EFFECT OF DUST PARTICLES ON THE GROWTH RATE AND AMPLITUDE OF TYPE II IRREGULARITIES IN THE E-REGION

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Sporadic-E layers are observed more often in the ionograms than in the VHF Radar echo traces both at equatorial and non equatorial latitudes. Observation of Sporadic-E layers in the ionograms and their absence or presence with weaker amplitudes in the VHF radar traces indicate that such layers are not always associated with Type II irregularities responsible for the radar echoes. It is possible to explain this feature as a manifestation of the effect of the E-region dust particles on the development and growth of Type II irregularities. Two stream and cross-field instability mechanisms operating in the E-region of the ionosphere are affected by the ambient dust particles. While in the upper E-region the number of dust particles is rather less, they exist in large numbers in the lower E-region. A new theoretical approach to estimate the growth of Type II irregularities is presented here taking into account the loss of ionization due to attachment on dust particles. The low effective conductivity of the mesospheric dusty plasma can explain the existence of vertical electric fields observed in this region. The observation of the persistence of Leonid meteor trails for unexpectedly long duration of time probably is due to a reduction in the wave amplitudes and their dependent diffusion rate by the process. This reduction is possible due to the presence of sub-micron size dust particles introduced mainly by meteors. It is shown that due to attachment of both ions and electrons on dusts the two stream instability requires drift velocities much higher than ion acoustic velocities for its onset. The wave growth rate and the amplitude of Type II irregularities can also be modified by the ambient dust particles by modifying the collision parameters as well as by creating electron bite outs. Sporadic-E layers, thus seen in ionogram traces, may not necessarily be associated with Type II irregularities responsible for the VHF radar echoes, if the height region under consideration is dominated by dust particles.

E-Region, Type II Irregularities, Meteoric Dust

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