From global to regional: How IBI-PHY-NRT improves the solution in 3 examples

The validation of IBI against independent measurements is routinely conducted to evaluate the model's veracity and prognostic capabilities. Noticeable efforts are done to define meaningful skill scores and statistical metrics, to quantitatively assess the quality and reliability of the IBI model solution. IBI products are also regularly compared against other model solutions on overlapping areas at different timescales.

Here we show 3 examples on how IBI compares against observations (buoy, HF radars) and models: CMEMS GLOBAL (NEMO, 1/12°) and SAMPA (MITgcm, Gibraltar strait area, 300-500m rés.).

**Freshwater plume**

A buoy detected an abrupt decrease in SSS and SST on the Galician coast in March 2018, due to freshwater discharge from the Miño river. The global configuration could not reproduce this event, but IBI was able to catch the drop in salinity and temperature.

**Exchange through the strait of Gibraltar**

The Atlantic Jet (AJ) inflow dynamics is captured by an HF radar. The higher the resolution, the better the representation of the speed and direction of the jet. IBI correctly simulates the AJ eastward flow, however only the coastal model captures the AJ reversals.

**Mesoscale: surface coastal currents and eddies**

An HF radar captured a coastal eddy off the Ebro delta in the Mediterranean. (Summer 2016). IBI has a sufficient resolution to reproduce this pattern at the right time and place, whereas the global cannot resolve it.

**Ongoing developments of IBI-PHY-NRT**

Validation and sensitivity tests are carried out to investigate the impact of the two following developments on the IBI-PHY-NRT system regional dynamics:

- Update of the tidal forcing (TPXO7.1 → FES2014)
- Sensitivity study of an upgrade of the bathymetry, from GEBCO08 to EMODnet.

**Bathymetry**

A modification of the coastline and small-scale topographic features are expected to impact greatly the tidal solution, the current position and the exchange and transport of water masses between the Mediterranean and the Atlantic through the Strait of Gibraltar. The feasibility of an upgrade from GEBCO08 to EMODnet is currently assessed.

**Tidal Forcing**

The tidal forcing will soon be updated from the existing TPXO7.1 to the LEGOS model (FES2014). The number of tidal harmonics is expected to be increased from 11 to 19, and sensitivity tests are performed to check the impact of adding the Self Attraction and Loading (SAL) effect.

**Future improvements of IBI-PHY-NRT planned to be achieved by the end of CMEMS Phase 2 (2021)**

- Increase of the vertical resolution from 50 to 75 levels (this improvement will be linked to the update of the CMEMS GLO 1/12°)
- Improvement of the Data Assimilation (new scheme + new observational data)
- Coupling with waves solution (offline 2-way coupling with IBI-WAV)
- Increase of the resolution of the reanalysis (from 1/12° to 1/36°)
- Development of tools to check system anomalies, and Ocean Monitoring Indicators (OMIs)

And, if the sensitivity tests are conclusive:

- Improve the runoffs (LAMBDA project → more rivers, switch from climatology to model)
- Improve the MED dynamics (new BDY forcing, barotropic component,...)

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