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NEMO Model Test Run for ROFI in the Gulf of Trieste

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Test runs for the Region of Freshwater Influence (ROFI) in the Gulf of Trieste were setup using the 'Nucleus for European Modelling of the Ocean' (NEMO) model. Two test simulations of plume spreading were performed: the first was run for the winter season with initially homogeneous water and a constant bora wind blowing along the Gulf's axis with a speed of 13 m/s. The second simulation was run for summer conditions with vertically stratified water and without wind forcing. The k-ϵ turbulence scheme on an Arakawa C-type grid common for NEMO, was applied as described in (Madec, 2008). The modeled area of the Gulf, 31.8 km $\times$ 33.0 km, is gridded in cells of dimension 0.6 km $\times$ 0.6 km, similar to the model setup in (Žagar et al. 2013). A simplification of the OBC was achieved by extending the domain by 15 km in a westward direction, and by closing the simulation area. Along the vertical, 25 $z-$layers were inserted. The forcing of the river Soča (Isonzo) was simulated with the conversion of the volume flow-rates for the summer (120 m^3/s) and winter (150 m^3/s) situations to the vertical mass density flow through the topmost cell by applying discharges of 0.33 kg/m^2 s and 0.42 kg/m^2s, respectively. The river temperature was set to the ambient temperature, while the salinity of the river runoff was set to 0 PSU.

Both simulations run for the period of 48h, when the nearly 'steady' state was reached. The winter simulation revealed a strong outflow current in the form of a belt of fresher water, attached to the northern coastline of the Gulf. This is mainly a wind-driven process, and in this case the salinity acts as a passive tracer. The water mass returns through the deeper layers in the central and southern parts of the Gulf, according to the topographic control (Malačič et al. 2012).

In the summer windless simulation, radial spreading of the freshwater stemming from the Soča River is present in the inertial plume area. The velocity vectors deflect due to the Coriolis force, forming outward spiraling paths of surface parcels. Once the scaling of terms in the equation of motion is completed, the transient situations with variable winds, tides, and the river flow rate can be tackled, as in (Querin et al. 2007).

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