Gravity wave propagation and effects in the low latitude MLTI

David C. Fritts and Sharon L. Vadas

NWRA/Colorado Research Associates (CoRA) Division, 3380 Mitchell Lane, Boulder, CO 80301 (dave@cora.nwra.com / Fax: 303-415-9702 / Phone: 303-415-9701, ext. 205)

Gravity waves (GWs) spanning a wide range of spatial scales and frequencies are excited by deep tropical convection. Of these motions, those having large vertical scales and high intrinsic frequencies propagate preferentially into the mesosphere, lower thermosphere, and ionosphere (MLTI) because of their large horizontal phase speeds and weak tendency for instability at lower altitudes. Below the turbopause, instability processes may lead to GW breaking, wave-wave interactions, and turbulence. These lead, in turn, to GW dissipation and momentum flux divergence, local body forcing, and excitation of additional GW motions. At greater altitudes, increasing viscosity suppresses neutral instability processes, but results in altered GW structures and ultimately viscous dissipation that depends strongly on GW parameters and solar forcing. Because GWs can achieve very large amplitudes in the MLTI, they are suspected of also playing a role in such ionospheric processes as seeding of equatorial spread F and plasma bubbles that may penetrate to very high altitudes, and which themselves exhibit both a strong correlation with the sites of strong convection and a clear solar cycle dependence.