

Sounding Rocket Particle Sampling in the Mesosphere

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Current estimates suggest that somewhere between 10 and 100 tons of meteoric material enters the Earth atmosphere each day. It is well known that the ablation of this incoming material is the source of metal atoms and ions regularly observed in the upper atmosphere by remote sensing techniques such as lidar and satellite limb measurements. What happens next is more uncertain but subsequent condensation and coagulation of the ablated material is thought to form nanometer-size particles, also denoted “meteoric smoke”. It has been suggested that meteoric smoke plays a key role in a number of mesospheric processes related to e.g. noctilucent clouds (NLC) and polar mesosphere summer echos (PMSE).

We will present a recently developed instrument, MAGIC (Mesospheric Aerosol - Genesis, Interaction and Composition), designed for in situ sampling of smoke particles during a sounding rocket flight. The MAGIC instrument has been built at the Naval Research Laboratory with particular emphasis on aerodynamic challenges imposed by the tiny size of the particles. By sampling smoke particles and making them available for laboratory analysis, their existence and properties can be studied. Basic questions concern their number density, size, altitude distribution and composition.

The first flights of the MAGIC instrument took place at Esrange, Sweden, in January 2005, and at Wallops Island, USA, in May 2005. An overview of the campaigns will be presented together with preliminary results from the transmission electron microscopy analysis carried out on these first flown collection surfaces.