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Approaches to reduce sampling noise of background error covariances used in AROME-France EnVar

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EnVar is based on the use of sampled background error covariances in a variationnal data assimilation system, which allows to consider flow dependent forecast errors in the assimilation process. As a consequence, a better exploitation of observations is possible, especially in clouds or precipitations where the use of climatological forecast errors in e.g 3DVar is known to be far from optimal. A prototype of EnVar is currently under evaluation for the AROME-France NWP system at convective scale. Its background error covariances are deduced from forecasts drawn from an AROME-based Ensemble of Assimilation (EDA), which considers perturbed observations in an ensemble of cycled 3DVars.

Two different strategies, aiming in reducing the sampling noise of these covariances will be presented, without modifying the background ensemble generation procedure. The first one makes use of a scale dependent localization (SDL), which consists of applying different amounts of localization to different ranges of background error covariance spatial scales. The second approach uses time-lagged forecasts (i.e forecasts of different ranges but valid at the same time) in order to increase the effective ensemble size, up to a factor of 3. In this study, deterministic analyses retrieved by the different flavors of EnVar and by the EDA rely on the same horizontal resolution of 3.8 km. Both systems have been run on a 5 week period and consider the same set of observations, closed to what is operationally considered. Impacts of both SDL and time-lagged approaches on the overall quality of the forecasts will be compared and discussed.