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Modelling the impact of the hydrodynamic processes on the organic matter export in the Gulf of Lions using a coupled physical/biogeochemical model.

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The Gulf of Lions is a coastal marine system which is a transition area between the continental shelf waters and offshore waters. This area is complex to study, owing to its general morphology, fresh waters inputs from the Rhone River, Modified Atlantic Water from the North Mediterranean Current and the intense process of vertical mixing in winter. The northern basin is considered as one of the most productive areas of the whole Mediterranean Sea. In the French National Program of Coastal Environment, a 3D coupled model has been developed, that describes the annual dynamics of water masses and pelagic foodweb. The biogeochemical model is a multi-nutrient (C, N, P, Si, Chl) and multi-functional groups (Synechococcus, diatoms) model. The resulting analysis of numerical simulations allow to know the impact of physical phenomena on the biogeochemical processes. In winter, for example, the Gulf of Lions show dense water formation on the shelf and cascading over the shelf break, evidenced both in the data and simulation outputs. We show by modelling that process of the dense water formation has significant impact on organic matter export. The way of export seems to follow dense-water plumes and down the slope. The organic matter export localization and modelled quantification allow to investigate transfers towards sediments on shelf or in canyons (vertical transport) or to the deep-sea zone (advection). Realistic simulation will allow to have a better understanding on role of coastal zones in global biogeochemical cycles, and their potentiel behavior as carbon source or sink.