Title: A Suite of Verification Exercises for the Barotropic Solver of Unstructured Ocean Models

Abstract: The development of any numerical ocean model warrants a suite of verification exercises for testing its spatial and temporal discretization. In this talk, I will be discussing a set of shallow water test cases designed for verifying the barotropic solver of unstructured ocean models. These include dispersive and non-dispersive geophysical waves and barotropic tides for testing the implementation of the linear pressure gradient terms as well as the linear but possibly variable-coefficient Coriolis and bathymetry terms. Standard test cases like the implementation of the heat equation, the viscous Burger's equation and manufactured solutions are also used for testing the non-linear advection terms, the linear variable-coefficient diffusion terms and complex bathymetry. Special care needs to be taken while implementing the non-periodic boundary conditions on unstructured meshes. Every verification exercise has been performed with the United States Department of Energy's Model for Prediction Across Scales — Ocean, an unstructured ocean model with variable resolution capability, which employs a mimetic finite volume spatial discretization. Finally, I will be presenting convergence plots of every test case in space and time at constant ratio of time step to grid spacing for a variety of time-stepping algorithms.