ELECTRON TEMPERATURE EFFECTS ON PLASMA IRREGULARITIES ASSOCIATED WITH CHARGED DUST IN THE EARTH'S MESOSPHERE

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Polar mesospheric summer echoes PMSEs are strong radar echoes in the 50 MHz to 1.3 GHz frequency range produced by scattering from electron irregularities in the earth's mesosphere. The electron irregularities believed to produce PMSEs result from electron charging on subvisible dust that exists in the mesosphere. The study of PMSEs is a forefront issue in near earth space science because of the tremendous remote sensing diagnostic possibilities that exist for studying the earth's middle atmosphere. Recently, experimental results have shown that PMSEs may be modulated by radio wave heating the irregularity source region with a ground-based ionospheric heating facility. The strength of the PMSEs is reduced within second time-scales upon turning on the radio wave heating and there is a similar time-scale for recovery of the PMSEs upon turning the radio wave heating off. Also, it has been recently predicted and observed that an overshoot effect may occur during the recovery period. The modification behavior of PMSE obviously shows great promise as a diagnostic of mesospheric dust. A numerical model is used to investigate the time evolution of the effects of radio wave heating on the irregularities believed to produce PMSEs. The effects of dust charging and chemistry as well as diffusion is included in the model. The results indicate that diffusion of electrons and ions are of primary importance at early times after turn on or turn off of the radio wave heating while dust charging may have important effects at later times. Also, the scale-size of the irregularities has important effects on the reduction and recovery behavior of the irregularities.

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2. H - Waves in Plasma

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4. I - Invited Paper, Program chair: M. Horanyi and L. Gelinas

5. Commisssion H dusty plasma session