Gravity wave distribution at low and mid-latitudes from the Nested Regional Climate Model

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Gravity waves are generated from the orography, convection, and spontaneous adjustment of unbalanced jet flow, with spatial scales from 10-1000 km and temporal scales between buoyancy frequency and intertial frequency. The gravity waves can significantly impact the energy and momentum budget, the transport and mixing of atmospheric species, and stability and variability in the middle and upper atmosphere. The vastly different spatial and temporal scales and the global distribution of the gravity waves pose a stiff change for both observational and numerical studies of the gravity waves. In recent years, very high resolution numerical simulations can be afforded with the increasing computational power, and gravity waves at increasingly finer scales can be resolved in regional and even global domains. In this study, results from the Nested Regional Climate Model (NRCM) are examined. The NRCM has a global coverage between 45S and 45N (thus a channel model) with horizontal resolution of 36 km, and extends from the ground to ~30 km. The potential energy density of the gravity wave perturbations between 100-1000km from the model is compared with that obtained from GPS measurements. Analyses of gravity wave characteristics, energy and momentum flux, their distribution at low and mid-latitudes, and their seasonal variation in the upper troposphere and lower stratosphere will be presented.

Seasonal variations in gravity wave activity at three locations in Brazil

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Using the variance in meteor radar winds as a measure of gravity wave intensity, we investigate the temporal variations in gravity wave activity at three locations in Brazil: São João do Cariri (7.3 S, 36.4 W), Cachoeira Paulista (22.7 S, 45.0 W) and Santa Maria (29.7 S, 53.7 W). The technique used is that of Hocking (2005) which makes it possible to separate the zonal and meridional components of the fluctuating wind velocity. We find that the seasonal variation of the fluctuating wind is similar to that of the amplitude of the diurnal tide, showing a predominantly semi-annual variation, stronger at Cachoeira Paulista and Santa Mara than at the quasi-equatorial station, Cariri. Both with respect to the seasonal trend and shorter term variations, strong coupling between gravity wave activity and tides is indicated by a remarkably close correlation between the fluctuating velocity and the vertical shear in the tidal winds. This coupling suggests that tidal wind shear might be an important in situ source of gravity waves in the mesopause region.