A stochastic parameterization of non-orographic gravity waves, impact on the equatorial stratosphere

F. Lott, L. Guez, and P. Maury
Laboratoire de Météorologie Dynamique, Paris, France (pmaury@lmd.ens.fr)

A formalism is proposed to represent a broadband spectrum of gravity waves via the superposition of a large ensemble of statistically independent monochromatic ones. To produce this large ensemble at a reasonable numerical cost we use the fact that the life cycles of the waves needed to be parameterized in General Circulation Models (GCMs) have time scales that largely exceed the time step of the model. We can therefore launch few waves with characteristics chosen randomly at each time step, and make them having an effect on a longer time scale by applying an AR1 relation between the gravity waves tendency at a given time and that at the model time step before.

We verify that the parameterization, when applied to a GCM with high vertical resolution in the stratosphere () but low horizontal resolution, is able to produce a quasi-biennial oscillation. We also show that the parameterization also improves the representation of the large scale equatorial waves, like the Kelvin waves with period near and below 10 days and the Rossby gravity waves with periods around 4-5 day, and which dominate the synoptic scale variability of the tropical stratosphere.