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Modelling error of a hydrodynamic model of the Mediterranean Sea

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The expected modelling error of a hydrodynamic model of the Mediterranean Sea is obtained by means of an ensemble of 250 members, in which various parameters are perturbed by different means: the bathymetry, the initial conditions, atmospheric forcing fields (air temperature, cloud coverage, wind), and internal model parameters (diffusion coefficients).

This ensemble is forwarded in time, and the evolution of the differences (i.e. the model error) between members is analyzed. In particular, we examine the time evolution and stationarity of its spatial average, and the spatial distribution of the error at different instants, by means of its first to fourth order moments, and of empirical orthogonal functions. We verify whether the a posteriori error distribution is Gaussian using the Anderson-Darling test. From these results, we are able to assess what parameters and forcing fields are most critical for the forecast. Qualitative conclusions are obtained, in accordance with our expectations. Moreover, quantitative estimations of the expected error are also obtained.