

## 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. Tons of such grains plunge into the Earth's atmosphere hourly. Part of their kinetic energy excites and ionizes the surrounding atmosphere, which is observed as a meteor phenomenon. A simultaneous radar and optical observation is promising to constrain the motion and mass of a meteor at a time. We launched a project to observe faint meteors with Middle and Upper Atmosphere Radar (MU radar) and a wide-field CMOS mosaic camera Tomo-e Gozen installed on the 105 cm Kiso Schmidt telescope. 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 directions of the meteors. Finally, we identified the 894 meteor events simultaneously detected in the both sites. The optical brightness of the simultaneous meteors ranged from about 3--11 mag. in the V-band, which is about 5 magnitude fainter than in previous studies. We confirmed a clear correlation between the meteor brightnesses and the radar cross sections.

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