Mapping and Modeling Sub-Committee Meeting

Thursday 26 January 2022 10:30 am - 4:30 pm

AGENDA

Annual Work Plan Overview –

10:30 – 10:40 Welcome, introductions, agenda overview (15-min)

- Jon Allan introduces agenda

10:40 – 11:00 Powell Center Source Workshops (Lead: Stephanie) *in progress*

- Held four out of six meetings to date: 1) Develop the overall approach, 2) Alaska-Aleutian Tsunami Sources, 3) US East Coast, Gulf Coast, and Caribbean Territories, and 4) Cascadia Subduction Zone
- Meeting #5 planned for March 27-31, 2023: Pacific Tsunami Sources other than Alaska-Aleutian Subduction Zone and Cascadia Subduction Zone
- Meeting #6 TBD: Final meeting, planned for 2024 to focus on crustal faults, unusual sources, and wrap up of the overall effort (to include discussions on future steps/knowledge gaps, and updates on related efforts)

    Presentation: Jay Patton on Cascadia source update ([slide deck](); Powell Center Meeting #4)

    - Goal: Keep PTHA consistent with most recent USGS National Seismic Hazard Model
    - Jay presents an overview and walk through of the logic tree and explains how the weighting method works- All scenarios add up to 1 (higher numbers mean weighed higher; i.e. more likely scenario)
        - Scenarios include both full margin and partial margin ruptures with multiple fault geometries to generate different tsunamis.
        - Uses published scaling relations to achieve magnitude estimates for each scenario
    - Results compared against a suite of offshore tsunami heights (calculated at 100m isobaths) representing percent likelihood/chance for tsunami sizes for a given annual probability of exceedance. Using whole suite model results allows for the calculation of quantiles that bracket a range of probabilities (work by Hong Kie Theo).
        - This translates to defining different tsunami sizes converted into a given return periods (e.g. the 975-year tsunami)
    - Next steps:
        - Oregon has partnered with Dr. Kelin Wang and Matthew Sypus at University of Victoria to construct the CZ megathrust surface deformation models for tsunami wave simulations.
        - Suzanne Carbotte and Harold Tobin are working with their students and collaborators to establish the fault geometry for the CSZ.
            - Up-dip region of the fault is based on new seismic data collected in 2021 during a margin-wide research cruise called CASIE21.

- The fault geometry in the down-dip region is based on analyses from Michael Bostock and their collaborators.
    - o These data will be integrated into the new deformation models.
- Timeline: Based on next ASCE updates. Goal to have CSZ source models done in *late* 2023. Tsunami modeling portion by Hong Kie Theo/Yong Wei to generate 100m bathy values will bleed into 2024 once source models are done. During 2024, states will be in a position to model their jurisdictions with new PTHA sources (e.g. 2,475-year tsunami).
- Chip M.: How is this work applicable to Tsunami Warning Center operations?
    - o PTHA work could tie into pre-set scenarios and potentially contribute to the event scenario catalogue produced for procedures or forecasting.
    - o Inundation mapping is a lower priority in forecasting and likely not needed within first ten minutes, but it may be useful to compare pre-computed seafloor deformations and modeled tsunamis with real event.

11:00 – 11:20 NCEI DEM development (Lead: Kelly C/Kelly S) *in progress*

- We reviewed the current requests for DEM development (CY23)
    - o NTHMP DEMs funded:
        - San Francisco Bay, CA – completed
        - Prince of Wales Island, AK – completed
        - Puget Sound, WA – in process
        - Santa Cruz, CA – in process
        - Southern Coast of WA and Northern OR (Columbia River; waiting for USACE NCMP)
    - o Non-NTHMP funded:
        - Hawaii – completed
        - U.S. East and Gulf Coast – completed
        - Guam – completed
        - Puerto Rico and U.S.V.I. – completed
        - CNMI – completed
        - Updates to SW Florida – completed
- Kelly asks for new DEM requests/priorities
    - o Washington interested in area between Puget Sound and Bellingham Bay tiles (San Juan Is./ Rosario Strait area)
    - o Oregon and Washington reiterate Columbia River interest (last update 2010; need USACE data collaboration)
        - FEMA region 10 is monitoring new data up Columbia River from USACE (contact FEMA for new data, they're contacting USACE Region 10)
    - o Alaska requests updated DEMs for Hyder, Angoon, Tenakee Springs, and Kake communities
    - o Washington asks if lakes are considered coastal locations that NCEI works on (seiche modeling interest)
        - Kelly explains lakes are considered regional sources and are state agency driven (Ecology and Aquatics)
        - Potential exception for Lake Washington.

