DMS results of the 2004 Perseids

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Abstract

In this article we present the results of visual and image intensified video observations on the Perseids of August 11/12 2004 by members of the Dutch Meteor Society (DMS). Using these techniques we can confirm higher activity of faint Perseids at 21 UT. The Perseids showed up with many bright meteors later that night, untypical for a normal return of this stream.

Picture 1: Romke Schievink is aiming his video system.

Introduction

Based upon predictions by Lyytinen et. al. [1] observers of the Dutch Meteor Society spread out over several parts of Europe to get the best chance to observe this years Perseid return.
One team consisting of Rita Verhoef, Koen Miskotte, Romke Schievink and Carl Johannink profited from clear spells in the southwestern parts of Germany during 11/12. After some last checks of the weather on the morning of August 11th, they travelled to the small village of Britzingen about 30 km south of Freiburg. An image intensified video camera setup was operated by this team.
Another team consisting of Casper ter Kuile, Jos Nijland and Arnold Tukkers joined the Romanian Society for Meteors and Astronomy, SARM (Valentin Grigore et al.) observing from Darmanesti and Corbasca. Image-intensified video systems were operated from both stations.
In the Netherlands, at least part of the night was clear too, so a third set of video data was gathered from Biddinghuizen (the Netherlands) by Robert Haas and Marco Langbroek.
Successfull double station photography was conducted from Spain by Hans Betlem and Jean-Marie Biets.
This article deals with the video and visual results obtained by all these DMS-observers spread over Europe.

Visual

The observers who's visual data from the night 11/12 August were used for further reduction are mentioned in table [1].

Table 1 : DMS observers active on 11 august 2004

Observer		Location	EL	NL	IMO code	Teff	Nper	Nother	Ntotal
Jean Marie	Biets	Aznalcazar, Spain	-5,2	37,2	BIEJE	7.61	183	29	212
Sietse	Dijkstra	Poio, Portugal	-8,2	37,2	DIJSI	5.35	335	28	363
Carl	Johannink	Britzingen, Germany	7,4	47,5	JOHCA	5.25	251	70	321
Marco	Langbroek	Biddinghuizen, the Netherlands	5,4	52,2	LANMA	3.61	182	41	223
Koen	Miskotte	Britzingen, Germany	7,4	47,5	MISKO	5.00	359	83	442
Remco	Scheepmaker	Lattrop, the Netherlands	7,0	52,4	SCHRE	4.74	211	29	240
Alex	Scholten	Bussloo, the Netherlands	6,1	52,2	SCHAL	5.33	174	32	206
Peter	Van Leuteren	Lattrop, the Netherlands	7,0	52,4	LEUPE	4.90	232	26	258
Daniel	Van Os	Lattrop, the Netherlands	7,0	52,4	OSVDA	5.08	274	35	309
Michel	Vandeputte	Reillane, Provence, France	5,7	44,0	VANMC	7.16	624	95	719
Rita	Verhoef	Britzingen, Germany	7.4	47.5	VERRI	5.33	263	47	310
Total	**11 observers**					**59.36**	**3088**	**515**	**3603**

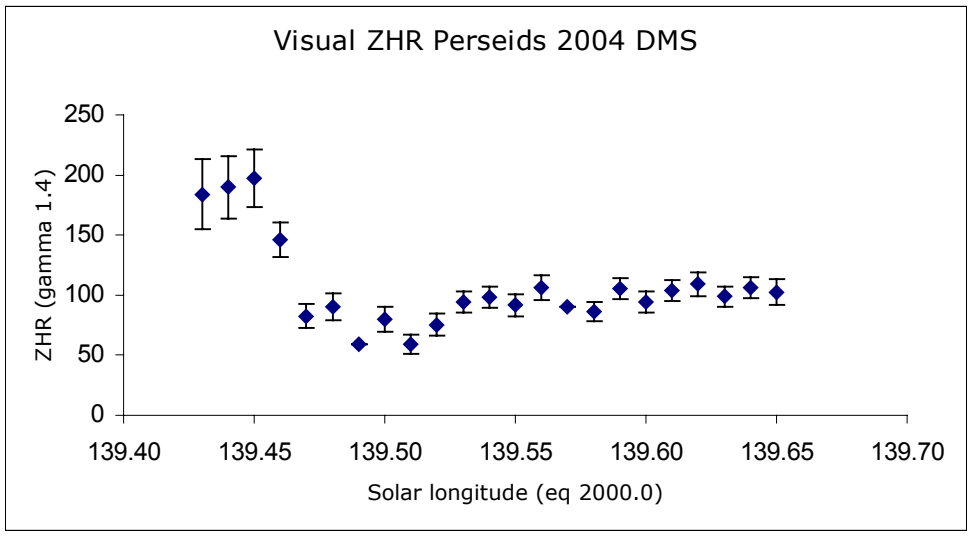
We calculated ZHR's using periods of 15 minutes and the well known formula

