DATA ASSIMILATION IN A NESTED MODEL OF THE GULF OF LIONS

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When using nested grids, a preliminary, simple, 1D test case showed the interest of combining all state vectors into one single vector, using global error matrices covering all the grids at once, and using error-space feedback. Assimilation of the same data in the coarse grids is not necessary anymore, and some large data transfers from local to basin-scale models can be avoided.

The GHER hydrodynamic model is applied to a three times nested model covering (a) the Mediterranean Sea, (b) the Liguro-Provençal Basin, and (c) the Gulf of Lions. In a twin experiment, sea surface temperature and salinity are assimilated in the model every 24 hours, using optimal interpolation. Different simulations are implemented, using different ways to combine grid nesting and data assimilation.

The perturbed initial condition is a delayed model state of the reference run. An initial reduced-rank model error-space is constructed from 20 EOFs, themselves built from the reference run. The comparison of those experiments shows that using a global statevector reduces the error in the coarser grids faster than the use of three separated statevectors.

The effect of data assimilation, and the performances of the different methods, can be examined by calculating RMS errors between the perturbed run and the reference run. They can also be observed by following the model state trajectory in the EOF-space. In the context of the twin experiment described above, the first assimilation cycle clearly takes the model back in time. This is consistent with the choice of the disturbed initial conditions. The following assimilation cycles have less effect, as the trajectory is already almost brought back on the reference trajectory.

References

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