A Global-to-Wetland Scale FVCOM System: A New Unstructured-grid Model Tool to Resolve Multi-scale Ocean Processes

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A global-to-wetland nested FVCOM system has been developed to resolve and examine the multi-scale oceanic response to climate change. This system includes the Global-FVCOM, GoM-FVCOM, Mass Coastal-FVCOM, and PIS-MR-FVCOM. Global-FVCOM uses the spherical version of FVCOM to cover the entire global ocean with inclusion of all major rivers. Its grid features a horizontal resolution of 5 km (in the coastal region of the Gulf of Maine/Georges Bank and the East and South China Seas) to 50 km (in the interior). Arctic-FVCOM is the Arctic regional model nested with Global-FVCOM. This regional model features a horizontal resolution of 0.5 km (in narrow channels in the Canadian Archipelago) to 25 km in the interior. GoM-FVCOM is the northeast US coastal regional model nested with Global-FVCOM. The subdomain spans from the Scotian shelf to Cape Hatteras, thus covering the Gulf of Maine (GoM) with a horizontal resolution ranging from 0.5 km to 10 km. Mass Coastal FVCOM is a high-resolution subdomain model with horizontal resolution varying from 15 m to 5 km. This model is nested with GoM-FVCOM and constructed to resolve all water passages, islands, and harbors in Massachusetts and Cape Cod Bays. PI-MR-FVCOM is the estuarine/wetland model configured for the long-term NSF LTER ecosystem-monitoring site in the Plum Island and Merrimack River complex.

The FVCOM system is fully coupled with UG-CICE (an unstructured-grid version of CICE) and driven by a) astronomical tidal forcing with eight constituents (M_2, S_2, N_2, K_2, K_1, P_1, O_1 and Q_1), b) surface wind stress, c) net heat flux at the surface plus shortwave irradiance in the water column, d) surface air pressure gradients, e) precipitation (P) minus evaporation (E) and f) river discharge. The system has been validated by comparison with field measurement data. Examples will be given in our presentation.

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