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Model upscaling

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The “upscaling” project from the first CMEMS Service Evolution aimed at studying whether regional or coastal models, using CMEMS basin-scale model results as initial or boundary conditions, could also provide some feedback to the CMEMS models.
The idea is to simulate two-way nesting by extracting pseudo-observations from the regional models and assimilate these in the basin-scale models. New results obtained during the second year of the project are presented.

An ensemble of 100 one-way nested NEMO models of the Mediterranean Sea (Med) (1/16°) and the North-Western Med (1/80°) is implemented to simulate the year 2014. Each member has perturbed initial conditions, atmospheric forcing fields and river discharge data. The Med model uses climatological Rhone river data, while the nested model uses measured daily discharges. Some processes are clearly improved by the method, such as the river plume position, while for other processes, the impact of upscaling is limited or difficult to isolate (e.g. SST, deep water formation).

The non-diagonal error covariance matrix of the pseudo-observations can be estimated by analysing the ensemble of nested models. The pseudo-observations are then assimilated in the parent model by means of an Ensemble Kalman Filter, newly implemented to use this non-diagonal matrix.