COMPARISON BETWEEN THE PLASMA WAVES WITHIN THE METEOR TRAILS AND THE NEW PLASMA WAVES OVER LOW LATITUDE E REGION

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ABSTRACT

The Plasma waves associated with meteor trails over low latitude region have been studied using VHF and UHF radars (Close et al JGR, 107, 2002) and also with theory (Dyrud et al., GRL, 2002). The radar observations reveal head echoes, specular and non-specular meteor trail echoes. The non-specular meteor trails are found to be associated with field aligned irregularities. The scale sizes of these irregularities responsible for giving rise to non-specular echoes are in the range of sub-meters. Theoretical studies reveal that the development of Farley-Buneman/gradient drift waves within the meteor trail driven by the diamagnetic current associated with plasma density gradient at the edge of the meteor trail.

Insitu measurements of plasma parameters were conducted from Sriharikota, India on 18 and 20 November, 1999, during a Leonid meteor storm period. These measurements reveal the presence of a new plasma wave over a low latitude E-region. The amplitude of these plasma waves on both the days are around 4% of the ambient density and are found to be located at 105 km altitude. The scale size of these waves is around 50cm. These waves encompass over a large altitude region on a meteor storm day and over a limited altitude region on a day (20 November 1999) when the meteor activity had fallen to one third of activity. Evidences are shown that these waves are not produced either by gradient drift or by the conventional two-stream instability mechanism (Gupta et al., Annales Geophysicae, 22, 2004). Comparison with the previous measurements taken from the same location on non-meteor storm days suggests that the observed waves are associated with meteor storm activity.

Similarities and dissimilarities are found between these two plasma waves. The scale sizes and the altitude region of maximum amplitude are found to be similar in both the cases. Further, both the waves are found to occur during meteor shower events. However, a spectrum of scale sizes of the plasma waves in the meteor trail are observed so that both VHF and UHF radars respond to these waves while only a particular mode is observed in the ambient medium for the case of plasma wave associated with meteor storm. The altitude extent is limited for the generation of plasma waves on meteor trail while the observed altitude extent is large for the plasma waves associated with meteor storm.