Measurements of tidal and planetary wave modes in the lower thermosphere

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The field-aligned ion velocity of the EISCAT Svalbard Radar at 78 deg N latitude shows in August 11-14 and August 17-19 strong diurnal and semidiurnal variations from 90 km to 120 km. This ion motion parallel to B is attributed to presumably meridional neutral wind. The phase gradient as well as the lack of corresponding ion temperature variations let us conclude that the tidal modes are global. At about 90-100 km, the semidiurnal amplitude is modulated at periods of about 10 and 15 hours, suggesting non-linear interaction between the semidiurnal mode and a 2.5 day planetary wave. The observation period is too short to see planetary modes, but MF radar observations from Japan at midlatitudes show a 2.5 day quasi-periodic oscillation of the meridional wind.

The magnetic field-aligned velocity obtained with the EISCAT Svalbard Radar located at 78 deg N latitude shows in the intervals August 11-14 and August 17-19 strong diurnal and semidiurnal variations in the altitudes from 90 km to about 120 km. In this height range the ion motion parallel to B is attributed to neutral wind which is presumably predominantly meridional. The phase gradient with altitude as well as the lack of corresponding diurnal and semidiurnal ion temperature variations let us conclude that the tidal modes are global and propagating to the observation site. However, the amplitudes of the variations so close to the North Pole are extraordinarily high. Between about 90 to 100 km, the semidiurnal amplitude is modulated producing peaks at about 10 and 15 hours periods in the Lomb-Scargle periodograms. This is compatible with a non-linear interaction between the semidiurnal mode and a 2.5 day planetary wave. The observation period at Svalbard is too short to see the planetary mode, but MF radar observations from Japan at midlatitudes show a clear, 2.5 day quasi-periodic oscillation of the meridional wind.