Meteor head echo climatology at Northern polar latitudes

C. Schult (1), G. Stober (1), J. L. Chau (1)
(1) Leibniz Institute of Atmospheric Physics, Rostock University, Kuehlungsborn, Germany (schult@iap-kborn.de)

Meteors have been studied with several observation techniques since decades. Until recently, only all sky meteor radars and optical camera systems offered the possibility to detect a large number of meteor events and were able to perform a nearly continuous observation of the Earth's meteor environment. At present High Power Large Aperture (HPLA) radars are the most sensitive meteor detector, but often do not provide continuous measurements.

The Middle Atmosphere Alomar Radar System (MAARSY) is an HPLA class radar, which is located in Andenes Northern Norway. MAARSY employs an active phased array antenna and has a transmitting power of 800 kW. Making use of the interferometric capabilities we are able to measure the meteor trajectory, the velocity as well as the deceleration. We are going to present quasi-continuous meteor head echo observations from the last three years. During this time we obtained over one million high quality meteor head echoes.

Based on this data, we derived a meteor climatology of the meteor influx at northern polar latitudes. As an example, Fig. 1 shows the variance of the ablation heights for each day of the year. The mean ablation heights vary up to 5 km from 97.5 km on day 162 to 102 km on day 323.

High power large aperture radar system have the sensitivity to observe smaller particles than all sky or optical systems. Fig. 2 shows the observed dynamical mass distribution for the different main sporadic sources at the point of detection. The statistics indicate also that this distribution is very sensitive on the precision of the elevation angle measurement and have to be treated carefully.

We present this unique data set, which is also the basis for additional studies on a radar-optical comparison and ablation modeling.

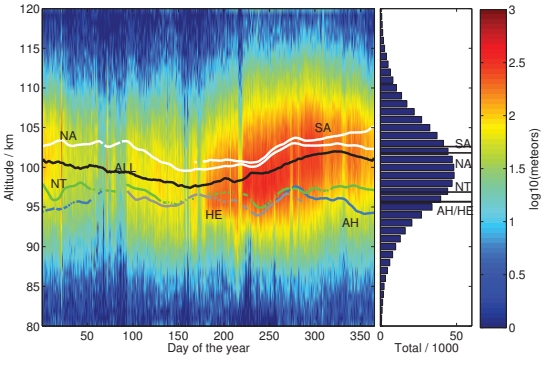

Figure 1: Altitude distribution for the different time of the year (North/South Apex NA/SA, Helion/Antihelion HE/AH and North Toroidal NT). The mean ablation height varies for all sources during the year over several kilometers due to changes in the background atmosphere and the changing in the elevation angle of the source.

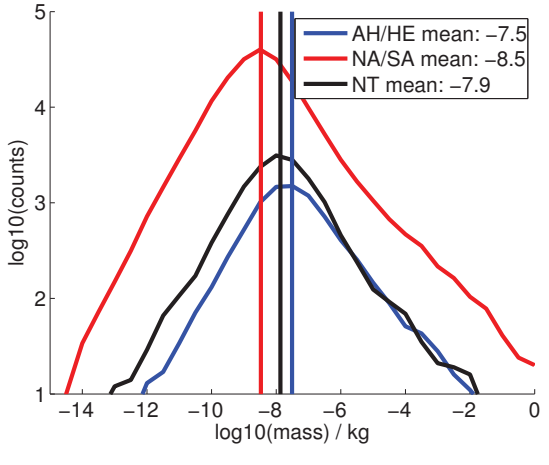

Figure 2: Dynamic mass distribution for the different sporadic sources. Meteoroids from the NA/SA complex seem to be one order of magnitude smaller than particles from the HE/AH sources.