

Reverse Ray Tracing of Wintertime Mesospheric Gravity Waves Observed Over Interior Alaska

*Eric J Davis¹, Kim Nielsen¹, Michael Negale²

1. Utah Valley University, 2. Utah State University

While atmospheric gravity waves have been observed and studied in details for decades, there are still many questions to be addressed with respect to their propagation from the lower atmosphere into the mesopause region. Waves generated in the lower atmosphere are capable of transporting energy from their origin to the upper atmosphere as they propagate upward. While these energy transports have been known to impact large-scale circulation in the atmosphere, recent observations and model results have shown they also impact space weather and may play essential roles in climate changes. For the later, climate models often conclude at altitudes well below where we investigate the wave dynamics. New models increasing the top altitude have shown the importance of including the energy budget at these higher altitudes. Therefore, it has become increasingly important to characterize the wave propagation dynamics. A mesospheric airglow camera observed short-period gravity waves during the 2011-2014 winter months over interior Alaska. As an undergraduate research project we have developed a simple reverse ray tracing model to propagate the observed waves downward through the atmosphere to their respective points of origin. Here we present preliminary results of the reverse ray tracing algorithm and discuss propagation characteristics and possible source locations.

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