Geophysical Research Abstracts, Vol. 9, 01146, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-01146

A hybrid and nonlocal convection parameterisation scheme for nonhydrostatic NWP models

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Convection can redistribute significant amounts of moisture, heat and mass on small temporal and spatial scales. Furthermore convection can cause severe precipitation events and is thus of major interest in numerical weather prediction (NWP). As a subgrid scale phenomenon convection usually has to be parameterised in NWP models. Classical mass flux convection schemes assume grid box sizes much larger than the scale of convective circulation. Thus, the convective mass transport is closed in the local grid column and no net mass transport occurs on the grid scale.

In contemporary NWP models with high horizontal resolutions, where convection is partially resolved, this approach leads to a conceptual problem. To overcome this, we propose a hybrid convection scheme, in which only the small scale convective up- and downdraughts are parameterised, whereas the environmental subsidence has to be determined by the grid scale equations. Therefore, our scheme produces a net convective mass flux exerting pressure gradient forces to the grid scale model.

We will discuss idealised and real cases simulated with the operational weather forecast model of the German Weather Service as the hosting model of our convection scheme.