Geophysical Research Abstracts
Vol. 15, EGU2013-2622, 2013
EGU General Assembly 2013

Deep gravity wave influences in the mesosphere and lower thermosphere

David Fritts (1), Brian Laughman (1), and Tom Lund (2)
(1) GATS Inc., Boulder Division, Boulder, CO, (2) NWRA, CoRA Division, Boulder, CO

Large-scale gravity waves (GWs) exhibit a variety of responses at high altitudes accompanying their attainment of large amplitudes. These include local instabilities, large induced mean flows, and significant phase speed variations. Large GW amplitudes enable local instabilities similar to those occurring at lower altitudes and higher Reynolds numbers that may extend well into the thermosphere. Because of the smaller Reynolds numbers at higher altitudes, instability structures are typically $\sim$1 to 10 km, thus $\sim$10 to 100 times larger than near the mesopause. Such GWs also induce strong mean flow accelerations, and these occur in the volume occupied by the GW itself. This results in accelerations of the GW phase speed that depend on altitude and yield strong changes in the GW vertical phase structure as accelerations increase. Phase speed variations exceeding the initial intrinsic phase speed cause the phase structure to pass through vertical and lead to "self acceleration" instability. This instability is 2D, but is accompanied by 3D instabilities that together lead to GW packet dissipation, major momentum deposition, and radiation of secondary GWs that may themselves propagate to much higher altitudes.