

Observations of MLT dynamics using meteor radars and meteor radar networks

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The winter 2015/16 was characterized by an unusually strong polar vortex with values up to 2 standard deviations guiding the mid-latitude planetary waves into the subtropical mesosphere. This exceptionally strong wave activity in the subtropical mesosphere led to a regionally reversed meridional temperature gradient resulting in a zonal wind reversal between 70 and 80 km at polar latitudes due to the thermal wind relation. This regional wind reversal changes the propagation conditions for waves propagating upward from the mesosphere into the thermosphere/ionosphere. The variability of the thermosphere/ionosphere is influenced by forcing from below and thus by gravity waves and atmospheric tides propagating upward from the mesosphere into the thermosphere.

To investigate the change in propagation characteristics of gravity waves and tides in the upper mesosphere/ lower thermosphere (MLT) during this unusual zonal wind reversal in winter 2015/16 we use data from a meteor radar network in Scandinavia. With this network we are able to apply tomographic wind field analysis obtaining horizontally resolved wind fields and horizontal wavelength spectra. Further, we are able to assess the spatial and temporal day-to-day variability of tides.

Keywords: meteor radar, horizontally resolved winds, planetary waves, atmospheric tides and gravity waves, vertical coupling