$$ZHR = n * (\sin h)^{-\gamma} * r^{(6.5-LM)} * Cp^{-1} / Teff \quad (1)$$

With γ taken as 1.4 (Jenniskens 1994) [2].
When the Cp of an observer was undefined, we used Cp = 1.

In figure [1] the results are plotted. It can be seen that around solar longitude 139.44 (2000.0) the ZHR of the Perseids is two to three times above the normal level for this solar longitude (Jenniskens 1994).

Figure 1 : ZHR of the 2004 Perseid outburst as observed by DMS.



After solar longitude 139.45 there is an abrupt decline back to normal activity. However, we want to emphasize that the radiant of the Perseids was below 30 degrees for all observers (unfortunately no visual data are available from Tukkers / Nijland in Rumania; see video). Besides that, all observations from the Netherlands had to deal with astronomical twilight until at least 21:45 UT (139.47 degrees).

Some observers in the Netherlands were not quite convinced about higher activity while, on the opposite, for their foreign-based DMS-colleagues higher activity was immediately very obvious.
When we remember that the 'peak' mainly contained of faint meteors, it is clear that observers in the Netherlands simply missed most of them because of twilight.

Some observers saw higher activity of the Perseids at solar longitude 139.6 too, as mentioned by Rainer Arlt [3].

Population index

The observers were surprised by the occurrence of numerous bright Perseids after 22 UT, making this night a very worthwhile one to observe. We split up the visual results in two periods: before 22:00 UT, and after.

In table [2] we present the calculated population index (using the magnitude interval [-2;5]) for these periods for two 'types' of observers : 'Dutch' and 'German'.

Table 2: Population index Perseids 2004 as observed from the Netherlands and Germany

Period <= 22 UT	R:	Period >= 22 UT	R:
RD	3.01	RD	2.35
RNL	2.40	RNL	2.11
Difference	0.61	Difference	0.24

From this table we see a great difference in 'r' between 'Dutch (NL)' and 'German (D)' observers before 22:00 UT. The fact mentioned above, that twilight made it impossible for most Dutch observers to see the 'peak' in full strength, could explain this difference.

After 22:00 UT the difference is much smaller, with 'r' around or even a bit below normal (i.e. brighter meteors) and clearly below the values observed prior to 22 UT.

Video

As mentioned earlier video observations were conducted from three different locations in Germany, Romania and the Netherlands listed in table [3].

All observers at these stations made use of image intensified video systems of which the technical characteristics are described in table [4].

Picture 2: some Perseids captured with the video system of Romke Schievink

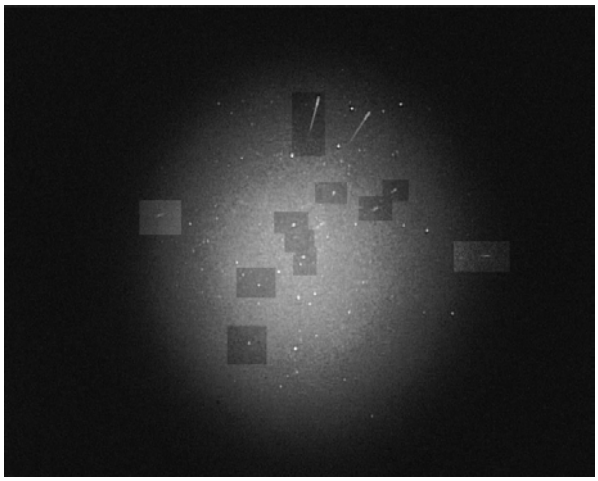


Table 3 : stations at which image intensified video systems were operated and essential astronomical data in the Perseids campaign during 11/12 august 2004

Station	**Biddinghuizen**	**Britzingen**	**Corbasca**
Country	The Netherlands	Germany	Romania
Longitude	52º27’	47º50’	46º16’
Latitude	05º42’	07º40’	27º10’
Civil Twilight ends	19:49 UT	19:23 UT	18:03 UT
Nautical twilight ends	20:40 UT	20:06 UT	18:44 UT
Astron. twilight ends	21:45 UT	20:56 UT	19:31 UT
Radiant elevation 21 UT	29	29	33

Table 4: technical characteristics of image intensified video systems applied at the Perseids campaign on 11/12 august 2004.

