

Radar and optical simultaneous observations of faint meteors with MU radar and Tomo-e Gozen

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The Earth is surrounded by small dust grains produced by comets and asteroids, parts of which plunge into the Earth's atmosphere, causing meteor phenomena. A simultaneous radar and optical observation is promising to constrain a meteor motion and a meteoroid mass at a time. We've started a project to observe faint meteors with Middle and Upper Atmosphere Radar (MU radar), which is operated by Kyoto University, and a wide-field CMOS mosaic camera Tomo-e Gozen installed on the 105 cm Kiso Schmidt telescope, which is in Kiso Observatory, the University of Tokyo. The observations were carried out in 18--21, April, 2018. From tons of the detected meteors, the simultaneous detections were extracted in terms of the times, loci, and velocities of the meteors. Finally, we identified 894 meteor events simultaneously detected in the both sites. The optical absolute magnitudes of the simultaneous meteors ranged from about 3--11 mag in the V-band. We confirmed a clear correlation between the meteor brightnesses and the radar cross sections, and derived a conversion function from a radar cross section to an optical brightness. The mass and size distributions of meteors detected by MU radar are compared to literature. The MU and Tomo-e Gozen collaboration will provide statistical properties of meteoroids in the range of 0.1--1 mg.