



The interaction between Gravity Waves and Solar Tides: results from 4D Ray Tracing coupled to a Linear Tidal Model

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Internal gravity waves contribute to an important part in the variability of the Stratosphere - Mesosphere - lower - Thermosphere. Numerous General Circulation Model do not present (for exemple) a Quasi-biennale Oscillation. Moreover, Internal gravity waves parameterizations often neglect time and horizontal dependence of the background flow ("column approximation").

Interactions between internal gravity waves and large scale flow, specially Solar tide waves, are studied here. Thermally driven global scaled waves, Solar tides describe the large-scale modulation (at sub-daily period) of all middle atmosphere fields.

Gravity waves propagate in a time and spatially varying background flow, composed by a climatological mean, stationary planetary waves and diurnal Solar tides. Global three-dimensional propagation of internal gravity waves is performed by a new W. K. B. gravity wave model (ray tracer scheme), where waves propagate in position-wavenumber phase-space in order to prevent the crossing of rays. Propagation of Solar tides is modeled by linearising a General Circulation Model over a climatological mean and a stationary planetary waves reference.

Gravity wave deposition of momentum and buoyancy are calculated. Characterizing the daily evolution, Rayleigh-friction and temperature-relaxation coefficients are calculated. They approximately describe the internal gravity wave forcing on the diurnal Solar tides propagation and are so used for it. The extracted diurnal Solar tides are then used for a new computation of the gravity wave fluxes. This is iterated a few times to obtain a converged result on gravity wave deposition and on tidal field.

Internal gravity waves are shown to influence both Solar tides amplitude and phase. Seasonal cycle of migrating and non-migrating tidal components is studied, as it is the seasonal cycle of gravity wave deposition. Gravity wave deposition and tidal fields are also obtained under the "column approximation". They show a clear rise in gravity wave deposition.

Key words: Middle-Atmosphere dynamics, Solar Tides, Internal Gravity Waves
