Quadrantids 2012

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ABSTRACT

In the poster are presented some results form our observations of the 2012 Quadrantids meteor shower and shown our way to process the data. The radiant position is obtained from photographed meteors.

Introduction

There is no human being on the Earth who is not charmed by the magic of the starry sky, but only few are those people who go deeper to a more serious investigation of the space objects. Astronomy is the most democratic science. Together with the professional scientists, there are a huge number of amateur astronomers all over the world with a significant contribution in its development. The modern digital technique for obtaining of photographic images of space objects gives incredible opportunities not only to the professional astronomers, but to the amateurs as well. Since not anyone can afford to buy a video camera for observing meteors, we are going to present a way to observe meteor showers with a camera in our case we have used Sony: SLT-A55VL .Here we are also going to show the ways of processing the data after acquiring it .

Acquiring the data

During the observation in the public astronomical observatory in Avren, Bulgaria in the night of 04-05 January, we (Georgi Georgiev, Mihail Enimanev and Antoaneta Avramova) observed the meteor shower Quadratids with a camera Sony: SLT-A55VL with 18 mm focal length and 800 ISO, light power of 3.5 and field of 71° × 47° without a guiding mechanism. The average exposure time was 20 seconds. It was carefully selected, because it were shorter there wouldn't be any visible stars and if it were longer the stars wouldn't have remained (point like) dots because of the around the rotation axis of the earth. Then every image is carefully examined for meteors and if we find any we determine whether if they are from the observed meteor shower. When we have an image with meteor, we star to processing it.

Primary processing

Together with the frames we make some technical frames – the so called dark frames, bias and flat field. They are used in further processing for reducing the noise created by the heating of the matrix, the noise appearing in the process of reading the image and correcting for the uneven distribution of the light flux across the frame.
When an image is saved in JPG format, the information of every four neighboring pixels is averaged, so that the corresponding file occupies less space in computer's memory. Such images are not useful. That is why we save the frames in RAW format, in which the information is more complete.
For the primary processing of the images we used the free software IRIS. We carried out the standard work – distracting the bias frames and dark frames and dividing by the flat field frames.

Processing

When the image noise is reduced we move on to finding the coordinates of the beginning and the end of the meteor with the astrometry function of IRIS. Even thought we didn't use any guiding mechanism the error is approximately 30" . In order to determine the beginning and the end of the meteor we examine the direction of the meteor, knowing the precalculated radiant and the fact that the meteor beginning is closer to the radiant. We can determine the speed of the meteor by its elongation from the observed radiant and its elongation from the horizon. After that the data is entered in VISDAT where the information is stored and brought in a type, usable by the program RADIANT , from where we can gain the observed by us radiant.

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Quadrantid meteors take their name from an obsolete constellation, Quadrans Muralis, found in early 19th-century star atlases between Draco, Hercules, and Bootes. The source of the Quadrantid meteor shower was unknown until December 2003 when Peter Jenniskens of the NASA Ames Research Center found evidence that Quadrantid meteoroids come from 2003 EH1, an "asteroid" that is probably a piece of a comet that broke apart some 500 years ago.
Characteristics of the meteor shower:
Active: December 28 — January 12
Maximum: January 4, 07h20m UT ($\lambda\odot$ = 283.16°)
ZHR = 120 (can vary ~ 60—200)

Our radiant of Quadrantids

For our data we use images from Georgi Georgiev. We have 34 images with meteors, but only four of them were from Quadrantids meteor shower. After processing with program IRIS we make this table (Fig.1) with the data we aquired.

