Geophysical Research Abstracts, Vol. 9, 08810, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08810

Limitations of the Equilibrium Assumption Between Convection and the Forcing

L. Davies (1), R. Plant (1) and S. Derbyshire (2)

(1) Department of Meteorology, University of Reading, (2) Met Office, UK
(l.davies@rdg.ac.uk)

Current convective parameterisations used in weather forecast and climate models require an equilibrium assumption between the large-scale forcing and the convective response. This assumption is valid for a convective system being forced at a constant rate. In those circumstances, the cloud ensemble reaches an equilibrium state, with fluctuations dependent on the ensemble size. However the extent to which the equilibrium assumption holds has not been quantified for situations in which the forcing is time-varying.

We compare simulations from a cloud-resolving model (the Met Office LEM) which is forced by time-varying surface fluxes. The periodicity of the forcing ranges from the cloud lifetime up to the diurnal cycle. A key feature of the analysis is a comparison with the equilibrium-fluctuation theory of Craig and Cohen (2006). It is shown as the periodicity of the forcing tends towards the cloud lifetime, fluctuations can no longer be explained by the theory. In this situation, the convective response at any given time cannot be characterised by the current forcing, but is also dependent on the time-history of the system. Preliminary results will also be shown identifing the physical mechanisms that persist in the convective ensemble and so cause the system to exhibit signs of memory.