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Meteor Observations at Kazan Federal University (Russia)

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Summary. This poster paper described initial results of recent meteor observations in Kazan obtained with a new meteor radar, SKiYMET. Significant improvements in the number of registrations are being recorded, enabling better statistics.

Radar observations of meteors have been carried out and archived since the mid-20th Century; at Kazan University (56°N, 49°E) they commenced in 1956, and have continued with only a few interruptions. A quasi-tomographic method (developed in-house in 2000) has been used to determine the coordinates of radiants of meteor showers, and to derive the orbital elements of small showers (microshowers).

The observations provide valuable information about the distribution of meteoric matter near the Earth's orbit. That information supports studies of stratospheric temperatures. A new radar, SKiYMET, was deployed in 2015 and measured parameters such as meteor speeds, but in 2016 its software was supplemented by an in-house package which performed more efficient pre-filtering of the primary data to eliminate non-meteor reflections from various sources. The new filtering algorithm has reduced substantially the threshold S/N ratio for detecting meteors (so fainter meteors can now be recorded), while the package also enables meteor velocities to be calculated much more efficiently than with SKiYMET, improving significantly the quality and statistical indicators of the processed data. By detecting a much larger number of meteors, it enables more detailed studies of the distribution of meteor velocities per day and per season.

Daily meteor counts for 2016–2017, extracted from the observations by the KFU programme, yielded significantly higher rates than with SKiYMET. These results support much better statistics, and also enable much finer details to be discerned. In particular, plots of meteor rates against speed are found to exhibit two maxima, one near 30 $\mathrm{km\,s^{-1}}$ and one near 55 $\mathrm{km\,s^{-1}}$. This bifurcation in the relationship can also be discerned in the seasonal dependences of the speed distribution.

Improvements in the measurements of the speeds of meteor particles entering the atmosphere reveal an increase in the numbers with higher speeds ($> 50\,\mathrm{km\,s^{-1}}$). The distributions of speeds and heights show a rather strong dependence of the meteor speed upon altitude; as predicted by meteor physics, those with higher speeds begin to burn at higher altitudes. A local increase in the number of meteors that have speeds of about 55 $\mathrm{km\,s^{-1}}$ has also been reported in the literature. The increase could be associated with heterogeneities in the distribution of meteoric matter in the vicinity of the Earth's orbit.

Keywords. Meteors and meteoroids, Meteor radar

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