Mesospheric Inversion Layers and Their Effect on Gravity Wave Propagation over Polar Regions

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Atmospheric gravity waves generated in the lower atmosphere have been shown to propagate up to thermospheric heights where they can contribute energy and momentum as well as introduce large scale instabilities. The upward propagation of these waves is strongly affected by the background wind and temperature fields through critical layer filtering and reflection. Mesospheric inversion layers (MILs) are large scale features exhibiting strong thermal gradients capable of altering the wave propagation. MILs fall into two categories: Lower (~75 km) and upper (~95 km) MILs, and can be generated by planetary wave breaking as well as wave interactions. Several studies of the lower mesospheric inversion layers exist while few studies have focused on the upper mesospheric phenomena. Due to the importance of these thermal structures on gravity wave propagation it is therefore essential to have a better understanding of the occurrence and variability of the upper mesospheric inversion layers, and how the impact wave propagation into the thermosphere.

In this study we utilize a decade (2002 – 2012) of vertical temperature profiles obtained by the Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) instrument to identify the upper MILs. Specifically, we report on their occurrence frequency in Polar Regions, and annual and seasonal variability.