Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

PEM032-P30 会場:コンベンションホール 時間:5 月 27 日 10:30-13:00

Monthly MU radar head echo observation programme for sporadic and shower meteors: 2009 June to 2010 December

Monthly MU radar head echo observation programme for sporadic and shower meteors: 2009 June to 2010 December

Johan Kero[1], Csilla Szasz[1*], Takuji Nakamura[1], David D. Meisel[2], Toshio Terasawa[3], Hideaki Miyamoto[4], Yasunori Fujiwara[5], Masayoshi Ueda[5], Koji Nishimura[1]
Johan Kero[1], Csilla Szasz[1*], Takuji Nakamura[1], David D. Meisel[2], Toshio Terasawa[3], Hideaki Miyamoto[4], Yasunori Fujiwara[5], Masayoshi Ueda[5], Koji Nishimura[1]

[1]National Institute of Polar Research, [2]SUNY Geneseo, Geneseo, NY, USA, [3]University of Tokyo, Chiba, [4]University of Tokyo, Tokyo, [5]Nippon Meteor Society
[1]National Institute of Polar Research, [2]SUNY Geneseo, Geneseo, NY, USA, [3]University of Tokyo, Chiba, [4]University of Tokyo, Tokyo, [5]Nippon Meteor Society

Meteors, or colloquially shooting stars, are caused by particles from space that are heated up and shattered in the atmosphere. Different estimates of how much mass these meteoroids bring to our planet vary by several orders of magnitude. We conducted a systematic set of monthly meteor head echo observations from 2009 June to 2010 December (>500 h), except for 2009 August, by the interferometric Shigaraki Middle and Upper atmosphere (MU) radar in Japan (34.85 degree N, 136.10 degree E). The ultimate purpose of our observation programme is to improve the estimate of the flux of extraterrestrial material into the Earth's atmosphere and to investigate the possible flux of extrasolar meteoroids entering the solar system and crossing Earth's orbit.

Using the interferometric ability of the MU radar we have developed analysis algorithms that give precise geocentric velocities and directions of the observed meteoroids - a few hundreds of metres per seconds and a fraction of a degree, respectively. About 3000 events from a total number of about ten thousand head echoes per 24 h observation have the above mentioned accuracy. The head echoes are detected in the height range of 73-127 km. A total number of more than 100 000 meteor detections allows us to map the seasonal variation of the sporadic meteor influx, as well as its characteristics in form of geocentric velocity and altitude distribution of the deposited material. The initial altitude distribution shows clear velocity dependence, higher velocity meteoroids ablating at higher altitude.

Our data set contains both shower and sporadic meteor detections. Sporadics are those meteoroids that cannot be directly ascribed to a parent body. Sporadics are the most numerous among our observed particles, and the main contributors to the mass influx into the Earth atmosphere.

Head echoes of shower meteors are quite rare in modern high-power large-aperture (HPLA) radar data, primarily because sporadics outnumber shower meteors in the low-mass regime observable with these radar systems. The small collecting area of an HPLA radar system further limits successful observation of shower meteors. Analysis performed on a limited data set may, therefore, contain no or only a few shower meteors due simply to low statistical probability. In this work, we have estimated the MU radar collection area, calculated the flux of Orionid meteors, and show that the Orionid meteoroid stream activity could be accurately tracked with the MU radar when the radiant is at least 10 degrees above the local horizon.

キーワード: meteor, meteoroid, HPLA radar, head echo, meteor shower
Keywords: meteor, meteoroid, HPLA radar, head echo, meteor shower