

Variations in the meteoric smoke distribution with latitude and season; a 2 dimensional model study

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Meteoric material reaching the Earth ablates mainly in the 80 -90 km region and is believed to re-condense into so-called "smoke particles". In the middle atmosphere these particles are thought to play a major role in a host of atmospheric phenomena such as noctilucent clouds, polar mesospheric summer echoes, metal layers and heterogeneous chemistry controlling key atmospheric species such as water vapour. Despite their obvious scientific importance little is known about their properties and their spatial distribution. In order to improve this situation we here present results from a 2-dimensional model study of smoke particles. We have for the first time coupled a detailed microphysical model (CARMA = Community Aerosol and Radiation Model for Atmospheres) with a complete 2-dimensional chemical transport model (the Naval Research Laboratories CHEM2D model). Unlike earlier studies this allows us to investigate the global behaviour of smoke particles. We find great sensitivity to both latitude and season. In particular the model suggests very low number densities at the summer pole where the smoke particles generally are thought to provide condensation nuclei for noctilucent clouds. We have also investigated the effects of a temporal and spatial irregularities in meteoric influx on the global distribution of smoke.