Geophysical Research Abstracts
Vol. 17, EGU2015-2579, 2015
EGU General Assembly 2015

Data-driven stochastic subgrid-scale parameterisation for tropical convection

Georg Gottwald (1) and Karsten Peters (2)

(1) University of Sydney, School of Mathematics & Statistics, Sydney, Australia (georg.gottwald@sydney.edu.au), (2) ARC Centre of Excellence for Climate System Science, School of Mathematical Sciences, Monash University, Clayton, VIC 3800, Australia (Karsten.Peters@monash.edu)

Data-driven stochastic subgrid-scale parameterisation for tropical convection

Observations of tropical convection from precipitation radar and the concurring large-scale atmospheric state at two locations (Darwin and Kwajalein) are used to establish an effective subgrid-scale parameterisation for tropical convection. Two approaches are presented which rely on the assumption that tropical convection induces a stationary equilibrium distribution. In the first approach we parameterise convection variables such as convective area fraction as an instantaneous random realisation conditioned on the large-scale vertical velocities according to a probability density function estimated from the observations. In the second approach convection variables are generated in a Markov process conditioned on the large-scale vertical velocity, allowing for non-trivial temporal correlations. Despite the different prevalent atmospheric and oceanic regimes at the two locations, with Kwajalein being exposed to a purely oceanic weather regime and Darwin exhibiting land-sea interaction, we establish that the empirical measure for the convective variables conditioned on large-scale mid-level vertical velocities for the two locations are close. This allows us to train the stochastic models at one location and then generate time series of convective activity at the other location. The proposed stochastic subgrid-scale parameterisations adequately reproduce the statistics of the observed convective variables and we discuss how they may be used in future scale-independent mass-flux convection parameterisations.

This is joint work with Karsten Peters.