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Latitude variation of tides and quasi-2 day waves three meteor radars in northern Norway

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A new meteor radar was installed at Bear Island (74.5 deg N, 19.0 deg E) in summer 2007 to investigate the mesospheric and lower thermospheric wind dynamics in the polar cap region. The meteor radar has been almost continuously operated since November 1, 2007, collecting abundant data set of 39 months (up to now) to investigate seasonal as well as year-to-year variations of mean winds, tides and quasi-two day waves (Q2DW). The meteor radar provides well height-resolved wind data typically in the height region between 80 km and 100 km with height resolution of about 3 km. In this study, the wind data are integrated into one-hour bin to reduce data perturbations for every month. Spectral analysis is employed using the hourly mean data to retrieve wave parameters of diurnal and semidiurnal tides. For Q2DW analysis, on the other hand, we use consecutive 8-day interval data. The major results are summarized as follows:

(1) Mean winds exhibit clear seasonal and year-to-year variations. The year-to-year variation is greater in winter than in summer. We think one of major causes is the influence of planetary waves. In particular, the effect of Sudden Stratospheric Warming (SSW) seems to be important. The SSW occurred in January and February 2009 and 2010.

(2) The amplitude of meridional component of diurnal tides shows clear difference between summer months (April to October) and winter months. It is almost constant between April and October. In winter months it is smaller, and is very small between 80 km and 90 km.

(3) The amplitude of semidiurnal tides grows with the altitude increasing, and it becomes 15-30m/s at 100 km except for October. In October over the 3 years, the semidiurnal tides have small amplitude between 90 km and 100 km.

(4) The amplitude of Q2DW is higher in winter and summer, and much lower at equinox. In winter, Q2DW activity can be found from 80 to 100 km, while in summer it is only limited above 90 km. There are, however, several events found in summer when the activity is high between 80 and 100 km.

Bear Island (74.5 deg N, 19.0 deg E) is located in the almost middle of two sites such as Longyearbyen (78.2 deg N, 16.0 deg E) and Tromsø (69.6 deg N, 19.2 deg E). The longitude of the three stations is almost the same, so we here investigate latitudinal variations of tides and Q2DWs using data obtained at these 3 stations from November 2007 to January 2011. We will present the results, and also will present variations of wind velocities associated with SSW events.

Keywords: northern Norway, meteor radar, tidal wave, quasi two day wave, latitudinal variation