

Radio meteors above the Arctic Circle: radiants and orbits

Csilla Szasz[1]; Johan Kero[2]; David D. Meisel[3]; Asta Pellinen Wannberg[4]; Gudmund Wannberg[4]; Assar Westman[5]; Takuji Nakamura[6]

[1] Research for Sustainable Humanosphere (RISH), Kyoto University; [2] RISH, Kyoto University; [3] SUNY Geneseo, NY, USA; [4] Swedish Institute of Space Physics; [5] EISCAT Scientific Association, Kiruna, Sweden; [6] RISH, Kyoto Univ.

We have used the tristatic EISCAT 930 MHz UHF radar system located at 68.9N and 21.9E to determine the geocentric velocities of sporadic meteoroids from meteor head echoes detected with all three receivers simultaneously at 96 km altitude. Head echoes are radio wave reflections from the plasma generated by the interaction of meteoroids with the atmosphere at about 70-140 km altitude. The data used in this study was collected between 2002 and 2005, during four 24h runs at summer/winter solstice and vernal/autumnal equinox to locate the largest seasonal difference. A total number of 410 tristatic meteors were detected.

Using an ablation model, the observed velocities of the tristatic meteors were integrated back through the Earth atmosphere to find their atmospheric entry velocities. We have used these for calculating the orbits of the meteoroids by taking zenith attraction, Earth rotation as well as obliquity of the ecliptic into account. The results are presented in the form of different orbital characteristics. None of the observed meteors appear to be of extrasolar or asteroidal origin. About 40% of the radiants can be associated with the apparent north apex sporadic meteor source and 58% of the orbits are retrograde. The geocentric velocity distribution is bimodal with a prograde population centered on 38 km/s and a retrograde population peaking at 59 km/s. A similar study at mid-latitudes with the Shigaraki Middle and Upper atmosphere (MU) radar located at 34.9N and 136.1E is underway. We will use head echoes and the interferometric capabilities of the MU radar to determine the orbits and the origin of detected meteoroids and compare the result with the EISCAT UHF results.