Tsunami Modeling and Mapping: Guidelines and Best Practices

Checklist for Evaluating Tsunami Modeling and Mapping Reports and/or Metadata

National Tsunami Hazard Mitigation Program
Mapping and Modeling Subcommittee
Written: 2009
Revised: September 2016[1]

Executive Summary

This document provides recommendations (check list) to consider for modeling tsunami information (flooding) and for the subsequent development of mapping reports, tsunami inundation maps, and digital documentation (metadata). It is suggested that this information, whenever available, accompanies all modeling and related products.

Background Information about Map Area/Region

- **Location/area of coverage**—Map, projection, horizontal datum, scale, date, version, supersedes version "x"
- **Communities covered**—Cities/counties included within map boundaries, estimated population
- **Tsunami history**—Notable historical and paleoseismic events
- **Previous maps/studies**—Existing maps/studies for tsunami hazard, evacuation, etc.
- **General limitations**—Summary/overview of what is not covered or addressed in map or products
- **Source**—Developer, point of contact
- **Intended purpose/use of inundation (flooding) maps**
  - **Emergency planning**—Maximum event(s) for evacuation
  - **Land-use planning**—Mandate (state vs. FEMA), initial and modified probabilistic tsunami hazard assessment (PTHA)
  - **Building code/structure designs**
  - **Mitigation, education, preparedness**
  - **Disclaimer**

Modeling Inputs

- **Numerical model(s) used**—Source, version, benchmark reference date, publications
- **Tsunami Source(s)**—Information for each scenario source modeled/considered
  - **Expert references, geologic references/supporting evidence**
  - **Generating Mechanism(s)**—Seismic, landslide, meteorological, others
  - **Proximity**—Distant vs. local generating mechanism
  - **Method for determination**—Logic tree, maximum credible/probable, expert reference
  - **Initial conditions**—Numerical model inputs

[1] This document was reformatted as part of the "Tsunami Modeling and Mapping: Guidelines and Best Practices" series in September 2016. No significant changes to the content were made.

    - **Seismic**—Fault movement, magnitude/seismic moment, displacement/slip, rupture area (length, width), strike, dip, rake, depth (top of rupture), NOAA Facility for the Analysis and Comparison of Tsunami Simulations (FACT) fault segments
    - **Landslides**—Type, initial positive/negative waves, area/volume of slide mass, geometry of slide mass, velocity of slide maps, mass consistency, water depth to head/toe of slide, runout distance and depth
    - **Historical activity**—Historical events, recurrence interval, paleoseismic/paleotsunami
- **Bathymetric/topographic digital elevation model (DEM) used for modeling**
    - **Data source(s)**—Original (pre-mosaic) and constructed (mosaic) DEMs
    - **Grid type(s)**—Structured vs. non-structured, nested vs. telescoping
    - **Resolution**—Original data vs. constructed, source area vs. inundation area
    - **Coordinate system metadata**—Projection, horizontal and vertical datums
    - **Other details**—Error bounds, software used for construction, merging of disparate data

Mapping (Application of Modeling Results for Inundation/Evacuation Map Creation)

- **Coordinate system metadata**—Projection, horizontal and vertical datums
- **Transfer of model data to map**
    - **Methodology**—Enhancements, references/sources
    - **GIS platform**—Software, GIS characteristics (raster vs. vector processing)
    - **Non-model data used**—Topographic contours, high resolution DEMs, orthophotography, stereophotography
    - **Past tsunami evidence**—References, eye-witness interviews, deposits
    - **Field checking/validation**—Partners, methods (surveying vs. reconnaissance), areas checked, note changes
    - **Other validation methods**—Higher resolution modeling, comparison to other inundation maps and/or past events
- **Inundation map without numerical modeling (Category 1)**
    - **Rationale**
    - **Methodology (incorporating attributes above)**
- **Map review process**
    - **Scientific**—Local working groups, geologic surveys, consultants
    - **Nonscientific**—Community (public, decision makers, emergency responders)
- **Inundation map/product version presentation**
    - **Consider accuracy/resolution/ease of interpretation needed by end users**
    - **Official map representation(s)**—Paper and/or digital copies, needs of public
        - **Hazard identification**—Inundation (single vs. multiple lines), flow depths (e.g., <0.5m, 0.5m to 2m, >2m), current velocities
        - **Base map**—Type (local high-accuracy vs. USGS orthophoto/topographic), scale, year
        - **Marginalia**—Intended use, methodology, limitations, disclaimers
    - **Internet**—Downloads, GIS layers
    - **Documentation**—Organizational document, report, or peer-review publication

Application of Maps/Products

- **Emergency response planning**
    - **Evacuation plan**—Maps, evacuation description per area
    - **Review of evacuation plan**—general, geotechnical-geologic hazards
    - **Incorporation of ATC 64 for vertical evacuation structures**

- **Land-use planning**
  - **Consider legislative mandates**—FEMA flood zones, state laws
  - **Guidelines for implementation**—Siting, construction
  - **Explore incorporation of ATC 64 construction guidelines**

Dissemination of Maps/Products

- **On Demand**
  - **Internet**—Downloads, GIS layers
  - **Brochures**—Maps, basic tsunami information, instructions for public response during tsunami alert and local earthquake; legible for all users
  - **Report(s)**—Description herein
- **Outreach**
  - **Workshops**—Conducted by scientists and/or community authorities to target audiences (emergency managers and responders, planners, harbor masters, service industry)
  - **Response exercises**—Table-top, functional, equipment tests
  - **Media**—Broadcasters etc.
  - **Schools**—Teachers, bus drivers, administrators, etc.
  - **Public meetings**
  - **Public events**
  - **Solicitation of feedback**

This document is part of the "Tsunami Modeling and Mapping: Guidelines and Best Practices" series. All the documents in this series are available on the NTHMP website at http://nws.weather.gov/nthmp/publications.html:

- *Part I: Tsunami Inundation Modeling*
- *Part II: Tsunami Inundation Maps*
- *Part III: Tsunami Inundation Determination for Non-Modeled Regions*
- *Part IV: Tsunami Evacuation Maps*
- *Checklist for Tsunami Modeling and Mapping Reports and/or Metadata*