

NTHMP MMS meeting 2 February 2022

Participants:

J. Allan, D. Arcas, N. Arcos, K. Carrigan, K.F. Cheung, P. Chu, A. Dolcimascolo, M. Eble, D. Eungard, C. Garrison-Laney, N. Graehl, S. Grilli, C. Guard, C. Hincapie-Cardenas, M. Kaipat, C. Kyriakopoulos, E. Lutu-McMoore, V. Heurfano, J. Horillo, D. Nicolsky; S. Ohlendorf, J. Patton, S. Ross, B. Salisbury, I. Sears, K. Stroker, H.K. Thio, R. Wilson, R. Watlington.

Topics covered:

10:00 - 10:10 *Agenda Overview (5-min)*

10:10 - 10:55 *Annual Work Plan*

Item-by-Item documentation of status (Completed / Incomplete / In Progress...)

1. *Powell Center (Lead: USGS) (20-min)*
2. *NCEI DEM development (Lead: NCEI) (10)*
3. *Tsunami source database (Lead: California) (5)*
4. *Maritime guidance (Lead: California) (5)*
5. *Complete maritime current modeling criteria (California/Oregon) (10)*
6. *Sediment Transport Guidance (Lead: East Coast) (15)*
7. *Landslide Modeling PTHA (Lead: East Coast) (15)*
8. *Tsunami Debris modeling (Lead: California) (15)*
9. *Proposals for MMS-endorsed projects in NTHMP Grant year 2022 (20)*
10. *Wrap-up/Discussion*

Meeting notes:

1. Powell Center (S. Ross, H.K. Thio)

Stephanie Ross: Update on Powell Center Working Group on Tsunami Sources

- Tsunami Source Standardization for Hazards Mitigation in the United States
- Goal: Increase coordination on common tsunamigenic sources that transcend the state and territory boundaries ...
- Powell Center meetings (past and future):

POWELL CENTER MEETINGS HELD:

1. Determining the process

2. AASZ: Work on AASZ tsunami sources and recurrence model funded by NTHMP/NOAA and NEHRP

3. East Coast/Gulf Coast/Caribbean:

-Landslide PTHA funded by NTHMP/NOAA (Stephan Grilli, Juan Horillo, and Pat Lynett)

-Seismic PTHA waited for general logic tree process (part of work on AASZ)

FUTURE MEETINGS:

4. Cascadia: May 9-13, 2022? Originally planned to follow separate Powell Center Cascadia Recurrence Group (their meeting was late March 2022, now postponed to summer/fall)

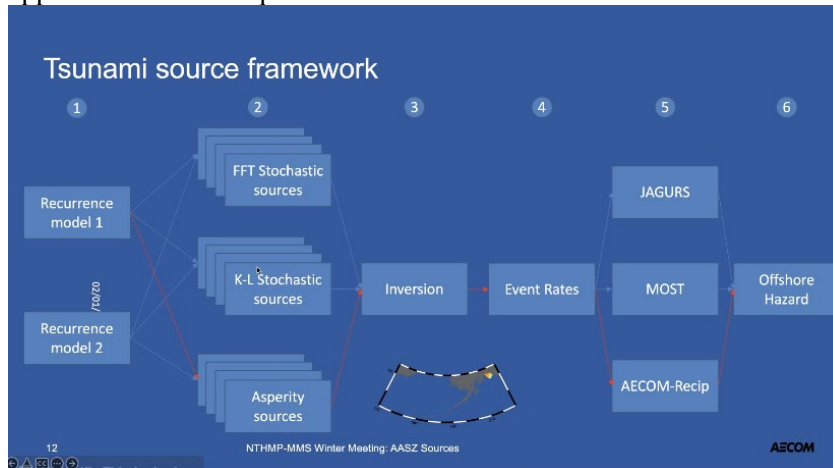
5. Pacific Sources (other than AK or CSZ): August 1-5, 2022