№	hour (UT)	Alpha begin	Delta begin	Alpha end	Delta end	error RA	error Dec
1	02:59:07	179.06	64.23	175.79	64.45	28.58"	21.64"
2	02:59:29	189.18	63.12	185.80	63.59	26.87"	22.96"
3	03:07:09	202.79	25.79	205.92	30.36	30.94"	18.67"
4	04:20:26	169.72	25.42	165.29	21.21	32.14"	14.58"

Fig.1 Data from Quadrantids

The results

Fig. 2 shows the result obtained by the method of probabilities. In this method for each meteor a region is determined where it is most probable its radiant to be located. . In the method or backward prolongations the prolonged meteor traces are plotted and the values of the pixels are summed (Fig. 3). On both diagrams the green circle marks the radiant position based on data of the International Meteor Organization. As can be seen there is very good agreement of our results to the official ones.
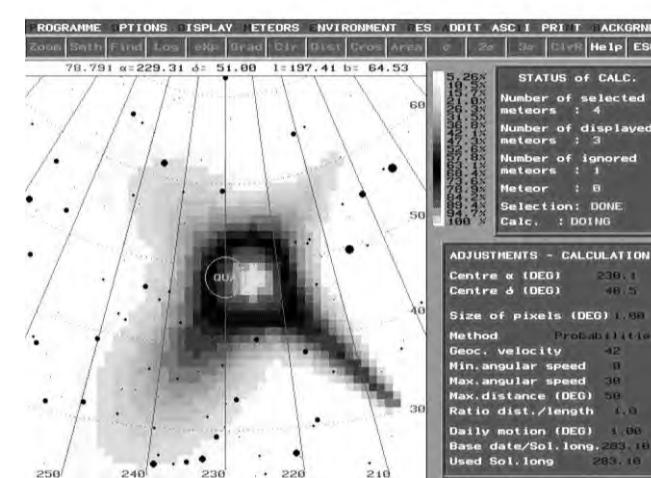

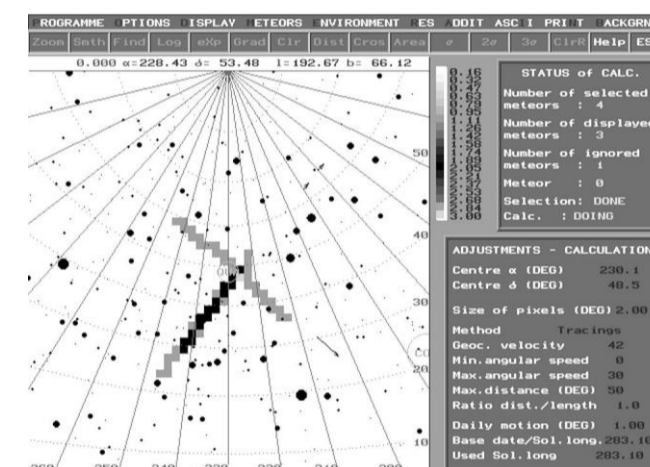**Fig. 2.** The Quadrantids radiant obtained by us with the method of probabilities

Fig. 3. The Quadrantids radiant obtained by us with the method of backward prolongations

Gallery

Fig. 4. A meteor from the Leonids meteor shower during 2009

Fig. 5. A meteor from the Leonids meteor shower during 2009
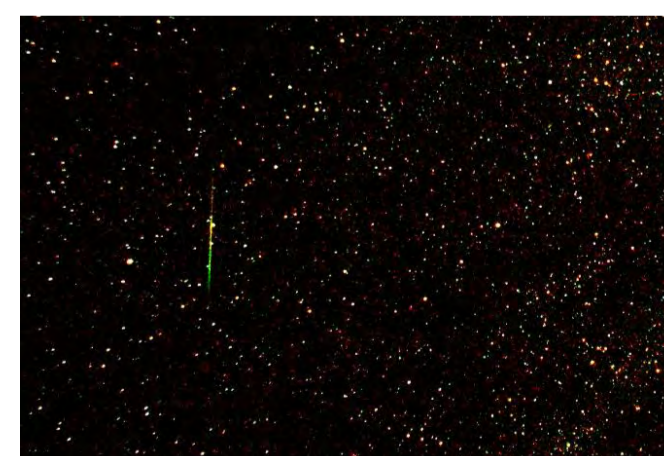

Fig. 5. A meteor from the Perseid meteor shower during 2010

Fig. . A meteor from the Quadrantids meteor shower during 2012

Conclusion

In our project we show it`s possible to achieve relatively good results using technical equipment available for the amateur astronomers. We investigated in details the potential of the equipment (camera and software), which will allow us to work in correspondence with the professional video meteor observers from all-around the world with hope for cloudless nights.

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