DETERMINATION OF METEORS BELONGING TO SHOWERS USING THE RESULTS OF SINGLE-STATION OBSERVATIONS WITH MMT

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Introduction

One of the important characteristic when taking observations of meteors is their color. There is a dependence between color indicator and stellar magnitude. At the same time, color indicator does not depend on the velocity. The method used to investigate the color of meteors should, on the one hand, admit a comparison with visual data, and on the other hand, be objective and reproducible. Based on the observations taken with Mini-MegaTORTORA (MMT) [1] in a system of BVR filters [2] a genetic belonging of the observed meteors to meteor showers was studied. MMT is a multi-channel monitoring telescope created at Kazan Federal University and located near the SAO RAS. The system consists of 9 cameras installed in pairs on 5 equatorial mounts. The initial results of observations are brought into database available at http://www.astroguard.ru/meteors.

Methods

The system of optical widefield monitoring of the celestial sphere with subsecond temporal resolution MMT should provide the detection and investigation fly phenomena with previously unknown location in the near and far space. The main way of getting information is the wide optical monitoring of the celestial sphere with a high temporal resolution. The main task-finding of new and study known non-stationary objects of different nature and localization is implemented in the monitoring process. The continuously updated dynamical picture of the near and far space with subsecond temporal resolution was obtained for the first time in the world. Robotic multi-channel (9 lenses) optical complex with the visual field of about 900 square degrees and a time resolution of 0,1 seconds was made for persistent observations. This complex accumulate information about all the stationary and transient (in time and space) sources of the optical radiation, localized in the celestial hemisphere (20000 sq. grad.) with the glitter up to 17.5 stellar magnitude. Temporal resolution of MMT is 0.1 s. The filters of BVR system [2] may be brought into the light beam of each camera if necessary. When taking observations with MMT, the channels are synchronized in time.

Results

As a result, it was determined that the disalignment of time labels in the database is not indicative of the channels physical disalignment, of which one may be convinced by analyzing the astrometric data. Here, we consider the meteors that were observed in all the three filters, when in V filter the colors could be incorrectly determined due to the fact that various parts of a meteor track were measured in various filters. This mainly refers to the cases when the image of a meteor crosses the frame border. Besides, MMT software automatically measures only one continuous part of a track, and particular attention should be paid to the cases when the image of a meteor is discontinuous. Using the method by Leonov V.A. [3], we examined meteors belonging to the principal meteor showers. Using the criteria similar to the ones applied in the paper [3] we determined belonging of meteors observed between May, 2015 and April, 2016 during principal showers activity. We found that out of 66 considered meteors 8 are Perseids (database IDs 8358101, 8359291, 8370873, 8372340, 8373347, 8378203, 8378430, 8397094), 6 are Southern Taurids (9050888, 9053145, 9055182, 9165928, 9188080, 9477957), 1 is an Orionid (9167228), 2 are Northern Taurids (9187884, 9442890), 15 are Geminids (9697471, 9697482, 9698052, 9701733, 9702156, 9705211, 9705824, 9705859, 9706792, 9706852, 9709175, 9710965, 9711659, 9720201, 9722169), 1 is a Lyrid (10397725), 33 are not identified with any principal shower (7616500, 8292834, 8293686, 8316514, 8339663, 8344018, 8356934, 8358349, 8363318, 8365632, 8369151, 8370808, 8371362, 8388493, 8396590, 8403656, 9032884, 9034034, 9041260, 9051568, 9165238, 9178199, 9187923, 9188121, 9523609, 9701814, 9705865, 9706977, 9720353, 9804766, 10025039, 10054060, 10397613). During the identification process we came to the conclusions as follows. Taking into account diurnal drift of radiants is necessary. Near the radiant point all the criteria become unstable, this is why the meteors observed near the assumed radiant should be considered very carefully.