6. Meeting on issues that need additional focus: TBD

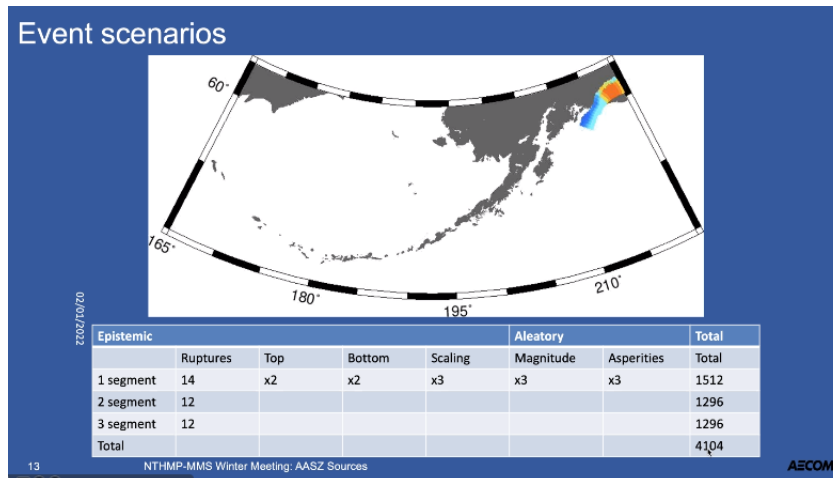
(potentially crustal faults, splay faults, landslide, or volcanic sources)

Hong Kie Thio Presentation: Development of Alaska-Aleutian Subduction Zone (AASA) recurrence model for earthquake and tsunami hazard.

- Main tasks to develop a framework for PTHA source characterization for the AASZ, develop a probabilistic tsunami source characterization, and develop source database access.
- Inputs to the AASZ model:
 - o Constrains to recurrence model include paleoseismic/tsunami data, and geodetic data.
 - Paleoseismic data is limited, but covers last 5000 years.
 - o New (multiple) segmentation model developed in Powell Center workshop.
 - Used Slab 2.0 for model.
 - Geodetically based coupling (Freymueller, Briggs).
 - Scaling relations. Different magnitudes from scaling, from which the average slip is then computed.
 - Recurrence probabilities up to 3000-5000 years.
 - In addition to the higher probability return periods, the offshore hazard curve can also be used for lower probabilities. For example, CA have created inundation models for average return periods for six hazard levels: 100yr, 200yr, 475yr, 975yr, 2475yr, and 3000yr.
 - o PTHA Framework outline slide. The inversion step is used to constrain the stochastic approach back to the paleotsunami data.



- o Total scenarios identified for : ~4000



- o Current Status:

Status of project

- Fully probabilistic event set for the AASZ
 - Using inversion and strict filtering of coupling - cumulative segment rates within 5% of effective (input) slip rates
 - Using inversion and free scenarios – cumulative segment rates within 15% overall
- Database of event scenarios
 - Online
 - Still need to develop simple selection tools
- Framework for PTHA analysis and addition of external models
- Open issues:
 - Further development of dissemination/selection mechanism for scenarios
 - Smaller events (G-R distribution) – expect from the NEHRP project
 - Additional logic tree branches?
 - Develop procedures for sanity checks of the PTHA results (e.g. using reciprocal Green's functions)

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NTHMP-MMS Winter Meeting: AASZ Sources

AECOM

- Will eventually create online database search for different scenarios
 - Can select scenarios by logic tree branch, segment, magnitude, etc.

Action item: Ongoing.

2. NCEI DEM Development (K. Carignan)

- Completed, pending, funding:

Digital Elevation Model Development

NOAA develops and uses digital elevation models (DEMs) to support a variety of mission requirements including coastal flood forecasts and warnings due to tsunamis, hurricanes, and storm surge, marine habitat research, and sea level change studies.

- CY21 DEMs completed:**
 - Juan de Fuca Strait, WA
 - Brookings, OR to California border
 - Tyonek, Kenai, Ninilchik, Anchor Point (Cook Inlet), Alaska
- CY21 DEM pending:**
 - San Francisco Bay (extents)
- Non-NTHMP funded:**
 - Hawaii - *completed*
 - Northeast U.S. Coast - *completed*
 - Texas Gulf Coast - *completed*
 - Guam - final review in process
 - Puerto Rico - FY22, post storm lidar
 - CNMI - FY22

ETOPO2022 scheduled for Q4 FY22!

