

Equilibrium statistical mechanics of moist atmospheric convection

George Craig
Institut für Physik der Atmosphäre
DLR Oberpfaffenhofen
Postfach 1116
D-82230 Wessling, Germany

Abstract

Cumulus parameterisation schemes are usually based on an assumption of equilibrium, so that the large scale interacts deterministically with statistical properties of convection. This is a statistical equilibrium like turbulence or gas kinetics, and to understand its limits, it is necessary to examine the underlying processes at the “microscopic” level.

This talk will develop a statistical characterisation of the convective scale behaviour, given the large scale environment, and show results from tests of the theory using a cloud-resolving model. Specifically, we will consider

- The time scale of adjustment to equilibrium.
- Length scale of the convective variability.
- Magnitude of the fluctuations about the equilibrium mean.

A stochastic convection scheme based on this theory is being developed, and some results from single column, radiative-convective equilibrium runs will be shown.