# Climatology and inter-annual variability of the auroral MLT region inferred from the meteor radar observations during solar cycle 24

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Wind and temperature fields in the northern polar mesosphere-lower thermosphere (MLT) region are studied using observations by the meteor radar located at Sodankyla (67N, 26E), i.e. in the vicinity of the statistical southern edge of the stratospheric polar vortex and also close to the equatorial part of the nightside auroral oval in the ionosphere. The mean zonal winds are characterized with summer westward flow at lower height levels and eastward flow, up to 30 m/s, at upper levels, and winter eastward flow at all heights. The meridional winds are dominated by winter poleward flow and summer equatorward flow, with a jet core of about 15 m/s located slightly below 90 km. The systematically varying winds are mostly the semidiurnal tides up to 40 m/s. Under conditions of low solar activity, pronounced sudden mesospheric coolings linked to major stratospheric warmings (SSW) are observed while no thermal signature of SSWs are detected in the mesosphere during the solar maximum. Mesosphere-ionosphere anomalies observed simultaneously by the meteor radar, the Aura satellite, and the rapid-run ionosonde during a period of major SSW include the following features. The mesospheric temperature minimum occurs 1 day ahead of the stratospheric maximum, and the cooling is almost of the same value as the corresponding warming (~50 K), the former decay faster than the latter. In the course of SSW, a strong mesospheric wind shear of ~70 m/s/km occurs. As the mesospheric temperature reaches its minimum, the gravity waves (GW) in the above ionosphere with periods of 10–60 min decay abruptly while the GWs with longer periods are not affected. The effect is explained by selective filtering and increased turbulence near the mesopause inversion layer.