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The 2009-2010 monthly MU radar head echo observation programme for sporadic and shower meteors

Csilla Szasz¹, Johan Kero^{1*}, Takuji Nakamura¹, David D. Meisel², Toshio Terasawa³, Hideaki Miyamoto³, Masayoshi Ueda⁴, Yasunori Fujiwara⁴, Koji Nishimura¹

¹National Institute of Polar Research, ²SUNY, Geneseo, USA, ³University of Tokyo, ⁴Nippon Meteor Society

We have in 2009 initialized 24 h monthly head echo observations of the meteoroid influx with the 46.5 MHz Shigaraki MU radar and intend to extend these observations for a full year. This study is still underway; here we review the current results.

Head echoes are radio wave reflections from the compact region of plasma surrounding and moving with the velocity of the meteoroid generated in its interaction with the atmosphere at about 70-140 km altitude. The MU radar is an excellent tool for meteor head echo observations. Its interferometric capabilities in combination with analysis algorithms we have developed give precise geocentric velocities and radiant directions of the observed meteoroids - a few tens of metres per second and a fraction of a degree, respectively. The high power, large aperture and low frequency of the MU radar enable a large number of high-quality meteor head echo detections. About 3000 events from a total of about ten thousand head echo detections per 24 h observation have the above mentioned accuracy. The main bulk of the meteoroids are in the mass range 10^{-9} - 10^{-5} kg. Data presented here was collected during 24 h experiments in June, July, September to December 2009 and January to March 2010.

Sporadic meteoroids are those which no longer can be associated to their parent bodies, but their orbital distribution in the interplanetary space may still resemble that of the comets and asteroids which released them. Sporadic meteoroids are most numerous among our observed particles and the main contributors to the mass influx into the earth atmosphere. However, we have also detected head echoes from several different meteor showers, e.g., the delta-Aquarids (July 2009), the Orionids (October 2009) and the Geminids (December 2009). Shower meteors have been investigated with many different kinds of instruments, thus we can compare the characteristics as velocities, radiant directions and masses with earlier results. Head echoes of shower meteors are very rare in other radar data.