,1K	19
13-14	AS	6	23 50 -01 00	1.20	5.80	1.00	59P,4A,1C	18
13-14	AS	6	01 00 -02 00	1.00	5.80	1.00	47P,5A,1K	10
13-14	AS	6	02 05 -03 15	1.20	5.80	1.00	61P,4A,2C,1K	16
13-14	DGF	6	22 35 -00 00	1.42	6.35	1.00	56P,6A,4K	19
13-14	LC	6	20 00 -21 00	0.66	5.30	1.00	16P,1K	1
13-14	LC	6	21 00 -22 00	0.75	6.00	1.00	15P,2A,2K	3
13-14	PR	6	20 00 -21 00	0.68	5.40	1.00	13P,2A	6
13-14	PR	6	21 00 -22 00	1.00	6.00	1.00	21P,2A,1C,3K	5
13-14	PR	6	22 00 -23 00	0.91	6.30	1.00	26P,3A,2C,2K	6
13-14	PR	6	23 00 -00 00	1.00	6.30	1.00	35P,7A,3K	13
13-14	PR	6	00 00 -01 00	1.00	6.30	1.00	41P,8A,1C,1K	15
13-14	PR	6	01 00 -02 00	0.94	6.30	1.00	33P,4A,2K	12
13-14	PR	6	02 00 -03 15	1.25	6.30	1.00	61P,6A,1C	12
Aug 14-15	PP	6	23 00 -00 00	0.63	6.20	1.00	10P,5A,2C	5
14-15	PP	6	00 00 -01 00	0.93	6.59	1.00	20P,4A	2
14-15	PP	6	01 00 -02 00	1.00	6.45	1.00	23P,1C	1
14-15	PP	6	02 00 -04 00	1.17	5.80	1.00	39P,2A	6

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Aug 14-15	GT	6	$20^h30^m-23^h00^m$	1.00	6.00	1.00	9P,3A,2K	3
14-15	GT	6	23 00 -00 00	1.00	6.30	1.00	24P,5A,2C,2K	11
14-15	GT	6	00 00 -01 00	1.00	6.50	1.00	33P,3A,1K	13
14-15	GT	6	01 00 -02 00	1.00	6.40	1.00	25P,1A,2K	15
14-15	GT	6	02 00 -03 15	1.25	6.25	1.00	43P,2A,1C	16
14-15	LC	6	22 00 -04 00	1.45	6.10	1.00	35P,5A,1C,2K	11
14-15	PR	6	22 00 -23 00	0.80	6.00	1.00	9P,4A,1C,3K	5
14-15	PR	6	23 00 -00 00	0.92	6.00	1.00	11P,3A,3C,2K	8
14-15	PR	6	00 00 -01 00	1.00	6.10	1.00	29P,5A,1C	7
14-15	PR	6	01 00 -02 00	1.00	6.30	1.00	17P,2A,1K	12
14-15	PR	6	02 00 -03 15	1.25	6.20	1.00	36P,7A	14
14-15	AS	6	23 05 -00 00	0.90	6.50	1.00	20P,5A,2C,5K	17
14-15	AS	6	00 00 -01 05	1.10	6.50	1.00	34P,10A,1C,3K	14
14-15	AS	6	01 15 -02 17	1.03	6.45	1.00	32P,6A,1K	15
14-15	IW	6	22 45 -23 00	0.75	6.85	1.00	5P,1A,1C,2K	4
14-15	IW	6	23 00 -00 00	1.00	6.89	1.00	27P,4A,2C,3K	14
14-15	IW	6	00 00 -00 45	0.75	6.90	1.00	23P,4A,3C,4K	13
14-15	IW	6	01 15 -02 00	0.75	6.90	1.00	19P,4A,1C,3K	16
14-15	IW	6	02 00 -02 45	0.75	6.90	1.00	35P,3A,2K	13
14-15	DGF	6	22 48 -00 00	1.20	6.25	1.00	17P,1A,3C,3K	18
14-15	DGF	6	00 00 -03 00	1.93	6.40	1.00	50P,8A,3C,4K	22
14-15	KD	19	20 49 -22 00	1.18	5.50	1.00	7P,2C,1K	8
14-15	KD	19	22 00 -23 00	1.00	5.80	1.00	9P,1A,1C	5
14-15	KD	19	23 00 -00 00	1.00	6.10	1.00	18P,1A,1C	7
14-15	KD	19	00 00 -00 36	0.60	6.10	1.00	7P,2A	7
Aug 15-16	OS	4	22 15 -01 00	2.75	5.98	1.03	15P,1A,3K	12
15-16	GP	5	22 00 -02 00	3.80	6.71	1.11	41P,8A,5C,1K	18
15-16	FP	12	21 30 -23 35	1.83	6.57	1.08	8P	19
15-16	PR	6	00 00 -02 00	2.00	6.20	1.00	17P,6A	17
15-16	PR	6	02 00 -03 03	1.05	6.20	1.00	12P,2A,1K	8
15-16	LC	6	00 00 -02 00	2.00	6.25	1.00	23P,6A	20
15-16	LC	6	02 00 -03 03	0.50	6.30	1.00	12P,2A	10
15-16	GT	6	00 00 -01 00	1.00	6.30	1.00	9P,3A	8
15-16	GT	6	01 00 -02 00	1.00	6.30	1.00	9P,7A,1K	6
15-16	GT	6	02 00 -03 03	1.05	6.10	1.00	16P,4A	14
15-16	AS	6	00 00 -01 00	1.00	6.35	1.00	7P,2A,1K	16
15-16	AS	6	01 00 -02 00	1.00	6.35	1.00	17P,8A,1C,1K	9
15-16	AS	6	02 03 -03 03	1.00	6.45	1.00	20P,2A,3K	12
Aug 31-32	LP	8	20 12 -21 16	1.03	5.23	1.11		2
Sep 04-05	GP	5	21 00 -03 00	5.23	6.85	1.00		62
07-08	GP	5	21 00 -03 00	5.25	6.82	1.00		58
08-09	LP	8	21 18 -23 16	1.78	5.60	1.11		8
08-09	GP	5	22 30 -01 30	2.63	7.11	1.01		44
10-11	GP	5	21 00 -23 05	2.00	6.65	1.00		9
26-27	GT	22	21 10 -22 40	1.50	5.60	1.03		12
Oct 09-10	GP	5	19 45 -01 15	5.10	6.45	1.00		33
09-10	GT	22	18 38 -20 10	1.50	5.50	1.21		5
10-11	GT	22	18 28 -19 28	1.00	5.30	1.00		3
26-27	GT	22	21 38 -23 00	1.37	5.60	1.00	6T	7
26-27	PR	?	00 34 -01 20	0.76	5.50	1.33	10	1
26-27	LC	?	00 34 -01 20	0.76	5.50	1.33	20	3
29-30	GT	22	19 20 -22 26	1.00	5.40	1.00	1T	6
29-30	FP	3	18 30 -22 35	3.68	6.15	1.11	8T	26
29-30	GP	3	18 30 -22 35	3.72	6.39	1.11	4T	15
31-32	PR	6	22 19 -01 00	2.33	6.50	1.00	10,11T	29

