Geophysical Research Abstracts, Vol. 8, 08740, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08740

Misrepresentation of horizontal rolls at high mesoscale resolutions

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Deficiencies in the representation of subgrid-scale convection by mesoscale models may lead to the generation of spurious strong grid-scale convection in mesoscale models. The problem is often triggered in dry convection over warm terrain for horizontal resolutions of the order of 1 km, which are too coarse to resolve the dry convective plumes but are fine enough to respond to the surface forcing with explicit convection. For this reason, resolutions between 500m and 2km may be difficult to use in many important situations. In this study we present a case study of dry convection simulated by a state of the art mesoscale model, MesoNH, comparing results at horizontal resolutions between 250m and 5km, which show the spurious nature of rolls simulate at the intermediate resolutions. Experiments with the new Eddy-Diffusivity Mass-Flux (EDMF) scheme show, for this case, a very positive impact in the results, showing that spurious grid-scale convection may be alleviated by a better representation of shallow convection.