

Semidiurnal tide observed in the polar mesosphere

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In order to understand effects of the upward propagating atmospheric waves onto background atmosphere in the mesosphere and lower thermosphere, we have investigated characteristics of atmospheric tidal waves in the polar mesosphere between 70 and 91 km using the wind data obtained with two MF radars located at the Tromsø (69.58 deg N, 19.22 deg E) and the Poker Flat (65.1 deg N, 147.5 deg W).

In our previous talk (November 2003, SGEPPS), we reported characteristics of semidiurnal tide based on MF radar wind data obtained from November 1998 to December 2002. We derived amplitudes and phases of two different semidiurnal tidal modes with zonal wave number 1 and 2. Observations at two sites make us possible to distinguish the two modes.

We examined characteristics of semidiurnal tide with two different zonal number ($s = 1$ and $s = 2$). Results are as follows:

For semidiurnal tide with $s = 2$, (1) At the all heights (88, 82, 76, 70 km), the day-to-day variability of phase (local time of maximum) is very small (less than 2 hours) during summer and winter, but the difference of phase between summer and winter is large and close to 6 hours. (2) Those year-to-year variations are not prominent over the 4 years at the all heights. (3) At the all heights, the phase values tend to shift towards earlier times with altitude increasing and the height profile of phase indicate the upward propagating waves.

For semidiurnal tide with $s=1$, (1) at 88 km, the phase values are almost constant in summer, while the phase exhibits short-time (10 - 20 days) variation in winter. At 82, 76 km, the phase shows an intra seasonal variation (30 - 60 days) over the 4 years. At 70 km, the variation of phase values in equinox vary largely compared to those in summer and winter.

In this talk, we will report these results, and discuss the differences of these two modes. Furthermore, a possible wave-wave interaction between quasi 2day wave and semidiurnal tide will be discussed.