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Nov 03-04	PR	6	18^h15^m-20^h00^m	1.75	6.40	1.00	2T	18
03-04	PR	6	20 00 -21 00	1.00	6.40	1.00	3T	8
03-04	PR	6	21 00 -22 00	1.00	6.45	1.00	6T	13
03-04	PR	6	23 13 -00 00	0.78	6.40	1.00	12T	8
03-04	PR	6	00 00 -01 00	1.00	6.40	1.00	4T	6
03-04	PR	6	01 00 -02 15	1.25	6.40	1.00	3T	13
03-04	PR	6	03 12 -05 05	1.87	6.40	1.00	5T,1O	41
04-05	PR	6	18 55 -20 00	1.08	6.40	1.00	4T	7
04-05	PR	6	20 00 -21 00	1.00	6.40	1.00	6T	11
04-05	PR	6	21 00 -22 00	1.00	6.40	1.00	9T	11
04-05	PR	6	22 00 -23 31	1.52	6.40	1.00	8T	20
04-05	PR	6	23 55 -01 00	1.08	6.40	1.00	4T	23
04-05	PR	6	01 00 -02 50	1.83	6.05	1.00	10T	25
05-06	PR	6	20 20 -22 32	2.20	6.30	1.01	9T	26
05-06	PR	6	00 04 -01 16	1.20	6.20	1.05	10T	23
06-07	PR	6	19 45 -21 00	1.25	5.50	1.09	1T	5
06-07	GP	3	18 30 -19 30	1.00	6.62	1.18	1T	4
06-07	GP	3	19 30 -20 30	1.00	7.02	1.18	4T	6
06-07	GP	3	20 30 -21 30	0.75	6.95	1.43	3T	4
06-07	GP	3	21 20 -22 30	1.00	6.75	1.15	4T	2
06-07	GP	3	22 30 -23 30	0.67	6.75	1.11	2T	0
06-07	GP	3	23 30 -00 30	1.00	6.85	1.11	2T	5
06-07	GP	3	00 30 -01 30	1.00	6.87	1.11	2T	8
06-07	GP	3	01 30 -02 30	1.00	6.98	1.11	7T	10
06-07	GP	3	02 30 -03 30	0.75	7.05	1.11	3T	8
06-07	GP	3	03 30 -05 15	1.75	6.82	1.11	6T	7
06-07	PR	6	19 55 -21 00	1.08	6.40	1.00	7T	11
06-07	PR	6	21 00 -23 00	2.00	6.30	1.00	12T	10
06-07	PR	6	23 00 -00 00	1.00	6.40	1.00	11T	12
06-07	PR	6	00 00 -01 00	1.00	6.40	1.00	15T	14
06-07	PR	6	01 00 -02 04	1.07	6.40	1.00	7T	14
23-24	GP	5	21 00 -22 10	2.18	6.73	1.10		23
26-27	GP	3	22 00 -03 00	4.58	6.52	1.12	7T,3L	50
29-30	GP	3	19 00 -00 30	4.93	6.62	1.02		46
Dec 03-04	GT	22	19 22 -21 00	1.63	5.60	1.00		6
03-04	GP	3	22 00 -00 00	2.00	6.60	1.00	1G	24
03-04	GP	3	00 00 -02 00	1.66	6.70	1.03	2G	21
03-04	GP	3	02 00 -04 00	1.75	6.70	1.15	5G	25
04-05	GT	22	19 40 -21 00	1.33	5.00	1.00	1G	3
04-05	GP	3	21 00 -00 00	2.72	6.50	1.28		17
05-06	GT	22	18 24 -19 00	0.60	5.60	1.00		0
05-06	GP	3	21 00 -23 00	2.00	6.70	1.00	2G	27
05-06	GT	22	21 52 -23 10	1.30	5.80	1.00		2
05-06	GP	3	23 00 -01 35	2.17	6.90	1.00	8G	23
10-11	GP	3	23 30 -02 45	2.22	6.50	1.20	6G	18
13-14	GT	22	18 50 -19 54	1.07	5.00	1.28	1G	1
13-14	LC	3	20 50 -21 50	1.00	5.20	1.00	19G	1
13-14	PR	3	20 50 -21 50	0.95	5.20	1.00	11G	0
13-14	GP	3	20 50 -22 00	1.17	6.00	1.00	21G	2
13-14	LC	3	21 50 -22 50	0.62	5.20	1.00	15G	0
13-14	PR	3	21 50 -22 50	0.62	5.20	1.00	10G	1
13-14	GP	3	22 00 -23 00	0.60	5.90	1.00	13G	1
13-14	LC	3	22 50 -01 00	2.15	5.20	1.00	59G	5
13-14	PR	3	22 50 -01 00	2.11	5.20	1.00	46G	4
13-14	GP	3	23 00 -00 00	1.00	5.80	1.00	28G	2
13-14	GT	22	23 45 -01 00	1.25	5.00	1.20	36G	0

Date	Obs	Loc	Period	T_{eff}	Lm	F	Showers	Spor
Dec 13-14	GP	3	00^h00^m-01^h00^m	1.00	5.70	1.00	42G	5
13-14	LC	3	01 00 -02 09	0.77	5.20	1.00	23G	5
13-14	PR	3	01 00 -02 09	0.77	5.10	1.01	22G	4
13-14	GP	3	01 00 -02 09	0.77	5.70	1.00	27G	5
13-14	GT	22	01 00 -01 45	0.75	5.00	1.00	20G	3
13-14	KD	22	02 01 -02 57	0.92	4.70	1.00	21G	1
13-14	GT	22	02 22 -03 00	0.63	5.00	1.19	18G	3
13-14	KD	22	03 28 -04 00	0.53	4.60	1.00	18G	0
13-14	GT	22	03 29 -03 59	0.50	5.00	1.67	9G	1
13-14	GT	22	04 17 -05 00	0.68	4.70	1.00	16G	1
13-14	KD	22	04 42 -05 15	0.55	4.30	1.00	6G	0
13-14	LC	3	04 39 -04 50	0.18	5.90	1.00	6G	0
14-15	GP	3	18 25 -20 00	1.58	5.30	1.00	9G	3
14-15	GP	3	20 00 -22 11	1.87	5.30	1.00	21G	8
14-15	GP	3	23 00 -01 30	1.91	5.50	1.00	17G	9

The Quadrantids 1987 in Belgium

Glenn Ticket

The observations of the Quadrantids 1987 in Belgium were severly hampered by bad weather, which was very unfortunate since observing conditions were otherwise favorable. Some observers nevertheless managed to see a glimpse of the Quadrantids; their results are presented.

