Ongoing meteor work

The Capricornids in 1984

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Dutch observations of the Capricornids from 1984 to 2003 are presented and analysed. It is concluded that the 1984 Capricornids were brighter and more numerous that the other years.

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1 Introduction

In 1984 three meteor observers of the Dutch Meteor Society, Carl Johannink (JOHCA), Koen Miskotte (MISKO) and Bauke Rispens (RISBA) stayed in Puimichel, Southern France from 22 July until 5 August. It was the very first observing project for which Dutch observers travelled to a region with more favourable weather than what they were used to in the Netherlands. They stayed at the holiday observatory of Danny Cardoen and Arlette Steenmans in those days. Considerable numbers of meteors were observed at that place according to Dutch standards. In about ten nights of clear sky over 4000 meteors were raked in. Most striking then were the Capricornids: with a maximum ZHR of about 10 and a good number of bright shower members absolutely worth the efforts. As it was the very first time that this shower was observed by DMS members from more southern latitudes, Rudolf Veltman (1984) assumed this was a normal Capricornid display. However, later observations from southern locations in 1985, 1986, 1990, 1991, 1993, 1994, 2001 and 2003 indicate that in 1984 there was something unusual happening. Koen Miskotte observed this shower from even more southern latitudes than in Puimichel, like the Greek islands Chios (2001) and Crete (2003). Furthermore Carl Johannink observed end July in 1994 and 2001 from Toscana, Italy. At these later returns only a fraction of the 1984 Capricornid numbers was recorded. When this article was written some more data turned up with the observations of Paul Roggemans of July 1984. The ZHR values calculated for these observations were used in this paper too.

Since Koen proclaims since years that the 1984 Capricornids were very special, although never documented with facts, it is time to take a closer look.

Figure 1 – The Dutch observers in Southern France July 1984: from left to right Carl Johannink, Marcel Lücht, Koen Miskotte and Bauke Rispens.

2 Summary of observations of past decades

2.1 1984

In 1984, three observers managed to observe the Capricornids in the period 22 July till 5 August. Most remarkable were the number of bright Capricornids, including some beauties of −4, −4, −5 and −8! Especially the −8 fireball was spectacular. This moved from the constellation Aries slowly to the Pleiades where it disappeared after a bright −8 end flare. Especially the build-up towards the maximum attracted attention as it was rich in (sometimes very) bright meteors. After the maximum the shower was to some extent less abundant in bright meteors. During the same year Paul Roggemans observed two nights at the Keys in Florida, USA. Although the sky conditions for these observations were less good as for those made in Puimichel, Southern France, they fit well together. At the same time several bright Capricornids were reported from the Netherlands and Belgium. Unfortunately the radiant remains too low above the horizon seen from these countries and therefore the correction factors are too large for the ZHR calculations.

2.2 1985

Encouraged by the success of 1984 the complete meteor observing team 'Delphinus' from Harderwijk, the Netherlands, landed in Puimichel in 1985: Arjen Grinwis (GRIAR), Robert Haas (HAARO), Koen Miskotte and Bauke Rispens. Between 6 and 22 August over 8000 meteors were counted. Most nights were clear, but some were a bit hazy. Because these observations were made after the maximum of the Capricornids, these datasets were not included in this analysis. Compared to 1984 the number of Capricornids was very disappointing. At that time we attributed this to the fact that we were observing far too long after the maximum.

