Validation of open boundary conditions for oceanmodels : application to a regional model of Bay of Biscay.

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Specifying boundary conditions at the limits of an ocean model remains a challenge, especially for long term (multi-year) simulations. In this work, we compare several methods in the context of a realistic regional model. The methods investigated are clamped and radiation open boundary conditions, one-way and two-way grid refinement within a model of larger extent, and Schwarz domain decomposition coupling of the regional model with a general circulation model. In our application, a 1/3 degree coarse resolution model of North ATLantic (NATL3) is used to provide boundary conditions on a 3 year period (1996 to 1998) to a coastal 1/15 degree fine resolution model of the BAy of BiscaY (BABY15). NATL3 provides the boundary information required by the clamped and radiation conditions when BABY15 is run alone. It can be refined from 1/3 to 1/15 degree in the region of the BABY15 model using the AGRIF mesh refinement software, the coarse grid and the fine grid being integrated with or without a feedback from the fine grid onto the coarse grid (two-way or one-way mode). Both models can also be configured separately, with different grids, and coupled using a coupler software and run simultaneously following Schwarz method. We present a comparison of these different methods through several three-year-long simulations with daily forcing. We pay particular attention to the behaviour of the solution in the vicinity of the boundary of the BABY15 domain and to its impact on the interior solution of the regional model.