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Spectacular Imaging Studies of Atmospheric Gravity Waves

MICHAEL TAYLOR, PIERRE-DOMINIQUE PAUTET, YUCHENG ZHAO, WILLIAM PENDLETON, Utah State University — Atmospheric gravity waves (AGW) play a vital role in controlling both the dynamics and temperature structure of the Earth’s upper atmosphere. We show how ground-based measurements of the naturally occurring airglow emissions in the Mesosphere and Lower Thermosphere (MLT, \sim 80-100 km) region can be used to investigate wave-driven dynamics as a function of season and latitude. In particular, high-quality all-sky imagers and temperature mappers provide unique information on the characteristics and propagation of a broad spectrum of AGW over large geographic areas. This presentation introduces the AGW phenomena, illustrating their properties using spectacular observations obtained at polar and mid-latitudes using an Infrared Advanced Mesospheric Temperature Mapper (AMTM) developed at Utah State University. These studies include high-resolution image measurements of gravity wave propagation and breaking, new spectral analyses of large-scale tides and planetary waves, and first results from the NSF DEEPWAVE mission which included airborne AMTM measurements from a Gulfstream V aircraft. The mission was based in New Zealand with multiple research flights during the Austral winter (June-July 2014), focused on investigating a prominent AGW “hot spot” region over the Southern Ocean.

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