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Research Interests

My research interests are centered on the application of numerical methods to problems in fluid and ecosystem dynamics. They include both scheme development, focused on implicit time stepping and adaptive methods, as well as applications, including sediment transport and near bottom flow, larval dispersal, individual based modeling, and the use of circulation models to improve estimates of fish movement.

Current Research

- 3/1/06 – 2/28/08 Rhode Island Sea Grant. Status: Current.
Modeling and observations of circulation and biochemical processes in Narragansett Bay: The relationship between the Upper Bay and its impacted sub-systems
- 10/1/07 – 9/30/10 NSF. Status: Current.
Collaborative Research: Effects of a warming climate on Arctic Shelf and Basin *Calanus* populations
- 4/1/08 – 3/31/09 NOAA. Status: Current.
Development of a modeling infrastructure for NERCOOS
- 2/1/08 – 1/31/09 WHOI Sea Grant. Status: Current
A measurement and modeling study of waves and currents in the coastal zone off of southeastern Massachusetts
- 2/1/08 – 1/31/10 EPA. Status: In Review
Assessing the impact of climate change on the potential success of invasive species in Lake Superior with application to other large lake systems

Recent Publications

- Cowles, G., 2007. Parallelization of the FVCOM coastal ocean model. *Int. J. High Perform. C.*, accepted.
- Chen, C., P. Xue, P. Ding, R.C. Beardsley, Q. Xue, M. Xianmou, G. Gao, J. Qi, C. Li, H. Lin, G. Cowles, and M. Shi, 2007. Physical mechanism for offshore detachment of the Changjiang diluted water in the East China Sea. *J. Geophys. Res.*, accepted.
- Huret, M., J. Runge, C. Chen, G. Cowles, Q. Xu, and J. Pringle, 2007. Dispersal modeling of fish early life stages: Sensitivity analysis with application to Atlantic cod in the western Gulf of Maine. *Mar. Ecol.-Prog. Ser.*, in press.
- Chen, C., H. Huang, R. Beardsley, H. Liu, Q. Xu, and G. Cowles, 2007. A finite-volume numerical approach for coastal ocean circulation studies: Comparisons with finite-difference models, *J. Geophys. Res.*, in press.
- Zhao, L., C. Chen, and G. Cowles, Tidal flushing and eddy formation in Mount Hope Bay and Narragansett Bay: An application of FVCOM, *J. Geophys. Res.*, in press.
- Chen, C., R.C. Beardsley, and G. Cowles, 2006. An unstructured grid, finite-volume coastal ocean model (FVCOM) system. *Oceanography*, 19(1), 78-89.
- Cowles, G., and L. Martinelli, 2003. Control-theory based shape design for the incompressible Navier-Stokes equations. *Int. J. Comput. Fluid D.*, 17:499-514.
- Martinelli, L., and G. Cowles, 2000. An adjoint method for the incompressible Reynolds averaged Navier-Stokes equations using artificial compressibility. IEEE 0-7803-5846-5/00, IEEE Aerospace Conference, Big Sky, MT, May 2000.
- Martinelli, L., and G. Cowles, Finite volume multigrid methods for ship hydrodynamics. *Proc. 4th ECCOMAS CFD Conference*, Athens, Greece, Sep 1998.
- Cowles, G., and L. Martinelli, 1998. A viscous multiblock flow solver for free surface calculations on complex geometries, 1998. *Proc. 22nd International Symposium on Naval Hydrodynamics*, Washington, DC, 1998.