

5-Year Topic 2: Coupling Between Physical, Biological and Human Processes in Earth Surface and Ocean Dynamics:

-- Group 3 of 3: Shelf/Estuarine Environments with Complex 3D Flows (Shorter version)

Questions/Objectives: Advance understanding and prediction of water quality (hypoxia, dead zones, pollution, larval transport, oil spills), sediment transport, morphological change and the effects of all of these on ecological function and ecosystem health.

Couplings: Swappable “external” models (e.g., land use/runoff, atmospheric forcing, oceanic forcing, stratigraphic evolution, particle tracking and visualization) should be linked to core 3D shelf/estuarine models.

Feedbacks: Morphodynamics incorporating complex 3D transport of fine sediment has been understudied. Morphodynamics in regions of complex 3D mud transport affects and is affected by water quality, biology and policy decisions.

Key Existing Models: 3D “core” community models include ROMS, FVCOM, SELFE, Delft-3D, etc. Advantages of ROMS include its use by many CSDMS members, it’s initial implementation within CSDMS, and the state-of-the-art USGS-CSTMS (with a “T”) suite of fine sediment transport processes already incorporated into ROMS.

Model (Approaches) That Are Needed: CSDMS can link ROMS with multiple exchangeable land use, atmospheric, ocean boundary, and visualization models, etc. Within ROMS, CSDMS can facilitate the simple exchange of grids, biological/water quality formulations, and sediment transport formulations (via USGS-CSTMS).

Long-Term Model Options: The approach with ROMS would be the first of parallel efforts to be done with other “core” 3D hydrodynamic community models such as Delft-3D, FVCOM, SELFE, etc.