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Ensemble methods for evaluating the convective-scale predictability of Mediterranean Heavy Precipitation Events.

B. Vié, O. Nuissier, and V. Ducrocq
CNRM-GAME (CNRS - Météo-France), Toulouse, France (olivier.nuissier@meteo.fr)

The aims of this study is to develop dedicated methods of generation of ensembles to identify and quantify the different uncertainty sources and meteorological processes that govern convective-scale predictability of Mediterranean Heavy Precipitation Events (HPEs) using the fine-scale atmospheric AROME model. The study examines in a quite separated way (i) the uncertainty at synoptic-scale on both initial and lateral boundary conditions and on the other hand (ii) the uncertainty at mesoscale on the initial conditions. The modelling errors in the physical parameterizations and dynamics are neglected for now.

The case studies are two past HPEs which occurred over Southern France: 21-22 Oct. 2008 and 1-2 Nov. 2008. In order to characterize the uncertainty at synoptic-scale on both initial and lateral boundary conditions, the methodology first uses the members of the short-range large-scale ensemble ARPEGE forecasting system (PEARP) for these HPEs as initial and lateral boundary conditions for AROME. A mesoscale data assimilation is also performed in AROME to improve the mesoscale initial conditions. On the other hand, the uncertainty on mesoscale initial conditions is described through an ensemble of mesoscale data assimilation experiments. Regarding perfect synoptic-scale initial conditions and lateral boundary conditions, the assimilation of randomly perturbed observations permit to generate a set of initial conditions for the AROME model, using its 3D-Var data assimilation scheme. Both approaches for assessing the uncertainty sources are thus evaluated and their impacts on the fine-scale precipitation forecasts as well as on the mesoscale meteorological environments are also examined.

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