

Development of an Earth System component for Medium-Range Predictability in Coastal Seas: Application on Gulf of Mexico Harmful Algal Blooms and Hypoxia Episodes

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This project supports coupling of the HYbrid Coordinate Ocean Model (HYCOM) hydrodynamic model to the Carbon, Silicate, Nitrogen Ecosystem (CoSiNE) biochemical model, and then using this new tool to study medium-range predictability of harmful algal blooms (HAB) and hypoxia episodes. This work is carried out by the Naval Research Laboratory Stennis Space Center in collaboration with RSMAS and AOML. The Gulf of Mexico (GoM), and particularly the Northern GoM shelf, is used as a test case study area due to the frequent Harmful Algal Bloom (HAB) and hypoxia episodes associated with Mississippi River (MR) nutrient loads. Initial model simulations and analyses have been conducted in this region (see Figure). Analyses emphasize coastal to offshore interactions that influence broader biophysical connectivity. These interactions are controlled by fronts and eddies associated with the Loop Current, which further influence cross-shelf nutrient exchanges and the ventilation of shelf waters. The version of HYCOM that is used is run at high ($1/50^0$) resolution and contains an advanced parameterization of river plume dynamics that includes both salinity and momentum fluxes (NGoM-HYCOM).

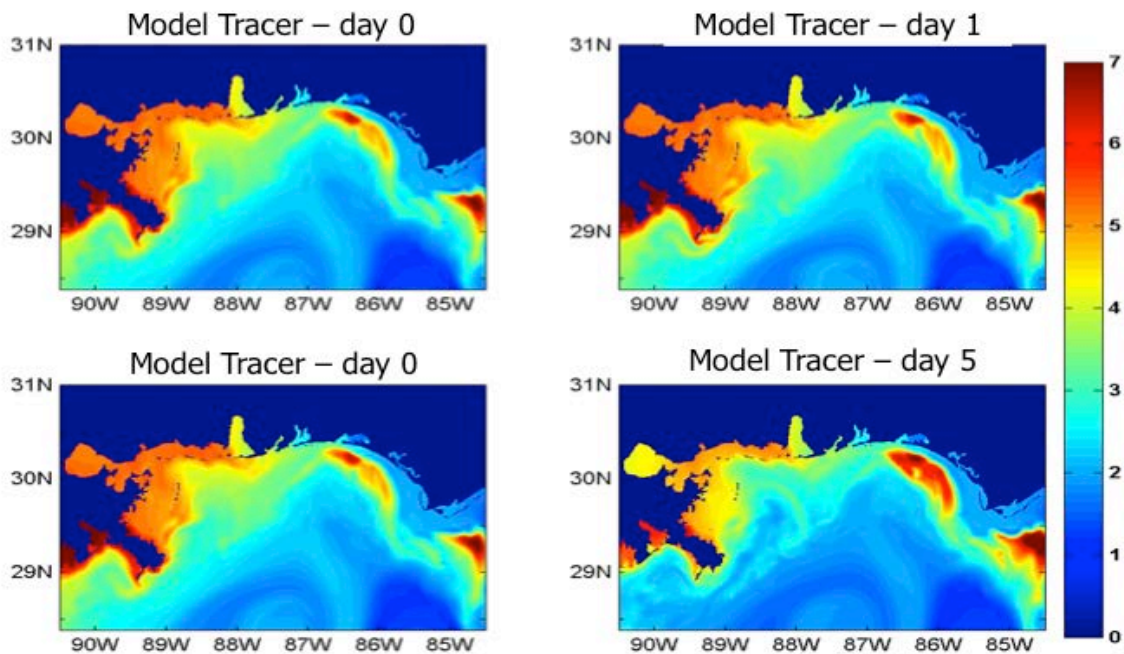


Illustration of the evolution of a passive plankton concentration tracer (mg/m³) in the biophysical model. Top (Bottom) 24 (120) hours from initialization. The coupling implementation is working properly as the tracer is clearly advected (and diffused) by the physical model.