NOAA logo and text: kelly.carignan is sharing National Centers for Environmental Information

- CY22 Priorities?

NTHMP DEM priorities CY22?

- New NOS Data:**
 - AK - False Pass, Yakutat, King Cove
 - WA - Tacoma, Hansville, Everett
- Recent Coastal Lidar:**
 - CA - Santa Clara County, Santa Cruz County, Eureka, Morro Bay
 - AK - Glacier Bay
- From MMS meetings:**
 - WA - Puget Sound update areas, southern coast
 - PR - covered under other funds but any requirements should be passed on

NOAA logo

- California (Rick Wilson): Renewed interest in Santa Cruz Harbor and would like this area as a priority if possible.

- Alaska (Dmitry Nicolsky): Will discuss with Emergency management which areas to focus on. Possibly Prince of Wales Island? Will follow up at a later date.
 - o New hydro surveys around that area.
- Washington to send Kelly a map of priority areas.
- PMEL (Diego Arcos): Is there a list to see what's already available so we can determine new priorities?
 - o Kelly(s) will send link/image/map to view already developed DEMs.
 - Possibly maintain an online dashboard.

Action item: MMS members needing new DEMs as part of CY22, please respond to Kelly C and Kelly S as soon as possible, preferably before mid-March (cc' MMS co-chairs). Ongoing task.

3. Tsunami Source Database (R. Wilson – California)

- Keep as is and work through Powell Center
- Questions:
 - o Chip Guard submitted an update and recommended a new heading about historical information regarding duration of ground shaking.
 - Columns can be added to the spreadsheet. Rick will look for email from Chip and add this information. Maybe we need more information on source deformation models. Chip and Rick will explore this.
 - o Jon Allan: Powell Center likely to go away in next couple years, will need to transfer database back to MMS?

Action item: Ongoing task.

4. Maritime Guidance (R. Wilson – California)

- Todd Becker Maritime Tsunami Guidance website (reviewed by NTHMP). Website is in a good place currently.
- Tsunami debris and product workshop could be integrated into maritime guidance.
- MRPWG work could also be integrated here.
- Ongoing task.
- Website: <https://arcg.is/0DeHrG>
- Questions:
 - o Jon Allan: Draft document has been reviewed, is there a plan to finalize it? Is it on NTHMP site somewhere?
 - Believe that it is on the NTHMP site, but goal is to make this its own website. Still sitting in draft form, but can be finalized.

Action item: Ongoing task.

5. Complete maritime current modeling criteria (R. Wilson/J. Allan)

- The purpose behind this guidance document is to summarize procedures for documenting modeled current speeds in ports and harbors. Generalized approach.
 - o One-two pages.
 - o Use a simplified binning approach to capture uncertainty (e.g. Lynett et al. 2014)
 - o No progress yet, but on to-do list.
 - o Stephan Grilli noted that 3D modeling may be needed in areas where lots of bathymetric structure.
 - Layered to represent 3-dimensional effects.
- Looping in Pat Lynett on this work.
- 3D modeling will be important with debris-flow modeling.

Action item: Jon Allan and Rick Wilson to develop simple guidance. Ongoing task.

6. Sediment Transport Guidance (J. Kirby)

- Jim Kirby absent for this meeting (main lead).
- Jim has reached out to a number of speaker/participants. More details to come.
- No additional news to report.

Action item: Ongoing task.

7. Landslide Modeling PTHA (S. Grilli)

- Monte Carlo Approach (order of 10,000s possible selections) for estimating hazard from submarine mass failures along the US coasts (Powell Center workshop, Grilli, Horrillo, and Lynett).
 - o Validation of Monte Carlo simulations (Grilli et al., 2009).
 - Objectives:

Objectives

- Probabilistically assess **landslide tsunami hazard** for the U.S. East Coast, Gulf, West Coast, Alaska,... as part of developing **inundation maps** for NTHMP, from **Submarine Mass Failures (SMFs)** :
 - > Apply and validate a **probabilistic model** based on **Monte Carlo Simulations** of slope stability (based on Grilli et al., 2009)
 - > Use this model as a **tool** to identify areas at risk to be selected for additional, more **detailed analyses**
 - > **Select parameters** of potential **extreme SMF sources** (volumes, length/width, and locations) and perform additional **deterministic simulations** of tsunami coastal impact

