Geophysical Research Abstracts
Vol. 21, EGU2019-14825, 2019
EGU General Assembly 2019

Downstreaming from CMEMS core forecast products to local scales: benefits of dynamical downscaling in the Strait of Gibraltar

Pablo Lorente (1,2), Marcos G. Sotillo (1), Arancha Amo-Baladrón (1,2), Roland Aznar (1,2), Álvaro de Pascual (1,2), Bruno Levier (3), José Carlos Sánchez-Garrido (4), Guillaume Reffray (3), Simone Sammartino (4), Cristina Toledano (1,2), and Enrique Álvarez-Fanjul (1)

(1) Puertos del Estado, Spain (plorente@puertos.es), (2) Nologin Consulting, Spain, (3) Mercator Ocean, France, (4) GOFIMA (Physical Oceanography Group of University of Malaga), Spain

Despite global circulation models have been steadily evolving in terms of complexity and resolution refinement, some coastal and shelf phenomena are still poorly replicated, especially for complex-geometry regions. Small-scale ocean features and processes must be thus explicitly computed by means of regional and coastal models with finer horizontal grid spacing but for a particular delimited area. In this context, there is a significant wealth of ocean forecasting systems routinely operated on overlapping regions, offering the opportunity to compare them, judge the strengths and weaknesses of each system and eventually evaluate the added-value of high-resolution coastal models respect to coarser parent model solutions.

In this work, a multi-parameter model inter-comparison was conducted, ranging from global to local scales in a two-phase strategy. Firstly, a comparison between GLOBAL and the nested IBI regional system, both operated in the frame of the Copernicus Marine Environment Monitoring Service (CMEMS), was performed with a focus on the impact of impulsive-type river freshwater discharge on local surface circulation in NW Spain. The increased horizontal resolution of IBI allowed a more accurate representation of horizontal salinity gradients, the horizontal extent of the river plume and the strength and position of the freshwater front, according to the results derived from the validation against in situ observations of sea surface temperature, salinity and currents provided by a moored buoy.

Secondly, a 1-year multi-model inter-comparison exercise was performed in the Strait of Gibraltar between CMEMS GLOBAL, CMEMS IBI and a high-resolution coastal system (developed by Puertos del Estado -PdE- and dynamically embedded in IBI) named PdE-SAMPA in order to elucidate both their ability to both characterize the Atlantic Jet (AJ) inflow and reproduce singular coastal ocean processes, such as the quasi-permanent (up to 48 h long) full reversal of the AJ surface flow under intense and prolonged easterlies. To this end, a High-Frequency radar system was used as benchmark since it regularly provides quality-controlled hourly maps of surface currents. Results showed the steady improvement in AJ representation in terms of speed and direction when zooming from global to coastal model configurations, highlighting both the benefits of the dynamical downscaling approaches and the relevance of a variety of factors at local scales such as the refined horizontal resolution, the tailored bathymetry along with the high spatio-temporal resolution of the atmospheric forcing.