

## On the coupling between gravity waves and background field including tides observed with MF radar at Poker Flat & Tromso

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The neutral wind velocity data from mesosphere to lower thermosphere observed by MF radars at Poker Flat in Alaska and at Tromso in Norway has been observed since the late 1990s. The present study examines the daily and seasonal variations of short-period mesospheric gravity wave activities associated with the background state including tides using these MF radars' data for 10 years of 1999-2008.

Observed wind velocities having the 1-4 hour period components are analyzed as short-period gravity waves and those having harmonic components with periods of 24, 12, and 8 hours are calculated every 30 minutes. The previous study in AGU2014 showed that the semidiurnal phases of zonal wind and kinetic energy of gravity waves (GW-KE) are locked for more than 10 days. Such phase lock events are found in several years at both observation sites. It is confirmed a phase lock phenomena at both Tromso and Poker Flat continued for about 20 days from November to December in 2000. However, between Tromso and Poker Flat, the phases of 12 hour component of GW-KE differed by 180 degrees. Next, we made climatological 1-day composite plots of semidiurnal components of zonal wind and GW-KE. The result showed that the maximum of GW-KE occurs at Poker Flat when zonal wind is westward from November to December and zonal wind transitions from westward to eastward from January to February and from May to August. The results of Tromso showed that the maximum of GW-KE occurs at local time when zonal wind is eastward from November to February and westward from May to September. Thus, it is suggested that the observed phase lock event is possibly to be occurred fluently. We plan to investigate the relations between other harmonic components of zonal wind and GW-KE and discuss the physical mechanism of the relations.

Keywords: middle atmosphere, gravity waves, tidal waves