Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Shallow Water Model Using Adaptive Wavelet Collocation Method[1] SHANON RECKINGER, Fairfield University, OLEG V. VASILYEV, BAYLOR FOX-KEMPER, University of Colorado at Boulder — The adaptive wavelet collocation method is applied to the shallow water model. This method solves the equations on temporally and spatially varying meshes, which allows higher effective resolution to be obtained with less computational cost. The grid adaptation is achieved by using the ability of wavelet multiresolution analysis to identify and isolate localized dynamically dominant flow structures, e.g., vortices, and to track these structures on adaptive computational meshes. In addition to studying how the shallow water model behaves on non-uniform, time varying grids, this work also sets out to improve the representation of continental topology through an extension of the Brinkman penalization method. This numerical technique works by altering the governing equations in such a way that no slip boundary conditions are enforced. When coupled with the adaptive wavelet collocation method, the flow near a complex boundary can be well defined. In addition the bathymetry is represented in wavelet compressed form, thus allowing active control of the roughness, length scales, etc., plus efficient representation of the detailed bathymetry, with automatic refinement in regions of active interaction of bathymetry and flow structures. The applications presented here include wind-driven flow in a square basin, North Atlantic circulation, and a tsunami simulation.

[1]This work was supported by DOE-CCPP (DE-FG02-07ER64468).

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Date submitted: 05 Aug 2011 Electronic form version 1.4