MESOSPHERIC TEMPERATURE MEASUREMENTS OF MOUNTAIN WAVES

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ABSTRACT

Gravity waves (GWs) are one of the main drivers of the Earth's atmosphere as they vertically couple energy and momentum throughout its successive layers. Orographic forcing caused by the wind flowing over a mountain range is a major source for these waves. Such perturbations are known to impact the troposphere as well as the stratosphere (Eckermann and Preusse, 1999), but it's only lately (Smith et al., 2009) that they were also observed as high as the MLT (mesosphere lower thermosphere, ~87km altitude). Newer results show that mountain waves (MWs) may reach the upper atmosphere under a variety of conditions and above very different topographies; not only high mountain ranges but also over more moderate terrains and even over small isolated islands (Pautet et al., 2016). Projects like DEEPWAVE in New Zealand (2014), GW LCYCLE in Scandinavia (2013 and 2016), or recent observations in the vicinity of the Andes mountain range, have focused on the measurements of mountain waves from the ground, where they are generated, throughout the stratosphere, where they interact with the background, up to the MLT, where they finally dissipate. The development of new high-quality instruments, such as the USU Advanced Mesospheric Temperature Mapper (AMTM) or the DLR Rayleigh lidar, has allowed unprecedented MW measurements and the quantification of their impact on the upper atmosphere. This talk will introduce orographic waves and present several examples of ground-based and airborne imaging observations at mesospheric altitude. The conditions under which they are generated and they propagate, as well as their impact on the upper atmosphere will be discussed.

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