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1.3B GRAVITY WAVES FROM THE STRATOSPHERE TO THE MESOSPHERE

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The propagation of gravity waves from the stratosphere to the mesosphere has important implications both for observers and those who are attempting to parameterized wave breaking in global models. As they propagate from the tropopause to their breaking level (here, assumed to be the mesosphere), gravity waves can encounter a refractive environment since the vertical group velocity is a function of the background wind. They may be focussed or scattered or dissipated before reaching the mesosphere. It is even conceivable that gravity waves may break, stop breaking, and begin breaking again at higher altitudes with a resultant loss of wave energy in the intervening region.

From a modeling viewpoint, the important concern for large-scale flows is the total upward flux of gravity wave (pseudo) momentum entering the stratosphere and mesosphere. Admittedly this quantity may show enormous spatial variations since the usual tropospheric generation processes for gravity waves (e.g. orography and thermal convection) are local. The refraction of gravity waves also presents a difficult problem for observers since waves passing through the tropopause may arrive a thousand kilometers upstream in the mesosphere. Thus, it would appear to a single station looking upward near the source point that all the gravity waves are absorbed in the stratosphere.

Since MST radars sense tropospheric and mesospheric conditions most accurately, they are ideally suited to assess the total gravity-wave flux through the tropopause and stratopause. Unfortunately, the refraction problem suggests networks of radars making coordinated measurements may be required to accurately determine the upward flux of momentum as well as the flux convergence between layers. The observational requirements needed to determine these fluxes are discussed in FRITTS et al. (1984).

REFERENCE

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