Mass analysis of charged aerosol particles during the MASS/ECOMA rocket campaign

S. Knappmiller*, S. Robertson, M. Horanyi, and Z. Sternovsky

Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, CO 80309 USA

Abstract. An electrostatic mass analyzer, the Mesospheric Aerosol Sampling Spectrometer (MASS), for charged aerosol particles was launched on sounding rockets on 3 August 2007 and 6 August 2007 from Andoya, Norway to find the masses of charged aerosol particles in the polar mesosphere in NLC/PMSE conditions and PMSE conditions alone. We compare the four data sets from the uplegs and downlegs of the flights. The MASS instrument collected ions, cluster ions, and charged nanometer-sized particles on four pairs of electrically-biased graphite plates that collect positive and negative particles separately. Electron collection was suppressed by the negative potential on the rocket body and their high thermal velocity. For the 3 August upleg, the data show charged particle collection on all channels with number densities of order several thousand per cubic centimeter in the four size ranges <0.5 nm, 0.5 – 1 nm, 1-2 nm, and > 3 nm. The occurrence of positively charged aerosol particles in the smallest sizes suggests positive ions as the nucleation sites because the smallest particles have negligible probability of charging by photoionization. The signals were smaller on the 3 August downleg as a consequence of the spatial variability of the cloud. For the 6 August upleg into PMSE alone, only smaller particles (<2 nm) were detected and these were both positive and negative with number densities of several thousand per cubic centimeter. On the downleg, 1-2 nm negatively charged were detected, but there were no positive particles in this mass range. Acknowledgement: This project is supported by NASA.