



HAL
open science

A stochastic parameterization of the gravity waves due to convection and impact on the equatorial stratosphere

Pauline Maury, Lionel Guez, François Lott

► **To cite this version:**

Pauline Maury, Lionel Guez, François Lott. A stochastic parameterization of the gravity waves due to convection and impact on the equatorial stratosphere. Symposium OGOA, May 2013, Lyon, France. hal-00840913

HAL Id: hal-00840913

<https://hal.science/hal-00840913>

Submitted on 11 Jul 2013

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

P. Maury (LMD)

A stochastic parameterization of the gravity waves due to convection and impact on the equatorial stratosphere

P. Maury, L. Guez, and F. Lott (LMD, Paris)

A formalism is proposed to represent the gravity waves due to convection in a General Circulation Model that includes a well resolved stratosphere. It is based on a stochastic approach, where an ensemble of monochromatic waves is built up, by launching few waves at each time step, and by cumulating the effect of these waves via an AR1 relation between the GWs tendency at a given time step and that at the next time step. Some properties of each waves are chosen randomly, like their wavenumbers and frequencies and with fixed probability distribution. Their amplitude nevertheless, is directly related to the precipitation, translating it in an heating rate and using linear theory to predict the amplitude of the waves such a heating can produce.

First, off-line tests are done using re-analysis and global precipitation data. They illustrate that the scheme launches GWs momentum fluxes that are much more heratic then when uniform sources are considered. This makes that the scheme has a tendency to act at lower level then when uniform sources are considered. We then verify that the parameterization, when applied to a General Simulation Model (GCM) with high vertical resolution in the stratosphere ($dz \sim 500m$) is able to produce a Quasi-Biennial Oscillation (QBO), and to improve the Semi-Annual Oscillation (SAO).

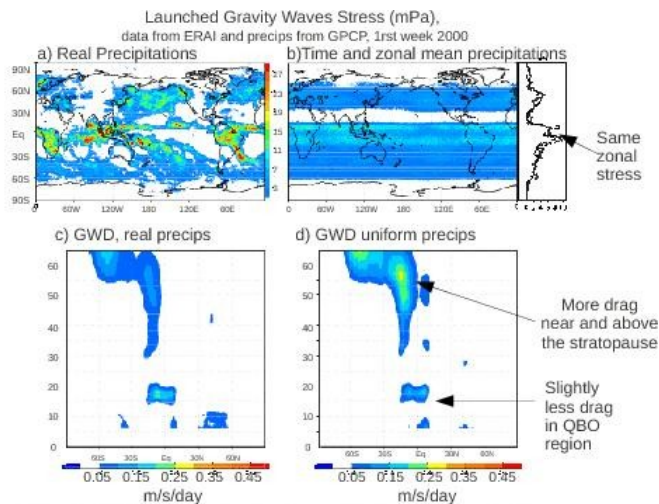


Figure 1: When the GWs amplitude is related to precipitations, the launched fluxes become much more erratic, fewer GWS of larger amplitude are launched than when the sources are uniform and un-specified (b and d).

1. Lott, F., L. Guez, and P. Maury 2012: A stochastic parameterization of non-orographic gravity waves: Formalism and impact on the equatorial stratosphere, *Geophys. Res. Lett.*, 39, L06807, doi:10.1029/2012GL051001.
2. Lott, F and L. Guez 2013: A stochastic parameterization of the gravity waves due to convection and impact on the equatorial stratosphere, *J. Geophys. Res.*, Submitted.