GRAVITY WAVE COUPLING OF THE LOWER AND MIDDLE ATMOSPHERE

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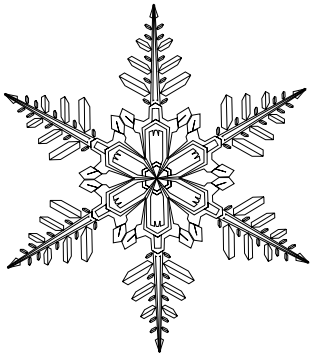

For Gail

Abstract

A method of inferring tropospheric gravity wave source characteristics from middle atmosphere observations has been adapted from previous studies for use with MF radar observations of the equatorial mesosphere-lower thermosphere at Christmas Island in the central Pacific. The nature of the techniques applied also permitted an analysis of the momentum flux associated with the characterised sources and its effects on the equatorial mean flow and diurnal solar thermal tide. An anisotropic function of gravity wave horizontal phase speed was identified as being characteristic of convectively generated source spectra. This was applied stochastically to a ray-tracing model to isolate numerical estimates of the function parameters. The inferred spectral characteristics were found to be consistent with current theories relating convective gravity wave spectra to tropospheric conditions and parameters characterising tropical deep convection. The results obtained provide observational constraints on the model spectra used in gravity wave parameterisations in numerical weather prediction and general circulation models. The interaction of gravity waves with the diurnal solar thermal tide was found to cause an amplification of the tide in the vicinity of the mesopause. The gravity wave-tidal interactions were highly sensitive to spectral width and amplitude. Estimates were made of the high frequency gravity wave contribution to forcing the MSAO with variable results. The data used in the analysis are part of a large archive which now has the potential to provide tighter constraints on wave spectra through the use of the methods developed here.

Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution, and to the best of my knowledge and belief contains no previously published or written by another person, except where due reference has been made in the text.

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Peter T. Love

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Contents

List of Figures

List of Tables