



The MAGIC rocket campaign: meteoric smoke particles in the mesosphere

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The fate of meteoric material in the mesosphere has been a longstanding scientific challenge. Ablated metal compounds undergo complex chemical processes and are thought to ultimately recondense into nanometer-size smoke particles. This meteoric smoke has been suggested as a key player in the mesosphere, e.g. for the condensation of ice particles, the generation of radar echoes, charge balance and heterogeneous chemistry. Nonetheless, despite of this potential importance, the actual existence of smoke particles has never been proven.

The MAGIC project has been initiated to address this fundamental challenge. The MAGIC idea is to sample smoke particles in situ during a rocket flight. To this end, the MAGIC particle samplers have been developed 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 MAGIC rocket campaign was carried out at Esrange, Sweden, in January 2005. Three MAGIC particle samplers were launched on a scientific rocket and collected samples at altitudes between 60 and 95 km. Additional instrumentation on the same payload, on three meteorological rockets, on two balloons and on the ground addressed complementary parameters like atmospheric structure, dynamics and charge state. After the recovery of the payload, the MAGIC samples have undergone the first stages of analysis by Transmission Electron Microscopy. We will provide details about the campaign and first scientific results about meteoric smoke particles in the mesosphere.