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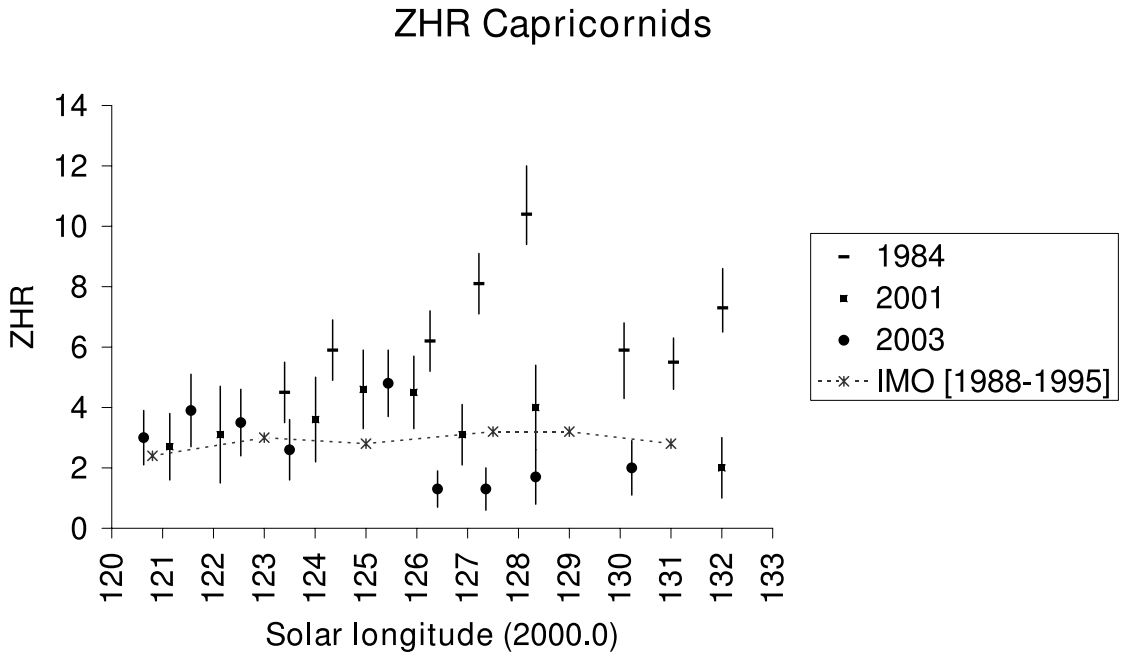

Figure 2 – Capricornid ZHRs for the years 1984, 2001 and 2003.

2.3 1986

The same goes for 1986 when MISKO and RISPA visited Puimichel again, then between 3 and 16 August. Also that year disappointing numbers of Capricornids were recorded. Also the observations of the Belgian meteor observer Paul Roggemans done from 25 July onwards that year listed very few Capricornids.

2.4 1990, 1991

Marco Langbroek (LANMA) visited Puimichel in 1990 and 1991. During the nights of 20, 21, 22 and 25 July 1990 some 6.5 hours were observed with as few as 3 Capricornids as a result. Unfortunately this is too few data for any serious analyses. In the period of the nights of 4–5 until 12–13 August 1991 Marco observed 8 Capricornids with a mean magnitude of 2.80, the brightest one being +2. Note that these observations were done after the maximum and the number of meteors is too small to enable any valid statistics.

2.5 1993

Rognes, Provence, Southern France. Because of the expected Perseid outburst on 11 August the observations took place in Southern France. Between 7 and 14 August very little was seen of the Capricornids. Also these observations are not included in the analyses.

2.6 1994

Toscana, Italy. JOHCA observed a few nights end of July and begin of August and recorded almost no Capricornids. Unfortunately too few Capricornids were seen to get any reliable data.

2.7 2001

In 2001 MISKO made observations on the Greek island Chios between 22 and 31 July. During 8 nights over 800 meteors were recorded. The Capricornids displayed a low activity and only few bright shower members were seen (the brightest was −2). JOHCA also observed that year again from a southern observing site (Toscana, Italy) and recorded low numbers too. From both observers data was used in this analysis.

2.8 2003

In 2003 MISKO observed from Southern Crete. Between 22 July and 3 August well over 1400 meteors were seen. It was noticeable that during the build up towards the maximum some more bright Capricornids were seen (just like in 1984) but the activity level didn't get up to the 1984 level.

