Geophysical Research Abstracts
Vol. 21, EGU2019-2083, 2019
EGU General Assembly 2019

Middle and high latitude mesosphere and lower thermosphere mean winds and tides in response to Polar-night Jet Oscillations

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A detailed description of the dynamical behavior of the mesosphere and lower thermosphere (MLT) region during severely distorted wintertime conditions commonly known as Polar-night Jet Oscillations (PJOs) is presented. For this purpose, wind measurements provided by two specular meteor radars located at Andenes (69°N, 16°E) and Juliusruh (54°N, 13°E) are used to estimate horizontal mean winds and tides. Winds and tidal main features are analyzed and compared for three different scenarios: years with (a) strong PJO events, (b) non-PJO events and (c) no major sudden stratospheric warmings (SSWs). We show that the distinction between strong PJOs and years with no major stratospheric warmings, instead of the classification into major or minor SSW, is better suited to identify differences in the behavior of the mean winds and tides during wintertimes. To assess the impact of the stratospheric disturbed conditions on the MLT region, we investigate the 30-year nudged simulation by the Extended Canadian Middle Atmosphere Model (Ext-CMAM30). Contrary to previous studies, we identify a recovery of the planetary wave activity between one or two weeks after the onset of strong PJO events. We speculate on the possibility that filtered gravity waves in situ generate these planetary waves. Finally, we discuss if changes in the time of occurrence of the 2-day wave and of the semidiurnal solar tide fall decrease may be related to a late response of the MLT to strong PJO events.