11:20 – 11:45 Maritime guidance update (Lead: Rick) *in progress*

- The current maritime checklist is in draft form
  - Needs further evaluation for TsunamiReady.
  - If NTHMP requests to formalize the maritime checklist by NWS, it needs to be reviewed and voted on by the NTHMP members before sending it to the NWS
  - Need to loop in Dept. of State
  - Includes product descriptions and guidance for identifying currents/damage potential, areas with high sediment deposition (hotspot map), depths to grounding, and other drawdown information
    - Upcoming sediment and debris movement modeling benchmark workshops will influence maritime guidance and product development for ports and harbors
    - Alaska + other partners interested in maritime products
- OR and CA are leading efforts for more specific offshore depth safety guidelines.
  - Existing guidance can be used as a baseline unless harbor-specific and/or scenario-specific information is developed to make recommendations for water depths less than 30-50-100 fathoms
    - Potential allowance of vessels to be closer to shore, leading to less offshore travel time
- MRPWG continuing to update tsunami mitigation and recovery products
  - New task to develop a step-by-step template for requesting funding for tsunami mitigation activities and recovery planning.
    - Utilize funding from FEMA, CGS, and USC for initial development of a maritime engineering and risk program
  - Hazus tsunami platform integration and/or other risk analysis tools… Are there plans for pilot projects?
    - Structural integrity may vary on climate.
    - Lateral spreading in navigation channels important to quantify (topic of interest to the USACE, check with them regarding previous studies undertaken to evaluate this. Non-federal channels fall on the states and territories to evaluate)
    - Is there a plan for loss estimation in different pilot areas?
    - Need engineering data collection on a dock-by-dock basis to determine how things would perform in harbors (fragility functions), which can be integrated into Hazus for lost estimations in harbors, not yet for ports (Pat Lynett).
- Does NTHMP have any Coast Guard representation/relationship?
  - Work in progress. NTHMP has opened this door, though USCG is not yet brought into the fold.
    - Had Coast Guard representation in past, but they have high turnover so hard to keep consistent relations
    - Change every two years in AK, Elena proposes to develop specific training for new Coast Guard onboarding
  - NTHMP aspires for USCG representation at the annual summer meeting (July 2023)
    - USCG onboarding a new position the week of 1/30. This person will be the primary USGC contact to Ian Sears

11:45 – 1:15 LUNCH

1:15 – 1:45 Maritime current modeling guidance (Rick/Jon) *in progress*

- Existing document: Guidance for Tsunami Hazard Analysis, Planning and Preparedness for Maritime Communities to be shared and reviewed (document utilizes 'track changes')
    - Last reviewed in 2015
    - Not hosted online currently, but goal to maintain an updated version of guidance document on NTHMP website.
        - There is precedence for maintaining these types of documents on MMS website (e.g. tsunami modeling, inundation mapping, meteotsunami and landslide modeling guidance document; https://nws.weather.gov/nthmp/mapping_subcommittee.html)
- Current document consists of 3 parts: 1) Guidance for Tsunami Hazard Analysis, 2) Guidance for Tsunami preparedness and outreach, 3) Guidance for mitigation and recovery.
    - Rick and Jon presented on some proposed changes up for review.
        - Highlighted some issues and challenges with different models, suggested new incorporations (e.g. dynamic tides, ensemble modeling, etc.)
    - Rick and Jon highlight different product guidance included in document:
        - A) ID of areas of past damage
        - B) Damage index and relationship between damage estimates and varying current levels
        - C) ID of areas of potential damage
        - D) Develop current threshold maps to ID timeframe for damaging currents
        - E) ID extreme water levels, vorticity, and grounding potential in ports and harbors
        - F) ID safe minimum offshore depths if offshore for scenario specific events (distant vs local)
- Daniel Eungard: Are there any recommendations for symbology and color to better standardize our products and also serve those who may have accessibility needs?
    - Yes, there is a section on suggested symbology, should be reviewed by MMS members. Don't necessarily have color coordination at this time. Different locations have different hazard level, which may lead to varying symbology. Can work towards standardizing this in the future across NTHMP partners.
    - Unit consistency to use fathoms and nautical miles (accommodate maritime community standards and needs)
- Stephan Grilli commented on products they worked on that show hazard level and the factors (currents, wave arrival times, water levels etc.) used to determine the levels.
- Need for speed vs vessel analysis?
    - Oregon is providing this for certain estuaries. Assumes a vessel is travelling at 6 knots and calculates the time from ports to both offshore and upriver staging areas.
    - Create something similar to USGS PEAT?