The Quadrantids are one of the three annual showers which can reach a ZHR of 100 or more. This year's expectations were high because of the absence of the moon. Moreover, the maximum was predicted for January 4 at 4 UT with the radiant at an elevation of approximately 67°. The only thing that could spoil the fun was the weather, and unfortunately this was the case. Nevertheless, five observers managed to see some Quadrantids: Ghislain Plesier (GP), Glenn Ticket (GT), Paul Roggemans (PR), Marc Gyssens (MG) and Paul Smits (PS). Out of their observations, the follwing data were collected:

Table 1 --- Quadrantid observations in Belgium, 1987.

Date	Obs	Period	T_{eff}	Lm	Quad	ZHR	Spor	HR
Jan 01-02	GP	22^h25^m-01^h00^m	2.48	6.7	5	4.8 ± 2.2	12	3.9 ± 1.1
	GT	23 12 -00 27	1.10	5.5	1	6.3 6.3	4	10.9 5.5
02-03	GP	23 25 -03 25	4.00	6.6	18	7.8 1.8	56	7.0 0.9
	GP	03 25 -06 25	2.83	6.6	29	10.4 1.9		
	GT	02 04 -03 44	1.67	5.8	4	6.9 3.5	9	11.6 3.9
03-04	PR	18 26 -21 26	2.60	6.2	24	54 11	9	4.8 1.6
	GP	19 22 -21 25	2.05	6.5	25	55 11	6	2.9 1.2
	MG	01 30 -02 12	0.70	5.2	18	162 38	2	13.0 9.2
	PS	01 30 -02 12	0.39	5.2	7	113 43	0	

The ZHR was calculated using r = 2.5 for the Quadrantids and the HR for the sporadics with r = 3. One must be very careful with the high ZHR-values obtained for MG and PS. The total amount of correction factors (clouds, lm, zenith distance) is for both observers 6.3 and the effective observing time is rather short: 42 and 23 minutes.

(continued on page 94)

FORWARD: A General Program
for Calculating the Observability Function

Christian Steyaert

Meteor reflection counts can be reduced to standard conditions in apllying the so-called observability function, similar to the application of the ZHR correction in visual work. The observability function depends on many parameters. Hence, publishing tables of all possible combinations is excluded. Therefore, a universally valid computer program was written into which all parameters were entered.

1. Forward scatter geometry

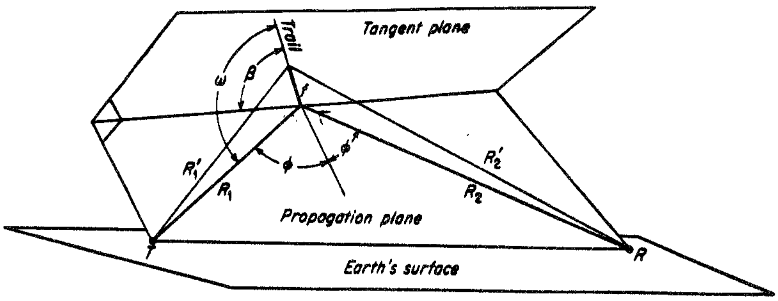


Figure 1 --- Forward scatter radio setup

In a forward scatter radio setup, transmitter *T* and receiver *R* are separated widely. Not all meteor trails will cause reception of *T* at *R*: the meteor has to be tangent at an ellipsoid of revolution, whose foci are *T* and *R*. This condition is not easy to visualize. The reflection points are assumed to lay at a constant height *h*, e.g. equal to the standard value of 100 km. The ellipsoids are characterized by their semi-minor axis *b*, the distance between their foci being fixed (2*D*).

Not all values of *b* will yield reflection points. This can only be found by trying out various values of *b*, the smallest value being the height of the reflection points. This leads to a quadratic equation, giving two or no reflection points. Furthermore, a flat earth is assumed, as justified by Hines and Pugh (1). Following Meeks and James (2), the projections of the reflection points on the earth is shown in a rectangular coordinate system with the receiver at (-*D*,0) and the transmitter at (*D*,0). (Figures 2 and 3)

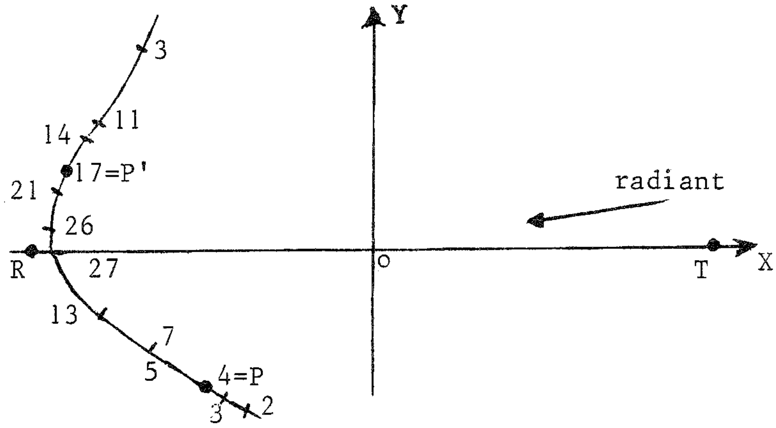


Figure 2 --- Shower locus of the Geminids at 21^h UT on Dec 13, 1987. The observer (51° N, 4° E) has a 4 elements Yagi antenna. The azimuth *RT* = 270° and *h* = 100 km. The radiant's elevation is 36°. The other features of Figure 2 are explained in the text.

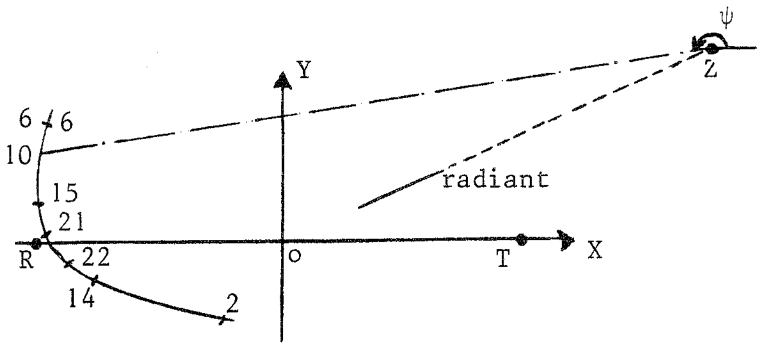


Figure 3 --- Same picture as in Figure 2 for the η-Aquarids at 6^h UT on May 5, 1987. The azimuth *RT* = 0°. The other features of Figure 3 are explained in the text.

The elements determining the locus of the reflection points are:

- the distance R-T (= $2D$);
- the radiant elevation;
- the difference in azimuth between radiant and transmitter.

2. Received power

The power received at R is a complex function:

$$P_R = P_T G_R G_T H(b) q^2 \lambda^3 \tag{1}$$

in which: P_T: transmitted power;
G_T: gain transmitting antenna in the direction of the meteor;
G_R: gain receiving antenna in the direction of the meteor;
$H(b)$: the geometrical function;
q: electron line density;
λ: wavelength.

(We consider only underdense meteor trails, as observed with sufficiently sensitive equipment.)

