Title : Meteoric Dust Effect on the E-Region Plasma Instability Mechanisms

Session: S1: Irregularity Physics

Preferred type of presentation: Oral

Abstract:
It is known that the meteoric dust particles play an important role in the electrodynamics of the E-region plasma. Large amounts of dust particles with average sizes of about 0.1m with number densities of up to several thousands per cubic centimeter and charge densities of the same order have been experimentally detected in the lower E-region altitudes. In some parts of the dust layers it was found that the negative charge density on dusts was so large that the number of free electrons was significantly reduced there, since the dust acted as a sink for electrons, thus causing electron bite outs. Recent studies show the possible role of neutral as well as charged dust particles of submicron size in altering the conductivity parameters in the equatorial E-region through the collision frequencies. In the upper E-region the dust particles are not very effective in capturing the ambient electrons and so do not affect the quase neutrality of the plasma. But they can alter the effective collision frequencies of the ambient electrons in this region by a factor as high as 4. They can also reduce significantly the growth rate and amplitude of plasma irregularities in this region. In the lower E-region the dust particles can affect significantly the electrical conductivities. When exist in sufficient numbers, charged dust particles can even reverse the ambient vertical polarization electric field in the lower E-region altitudes. This can affect the plasma instability mechanisms like Cross-Field Instability and Two-Stream Instability that operate in the E-region. Assuming a simple exponential model for the dust layer, the role of these dust particles in altering the E-region electrodynamics by affecting the collision and conductivity parameters is investigated here.

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