



Vertical resolution refinement in an aqua-planet and its effect on the ITCZ

Matthias-Heinz Retsch, Cathy Hohenegger, and Bjorn Stevens
Max Planck Institute for Meteorology, Hamburg, Germany

The General Circulation Model ECHAM is used to study the effects of three refined vertical resolutions on convection in the tropics and on the structure of the intertropical convergence zone (ITCZ). Additional vertical resolutions have 76, 134 or 192 levels, which is over four times the default resolution of 47 levels. New levels are placed in the troposphere only. The simulations are conducted on an aqua-planet with equator symmetrical sea surface temperature and neither a yearly nor a diurnal cycle.

Whereas the default vertical resolution shows a double ITCZ, refining the vertical resolution yields an equatorward shift of the ITCZ. The ITCZ converges to its equatorial position with 134 levels. Refining the vertical resolution has a stronger impact on the location of the ITCZ than changing the convection scheme, at least in ECHAM. The sensitivity of the ITCZ to the vertical resolution is traced back to the mixing formulation in the convection scheme. Here, a higher number of vertical levels leads to a stronger mixing between the updraft and its environment per default, which favors an equatorward position of the ITCZ. Cloud radiative effects explain most of the remaining differences between the simulations.