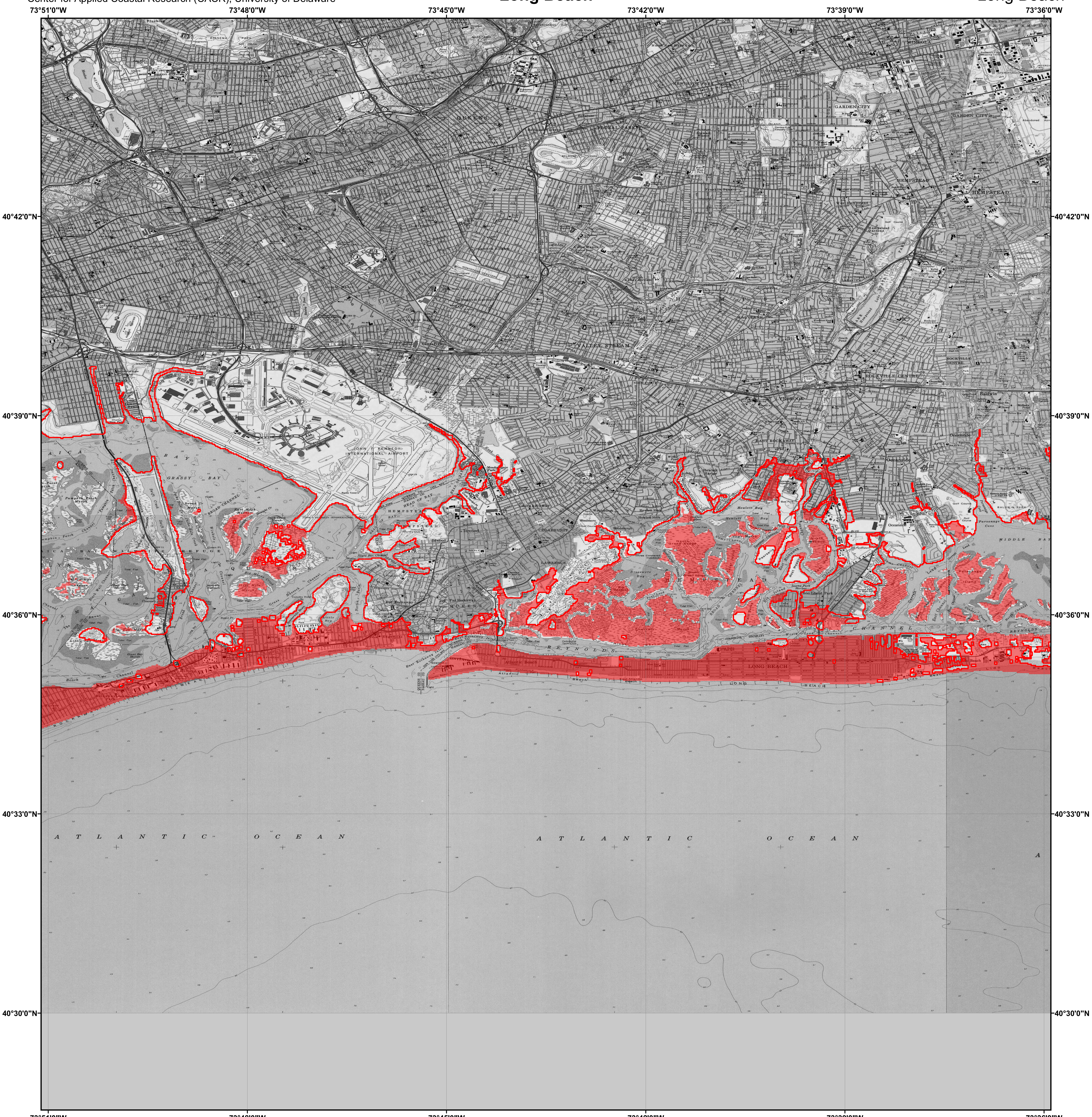
National Oceanic and Atmospheric Adminstration (NOAA)
National Tsunami Hazard Mitigation Plan (NTHMP)
Center for Applied Coastal Research (CACR), University of Delaware

Tsunami Inundation Map for Emergency Planning
Long Beach

State of New York
Long Beach



METHOD OF PREPARATION

Tsunami source modeling was performed by the University of Rhode Island (URI) funded by the National Tsunami Hazard Mitigation Program. First, a large earthquake in the Puerto Rico Trench (PRT) in the well-known Caribbean Subduction Zone (CSZ) was modeled (Grilli and Grilli, 2013a). The other coseismic source that was studied here is located on Azores Gibraltar plate boundary (Grilli and Grilli, 2013b). Both of these sources are generated according to the standard Okada method. Cumbre Vieja volcanic (CVV) collapse located in Canary Islands is also considered to be another significant tsunami source which threatens the location of study. A multi-fluid 3D Navier-Stokes solver (THETIS) was used to compute the volcanic collapse tsunami source (Grilli and Grilli, 2013c). Also, in this project four different locations are chosen on the US east coast shelf break as the most probable to experience a submarine mass failure tsunami (Grilli et al., 2013). The landslide movement is simulated with NHWAVE model.

