Geophysical Research Abstracts
Vol. 16, EGU2014-8071, 2014
EGU General Assembly 2014

Wave-meanflow interactions forcing the Quasi-Biennial Oscillation

Thomas Krismer and Marco Giorgetta
Max-Planck-Institute for Metorology, Atmosphere in the Earth System, Hamburg, Germany (thomas.krismer@zmaw.de)

The Quasi-Biennial Oscillation (QBO) in the tropical stratosphere is driven by a continuous spectrum of atmospheric waves. Due to the involved small scales, it is not yet possible to close the QBO's momentum balance based on observations, and models are still the optimal choice for studies on QBO dynamics. In model studies on the QBO forcing, the propagation and dissipation of the resolved wave field has mostly been studied based on the divergence of the wave momentum flux and the decrease of spectral power in atmospheric variables. However, the physical processes leading to wave attenuation in general circulation models, which are radiative and diffusive wave damping and are covered in theoretical work, have not been studied. Applying a general circulation model spectrally truncated at T63 and internally generating a QBO, this study illustrates how the Doppler shift of the resolved waves vertical wavelength and amplitude facilitates wave damping and identifies the dominating wave damping mechanism leading to the forcing of the QBO jets for different parts of the resolved wave spectrum. As argued in theoretical work, radiative damping is important for large scale, low frequency waves. Small scale waves are damped by the horizontal diffusion scheme, while vertical diffusion plays no role for wave damping. Due to observational limitations, it is difficult to validate the simulated strength of resolved waves in the stratosphere. However, increasing the horizontal resolution from T63 to T255 and adjusting the applied horizontal diffusion illustrates the constraints on wave propagation in low resolution models.