Station	**Biddinghuizen**	**Britzingen**	**Corbasca**
Country	The Netherlands	Germany	Romania
Optics	Canon	Sony V-mount	Canon
	2.0/135 mm	2.8/25 mm	1.2/55 mm
	FOV = 12º	FOV = 35º	FOV = 35º
Image intensifier	XX1332	Delnocta	XX1332
	2-nd generation	1-st generation	2-nd generation
	Mullard	OIDelft Instruments	Mullard
Camcorder	Panasonic	Sony	Panasonic
	NV-DA1	DCR-TRV900E PAL	NV-DA 1

Between 20:07 and 00:27 UT, Romke Schievink carried out video observations from Britzingen. The video was pointing continuously towards the radiant. The images were analyzed by Carl Johannink in the days following the maximum.
The higher amount of Perseids around 21:00 UT was clearly visible. We decided to take a closer look at the period 20:45 - 21:20 UT. Therefore Romke Schievink made a copy of the period 20:42 - 21:19 UT on his PC.
He then duplicated this fragment two times and overlaid the three fragments, but shifted each of them one frame with respect to the other. Following this he gave each of them a 'transparancy' of 33%, in order to get an 'average' of these three fragments (the same technique is used by WEBCAM astronomy, it is a variant of "stacking").
This resulted in a much more 'stabilized' view, and, as another advantage, every meteor lasted two frames longer. Both effects made it easier to pick up meteors from the screen.
Romke Schievink and Carl Johannink scanned the whole period from 20:42 until 21:19 UT simultaneously for two times, more than doubling the number of meteors during this interval : 52 meteors.
In Romania Jos Nijland and Casper ter Kuile set up image intensified video systems at Darmanesti and Corbasca respectively in order to obtain orbital elements from simultaneously filmed Perseid meteors. Unfortunately the Darmanesti station appeared to be clouded out at 11/12 august so no multistation Perseids could be obtained.
In Corbasca the sky appeared to be clear except from the passage of a small cloud in the interval from about 20:52 until 21:02 UT. The videosystem at Corbasca was operated from 19:30 until 21:30 UT when 176 meteors were filmed. 143 Perseids were filmed in the interval from 20:30 until 21:30. The aiming point on 18 UT for this videosystem was located at Corona Borealis.
Last but not least, Robert Haas made observations from Biddinghuizen in the Netherlands between 20:27 and 21:32 UT. He captured 47 meteors with his video aimed at Cassiopeia. We used these data to produce [figure 2a,b,c].

