Interaction of Finite Amplitude Gravity Waves in the Mesosphere and Lower Thermosphere.

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Gravity waves play a dominant role in transporting energy and momentum from lower atmospheric sources to the Mesosphere and Lower Thermosphere region (MLT) [e.g. *Fritts and Alexander*., 2003 and references therein], which they can then deposit through various dissipation mechanisms. Small-scale, high frequency gravity waves in particular contribute a significant amount of momentum flux to the MLT [e.g. *Fritts et al*., 2014], such that they impact both overall dynamics and local variability. However these wave scales are also easily refracted, reflected, or ducted by the ambient atmosphere and other larger scale waves, inhibiting their ability to propagate into the MLT and dispersing their momentum and energy.

Recent studies have confirmed a rich spectrum of waves of different scales interacting in the MLT [e.g *Bossert et al*. 2014, 2015, *Fritts et al*. 2014, *Yuan et al*. 2016] which can influence small-scale gravity wave propagation and momentum deposition. In order to investigate the role and importance of these interactions, a 2D compressible, nonlinear model is used to simulate the interaction between small-scale (25km, 10 min) and medium scale (250km, 90min) waves in the MLT. Waves are investigated at finite amplitudes similar to those typically observed by airglow and lidar systems. We use these simulations to assess propagation and interaction effects, momentum deposition and transfer between the two waves and the ambient flow, and the instability scales and regions. Context relevant for the interpretation of MLT-region data, which may exhibit interactions between scales in addition to generation of waves across scales, is provided.

Key words: gravity waves, wave-wave interaction, numerical modeling, MLT.

References

Bossert, K., et al., 2015: *J. Geophys. Res*, **120**, 18.
Bossert K., et al., 2014: *J. Geophys. Res*, **119**, 16.
Fritts, D.C, et al., 2014: *J. Geophys. Res.*, **119**, 24.
Fritts, D. C., and M. J. Alexander, 2003: *Rev. Geophys.* **41**, 1.
Yuan, T., et al., 2016: *J. Geophys. Res.*, **121**, 2.