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Polar Mesosphere Winter Echoes and their relation to infrasound

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Polar Mesosphere Winter Echoes (PMWE) are radar echoes that originate from the mesosphere at 50-80 km altitude and are observed with VHF radars during equinox and winter seasons. Strong PMWE are relatively rare phenomena, in most cases they are observed when the lower ionosphere displays high ionisation. Interpretations of observational results concerning PMWE are controversial and the origin of the echoes is still under debate. Especially intriguing is that in some cases of strongest PMWE the measured horizontal speeds of the radar reflecting structures can exceed 300 m/s. Infrasonic waves at frequencies below about 2 Hz were suggested in order to explain the observations.

The present declining phase of the solar cycle provides favourable conditions for PMWE observations and we carried out observations with the 52 MHz atmospheric radar ESRAD and the 224 MHz incoherent scatter radar EISCAT VHF. The radars are located in Northern Sweden (ESRAD) and Norway (EISCAT) approximately 200 km apart. On 4 November 2015 we detected strong backscatter from about 70 km and preliminary analysis shows that the horizontal speed for some of the echoes is above 300 m/s. We will present the main characteristics of the detected echoes such as the scattering cross section, velocities, aspect sensitivity, Doppler spectra derived with these different radars. We will discuss two hypothesized scenarios of PMWE generation involving infrasound and evaluate whether the experimental results can help us to distinguish the different suggested generation mechanisms.