

Meteor observations with large aperture radars - an outlook for EISCAT_3D and EMU

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Meteoroids deliver various elements into the atmosphere and the meteoric dust particles are of great importance in the terrestrial atmosphere. They act as nuclei for condensation and clouds and affect various atmospheric phenomena in both physical and chemical aspects. We present highlights and experiences from meteor head echo observations conducted with the tristatic EISCAT radar and the interferometric middle and upper atmosphere (MU) radar of Kyoto University at Shigaraki, Japan. The results are used in the context of providing an outlook for meteor observations with EISCAT_3D and the Equatorial MU radar (EMU).

MU radar observations demonstrate that meteors originating from any direction down to a few degrees above the local horizon can be accurately detected with an interferometric phased array. The location of EMU at the equator therefore enables coverage of a large fraction of the celestial sphere during each diurnal cycle. A meteor observation programme at EMU operating in parallel with atmospheric measurements would give excellent overall coverage of the meteor activity and transient outbursts. We present a coverage estimation based on observations conducted with MU and show how an observation programme at EMU would complement observations with radar facilities at other latitudes.

EISCAT_3D will consist of multiple phased arrays located in northern Fenno-Scandinavia. The multi station- and interferometric design offers extended possibilities to investigate the fine details of meteoroid-atmosphere interaction processes, as well as significantly increased accuracy of meteoroid orbit determination capabilities compared to currently available radar facilities.

Keywords: meteor, upper atmosphere, high power large aperture radar