- V(essel)EAT…M(aritime)EAT…B(oat)EAT? Could emphasize the lack of time available to get to deep water

1:45 – 2:15 Sediment Transport Guidance (Lead: Stephan/Jim) *in progress*

Presentation: Jim Kirby

- Introduction: Tsunamis transport sediment. Static maps vs dynamic morphology leads to adjustments in response to event conditions. Small events could cause significant morphology changes. There is a growing body of lab tests examining profile changes and local processes around structures for benchmark tests.
- The benchmark workshop organization is ongoing…
  - Recruitment and organizing committee: MMS organizers: Jim Kirby, Stephan Grilli, Bruce Jaffe (USGS), Daisuke Sugawara (U. Tohoku). Additional interest in assisting from Chris Moore, Jon Allan.
    - In process of identifying benchmarks and persons responsible for organizing data and documentation needed for each
    - In process of identifying the pool of potential workshop participants (guest speakers and modelers)
      - Involvement – 30ish participants
- Following workshop, the goal is to develop website that will include overview of workshop goals and distribution of benchmark data (modeled after the 2017 landslide workshop website)
- Open questions: Should workshop topics include small scale processes such as scour around structures, boulder or debris transport?
  - Inclined to stay away on these topics. Though scour around structures could greatly inform the ASCE process and provide validation to building designs.
- Is August 2023 date too soon? Tentative dates are 8/4-5/2023 – following NTHMP Summer meeting in Portland, OR
- Is there a European/Middle East contingent which we have failed to make contact with to date?

2:15 – 2:45 Landslide Modeling PTHA (Lead: Stephan/Juan) *in progress*

Presentation: Stephan Grilli/Juan Horillo

- Implementing approach from Powell Center Workshop #3
- Developed a landslide PTHA logic tree that is similar to the Cascadia seismic logic tree, but with additional boxes (e.g. sediment, slope, other bathymetric variables)
- MMS task: following 2019 Powell Center meeting recommendations, develop and validate a new unified LPTHA methodology performing monte carlo simulations of slope stability (or logic tree) for randomly selected submarine mass failures (SMFs), and for those SMFs that fail, perform fast SMF tsunami propagation and coastal impact modeling for potentially 10,000s of cases.
  - Sources: Coseismic, volcanic, SMFs. SMF scars on East Coast are mostly old (1000 years?)
- Showed modeled tsunami propagation video for SMF off Montauk, NY

- A large SMF tsunami is a global event.
- Simulated 7000 examples of the Palu 2018 event to develop LPTHA framework
  - MMS task: Limitations/improvements – There are data limitations… Need seafloor sediment types for each region and more field data of historical SMFs for statistical validation.
    - Historical events: Grand Banks- 1929
    - Need to consider multiple SMF failures together
- Purpose – East Coast faces skepticism from Emergency agencies when there is no return period. A probabilistic approach allows for this and makes a connection to recurrence intervals. This can then be included in a PTHA multihazard analysis and potentially incorporated into forecasting