3 Comparing ZHRs of 1984 with 1994, 2001 and 2003

In this analysis the observations of 1984 were reconsidered. This was done before by Rudolf Veltman (1984), but at that time the personal perception coefficient cp of the observers wasn't yet taken into account and the observations of Carl Johannink weren't included in the analyses. The ZHR was determined with the method described in the DMS visual book 1988. The standard deviation of the individual ZHR values was derived as $\mathrm{ZHR}/\sqrt{n}$ From the magnitude distribution of the meteors observed by MISKO, RISBA and JOHCA population index values r of respective 2.40 , 2.59 and 2.53 were derived. For the ZHR calculations of the Capricornids in 1984 the r-value was assumed to be 2.50. This is also the value mentioned in the handbook for visual observations of IMO (Arlt et al., 1995). The computed ZHR values are reproduced in Table 1. Table 2 lists the results for ROGPA from the Florida Keys (USA). These values agree very well with the results from Southern France, except for one data point. His magnitude distributions show that relatively many bright shower mem-

Table 1 – 1984 Capricornid ZHRs for MISKO, RISBA and JOHCA.

$\lambda_\odot$	ZHR	
(eq. 2000)	Mean	σ
120.00	2.0	1.0
123.40	4.5	1.0
124.34	5.9	1.0
126.26	6.2	1.0
127.22	8.1	1.0
128.16	10.4	1.6
130.08	5.9	0.9
131.05	5.5	0.8
132.02	7.3	1.3

Table 2 – 1984 Capricornid ZHRs for ROGPA.

$\lambda_\odot$	ZHR	
(eq. 2000)	Mean	σ
123.67	10.8	4.4
123.74	7.7	3.4
126.51	11.5	3.3
126.62	3.2	1.9

bers were recorded (+2 or brighter up to −4).

For comparison the ZHR values of the Capricornids according to IMO based on 1625 observations from the period 1988 – 1995 are listed in Table 3 (Arlt et al., 1995).

Table 3 – 1988–1995 Capricornid ZHRs according to IMO.

$\lambda_\odot$	ZHR	
(eq. 2000)	Mean	σ
120.8	2.4	0.3
123.0	3.0	0.3
125.0	2.8	0.2
127.5	3.2	0.2
129.0	3.2	0.2
131.0	2.8	0.2

It occurs immediately that the ZHR values recorded in Puimichel in 1984, are about twice as high as the averaged ZHRs of IMO for the entire observing interval. The ZHR values for the observations of 2001 and 2003 by MISKO from Crete and the 2001 observations of JOHCA from Toscana are also calculated. These are listed in Table 4 for 2001 and in Table 5 for 2003. It is clear that a maximum ZHR of about 5 is found, about half of the value for 1984!

For all ZHR values of the years 1984, 2001 and 2003 as well as for the average ZHR values of the IMO a graph has been created (Figure 2). This shows in one view that the Capricornids in 1984 were an exceptional appearance.

For the datasets of 1984, 2001 and 2003 magnitude distributions were derived. For the years 2001 and 2003 only data for MISKO was used because JOHCA recorded rather too few Capricornids these years. The magnitude distributions were limited to the interval −2, +5, the observing conditions were compatible (Table 6).

Table 4 – 2001 Capricornid ZHRs for MISKO and JOHCA.

$\lambda_\odot$	ZHR	
(eq. 2000)	Mean	σ
120.10	4.0	1.3
121.14	2.7	1.1
122.13	3.1	1.6
124.01	3.6	1.4
124.95	4.6	1.3
125.94	4.5	1.2
126.89	3.1	1.0
128.34	4.0	1.4
132.00	2.0	1.0

Table 5 – 2003 Capricornid ZHRs for MISKO.

$\lambda_\odot$	ZHR	
(eq. 2000)	Mean	σ
120.63	3.0	0.9
121.56	3.9	1.2
122.54	3.5	1.1
123.50	2.6	1.0
125.44	4.8	1.1
126.41	1.3	0.6
127.36	1.3	0.7
128.34	1.7	0.9
130.23	2.0	0.9
132.00	2.0	1.0

4 Conclusion

From these data it is obvious that the average magnitude of the Capricornids varies from one year to the other. Of these three years 1984 shows the brightest average magnitude. Furthermore the meteor shower displayed most of the meteors brighter than −2 in 1984. The conclusion therefore is that this meteor stream outnumbered other years in quantity but also surpassed them in quality.

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Table 6 – Magnitude distributions for 1984, 2001 and 2003.

Year	Averaged Capricornid magnitude
1984	2.84
2001	3.36
2003	3.01

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