Geophysical Research Abstracts
Vol. 17, EGU2015-9975, 2015
EGU General Assembly 2015
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On the presence of equatorial waves in the lower stratosphere of a general circulation model.

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Following the general consensus that equatorial waves in the stratosphere are forced by convection, we use the stratospheric version of the LMDz atmospheric model to compare two simulations having distinct convection schemes but no quasi biennal oscillation. On the one hand the time mean precipitation climatologies are realistic and comparable which follows that both schemes have been tuned to be used in CMIP experiments. On the other hand, the precipitation variability is very different between the two versions and is significantly smaller in one of the two versions than in the observations. Also, the two versions underestimate the convectively coupled equatorial waves in the troposphere.

Despite these differences, the equatorial stratospheric Kelvin wavesat 50 hPa are realistic and comparable between the versions. The two LMDz versions also simulate almost identical Rossby-gravity waves, which are nevertheless weaker than in observations. A composite analysis shows that this last defect is essentially due to a dynamical filtering of the Rossby gravity waves by the model zonal wind, which is systematically westward, and not to a deficiency in the sources. In LMDz, we believe that the direct effect of convection is in part hidden by the fact that (i) the dynamical filtering is dominant, and by the fact that (ii) other sources of waves exist. This last point is illustrated by Eliassen and Palm fluxes diagnostic, which shows that the Kelvin waves in the model come from the subtropics and mid-latitude regions whereas the sources are more equatorial in the
reanalysis. For the Rossby gravity waves, we show that mid-latitudes sources can also play a role, but we can only use the Reanalysis to support this view. In them we make composite of Rossby-gravity waves in a dynamical configuration where the stratosphere is dynamically separated from the troposphere and still found Rossby gravity waves at high altitude, and refer to this process as a stratospheric reloading.