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Convective parameterization development from cloud resolving simulations of convective equilibrium: what can we still learn?

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In recent years there has been a rejuvenation of interest in cloud-resolving simulations of radiative-convective equilibrium. Programmes such as RCEmip are focussed on the organization of convection stimulated by interactive radiation over large domains. While there is much interesting work ongoing in that area, this presentation revisits very simple idealized numercal experiments in which moist convection is allowed to reach an equilibrium against a prescribed forcing. We argue that the study of such cases is very far from exhausted and that there is still much to be learnt that may be valuable for parameterization developments.

The ParaCon programme is a large joint effort between UK universities and the Met Office to develop the next-generation parameterization for the operational Unified Model. High resolution simulations of equilibrium convective archetypes have been performed and analysed as part of the programme, and we highlight some important findings relevant for the future parameterization development. Topics of interest include the equilibrium response to imposed shear and to strength of forcing, the characterisation of convective memory and spatial organization, the variability and internal structures of convective updrafts, diagnosing the turbulent budgets and the possibilities for decomposition of turbulent transports into a spectral representation.