Tides and Waves for the National Weather Service River Forecast System
Report for the Period Spanning December 1, 2005 – May 31, 2006

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During the reporting period that spans December 1, 2005 – May 31, 2006 three (3) major tasks were completed:

1. Numerous simulations including astronomic tide, wind, and pressure forcing with river inflows was conducted for the St. Johns River for the period spanning June 1 through September 30, 2005. The simulations employed three mesh versions all with the St. Johns River up to and including Lake George: 1) The Western North Atlantic Tidal model domain; 2) a continental shelf based mesh; and 3) and inlet based mesh. The exercises resulted in five major conclusions:

    a) Tides and winds are the most important forcings to include for a robust St. Johns River model;
    b) Pressure forcings are negligible (Of course we must emphasize that given a landfalling hurricane in the vicinity of the St. Johns River inlet, pressure will become significant.);
    c) The response to wind and pressures may be superimposed linearly as the interaction between wind and pressure is weakly nonlinear;
    d) Deep water (off shelf) winds are as significant as the inclusion of flows and at times overshadow flow contributions to the St. Johns River elevations;
    e) Regardless of whether a St. Johns River model is built with its open water boundary at the inlet or out on the shelf, it will perform well given and accurate open water hydrograph that includes astronomic and meteorologic tides.

2. A hindcast of Hurricane Floyd was conducted including astronomic and wind and pressure forcings with inflows with uni-directional wave coupling.

3. A hindcast of Hurricane Floyd was conducted including astronomic and wind and pressure forcings with inflows with two-way wave coupling.

The following journal and conference publications acknowledge NA04NWS4620013 as a direct result of research performed up to the end of this reporting period.

Hagen, S.C., A.T. Cox, Y. Funakoshi, and V.J. Cardone, “The Role of Meteorological Forcing on the St. Johns River,” *Journal of Hydrometeorology*, In Preparation.

Funakoshi, Y. and S.C. Hagen, “Evaluation of Two Numerical Wave Models for Coupling with a Hydrodynamic Model: A Case Study for Hurricane Floyd,” *Coastal Engineering*, In Preparation.

Funakoshi, Y. and S.C. Hagen, “Uni-Coupling of Hydrodynamic and Wave Models: A Case Study for a Hurricane Floyd Hindcast,” *Journal of Waterways, Port, Coastal, and Ocean Engineering*, In Review.

Salisbury, M.B. and S.C. Hagen, “The Effect of Tidal Inlets on Open Coast Storm Surge Hydrographs,” *Coastal Engineering*, In Review.

Dietsche, D., S.C. Hagen, and P. Bacopoulos, “Storm Surge Simulations for Hurricane Hugo (1989): On the Significance of Inundation Areas,” *Journal of Waterways, Port, Coastal, and Ocean Engineering*, In Press.

S.C. Hagen, A. Zundel and S. Kojima, “Automatic, Unstructured Mesh Generation for Tidal Calculations in a Large Domain,” *International Journal of Computational Fluid Dynamics*, In Review.

M. Salisbury and S.C. Hagen, “The Effect of Tidal Inlets on Storm Surge Hydrographs,” *Proceedings, WAVES 2005*, Madrid, Spain, CD-ROM, July 3-7, 2005.

Y. Funakoshi and S.C. Hagen, “Towards an Integrable Short and Long Wave Model for Tidal Hydrodynamics,” *Proceedings, WAVES 2005*, Madrid, Spain, CD-ROM, July 3-7, 2005.

Y. Funakoshi, Hagen, S.C., A.K. Zundel, and S. Kojima, “Driving an Integrated, Surface Water, Three-Dimensional Model,” *Proceedings, Sixth International Conference on Hydro-Science and –Engineering*, Brisbane, Australia, CD-ROM, May 30 – June 4, 2004.