We have furthermore:

- The transmitted power P_T is kept constant.
- The gain G_T of the transmitting antenna poses a problem. A given (commercial) transmission might be directed to a specific area. Reflections near the receiver are more reliable, as these occur within a more restricted angle, as seen from the transmitter. G_T is always taken to be 1.
- G_R is a function of the horizontal and vertical angle from the axis of the antenna to the direction of the meteor. This function can be approximated for the common Yagi antennas. The more elements a Yagi antenna has, the narrower the beam is in which reflection will be captured.
- $H(b)$ can be expressed in R_1, R_2, ϕ and β (see Figure 1).
- P_R has to be summarized over the whole locus. The values indicated at some points in Figures 2 and 3 are proportional to P_R. Theoretically, we have to evaluate the line integral:

$$W = \int_{\text{locus}} P_R \, ds \tag{2}$$

This is not a trivial matter, as the points of the locus are not found in the correct sequence. E.g. the points marked P and P' in Figure 2 belong to the same value b = 230 km. The locus is not necessarily single-valued in x or y, hence no sorting on these coordinates can be performed. Instead, we calculated for each point the auxiliary angle ψ for the direction Z-reflection point, where Z is in the direction of the radiant, at a distance $2D$ of O. This guarantees a correct numerical approximation of the integral (2). For these auxiliary constructions, see also Figure 3.

3. Number of reflections

The ultimate purpose is to translate the total average received power W into a correction factor on the number of observed reflections: this is the ultimate observability function. From (1) and (2) it follows:

$$W \propto q^2$$

or:

$$q \propto \sqrt{W}$$

Furthermore, we use the relationship:

$$M \propto -\log q$$

where M represents the absolute visual magnitude.

Finally, the stream characteristic r comes into play:

$$N \propto N_0 r^M$$

where N is the cumulative number of observed meteors up to magnitude M and N_0 is a measure for the stream activity. The observability function computed with *FORWARD* is proportional to r^M. Hence by dividing the number of observed reflections by the value given by the propability function, we obtain a comparable measure for the activity of the stream during the observation period. Tables 1 to 3, below give some examples of these values.

Table 1 --- Observability function for a 4 elements Yagi antenna at an elevation of 90° ($2D$ = 900 km) as a function of the difference in azimuth between the radiant and the transmitter (horizontally) and the height of the radiant (vertically).

h(°)	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
80°	3	2	0	0	0	0	0	0	0	0	0	0	0
70°	47	46	44	33	30	22	14	5	0	0	0	0	0
60°	76	76	72	57	54	44	33	22	10	0	0	0	0
50°	89	88	82	70	64	55	44	31	20	7	0	0	0
40°	83	86	80	64	62	53	44	36	25	14	1	0	0
30°	61	67	54	56	49	46	41	35	26	17	6	0	0
20°	37	43	34	35	36	33	30	27	22	17	8	0	0
10°	12	12	16	17	17	16	16	15	13	11	7	9	0

Table 2 --- Same as Table 1, for an antenna elevation of 60°

h(°)	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
80°	0	0	0	0	25	40	51	60	66	72	106	113	106
70°	0	20	46	72	92	105	113	118	119	120	146	143	134
60°	65	72	95	116	130	138	142	143	142	169	161	155	140
50°	115	119	130	141	146	147	147	147	147	170	163	155	145
40°	138	142	145	146	142	139	138	137	137	160	156	148	130
30°	132	139	138	129	121	116	114	114	115	139	138	132	107
20°	107	115	109	97	88	83	81	81	84	103	108	105	82
10°	59	67	59	52	46	44	42	43	45	56	60	63	47

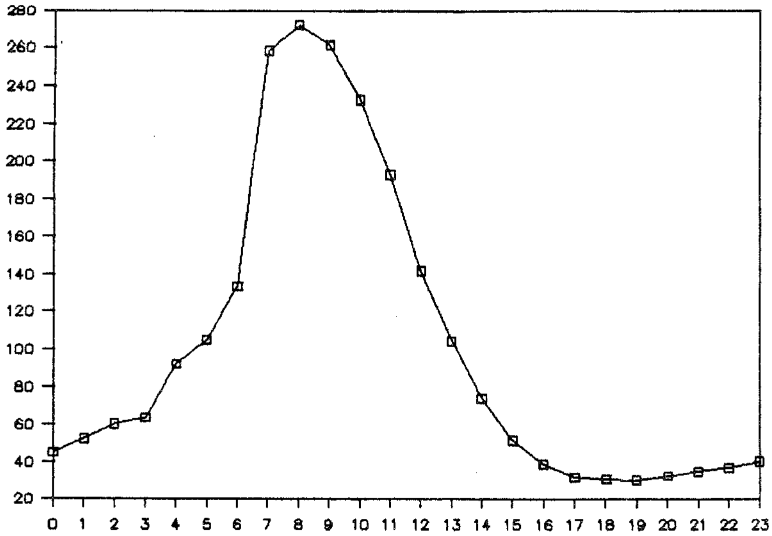
Table 3 --- Same as Table 1, for an antenna elevation of 10°

h(°)	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
80°	0	0	0	0	0	2	9	18	21	17	0	0	0
70°	0	23	59	99	135	162	181	196	205	212	266	275	258
60°	34	58	104	147	178	199	213	224	233	287	284	284	266
50°	79	80	134	170	192	204	213	222	231	281	281	279	271
40°	117	119	150	174	183	188	193	200	209	256	262	261	241
30°	143	144	151	157	156	155	156	161	171	217	226	227	195
20°	133	137	129	122	114	110	110	113	121	155	169	177	148
10°	84	90	78	67	61	58	57	58	63	80	92	102	81

When some N-values are zero, no specular reflections of this stream under the given conditions can be observed. The best observing conditions occur for elevations of the radiant between 40° and 60°. Some communication setups try to take advantage of these maxima (hot spots).

The vertical antenna setup has the least sensitivity, but has other advantages in terms of constant observing conditions and minimizing interference.

4. Backscatter



The same program can also be used for backscatter (by putting $2D$ very small), or tracking (antenna direction is 90° from radiant, azimuth antenna = azimuth radiant + 180°). For an example, see Figure 4.

Figure 4 --- Example of tracking for the Perseids ($2D$ = 900 km, azimuth antenna = 270°) for an observer at 51°N and 4° E. Horizontally is the time in UT and vertically the observability function.

References

(1) Hines C.O., Pugh R.E., "The Spatial Distribution of Signal Sources in Meteoric Forward Scattering", *Can. J. Phys. 34*, 1956, pp. 495-544.

(2) Meeks, M.L., "On the Influence of Meteor-Radiant Distributions in Meteor-Scatter Communication", *Proc. IRE*, Dec. 1957, pp. 1724-1733.

