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Non-reasonable but efficient use of schemes in current model to improve realistic explicit convection modelling

christophe messager and marc honnorat
Extreme Weather Expertises, 2 Rue de Keraliou, 29200 Brest France (cm@exwexs.fr)

There is actually no limitation of current high-resolution weather model for producing simulation and forecast of convection at kilometer and infra-kilometer horizontal resolutions. However, the disappointing results as well as the associated huge amount of computer resources required may lead to focus on Large Eddy Simulation model instead. However, the use of LES is not trivial and required a long and non-portable adjustment over the region of interest. Also, it is difficult to use in operational mode for daily forecast since they require specific inputs.

In the other side, pushing the current regional or Limited Area Model towards very high resolution is a convenient way to reach explicit resolution of convective process for instance. However, an explicit simulation is not a guarantee of a realistic result mainly due to the fact that initial condition is crucial as well as all other descriptions of the environment (soil, vegetation, sst, etc) and use of correct parameterization schemes.

For instance, within the WRF model framework, one can identify more than 4000 set of parameterizations plus all the scheme adjustments and threshold associated to.

However, a physically based analyze of what it is necessary for a realistic and explicit convection simulation may conduct a physicist user to define its “ideal” physics with what it already exists in the model. It may conduct to so-called unrealistic model requests in term of computation requirement regarding the radiative, the turbulence and the microphysics schemes but it does works with HPC systems. This kind of parameterization will be presented here and used with a very realistic vertical circulation into convective systems with convective updraft and downdraft modelling, from few meters up to several kilometers height.