MICROSHOWER STRUCTURE OF THE METEOR COMPLEX

V. SIDOROV, S. KALABANOV, S. SIDOROVA and I. FILIN

Physics Department, Kazan State University, Kremlevskaya st., 18, Kazan, Tartarstan, 420008, Russia
E-mail: Sergei.Kalabanov@ksu.ru

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Abstract. Meteor radar observations of ionized trails in the Earth’s atmosphere provide observations that do not depend on weather conditions and time of day and provide good statistics for analysis. Further development in the new quasitomographic analysis of the goniometric data of the Kazan meteoric radar has revealed a number of very weak meteoric streams with rates of more than 5–6 meteors per day. In addition to the known large meteor showers, we have found up to as many as 1000 small showers per month that we have named microshowers. We shall operationally define a microshower as the minimal meteoric stream which can be detected with the Kazan meteoric radar while quasitomographic procedures of processing interferometer data are used.

Keywords: Microshower structure, radar measurements, radiant coordinates

1. Introduction

Meteor radar observations of ionized trails in the Earth’s atmosphere provide observations that do not depend on weather conditions and time of day and provide good statistics for analysis. Further development in the new quasitomographic analysis of the goniometric data of the Kazan meteoric radar has revealed a number of very weak meteoric streams with rates of more than 5–6 meteors per day (Sidorov and Kalabanov, 2001, 2003). In addition to the known large meteor showers, we have found up to as many as 1000 small showers per month that we have named microshowers. We shall operationally define a microshower as the minimal meteoric stream which can be detected with the Kazan meteoric radar while quasitomographic procedures of processing interferometer data are used.

Thus we take as a provisional and practical definition that a microshower is 5 or more meteors which are observed within 1 day having radiants at a discrete location on the celestial sphere. Each cell has a $2^\circ$ by $2^\circ$ angular dimension and contains statistically identical velocities within a 3 km/s velocity uncertainty. The corresponding spread in orbital elements of each group is a non-linear function determined by the coordinates and dimensions.
of each resolution site and cannot be specified in general. This is not a disadvantage since tests for determining stream membership without conversion to orbital elements are now available in Valsecchi et al. (1999a); and Jopek and coworkers (1999b). Hence, in this context, a meteoric shower becomes a set of independently observed microshowers with closely located radiant coordinates and similar velocities. Microshower detection then becomes a non-linear procedure determined by choosing suitable thresholds. In general, thresholds are determined so that the possibility to detect false a shower would be always less than 5% (Sidorov and Kalabanov, 2001, 2003) and as such would give us a probability of detection of up to 10 times more than would a Poisson density of sporadic meteors with a uniform radiant distribution on celestial hemisphere. But we don’t know a priori what the real distribution of sporadic radiants is. If the sporadic radiants have an irregular distribution, the observed microshowers are just the peaks of its irregularities. So what constitutes a peak irregularity? It is just a group of meteors with the equal velocities and equal radiant coordinates. Thus a microshower may be either a fragment of the sporadic background or a fragment of a meteor shower without distinguishing them in an operational sense. In order to represent microstreams from an astronomical point of view requires converting the data to orbital elements’ which is not done here.

2. Distribution of Microshower Radiants on Celestial Sphere

In Figure 1, the general distribution of radiants of 2802 microstreams on celestial sphere for 1 month (August 1986) of radar observation is shown. Here we present microshowers with more than 5 meteors per day. The coordinate system is centered on the apex with the x-axis proportional to the

![Figure 1. Microshower radiant distribution on celestial sphere in August 1986.](image)