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Planktonic ecosystem response to meso and submesoscale dynamics above a shelf slope.

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In this numerical process study, we examine the impact of the relative positions of a coastal current and the continental slope on the dynamics of a planktonic ecosystem.

In the open ocean, previous studies have evidenced the importance of mesoscale and submesoscale turbulence on the structure and functioning of planktonic ecosystem (Rivière et Pondaven, 2006; Perruche *et al*, 2011). In coastal areas, the presence of the continental slope induces a complex ocean dynamics and impacts the spreading of biochemical tracers between the shallow continental shelf and the deep open ocean. The topographic parameter (ratio between the shelf slope and the isopycnal slope), the vertical aspect ratio (ratio between the depth of the current and the total depth) and the Burger number control the stability of surface coastal currents and the emergence of meso and submesoscale structures (Pennel *et al*, 2012; Poulin *et al*, 2014). Thus, different positions of the current above the shelf slope, by changing the local depth or the local slope, induce different dynamical regimes that may imply a large impact on ecosystems through changes in nutrient inputs from the deep ocean into the euphotic layer or changes in the cross-shelf transport.

Simulations of a geostrophically balanced gravity current with a mixed layer are carried out using the Regional Ocean Modeling System (ROMS). The domain consists of a re-entrant channel with an hyperbolic tangent shelf bathymetry. The 600 m horizontal resolution (12 grid points per radius of deformation) and the 60 vertical levels allow the model to resolve both the meso and submesoscale dynamics. An idealized biological model is included and accounts for the existence of two different trophic chains involving small and large species (NP_2Z_2D).

A suite of few months long simulations is performed with different positions of the coastal current above the bottom topography. The results are discussed in terms of primary production, cross-shore export of biomass and structure of the ecosystem.