Towards a regional operational modelling system of the Catalan Coast (NW Mediterranean Sea)

The Catalan Coast, located in the Catalano-Balearic basin (North-Western Mediterranean Sea), encompasses a 580 km-long coastline subjected to strong anthropogenic pressure. The area is highly urbanized (81%) with around 50% of the Catalan population living in a stripe of 3.8 km width. Many important infrastructures, from a socio-economic point of view (e.g., marine trade of goods and people, seafood production and tourism), are deployed in the coastal area, sharing the space with several Marine Protected Areas vulnerable to climate change and extreme events (e.g., Ebro's Delta). The Catalan Institute of Research for the Governance of the Sea (ICATMAR) is developing a regional operational modelling system that will serve as a tool for policy makers and authorities to face the threats and impacts of such anthropogenic pressure on marine and littoral ecosystems, and to undertake mitigation and adaptation measures for climate evolution.   The ICATMAR operational system will provide high-resolution ocean forecasts, over a 3-day period, of basic physical properties such as 3D ocean currents, temperature, salinity and sea level. We are presently working with two different ocean models, MITgcm and CROCO, applied to the same domain, with a horizontal resolution of 1/128° (~800 m) and 60 vertical levels, reaching a maximum depth of 3000 m. The domain extends from the Gulf of Lions in the north-east, to the Gulf of Valencia in the south-west, including the Balearic Islands. It accounts for 17 Spanish and French rivers, including the Ebro and the Rhone. The atmospheric forcing is provided by the Catalan Meteorological Service (METEOCAT). Initial and open boundary conditions are derived from the MEDSEA products delivered by the Copernicus Marine Service. However, each model is configured for different purposes, with distinct features and physical parameterizations. Building on the experience acquired in previous projects and collaborations, the non-hydrostatic MITgcm configuration is being coupled with a biogeochemical module by using the relocatable MITgcm-BFM modelling system, while the hydrostatic CROCO configuration is being coupled with the WaveWatch III wave model.   In this work we present model results and validation against remote sensed SST and buoy data, characterizing the observed variability of the two models. The dynamical downscaling of both configurations demonstrates that only a few days are enough for realistic fine turbulent mesoscale structures, not present in the parent model, to develop.

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