For bathymetry data, the integrated bathymetric-topographic digital elevation model (DEM) generated by National Geophysical Data Center (NGDC) is used for high-resolution inundation mapping. For ocean basin tsunami propagation, the depth values were obtained from the 1 arc-minute ETOPO-1 database, while nearshore bathymetry and topography were obtained from NGDCs Coastal Relief Models, which are typically provided on a 1/3 arc-second grid.

Tsunami nearshore propagation and onshore inundation were performed by University of Delaware funded by the National Tsunami Hazard Mitigation Program. Here, we used FUNWAVE-TVD code to obtain the tsunamni inundation line. FUNWAVE-TVD (Shi et al., 2012) is a public domain open-source code that has been used for modeling tsunami propagation inside ocean basin, nearshore tsunami propagation and inland inundation problems. We used the recorded data on the boundaries of Ocean City NGDC DEM to perform our nesting approach to achieve high resolution results close to the shorelines. Simulations with grid sizes of roughly 125.0 meters (about 4 arc-sec) are implemented on this grid to record proper data around four DEMs with resolution of 1 arc-sec (extracted from 1/3 arc-sec Ocean City DEM) inside the main region. Using this data, 1 and 1/3 arc-sec grids were used to generate the inundation line (Tehranirad et al., 2014).

The accuracy of the inundation line shown on this map is constrained by several factors such as the accuracy of the models used here as well as the bathymetry data exactness. It should be noted that the inundation line depicts the envelope of the inundation lines for all the tsunami sources studied here and does not demonstrate one particular source.

References:

Grilli, A. R., and Grilli, S. T., 2013a, “Modeling of tsunami generation, propagation and regional impact along the upper US East Coast from the Puerto Rico trench”, Technical report, No. CACR-13-02, Center for Applied Coastal Research, University of Delaware.

Grilli, A. R., and Grilli, S. T., 2013b, “Modeling of tsunami generation, propagation and regional impact along the upper US East Coast from the Azores convergence zone”, Technical report, No. CACR-13- 04, Center for Applied Coastal Research, University of Delaware.

Grilli, A. R., and Grilli, S. T., 2013c, “Far-field tsunami impact on the U.S. East Coast from and extreme flank collapse of the Cumbre Vieja Volcano (Canary Islands)”, Technical report, No. CACR-13-03, Center for Applied Coastal Research, University of Delaware.

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Shi, F., Kirby, J. T., Harris, J. C., Geiman, J. D., and Grilli, S. T., 2012 , “A high-order adaptive timestepping TVD solver for Boussinesq modeling of breaking waves and coastal inundation”, Ocean Modelling, 43-44, 36-51.

Tehranirad, B.,Kirby, J. T, Callahan, J. A, Shi, F., 2015, “Tsunami Inundation Mapping for the New York City”, Technical report, No. CACR-15-03, Center for Applied Coastal Research, University of Delaware.

TSUNAMI INUNDATION MAP FOR EMERGENCY PLANNING

States of New York
Long Beach

MArch 27, 2015

Scale 1:50,000

0.85 0.425 0 0.85 1.7 Miles
3,750 1,875 0 3,750 7,500 Feet
0.850.425 0 0.85 1.7 Kilometers

Tsunami sources modeled for the Ocean City coastline

	Sources	Location
Local sources	Submarine Mass Failure 1	72.21 W , 39.22 N
	Submarine Mass Failure 2	71.46 W , 39.70 N
	Submarine Mass Failure 3	73.19 W, 38.41 N
	Submarine Mass Failure 4	73.60 W, 38.10 N
Distant Sources	Puerto Rico Trench Zone (M=9.0)	Caribbean Subduction Zone
	Azores Convergence Zone(M=8.6-9.0)	Azores Gibraltar plate boundary
	Cumbre Vieja volcanic (CVV) collapse	Canary Islands

Center for Applied Coastal Research

MAP EXPLANATION

Tsunami Inundation Line

Tsunami Inundated Area

PURPOSE OF THIS MAP

This tsunami inundation map was prepared to help coastal communities to identify their tsunami hazard. This map is not a legal document and does not meet disclosure requirements for real estate transactions nor for any other regulatory purpose. The inundation map has been obtained through using the best available scientific information. The inundation line represents the maximum tsunami runup extent utilizing a number of extreme, yet scientifically realistic, tsunami sources. This map is supposed to portray the worst case scenario and does not provide any further information about the return periods of the events studied here.

MAP BASE

Topographic base maps prepared by U.S. Geological Survey as part of the 7.5-minute Quadrangle Map Series (originally 1:24,000 scale). Tsunami inundation line boundaries may reflect updated digital topographic data that can differ significantly from contours shown on the base map.

DISCLAIMER

The National Tsunami Hazard Mitigation Program (NTHMP), the University of Delaware (UD), and the University of Rhode Island (URI) make no representation or warranties regarding the accuracy of this inundation map nor the data from which the map was derived. Neither the NTHMP nor UD shall be liable under any circumstances for any direct, indirect, special, incidental or consequential damages with respect to any claim by any user or any third party on account of or arising from the use of this map.