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Shelf-coastal seamless Mediterranean-Black sea model nested in Atlantic Ocean: towards an operational forecasting system

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The present work shows the development and implementation of a new 3D-thermo-hydrodynamic fully-baroclinic pre-operational forecasting system, (i) covering the entire Mediterranean and Black Sea with a unique-continuum-seamless grid and (ii) solving with appropriate resolution different oceanographic scales, with detailed focus on the shelf-coastal scale. The system is based on the unstructured-grid finite-element SHYFEM model (Umgiesser et al., 2004; Federico et al., 2017).
The model domain extends in a large Atlantic box (similar to the one described in Oddo et al., 2009) with a lateral open boundary nested into high-resolution global ocean circulation model (Iovino et al., 2016).
The horizontal resolution is optimized on the local bathymetry, coastline and expected solutions (relevant dynamics and coastal scale features), and ranges from 4-5 km in open-ocean to 1km-500m in overall shelf-coastal seas to 50-60m in narrow straits (Dardanelles and Bosphorus).
The model has been run both in hindcast and forecast mode, simulating different seasonal conditions. Preliminary comparisons with satellite observations and in-situ coastal observations show promising features of the system.
The system is valuable tool (i) for process study focused on the coastal areas of the entire Mediterranean and Black seas, (ii) to assess the impact of straits (Gibraltar-Sicily-Dardanelles-Bosphorus-Kerch) on the dynamics and exchanges of interconnected basins, (iii) to provide high-resolution operational forecasts for the overall coastal zones.