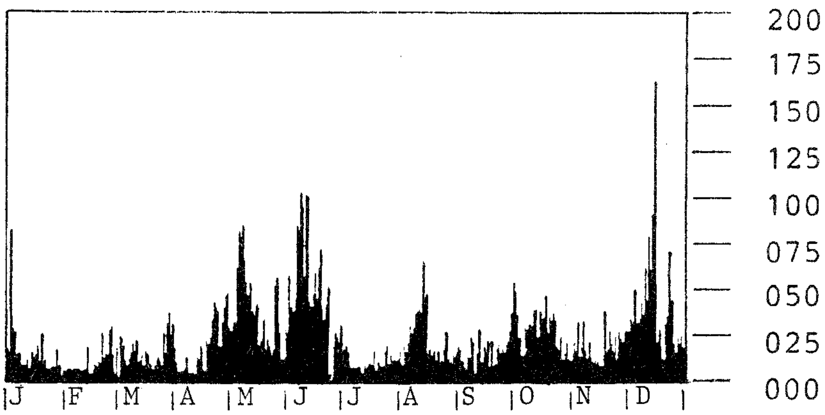
(3) McKinley D.W.R., "Meteor Science and Engineering".

(4) Nes H., "Dimension Technique for Meteor Burst Communication systems", *IEEE Proc. vol. 132 pt. F no. 6*, Oct. 1985, pp. 505-510.

Radiowork in Denmark

G.M. Kristensen

In 1986, Kristensen observed 34514 reflections, during daily observations which lasted at least 6 hours.



In 1986, I observed 4385 hours and registrated 34514 signals. I listen minimum 6 hours per day. Only 23-25 June and 8-9 September are lost. In the diagram, the maximum hourly rates for each day are plotted. The diagram corresponds very well with the small and major meteor showers.

My equipment consists of a SONY STR-VX10L stereo/FM-AM receiver with digital tuning. I use a 8-elements Yagi antenna (5 directors and 2 reflectors). The direction of my antenna is most of the time due south and 35° above the horizon. I listen on 100.50 MHz to 100.65 MHz. Most of the other frequencies are used by local radio stations.

About the Ursids

We received a few letters regarding the 1986 Ursid outburst.

Gary W. Kronk from Collinsville, Illinois, USA wrote: *Luc Gobin's detection of the Ursids was especially interesting. During my research on meteor showers I had noted that the largest outbursts of the Ursids had occurred in 1945 and 1973. This indicated a period of 14 years, which closely matched the 13.7 period of the Ursid's parent comet Tuttle; however, both outbursts came six years after that comet had passed perihelion! During early December I had alerted a few friends in my country as to a possible outburst. A few observations were aquired which confirmed the generally accepted view of a sharp increase in activity on the 22nd, but no observer confirmed my prediction of abnormal activity. Gobin's detection was a welcome sight. Gobin's observation has been included in my just completed book on meteor showers (it should be published before the end of the year).*

And *George Spalding*, Oxon, England, UK, wrote to us: *I have one more set of Ursid data for you. They are from Steven Phipps in Rugby, Warwickshire (52°.345 N, 1.287 W) and obtained on December 22-23, 1986:*

Period	T_{eff}	Lm	F	Urs	Spor	Tot
21^h59^m-23^h34^m	1.58	5.0	1.05	8	2	10
00 27 -00 32	0.08	5.0	2.00	0	0	0
00 42 -01 11	0.48	5.0	1.05	1	2	3

It is a pitty that so few observations were made anywhere after midnight UT, but I have a feeling that the good activity was probably all over by midnight. So far there has been silence from US observers, and this would accord with my hypothesis - unless you have heard otherwise. Observers in the USSR and eastern Europe should, however, have been well placed.

(continued from page 89)

Table 1 --- Magnitude distribution of the Quadrantids 1987 in Belgium

Obs.	Lm	−2	−1	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
GP	6.6	0	0	0	6.5	16.5	19	23	10.5	1.5	77	3.2
GT	5.7	0	0	0	0.5	2.5	2	0	0	0	5	2.3
PR	6.2	0	0	1.5	4	4	5.5	6.5	2.5	0	24	2.8
MG	5.2	1.5	0.5	1	3.5	2	3.5	4.5	1.5	0	18	2.2
PS	5.2	0.5	1.5	0	1.5	1.5	1.5	0.5	0	0	7	1.2

(continued on page 95)

The η-Aquarids in 1986

Australia

Jeff Wood

The results of the η-Aquarid watch in Australia are presented.

Poor weather greatly affected the 1986 Australian η-Aquarid watch. Although a huge project to monitor the stream had been planned, much of the month of May was cloudy in the areas of the country where our observers live. Observations therefore could only be made on 6 nights during the period of η-Aquarid activity. 13 people took part in the 1986 η-Aquarid watch. They were as follows:

Jeff Wood, Katrina Mitchell, Andrew Whitney, Peta Fitzgerald, Meeghan Clay, Ricky Maloney, Jeremy Nelson, Darren Anthony, Brian Macauley, John Goldsmith, Justin Whitney, Shane Smith, Robert McLaughlin.

Below are our observational results:

Table 1 --- ZHR-values of the η-Aquarids 1986

Date	Nr. Obs.	ZHR
May 01-02	2	14.35 $\pm$ 0.62
02-03	12	26.48 4.32
03-04	3	32.90 4.94
04-05	2	45.75 0.54
10-11	2	27.54 1.97
17-18	3	3.01 0.49

Table 2 --- Magnitude distribution of the η-Aquarids 1986 in Australia

Magnitude	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot
Number	6	3	5	11	20	36	75	81	64	32	8	341

The average magnitude was 2.46. For the meteors between -2 and +5, an r-value of 2.32 was obtained. 31.96% of the η-Aquarids had a train. All of these were of short duration with none lasting longer than 10 seconds. The following color distribution is for 156 η-Aquarid meteors of magnitude +2 or brighter:

Red:	1.28%	Orange:	4.49%	Green:	1.92%
Blue:	5.77%	White:	47.44%	Yellow:	39.10%

(continued from page 94)

Table 2 --- Magnitude distribution of the sporadics during the Quadrantids 1987

Obs.	Lm	-2	-1	0	+1	+2	+3	+4	+5	+6	Tot	$\bar{m}$
GP	6.6	0	0	1.5	7	12	17	16	17.5	3	74	3.4
GT	5.7	0	0.5	0.5	0	2.5	5	4.5	0	0	13	2.9
PR	6.2	0	1	0	0	1	0.5	3.5	3	0	9	3.5
MG	5.2	0	0	0	0.5	0.5	0.5	0.5	0	0	2	2.5

Brazil

Gilberto Klar Renner

The results of the η-Aquarid watch in southern and northeastern Brazil are presented.

The members of the União Brasileira de Astronomia (UBA) that live in Porto Alegre and Fortaleza, respectively in southern and notheastern Brazil, observed once more the η-Aquarids. The observations were obtained by groups of two or more participants working in a same site. Only on May 3 and 4, groups of observers in southern Brazil observed in different sites. Though all persons made magnitude estimations only those of four of them were used. 24.30% of these meteors showed trains. The brightest η-Aquarid appeared on May 5 in Sagittarius and Scorpius and had a magnitude of -3.

