Geophysical Research Abstracts
Vol. 19, EGU2017-12687, 2017
EGU General Assembly 2017

Organised convection embedded in a large-scale flow

Ann Kristin Naumann, Bjorn Stevens, and Cathy Hohenegger
Max Planck Institute for Meteorology, Hamburg, Germany (ann-kristin.naumann@mpimet.mpg.de)

In idealised simulations of radiative convective equilibrium, convection aggregates spontaneously from randomly distributed convective cells into organized mesoscale convection despite homogeneous boundary conditions. Although these simulations apply very idealised setups, the process of self-aggregation is thought to be relevant for the development of tropical convective systems. One feature that idealised simulations usually neglect is the occurrence of a large-scale background flow. In the tropics, organised convection is embedded in a large-scale circulation system, which advects convection in along-wind direction and alters near surface convergence in the convective areas. A large-scale flow also modifies the surface fluxes, which are expected to be enhanced upwind of the convective area if a large-scale flow is applied. Convective clusters that are embedded in a large-scale flow therefore experience an asymmetric component of the surface fluxes, which influences the development and the pathway of a convective cluster.

In this study, we use numerical simulations with explicit convection and add a large-scale flow to the established setup of radiative convective equilibrium. We then analyse how aggregated convection evolves when being exposed to wind forcing. The simulations suggest that convective line structures are more prevalent if a large-scale flow is present and that convective clusters move considerably slower than advection by the large-scale flow would suggest. We also study the asymmetric component of convective aggregation due to enhanced surface fluxes, and discuss the pathway and speed of convective clusters as a function of the large-scale wind speed.