



Lower mesospheric turbulent radar echoes and their connection to neutral dynamics

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VHF radar echoes originating from structures in the mesosphere have been observed since more than 40 years. These radar echoes can be divided into summer and the so-called winter echoes and are observed at polar and middle latitudes.

The mesospheric summer echoes (MSE) are basically well understood and relate to reduced electron diffusivity due to the presence of charged ice formed in the cold summer mesopause region around 84km altitude.

The so-called winter echoes, however, actually are a rather equinoctial phenomenon, typically occur between 50 and 85km altitude. These echoes are generally fainter and highly depend on the current electron density of the ionospheric D region including a clear diurnal pattern based on the solar zenith angle. These radar echoes have gained more interest in the last two decades resulting in various studies, including rocket campaigns. These campaigns aimed to shed some light on the formation and propagation of these radar echoes, which are assumed to be related to turbulent structures propagating through the medium. Despite these activities, the source of such radar echoes remains unclear.

The intensity of the radar echoes is found to be quite dependent on the actual ambient electron density, but does not explain the echoes occurrence. The neutral dynamics are assumed to play a crucial role for the formation, i.e. creation of turbulent structures of suitable scales and their transport.

To investigate the formation and propagation of these echoes we analyze the dynamics within the mesosphere and lower thermosphere in the vicinity of the VHF radar. For this the co-located Saura partial reflection radar, measuring winds and electron density, as well as a multi-static meteor radar network measuring horizontal winds are exploited. Additionally, it is planned to use ECMWF reanalysis data to find probable scenarios allowing favorable conditions to generate such lower mesospheric echoes.

Suggested session: G13 - The high-latitude atmosphere