## NTHMP Grant Semi-Annual Progress Report

**NOAA Grant Award Number:** NA15NWS4670029

**Period of performance (start date to end date of entire grant):** September 1, 2015 – August 31, 2017

**Award reporting period (date range):** September 1, 2016 – February 28, 2017

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**Person submitting report:** James T. Kirby

**Date of this report:** April 11, 2017

Instructions: add rows to the table below as needed to complete reporting on all tasks awarded. Fill in all cells within the table. Make sure that task titles match the current Project Narrative for this grant.

<table>
<thead>
<tr>
<th>Task #</th>
<th>Task title</th>
<th>Progress made during this reporting period</th>
<th>Challenges and successes</th>
<th>% of total task completed</th>
</tr>
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</table>
| 1      | Tsunamigenic Landslide Modeling Benchmark Development, Validation Workshop and Workshop Documentation | The workshop was held in Galveston in January. An overview of activities may be seen at [www.udel.edu/kirby/landslide/](http://www.udel.edu/kirby/landslide/)  
The site will be maintained as a public repository for data and model results after the workshop completion.                                                                                                                                          | Workshop was completed successfully, with over 30 attendees and with results for over 10 models submitted.                                                                                                                                                                      | 80%                      |
| 2      | Refinement and extension of potential SMF sources and source modeling techniques for tsunami activity in the North Atlantic  | Work on West Bahama Banks potential landslides was published.  
SMF Currituck slide proxies modeled as rigid slumps north of the Carolinas were revisited and modeled as deforming slides. The Hudson River                                                                                                                     | Four journal papers published on Bahama Bank, Deforming slides in Kitimat and upper east coast, and tide- tsunami interactions.                                                                                                                                                  | 80%                      |
Canyon SMF (Area 1; Grilli et al., 2015b) and the Currituck slide were first remodeled assuming they behave as a dense fluid layer (Fig. 1). The model used was validated with lab. Experiments. As expected, tsunami generation is reduced. Model parameters/rheology for the deforming slides were selected based on simulating laboratory experiments and field case studies.

A comparison solid vs deforming slide with respect to coastal hazard off of NJ, NY/Long Island was performed. Both maximum elevation and minimum drawdown are reduced when assuming a deforming slide rather than a rigid slump. For detail see, Grilli et al. (2015b, 2017).

Following the same methodology, deforming SMFs of various rheologies were simulated in Areas 2, 3 and 4, further south using NHWAVE and results compared to rigid slump simulations. Simulations with FUNWAVE in higher resolution nested grids are being performed to serve as a basis for updating inundation maps in the future.

Additional SMFs will be simulated in the southern New England arc, East of Long Island, and in the Cape Fear area, once we receive information and parameters from USGS.

NGDC tsunami DEM’s are now available for the southern portion of Florida, and delayed inundation mapping will be completed during the remainder of this project.

Work on deformable slide modeling is strongly synergistic with Grilli and Kirby NSF supported work, covering ongoing model development and improvement, with technology immediately transferred to NTHMP project. This is also synergistic with the organization of the landslide model benchmarking workshop.

### Table

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<thead>
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<th>3</th>
<th>Tsunami Hazard Assessment for Un-modeled East Coast Sites</th>
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<tbody>
<tr>
<td></td>
<td>Storm surge maps for US East Coast stated being collected from constituents. Analysis of correspondence between storm surge inundation lines and tsunami inundation lines for mapped areas underway. Work on effect of shelf geometry in controlling location</td>
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<tr>
<td></td>
<td>Contacts are being made with individual state agencies to gather information on category 1-5 storm surge inundation maps and evacuation procedures to assist in interpreting tsunami height estimates based on</td>
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</tbody>
</table>
During this reporting period, was any budget reprogramming required for this award? If so…

a. Date reprogramming approved by NWS Tsunami Program Office:

b. Date approved by NOAA Grants Office:

c. Describe where funds were moved and why:

General comments from recipient about progress during this reporting period:

PROBLEMS ENCOUNTERED: DEM’s for southern Florida were recently obtained. Inundation mapping for the Florida east coast is underway. Work is slowed somewhat by a change-over in student assigned to the project, with Babak Tehranirad graduating in December 2016.

ANTICIPATED OUTCOMES: Results for the additional mapping efforts described here will be presented in the form of technical reports for each NGDC DEM or similarly sized coastal region, and in the form of draft inundation maps for coastal communities within the DEM regions. Project results are displayed at the project website http://www.udel.edu/kirby/ntmp.html and will be displayed at the NTHMP website http://ws.weather.gov/ntmp/index.html as they are finalized. Draft maps and reports are presently available at an unlinked site http://www.udel.edu/kirby/ntmp_protect.html prior to their review by local state agencies.

Refinement of modeling techniques for simulating landslide (SMF) tsunami generation has led to published papers, and more will be prepared, and enhancements to the public domain model NHWAVE. These have played a central role in the organization and preparation of the landslide tsunami benchmark workshop in January 2017.

PUBLICATIONS AND PRESENTATIONS REFERENCING FY14-15 WORK


Grilli, S.T., Shelby, M., Kimmoun, O., Dupont, G., Nicolsky, D., Ma, G., Kirby, J. T. and Shi, F., 2017, Modeling coastal tsunami hazard from submarine mass failures: effect of slide rheology, experimental


Tehranirad, B., 2015, “Effects of bathymetry on tsunami propagation on the US East Coast: Application of ray tracing to tsunamis”, presented at Young Coastal Scientists and Engineers Conference - North America, Newark, July.


Tehranirad, B., Kirby, J. T., Callahan, J. A. and Shi, F., 2015c, "Tsunami inundation mapping for New York City", Research Report No. CACR-15-03, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware. (DRAFT)


Tehranirad, B., Kirby, J. T., Callahan, J. A. and Shi, F., 2015e, "Tsunami inundation mapping for Nantucket, MA NGDC DEM", Research Report No. CACR-15-05, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware. (DRAFT)


Tehranirad, B., Kirby, J. T., Callahan, J. A. and Shi, F., 2015g, "Tsunami Inundation Mapping for Cape Hatteras, NC NGDC DEM", Research Report No. CACR-15-12, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware. (DRAFT)

