

Charged mesospheric smoke particles studied by rocket and radar techniques

Markus Rapp (1), Irina Strelnikova (1), and Jörg Gumbel (2)

(1) Leibniz Institute of Atmospheric Physics, Schlossstr. 6, 18225 Kuehlungsborn, Germany (email: rapp@iap-kborn.de) (2) Department of Meteorology, Svante Arrhenius väg 12, Stockholm University, 106 91 Stockholm, Sweden (email: gumbel@misu.su.se)

It has long been speculated that the mesosphere and lower thermosphere is host to so-called meteoric smoke particles. According to these speculations, these particles form as a secondary meteoroid ablation-product, i.e., the ablated meteoroid material is thought to undergo a recondensation process which ultimately results in the production of particles with typical dimensions of just a few nanometers. These particles have caught the scientific interest, because they might be involved in the nucleation of mesospheric ice particles, in heterogenous chemical reactions, and they might also significantly alter the charge balance in the lower ionosphere. In this paper, we report on the currently available direct and indirect experimental evidence for the existence of these particles from both sounding rocket experiments and incoherent scatter radar observations. Starting from in-situ measurements which have recently been obtained with the new particle detector of the Leibniz Institute of Atmospheric Physics in Germany, we will collectively discuss all such measurements of charged mesospheric particulates that have been performed to date. Finally, we will address incoherent scatter observations with incoherent scatter radars in the Arctic that can currently not be adequately described by available incoherent scatter theory unless charged meteoric particles are explicitly accounted for.