Geophysical Research Abstracts
Vol. 14, EGU2012-6208, 2012
EGU General Assembly 2012

Assessing and improving the representation of sources for non-orographic gravity wave schemes in Earth-System Models

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An activity is under way within the EU FP7 project "Earth system Model Bias Reduction and assessing Abrupt Climate changE" (EMBRACE) to explore the representation of convectively forced gravity waves and their impact on the upper troposphere and stratosphere. Many state-of-the-art climate atmospheric general circulation models (GCM) use parametrizations that represent unresolved gravity waves in order to provide momentum necessary to drive the mesospheric global scale circulation and the quasi-biennial oscillation of stratospheric equatorial winds. However, the representation of gravity wave sources in such schemes is often relatively unsophisticated.

The UK Met Office GCM (MetUM) is run in both operational numerical weather prediction (NWP) and climate configurations with a top around 85km and a non-orographic gravity wave parametrization scheme, based on the concept of Warner and McIntyre (1999), which usually has globally invariant sources. Introduction of a parametrization for the generation of gravity waves from convection has the potential to allow feedback, as changing climatic conditions alter the strength and distribution of convective activity, upon the resolved flow in tropical and mid-latitude regions. The goal of the EMBRACE collaboration is to install and test various choices for such convective gravity wave source parametrizations both offline and within global models such as the MetUM, evaluating their behaviour against a mix of in-situ observations and high-resolution simulations (limited in time or regional area). Initial results from this activity will be presented.