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Polar Mesosphere Winter Echoes at high Latitudes

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VHF radar observations are used for investigations of different parts of the Earth's atmosphere. Echoes from the mesosphere can be observed during summer months mainly at polar latitudes (PMSE - polar mesosphere summer echoes). During the last years also the correspondent echoes during winter time (PMWE) became interesting.

The topic is about VHF radar measurements during the months between September until April at Andenes (2001-2005) to derive the mean features of PMWE at polar and mid latitudes. The PMWE are a rare phenomenon with mean occurrence rates of about 2.9% in polar latitudes with a maximum occurrence height at 70.5 km for daytime and 77.5 km for night-time echoes. The diurnal variation is characterised by a maximum near noon and minimal values during night-time. The seasonal variation of PMWE is not very strong with some indications of an increasing number of PMWE during mid winter. The occurrence rate of PMWE is positively correlated with the ionisation level of the ionospheric D region. Mainly high energetic proton (and electron) fluxes and enhanced X-ray radiation are important for the existence of PMWE. The second factor for the existence of PMWE are irregularities of the refraction index of half the radar wavelength (about 3 m for a 50 MHz radar). Neutral air turbulence due to breaking gravity waves seems to be the most essential process.