2:45 – 3:15 BREAK

3:15 – 3:30 Tsunami Debris modeling (Lead: Rick/Pat) *in progress*

- Purpose: to understand ability of debris transport models to accurately predict the initiation, motion, and fate of debris of various (but not small) sizes.
  - Not focused on how debris is generated and stepping away from massless LaGrangian particle tracking.
  - Range of models, from shallow water to CFD (3D).
- Workshop information:
  - tentative dates: May 22nd-23rd
  - Workshop location: Newport Oregon at OSU Hatfield Marine Science Center (tsunami evacuation building)
  - Day 1 + Day 2 (first half) – benchmark data presentations; Day 2(second half) mitigation product discussion.
  - Data will be provided on a Google CoLab notebook
- Benchmark problems:
  - Benchmark 1: Optical measurements of tsunami inundation and debris movement in a large-scale wave basin. Block moving with flow with obstacles.
  - Benchmark 2: Non-uniform density groups and obstacles, varying particle clouds moving with flow and obstacles
  - Benchmark 3: Modeling debris transport due to tsunami flow in coastal urban area – represent ships
  - Benchmark 4: Debris sector tests from ASCE
  - Benchmark 5: Large debris moving in tsunami to represent large container vessels
- What products can come from this? Let the modelers/MMS know what you think could be helpful

3:30 – 3:45 Post wave arrival workshop meeting discussion (Alex) *in progress*

- Provided a link to a survey to create an informal "Tiger Team" working group, in addition to inventorying how NTHMP partners are currently using wave arrival in their products and messaging.
  - Will be basis for guidance
- FEMA wave arrival definition for Hazus is 1m amplitude

o   Will work with Laura Kong on IOC Glossary of terms (included on Tiger Team)

3:45 – 4:00 Proposals for MMS-endorsed projects in NTHMP FY23 (All) *new*

- Eats Coat/Gulf States proposed a task to develop final publications summarizing both the Landslide and Sediment transport modeling workshops
- Alaska proposed a task to establish a Maritime council – request more information from Dmitry (AK). Could bring harbormasters into the fold this way
- California proposed developing a task to evaluate a suite of products that could be useful regarding debris transport
- MMS voted unanimously to endorse each of these tasks.

4:00 – 4:15 Placeholder - WCS needs (All) *in progress*

- Yvette will send out document to be shared with MMS that outlines WCS needs.

4:15 – 4:30 MMS co-chair nominations and voting (All) *completed*

- Nominations were call for prior to the meeting. Elizabeth Vanacore (PR) expressed interest;
- A call to vote by MMS members to support Elizabeth's nomination. Votes were unanimous in support.
- Elizabeth Vanacore (PR) voted into MMS co-chair, joining Summer Ohlendorf and Alex Dolcimascolo, to be ratified at CC meeting on 1/27/2023. Jon Allan's term after many years is ending and stepping down.

4:30 Wrap-up… any final comments

- Casualty Modeling 'Tiger Team' to regulate criteria for defining casualties and exposures in tsunami zones
    o   Members: Chip Guard (Guam), Corina Allen (Washington), Althea Rizzo (Oregon), Danté DiSabatino (Washington), Maximilian Dixon (Washington), Todd Becker (California), Nate Wood (USGS), Christa von Hillebrandt-Andrade (NOAA ITIC/PR), Drew Herseth (FEMA), Ed Fratto (NESEC) + TSTAP help, Jon Allan (Oregon).
- James Gridley presented on the Barry Arm landslide near Barry Glacier, Prince William Sound, AK
    o   Potentially ~500,000,000 m^3 landslide material sliding into the fjord (dimensions = 1.5 mile x 1 mile).
    o   Tsunami wave travel time to Whittier (deemed the "most dangerous city in the US") is ~22 minutes, very high risk.
    o   Camera views (not real time), experimental monitoring, and sensors of various types deployed as part of interagency effort (NOAA/USGS/ADGGS)… unfortunately not within scope of NTHMP to get sensors deployed elsewhere. Deployment, maintenance, comms are difficult and $$$
        ▪   Funding elsewhere from USGS or NWS?
    o   There is also a lot of risk with the warning decision time frames involved and current monitoring

- Summer Ohlendorf mentions this problem requires a lot of outreach with the nearby communities to help them understand the monitoring and sensor capabilities. There is also the very real potential for false alarms