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Numerical Modeling of physical-biological interactions in the Alboran Sea with a submesoscale-resolving model

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Ageostrophic motion, such those associated to internal hydraulic jumps, propagating nonlinear internal waves, and submesoscale vortices, are recognized to efficiently supply nutrients to the euphotic zone and thereby fuel biological productivity. These processes are ubiquitous in the Strait of Gibraltar and the adjacent Alboran Sea, and therefore are expected to play an important role in the overall biomass budget of the basin. This has been investigated with a three-dimensional, tidally-forced, high-resolution model [O(1km)] ocean model embedded with an ecosystem NPZD module. We found that tidal mixing in the Strait of Gibraltar enhances remarkably local primary production and drive a net flow of biomass to the Alboran Sea. Additionally, tides also cause an inflow of nutrients confined to the photic layer, which increase further the Alboran Sea biomass through the enhancement of local primary productivity. Subinertial accelerations of the Atlantic flow are also found to temporary enhance biological productivity through the advection of shear vorticity (and submesoscale eddies) from the Strait to the Alboran Sea.