

Damping in the Growth of Plasma Irregularities Caused by Meteoric Dust Particles in the Equatorial E-Region

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Two stream and gradient drift instability mechanisms operating in the E-region of the equatorial ionosphere can be affected by dust particles of meteoric origin. The dust particles can capture the ambient electrons and cause considerable increase in the loss rate of electrons thus affecting the growth rates and amplitudes of the plasma irregularities. The attachment of electrons on dust particles can increase the threshold velocities needed for the onset of two stream and gradient drift instability mechanisms responsible for the generation of Type I and Type II plasma irregularities respectively, observed in the equatorial E-region plasma. Also from simple theoretical considerations one can see that the growth rate and amplitude of both Type I and Type II irregularities can be reduced considerably by the meteoric dust particles by increasing the collision frequencies. Observation of persistence of Leonid meteor trails is probably due to the reduction in the wave amplitudes and their dependent diffusion rate caused by the electron bite outs produced by the ambient dust particles. In situ rocket observations also indicate that, under similar ambient conditions, the amplitudes of Type II irregularities observed in the lower E-region are considerably smaller than those observed at higher altitudes. This probably is a direct evidence for the effect of dust particles that dominate the lower E-region altitudes practically all the time.