The participants were:

Southern Brazil: Darlan Morais (DM), Clarice Azevedo Machado (CAM), Luis Antonio da Silva Machado (LASM), Luiz Augusto Leitão da Silva (LALS), Onofre Dácio Dalávia (ODD), Luís Antonio Reck de Araújo (LARA), Hilário José Nunes (HJN), César Augusto da Silva Sommer (CASS), Gilberto Klar Renner (GKR).

Northeastern Brazil: Plínio Coelho de Araújo (PCA), Eddie William de Pinho Santana (EWPS), Edísio Oliveira Rocha (EOR).

Table 1 --- The η-Aquarids 1986 in southern and northeastern Brazil[1]

Date (UT)	Obs.	Period (UT)	T_{eff}	Lm	Aq	ZHR		Spor
May 01	DM	07^h00^m–08^h45^m	1.50	5.25	2	6.9	± 4.8	8
	LALS	08 15 -08 45	0.50	5.15	1	9.2	± 9.2	3
	GKR	07 00 -08 00	1.00	5.10	1	6.7	6.7	10
	HJN	07 00 -08 45	1.50	5.15	4	15.2	7.6	10
	LARA	07 00 -08 45	1.50	5.00	5	21.4	9.9	12
	LASM	07 00 -08 45	1.50	5.30	3	9.9	5.8	11
May 02	LALS	07 00 -08 30	1.50	5.25	4	13.6	6.9	14
	DM	07 00 -08 30	1.50	5.30	4	12.9	6.4	10
	LASM	07 00 -08 30	1.50	5.25	7	23.7	9.0	11
May 03	LALS	06 45 -08 45	1.75	5.10	11	38	12	6
	GKR	06 45 -08 45	1.75	5.20	12	38	11	9
	LASM	06 45 -08 45	1.75	5.20	14	45	12	14
	CAM	06 45 -08 45	1.75	5.15	13	43	12	5
	CASS	06 30 -07 30	1.00	5.05	5	37	17	8
	HJN	06 45 -07 30	0.75	5.15	3	30	17	2
	LARA	06 30 -07 30	1.00	5.20	8	58	20	9
May 04	GKR	07 00 -08 53	1.63	5.50	24	56	11	9
	DM	07 00 -08 53	1.63	5.50	28	66	12	9
	LASM	07 00 -08 53	1.63	5.50	39	91	15	17
	CAM	07 00 -08 15	1.25	5.50	14	49	13	6
	ODD	06 30 -08 45	1.85	5.45	23	50	10	75
	LALS	06 30 -08 45	2.00	5.45	15	29.9	7.8	16
May 05	GKR	06 15 -09 00	2.50	5.50	42	77	12	19
	DW	06 15 -09 00	2.50	5.50	56	103	14	12

[1]The ZHR-values were computed by the editor using r = 2.3 as to allow comparison with the results communicated by Jeff Wood.

Date (UT)	Obs.	Period (UT)	T_{eff}	Lm	Aq	ZHR		Spor
May 05	LASM	$06^h15^m-09^h00^m$	2.50	5.50	69	127	± 16	28
	CAM	06 15 -09 00	2.50	5.50	51	94	13	12
	PCA	06 15 -07 45	1.40	5.50	27	68	13	12
	EWPS	06 15 -07 45	1.40	5.50	24	60	12	6
	EOR	06 15 -07 45	1.40	5.50	21	53	11	6
May 06	EWPS	06 10 -07 30	1.21	5.50	19	57	13	15
	EOR	06 10 -07 30	1.21	5.50	20	60	14	15
	PCA	06 10 -07 30	1.21	5.50	26	79	18	18
May 07	PCA	07 15 -07 40	0.86	5.50	15	57	15	10
	EWPS	07 15 -07 40	0.86	5.50	8	30	11	9
May 08	GKR	06 30 -07 30	0.95	6.25	20	57	13	12
	LASM	06 30 -07 30	1.00	6.25	22	60	13	22
	DM	06 30 -09 00	2.50	6.15	72	64.1	7.6	33
	CAM	06 30 -09 00	2.50	5.90	55	60.3	8.1	46
	ODD	06 30 -09 00	1.80	6.25	54	61.4	8.4	87
	LALS	08 00 -09 00	1.00	5.95	22	51	11	10
May 11	ODD	07 45 -09 00	1.12	6.20	28	43.9	8.3	62
	LALS	07 45 -08 45	1.00	6.25	20	34.8	4.5	16

Table 2 --- Magnitude distribution of the η-Aquarids in Brazil

Magnitude	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	Tot
η-Aquarids	0	0	1	0	3	66	123	161	109	55	2	520
Sporadics	4	0	0	1	5	34	70	123	118	100	2	457

For the meteors brighter than +2, the following color distribution was deduced:

Yellow	54.41%	Blue	4.68%	Green	0.28%
White	39.51%	Orange	1.12%		

Observational Results

Finland - November and December 1986

Teemu Hankamäki

Below are theFinnishobservations of the Orionids, Taurids, Leonids and Geminids in November and December 1986.

During November and December 1986, 549 meteors were recorded, among which 1 Orionid, 3 Leonids, 32 Taurids and 233 Geminids. The mean magnitude for the Geminids was 2.12. The observers were:

Ismo Luukkonen (IL), Marko Riikonen (MR), Markku Nissinen (MNi), Teemu Hankamäki (TH), Leo Rajala (LR).

On the next page, the results of these observations are given.

Table --- Finnish observations of Orionids, Leonids, Taurids and Geminids

Date	Obs.	Period	T_{eff}	Lm	F	O/L	Tau	Gem	Spor
Nov 03-04	IL	18^h56^m-21^h16^m	2.30	6.35	1.00	1	7	0	22
03-04	MR	17 27 -20 18	2.70	6.30	1.00	0	9	0	11
03-04	MNi	20 31 -21 53	0.95	5.34	1.25	0	1	0	2
07-08	TH	16 10 -18 00	1.62	5.90	1.05	0	3	0	10
09-10	TH	16 05 -17 15	1.12	5.50	1.03	0	3	0	7
11-12	LR	15 20 -16 45	1.32	5.82	1.00	0	2	0	12
12-13	LR	00 50 -03 00	2.05	6.24	1.00	3	8	0	26
03-04	TH	16 05 -17 30	1.05	6.00	1.05	0	2	0	8
Dec 02-03	LR	17 00 -18 30	1.43	6.00	1.11	0	1	0	10
04-05	IL	20 33 -21 25	0.80	6.20	1.11	0	0	1	7
06-07	IL	20 40 -23 36	2.65	6.25	1.11	0	0	7	32
06-07	IR	01 55 -04 30	2.45	6.27	1.00	0	0	9	46
11-12	MR	20 30 -04 01	7.22	5.74	1.00	0	0	50	56
13-14	MR	22 05 -05 07	6.93	5.55	1.00	0	0	167	26

Canada - Taurids and Geminids 1986

Peter Brown

Below are the results of Canadian meteor observations between November 15 and December 15, 1986.

Observing over this last month has been quite good. Although the Leonids were missed altogether this loss was definitly offset by a fantastic Geminid peak night.