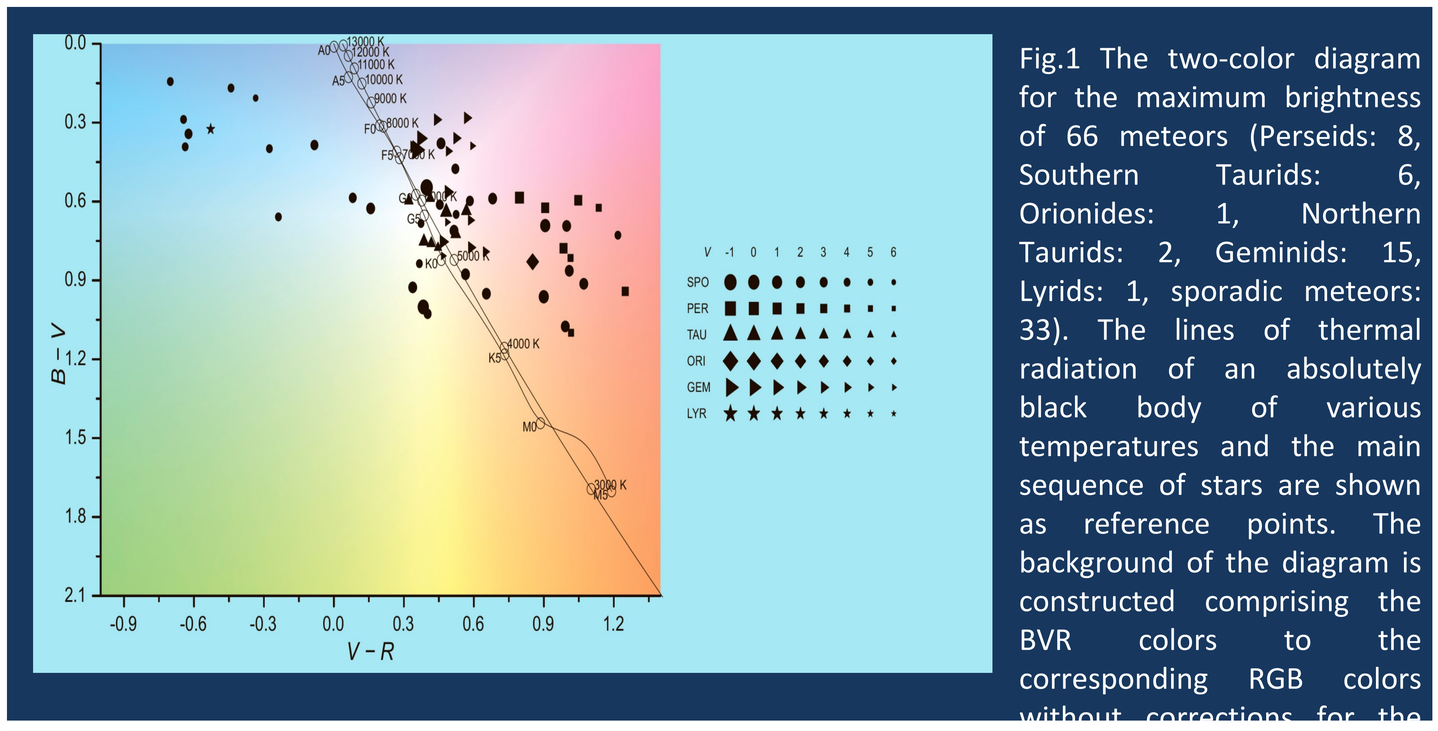

Fig.1 The two-color diagram for the maximum brightness of 66 meteors (Perseids: 8, Southern Taurids: 6, Orionides: 1, Northern Taurids: 2, Geminids: 15, Lyrids: 1, sporadic meteors: 33). The lines of thermal radiation of an absolutely black body of various temperatures and the main sequence of stars are shown as reference points. The background of the diagram is constructed comprising the BVR colors to the corresponding RGB colors without corrections for the conversion between the photometric systems. White [illegible]

Conclusion

Analysis of BVR observations taken with MMT and application two-color diagrams have shown that the main factor defining the color of stream meteors observed by us in the visible range is their belonging to the showers. Other factors do not lead to the dissipation of groups defined by showers on the two-color diagram. Further determination of synthetic color indicators by meteor spectra known from literature is going to allow comparing color classification with the spectral one and marking out emission lines of the chemical elements providing the greatest contribution to the visible light.

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