Geophysical Research Abstracts
Vol. 18, EGU2016-1944, 2016
EGU General Assembly 2016

Radar observations of the quarterdiurnal tide in the mesosphere/lower thermosphere

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While the diurnal, semidiurnal and terdiurnal tides in the mesosphere/lower thermosphere (MLT) have been observed from the ground and from satellites, the quarterdiurnal tide has been investigated on a few occasions only. Therefore, meteor radar observations of horizontal winds in the MLT (80-100 km) at Collm (51.1°N, 13.0°E), Obninsk (55°N, 37°E), Cariri (7.4°S, 36.5°W) and Cachoeira Paulista (22.7°S, 45.0°W) have been used to analyse the seasonal variability of the quarterdiurnal tide at middle and low latitudes. At Collm and Obninsk, the zonal amplitudes show a clear maximum in boreal winter and a weaker one during spring. Amplitudes increase with height, with up to 7 m/s in the lower thermosphere. The meridional amplitudes are weaker, but show a similar seasonal cycle. Amplitudes and phases at Collm and Obninsk are similar, indicating that most of the observed 6-hour oscillation at higher midlatitudes is due to the migrating quarterdiurnal tide. Obninsk amplitudes show an interdecadal variation with smaller values during the 1990s and larger ones during the 2000s. At low southern latitudes over Cariri, the maxima during boreal winter and spring are also visible, but there is another one during austral winter, and generally the amplitudes are smaller. Meridional amplitudes at Cariri are larger than the zonal ones, and maximize during austral winter. At Cachoeira Paulista there are two maxima at the upper altitudes during the equinoxes in both wind components, and another one during austral winter in the mesosphere, which is mainly visible in the zonal component.