



Approaches for Statistical Cumulus Dynamics

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In discussing the closure issue, Arakawa and Schubert (1974) states in passing that "that should be an eventual goal of *statistical cumulus dynamics*" (SCD, with the italics by the present author). We should realize that from this respect the *convective quasi-equilibrium hypothesis* is proposed as a "provisional" solution until SCD is well established. Unfortunately, not much progress is made for SCD is since then.

The present talk discusses possible approaches for SCD.

First to realize is that a set of prognostic energy cycle equations for the kinetic energy and the cloud work function constitutes an almost closed set. A closed set is obtained by replacing the massflux by the convective vertical velocity in the cloud-work function budget equation, which reduces to a population dynamics of analogous to the Lotka-Volterra system. It constitutes a closed system.

Generalizations of these basic SCD systems can be considered in two dimensions: 1) relaxation on plume dynamics, and 2) inclusions of more explicit interactions between the plumes.

Finally, phenomenologies may be developed in analogy with Maxwell-Boltzmann type of statistical mechanics.