Starting off the period, besides losing the Leonids, November 21 was clouded out and I did not get the chance to check and see if any meteors were produced from the Monocerotid stream which was seen to be active at this time period last year. Future years may be more productive, as it now appears likely that Olivier's 10 year period for this shower has been confirmed I probably would not have caught too many shower members anyway.

The first session I had in this period occured on November 28-29 at the dark site near Maqua lake. Under a moonless sky, the limiting magnitude dropped to below 6.0, even with mild auroral interference to the North. This session went on for six non-stop hours, tying my previous record of six hours. Activity that night was mainly provided by the Taurid complex, which was still producing fair rates. In the last hour of the session I obtained the highest Taurid rate of the year, 5 Taurids in one hour between 07^h25^m-08^h25^m UT. Fittingly enough these were also my last Taurid members for 1986.

Weather prevented any more observing for the remainder of November, and the first part of December. However I geared up for the Geminid peak, even though it would be under heavy moon conditions. The 12-13 turned out to be much of a bust with observing confined to my backyard under a limiting magnitude of 4.2, my worst Lm hourly count in 1986. Much of this was contributed by high clouds, which scattered the already bright Moonlight. Even so I managed to catch 8 mets, 6 of them Geminids.

The 13-14 started off looking great, and for a change stayed that way. We headed out to the dark site at about 9:30 p.m. local time and arrived in time to start counts at 10:40 p.m. local time. At the onset of the session it became clear that even the bright Moon could not hide the splendor of the Geminid peak, with hourly combined counts of Gems and sporadics reaching as much as 33 on this night.

My peak Geminid rate came from 07^h40^m-08^h40^m UT with 28 being seen in that hour. At 11^h15^m UT I was treated to a -5 Geminid falling right out of the radiant. It was a wonderfully beautiful shade of blue, and last 0.6 seconds. It was also one of the few Geminids that left a train. Unfortunately due to moonlight and poor limiting magnitude conditions, mean magnitudes for this year are very unreliable, as are magnitude distributions for the Geminids.

This session was a record setting session all around. It was my longest session ever, lasting 6.5 hours, and also produced the greatest number of meteors I have ever seen in one session: 194. As well it nearly tripled the number of Geminids I had seen in total, compared to last year.

Table 1 --- Hourly counts November 15 - December 15, 1986.

Date	Period (UT)	T_{eff}	Lm	F	Tau	Mon	Gem	Spor
Nov 28-29	02^h25^m-03^h25^m	0.96	6.1	1.0	2	0	0	3
28-29	03 25 -04 25	0.99	6.1	1.0	0	0	0	10
28-29	04 25 -05 25	0.93	6.0	1.0	0	0	0	10
28-29	05 25 -06 25	0.99	6.1	1.0	2	1	0	7
28-29	06 25 -07 25	0.96	6.1	1.0	1	0	0	8
28-29	07 25 -08 25	0.92	6.0	1.0	5	0	0	10
Dec 12-13	06 26 -07 26	0.98	4.2	1.7	0	0	6	2
13-14	05 40 -06 40	0.98	4.9	1.0	0	0	26	1
13-14	06 40 -07 40	0.93	4.9	1.7	0	1	16	3
13-14	07 40 -08 40	0.96	4.8	2.0	0	0	28	5
13-14	08 40 -09 40	1.00	4.7	2.5	0	0	23	10
13-14	09 40 -10 40	0.88	4.7	2.5	0	0	20	10
13-14	10 40 -11 40	0.97	4.9	1.2	0	1	22	7
13-14	11 40 -12 40	0.49	4.9	1.0	0	0	15	4

Table 2 --- Magnitude distribution of the Geminids.

Magnitude	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	Tot
Number	1	0	2	4	9	21	18	46	40	15	156

The mean magnitude of these Geminids was 1.69. 4.5% of them had a train. Of the meteors of +2 and brighter, the following colors were noticed:

White:	25.7%	Orange:	20.0%
Yellow:	39.0%	Blue:	17.1%

All sessions were held at Maqua lake (56°23'26" N, 111°16'23" W) except the 12-13 session which was held in Fort. Mcmurray (56°43' N, 111°26' W).

When all the stars are falling down
Into the sea and on the ground,
And angry voices carry on the wind,
A beam of light will find your head
And you'll remember what's been said
By all the good men this world's ever known,
Another man is what you'll see,
Who looks like you and looks like me,
And yet somehow he will not feel the same,
His life caught up in misery, he doesn't think like you and me,
'Cause he can't see what you and I can see.

"Melancholy Man", Mike Pinder

The First Norwegian Meteor Camp

Trond Erik Hillestad

The first Norwegian meteor camp was held in Kristiansand during the Perseids in 1986. Ten Norwegian amateurs participated during a week with clear skies most of the time. The meteor camp was a success, and a new one is planned for August 1988.

Norwegian amateur astronomers face several problems. One problem is the geographical distance between them, which is often very large. They seldom get to see each other, there is little exchange of experience and observational results. Many amateurs pay little attention to astronomy. Interest in astronomy has always been rather low in Norway, and there are few people to join the existing amateurs.

It is far more interesting to work in group compared to observe alone since it is possible to discuss problems, improve observing methods etc. The successful meteor camps and gatherings that have been arranged in mid- and southern Europe throughout many years inspired us to arrange a camp during the Perseids in 1986. One of the goals was to bring people interested in astronomy together. The preparations for the meteor camp started in April.

One of the problems we had to face during the preparations for the camp, was the high northern latitude of the country; Norway is situated between 58° and 71°N. This implies very short summer nights. Even at 58°N, one can observe only four hours around mignight in mid-august. This time is reduced to three hours at 60° N (including faint dusk in the north). Serious observing (with limiting magnitude of 6.0 or better) cannot be carried out north of 63° N. At 68° N, stars are hardly visible at all, the sun being only 6° below the northern horizon at midnight. Consequently, the camp had to be arranged in the southernmost parts of Norway.

Kristiansand was chosen for the meteor camp. It is a city at the sunny south coast of Norway, and a very popular place to spend the summer holiday. The population is around 50 000 and the majority of all the people (and astronomers!) can be found within some 500 km. The city is located at 58°.2 N and 8°.0 E. The meteor camp started on Saturday, August 9, and lasted one week.

A total of ten amateur astronomers participated at the meteor camp: Finn Gundersen, Kai Gaarder, Lars Trygve Heen, Geir Jakobsen, Terje Larsen, Tor Vidar Lian, Torstein Sandvik, Kai Stokkeland, Magne Svanemsli and the author. Some of them could only stay for a day of two, but most people joined the camp for the whole week. Four of us lived in a cabin at a camp site. Practical problems were solved in the cabin. Discussions also took place in the cabin. Two persons lived at other places, while the rest (4) lived in Kristiansand. These four helped selecting observing sites, and provided transportation from the camp site to the observing site. Assistance from local amateurs was a necessity for the camp, since many of us travelled to Kristiansand by train, and were not familiar with local observing sites.