Figure 2a: Video results of station Biddinghuizen, the Netherlands

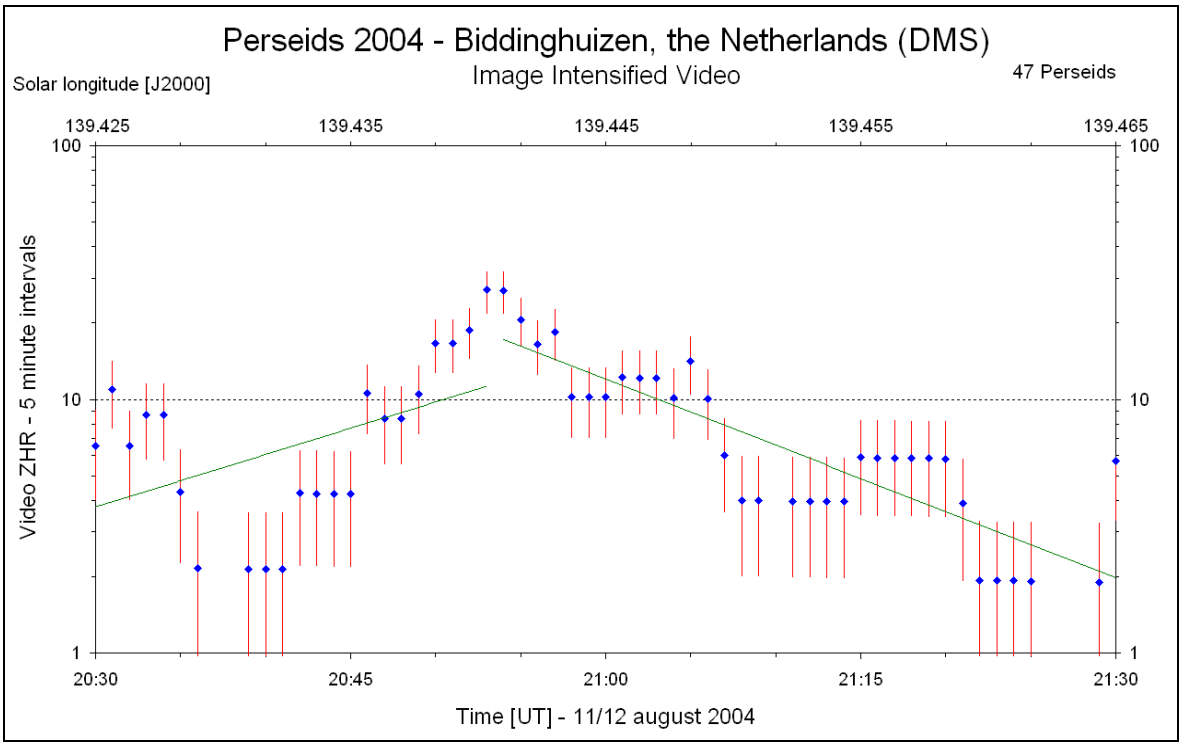


Figure 2b: Video results of station Britzingen, Germany

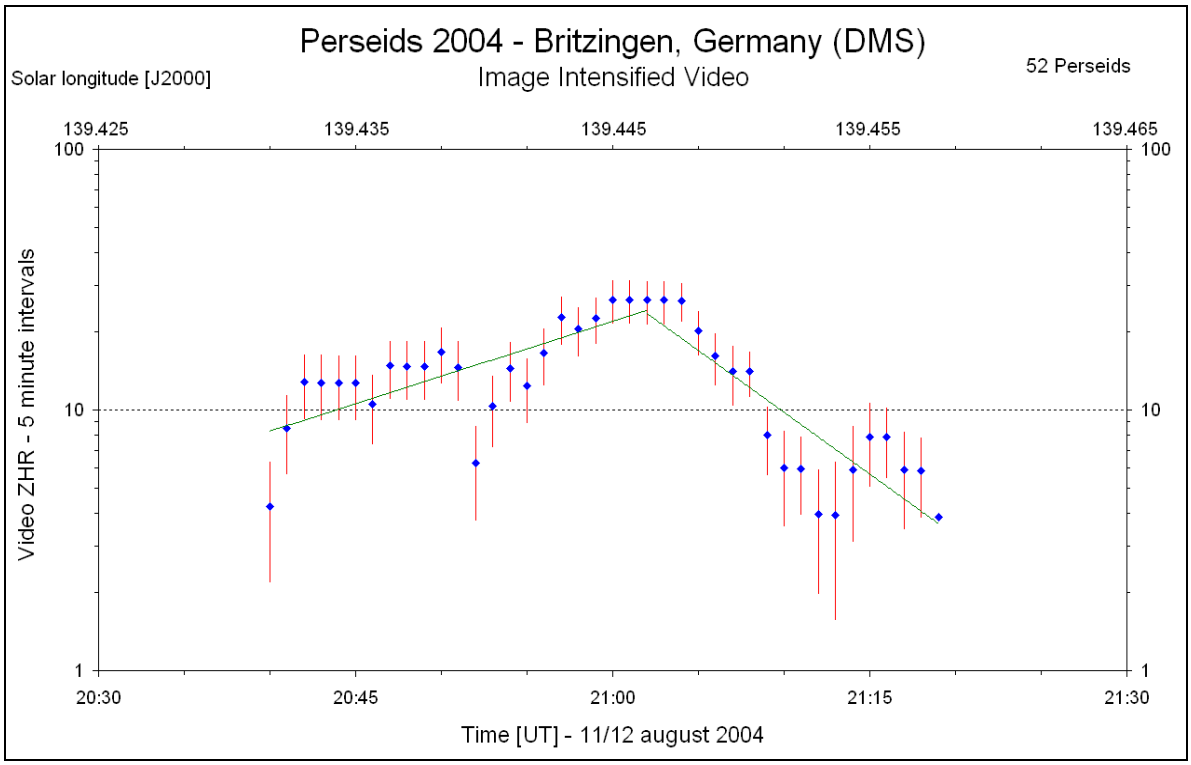
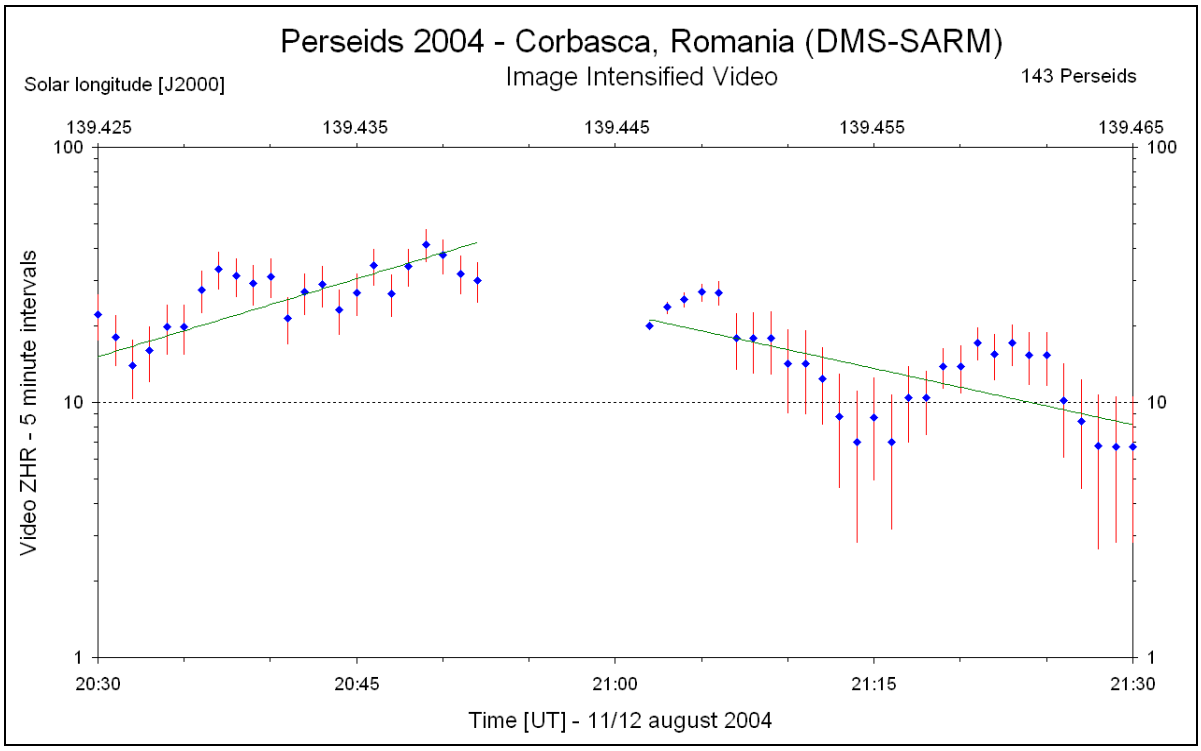


Figure 2c: Videoresults of station Corbasca, Romania



The lenght of the interval (bin) was calculated from the amount of minutes and the number of meteors observed using a number of statistical "rules of thumb". We computed the bin to be 5 minutes taking the total number of observed meteors and the observation interval into account.
A sliding mean period of one minute was used to smooth the statistical scatter. The observed number of meteors has been corrected for radiant height only, using the factor $\sin^{-1.0} h$ to get a 'video ZHR'.
In these plots the higher activity around ~ 21 UT is clearly visible for each station.

More information regarding the image intensified video measurements is presented in the proceedings of the IMC-2004 [4].

Conclusion

In both visual and video data the Perseid return of 2004 showed up with a peak of faint meteors on August 11th around 21 UT as predicted by Lyytinen et al. [1].

Acknowledgements

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References

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