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Multi-scale parameterization concept ALARO: an example of its concretization

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Progress of Numerical Weather Prediction models to higher horizontal resolutions brings new problems and dilemmas with respect to paradigms traditionally used when building parameterization schemes. To answer this challenge we developed a concept to address and/or anticipate the forthcoming problems by deriving a set of governing equations for moist physics and by introducing prognostic character and consistency to newly developed parameterizations. These are progressively introduced into the operational high resolution models under the name ALARO, denoting the unifying above mentioned strategy. Here we shall specifically address the problem of moist deep convection, which becomes partly resolved for grid length sizes going roughly from 7km to 1km, also known as a "grey zone". We shall present the flexibility of an existing "convection permitting" scheme for the multi-scale parameterization of precipitating convection (3MT = Modular, Multi-scale Microphysics-Transport) and its recent enhancements. In particular, these novelties allow getting qualitatively very homogeneous results across the grey zone grid-mesh sizes. Additionally, the importance of the sub grid scale geometry of cloudiness and falling precipitation in microphysics, of the "convection memory" and of the interaction with radiative transfer shall be demonstrated, e.g. for getting an improved diurnal cycle of simulated deep convection. Enhanced forecast skills are shown using the operational ALARO configuration of Czech Hydrometeorological Institute.