The meteor camp was a great succes in many ways. It was very important to talk to other meteor workers. We were able to discuss problems, theories, views, exchange results and experience, learn about each other's observing routines and together improve them. A few small lectures were held by the author: "Introduction to Meteor Astronomy and Meteor Observations" (including photographical techniques and the use of a cassette recorder), "Fatigue in Visual Meteor Observing" (from *WGN 13:3*), "The Effect of Lm, Cloud Cover and Radiant Distance on Hourly Rates", "How to Calculate Lm, Cloud Cover, Hourly Rates (but not ZHR), Magnitude distributions", etc. We could of course have arranged more lectures, and had higher level in them. However, most observers in Norway are rather inexperienced. "Professional amateurs" are rare. Thus, we never wanted to make any advanced project. The camp was ment to be a holiday camp for people with interest in astronomy and meteors, not a professional arrangement with a dense schedule for each day. This is probably why it was so successful. I believe all participants enjoyed the unformal atmosphere of the meteor camp.

Observations were carried out during the nights from 9-10 to 13-14 of August. All nights had clear skies, except 10-11 which had some clouds. Most observers had an individual limiting magnitude of 6.1 up to 6.3. According to our results, the Perseids had a very respectable display in 1986. At midnight, August 12-13, several observers counted 70 till 90 Perseids per hour (the record was 112!). Four amateurs had cameras: 450 pictures were taken during a total exposure time of 52.4 hours. Fourteen possible meteors have been found on the films. Visual results: 9 observers, 66 hours of effective observing and 3700 magnitude estimates. This gives the best total ever for the Perseids in Norway. Previous years have given between 300 and 1000 meteors visually, and some 0-20 photographed meteors. The results are briefly described in the tables below. A more detailed report on the Perseids is available on request (author's address on inside of back cover).

Table 1 --- Visual results of the Norwegian meteor camp

Date	Nr. Obs	T_{eff}	Pers	κ-Cy	Spor	Tot.
Aug 09-10	5	11.3	120	3	92	215
10-11	3	3.2	48	4	20	72
11-12	5	13.8	469	24	185	678
12-13	6	20.9	1406	38	286	1730
13-14	5	16.8	757	46	204	1007
Total	7	65.9	2800	115	787	3702

Table 2 --- Overview of the photographic results of the Norwegian Meteor camp

Date	Nr. Cam	Exp. Time	N	Date	Nr. Cam	Exp. Time	N
Aug 09-10	3	5.4	2	Aug 12-13	6	17.3	2
Aug 10-11	2	3.0	1	Aug 13-14	4	10.9	1
Aug 11-12	6	15.8	8	Total	7	52.4	14

A total of seven cameras were at our disposal. There was simultaneous photographing from the meteor camp and three other sites. Unfortunately, we were hampered by dew on the camera lenses. Daytime temperatures (southern Norway) are typically around 20°C-30°C. At night, temperature drops to 5°C-10°C, resulting in an air humidity well above 100%. We have tried several ways to prevent formation of dew. Most of them did not work. The only solutions seem to be using a rotating shutter with "twisted" blades in order to create turbulence in front of the lens, or heating the front filter on the lens by electric equipment.

A new meteor camp is being planned for the maximum of the Perseids in 1988. The camp will last one week, and we shall stay in Kristiansand. Local astronomy groups in other cities will be asked to observe visually and to participate in simultaneous photography. Swedish and Danish meteor workers are hereby invited to join in our photographic efforts.

Please send your contributions for the August-issue of WGN to Marc Gyssens (see address on inside of back cover). They should reach him no later than June 20 (instead of July 1, due to summer holiday arrangements).

Where to observe in the Haute-Provence?

Paul Roggemans

Sky conditions are excellent in the Haute-Provence, in the South-East of France. Alternatives to find a place to stay suited for (meteor) observation are discussed.

Puimichel; it became famous for its excellent sky conditions for meteor observations. Indeed the Haute-Provence, a region in the southeast of France is a favorite area for European astronomers because of the exceptional large number of transparant dark nights each year. The region is well protected from Atlantic depressions and perturbations covering most parts of Europe. It is surrounded by mountains and these geological obstructions guarantee excellent sky conditions. A house was bought by two Belgians in 1982 to build an observatory where amateurs could stay. Plans were made, observations were carried out in very primitive circumstances. Hope grew among scientific minded amateurs to be able to work along observing programs on variable stars, comets, meteors. A project on photometric work and a meteor observatory were planned. Unfortunately Puimichel became popular among ordinary visitors and tourists. An observing program in the summer of 1986 was frequently disturbed by these people. The visitors often requested the observers to give some explanations about their work. Popularization is not our aim during such observing programs and we thus regret that observers are expected to be helpful to the public. It seems that Puimichel becomes a public observatory and thus of little use for amateur observations. We are afraid that these problems will get worse in the future so we tried to find another possibility to stay in the Haute-Provence, to escape from the disturbance by the public. A French organization offers hundreds of houses available for one or two weeks. It is rather inexpensive to rent these and many of them are excellent residences for astronomical activities. The houses are complete with kitchen, dining room, sleeping rooms, bathroom etc. for 3 up to 8 persons. The advantages of this alternative are:

- very cheap: your stay will cost less than 50% of a stay in Puimichel;
- very comfortable;
- you will not be disturbed by visitors or other residents.

The disadvantages are:

- you have to prepare your meals by yourself, compensated by the extremely low price of your stay;
- you need a car: it is much cheaper to drive south by car with three persons in one car (50% of the price by train);
- telescope users have to bring along their own instrument, but this guarantees the availability of a telescope.

As long as Puimichel is overbooked by tourists, amateurs may save their observing facilities and continue to execute observing in the Haute-Provence. Plans for a meteor observatory or photometric work in Puimichel were cancelled. Information on the available residences can be obtained from:

Maison du Tourisme
Le Rond Point
F-04000 Digne
France
tel. (33)92 31 52 39

We advise you to make arrangements with other amateurs, as to go south with a group of 3 to 8 observers!

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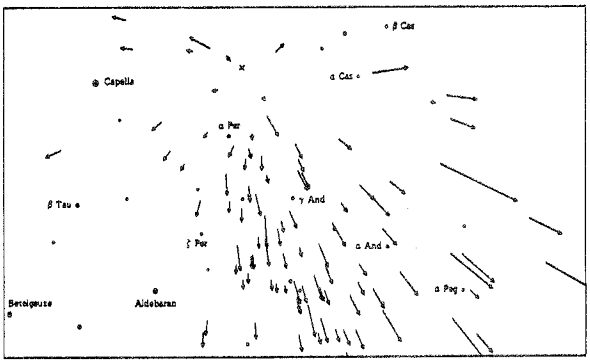

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To all meteor observers who want to enjoy meteor showers at the perfect sky in Southern France :

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- 1987 October 17 - 24 ; to observe the Orionids
- 1987 December 10 - 26 ; to observe the Geminids and Ursids

People who want to participate are invited to contact me, depending upon the number of participants I'll make the necessary arrangements. Costs of the stay will be very inexpensive , don't hesitate and confirm your participation as soon as possible.

Paul Roggemans.