MESOSPHERIC CHARGED DUST LAYER: IMPLICATIONS FOR NEUTRAL CHEMISTRY

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Abstract Submission Form

2004 National Radio Science Meeting

Abstract: gelinas6268

Date Received: September 22, 2004

The presence of a dust layer in the Earth's mesosphere is generally accepted on theoretical grounds [Hunten et al., 1980], but its experimental verification has been difficult and its influence on mesospheric dynamics and chemistry is not yet understood. Four sounding rockets carrying detectors designed to measure nanometer-sized charged dust particles were flown from Poker Flat in March 2002. In-situ measurements of charged dust and plasma densities were compared to the ground-based lidar data. Ground-based lidars were used to measure neutral sodium and iron densities during the launches in an effort to determine whether dust has an influence on mesospheric chemistry, specifically, as related to atomic sodium and iron. Strong correlations between the charged dust and neutral iron profiles were observed on all four flights.

The observed correlations between charged dust and iron indicate that dust does influence mesospheric chemistry, possibly serving as a metal reservoir for atomic iron at low altitudes, and may also be a sink for atomic sodium. Models of mesospheric atomic metals have shown that sodium and iron are good tracers of neutral wind motions above about 85 km, but that chemical enhancements can affect metal densities at lower altitudes [Plane et al., 1999]. The similarity of the iron and dust profiles may also indicate that gas-phase chemical enhancements are less efficient in shaping the iron layer than dust-related chemistry. In this paper we describe the ground-based and in-situ measurements investigating the link between meteoric dust particles and atomic metals in the mesosphere, and discuss the charged dust measurements in the context of the Hunten et al. (1980) mesospheric dust model.

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2. H - Waves in Plasma

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4. C - Contributed Paper, Program chair: Horanyi

5. No special instructions