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- Methodology:

Methodology of Monte Carlo Simulations

- **MC selection** of (order 10,000s) **SMFs**:
 - > Defining many coastal **transects** and their **slope geometry**
 - > Randomly **siting potential SMFs** on transects and **selecting their geometry**
- **Probabilistic computation** of each SMF's **slope stability**:
 - > Simulate random EQ events => predict **local seismicity (PHA)** and **overpressures** as **SMF triggers** along transects
 - > Using site-specific **sediment properties** (type, density,...)
 - > Slope stability => compute as **factor of safety** (translational/rotational ruptures)
- **Prediction** of each SMF's **tsunami generation/propag./coastal runup**:
 - > Predicting **initial tsunami amplitude** using various model (actual, analytical)
 - > Predicting **corresponding coastal runup** using various model (actual, analytical)

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- Have good topobathymetric data now, did not in 2009.
- There is a need to identify surficial sediment properties on transects. Important to make analysis more realistic.
- Seismicity data from USGS hazard maps is needed.
- Limitations/improvements: need to define framework for MMS tasks.

Limitations/Improvements as part of MMS task

- Limited Field validation of predicted SMFs (USGS) -> *New field data*
- Poor accuracy of USGS PHA offshore -> *New Seismic maps*
- Few surficial sediment data and large uncertainties in stratigraphy for geotechnical properties -> *need for more site specific data and coring* (from recent USGS cruises ?)
- Limitations of limit equilibrium methods to model progressive failure or multiple failure scenarios -> *Need to consider multiple scenarios*
- Simplified estimates of runoff (correspondence principle, no breaking waves) -> *Need to use actual (fast) model ONGOING*

=> *New fast models (Grilli et al., 2021); New AI methods (Pat Lynett)*

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Action item: Ongoing task.

8. Tsunami Debris modeling (R. Wilson & P. Lynett)

- Dan Cox at Oregon State and Pat are in charge of putting together a workshop on debris transport.
- Plan is to set this up the same as previous benchmarking (3-5 datasets, lab and field mix).
 - o Participating modelers will complete 2-3 of these tests.
 - o Hydrodynamics of these tests are well constrained. Simplest tests will be provided by OSU and will reflect the following:
 - Evaluation of a single debris piece.
 - Evaluation of 4 debris pieces.
 - Evaluation of a debris field.
 - o Will also use field observations that drove ASCE debris section (Japan data)
- 2 day workshop (introduction/justification day leading in to initial modeling results; second day to synthesize results)
 - o Tentatively scheduled for week of August 15th in Newport Oregon. Still needs to be arranged.
 - OSU vans to shuttle people from hotel. Will likely have a room block at a hotel. Logistics planning in progress.
 - o Invitation to participants coming soon.
 - o Focus of this workshop will not be on product development (at least formally).

Action item: Ongoing task.

9. Proposals for MMS-endorsed projects in NTHMP Grant year 2022

- o No MMS endorsed projects for FY22 grant cycle.

Action item: None.

10. Wrap-up/Discussion

- Corina and Rick on Science Technical Advisory Panel. Came out with first report and now publically available: https://sab.noaa.gov/wp-content/uploads/2022/01/TSTAP-Report_Oct2021_Final_withCoverandLetter.pdf
- Jon: Trying to set up second MMS meeting soon to go over USGS ITIC Tsunami Data Collection Plan
 - o Poll will be out shortly.
- CA Tonga Tsunami Website: <https://www.conservation.ca.gov/cgs/tsunami/tonga>

Follow-up Meeting, Date TBD

- 10:00 – 10:30 USGS/ITIC Post-tsunami data collection plan update (Lead: USGS, Bruce Jaffe)
- 10:30 – 10:50 California Post-tsunami data collection plan update (Lead: California)
- 10:50 – 11:10 Washington multi-hazard clearinghouse presentation (Lead: Washington)
- 11:10 – 12:00 Discussion (ALL)