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Joint effects of turbulence parameterizations, microphysics and grid spacing on the high resolution modeling of deep moist convective processes

Elisabetta Fiori, Antonio Parodi, and Franco Siccardi
CIMA Research Foundation, Savona, Italy (antonio.parodi@cimafoundation.org)

The increasing availability of computational power makes possible the numerical modeling of severe weather events at unprecedented fine mesh-scale. This strong progress of high-resolution numerical modeling capabilities has not only the potential for enabling a deeper understanding of spatio-temporal properties of deep moist convective processes and related intense rainfall phenomena, but also calls for a better characterization of the uncertainty associated with the adoption of different physical parameterizations. In this respect, the assessment of effects of subgrid scale closures such as those associated with microphysics and turbulence processes on fine mesh-scale modeling has been subjected to growing attention.
In this study, deep moist convective processes in simplified atmospheric scenarios (e.g. supercell) are by means of high resolution numerical simulations with Cosmo Model.
Particular attention is paid to determine if and at which extent the convection-resolving solutions, in the range of grid-spacing between 1km and 100 m, statistically converge from a turbulence perspective with respect to flow field structure, transport properties and precipitation forecast. Different turbulence closures, microphysics settings and grid-spacings are combined and their joint impact on the spatial-temporal properties of storm processes is assessed and discussed.