Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

ACG31-07 会場:201B 時間:5 月 25 日 17:00-17:15

MF radar observations of gravity wave variation with 12-/24-hr periods
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Intensive observational studies have been conducted in past of interaction between atmospheric gravity waves (GWs) and tides in the mesosphere and lower thermosphere. Tidal winds can be background winds for small-scale and/or high-frequency GWs. If mesospheric tides play a role in the mesospheric GW momentum dissipation process, the tides may be a substantial element for the mean flow acceleration process since there are tides every day and every months in the middle atmosphere almost all over the globe. In this study, we employed 10-year horizontal wind velocity datasets in the mesosphere and lower thermosphere observed with MF radars at Poker Flat, Alaska and at Tromso, Norway. The data analysis was carried out for 1999 ? 2008, to show daily and seasonal behaviors of mesospheric gravity waves and the 12 and 24 hour components of horizontal winds. The wind velocity component with the wave periods of 1-4 hours are analyzed as short-period gravity waves, to which a harmonic analysis was applied in terms of temporal variations with periods of 24, 12, and 8 hours with the 5-day running window shifted by every 30 min. Sinusoidal curve fitting is not the best fit model for the behavior of GW kinetic energy (GW-KE), but the fitted amplitude and phase can be used as measures of GW activity variation with a target period (24, 12, or 8hrs) and local time identification where GW-KE enhances and decreases. In case studies that we have carried out, phase relation between the 12-hr components of zonal wind and GW-KE shows that their phases are locked for more than 10 days, in several cases in multiple years at the both observation sites. We 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 are almost in anti-phase or differed by approximately 180 degrees. We plan to discuss climatological aspects and also more detail of underlying physical processes, focusing on gravity wave drags and background state of horizontal wind velocities at both sites.

キーワード: 中間圏, 大気重力波, 大気潮汐, 相互作用, MF レーダー
Keywords: mesosphere, atmospheric gravity waves, atmospheric tide, interaction, MF radar