

# **D-region incoherent radar spectral widths and reflectivities as diagnostics of PMWE**

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Polar Mesosphere Winter Echoes (PMWE) are strong radar echoes from altitudes around 70 km. The reasons for PMWE are still not understood, but suggestions include strong turbulence, thin layers of charged meteoric dust and ion-acoustic waves. For PMWE to occur, enhanced ionization is needed, following for example a solar proton event (SPE) when high energy protons from the sun cause extensive ionization in the ionosphere. Reflectivities and spectral widths obtained with incoherent scatter radars and from theory are used to characterize PMWE.

Atomic oxygen plays a crucial role in the ion chemistry of the D-region and especially affects the negative ion and electron concentration, hence also the reflectivities and spectral widths. It exhibits a strong diurnal variation, which is expected to be restrained during an SPE.

Data from the EISCAT VHF radar for 30 October, 2003, which was part of a strong SPE, are here presented. During this day, there were also PMWE detected. Modelled and measured spectral widths outside the layer of PMWE are used to estimate the atomic oxygen concentration, which is then input to an ion-chemistry model for the D-region. Based on modelled ion concentrations and EISCAT measurements of electron densities, the theoretical radar reflectivity expected from turbulence and theoretical incoherent spectra within the layer of PMWE, are deduced. Comparing spectral widths and reflectivities with EISCAT measurements provide means of examining the nature of PMWE.