2013 Update

California Maritime Planning:

In-Harbor Hazard Mapping, Offshore Safety Zones, and Guidance: Response, Mitigation, and Recovery Planning

Rick Wilson, California Geological Survey
Kevin Miller, California Office Of Emergency Services
Maritime planning products available starting 2013

- In-harbor tsunami hazard maps
- Offshore safety zones for boats
- Guidance for maritime response (new brochure)
- Response/Recovery/Resiliency
Maritime Safety Products

Analysis of 2010 and 2011 tsunamis in pilot study harbors

Crescent City, Santa Cruz, Ventura, Ports of LA/Long Beach, and San Diego Bay

Video and other analyses of currents, sediment scour/deposition, areas of damage, safe areas

March 11, 2011 tsunami in Santa Cruz
Can we filter this information, create areas where certain levels of damage might be expected?

**Need to develop current–damage relationships**

- Based on previous observations of damage, and numerical hindcast & direct speed measurements at the damage location

<table>
<thead>
<tr>
<th>Damage Index</th>
<th>Damage Type:</th>
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<tr>
<td>0</td>
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<tr>
<td>1</td>
<td>small buoys moved</td>
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<tr>
<td>2</td>
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</tr>
<tr>
<td>3</td>
<td>Moderate dock/boat damage, mid-sized vessels off moorings</td>
</tr>
<tr>
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<td>Complete destruction</td>
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**Tsunami Current Hazard Maps Map Generation**

- No observations of damage for currents < 3 knots
- Minor / moderate damage observed for currents between 3 and 6 knots
- Minor to transition to major with currents > 6 knots
- Major to complete damage for currents greater than 9 knots

Damage begins to transition to major with currents > 6 knots
Tsunami Current Hazard Maps
Map Generation

- **current–damage relationships**
- Based on previous observations of damage, and numerical hindcast & direct speed measurements at the damage location

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Develop Hazard Zone maps for three different “classes” of tsunami events:
- Large Advisory
- Warning
- Large Warning

Velocity-threshold map for strong currents in Crescent City Harbor from large Aleutian Island event (Pat Lynett)
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Velocity-threshold map for strong currents in Crescent City Harbor from large Aleutian Island event (Pat Lynett)

- **9+ knots** = widespread major damage to harbor structures, vessels of all sizes pulled from mooring lines
- **6-9 knots** = moderate damage, small vessels pulled off moorings
- **3-6 knots** = minor damage to docks
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Develop Time-Threshold maps for 3, 6, and 9 knots for three different “classes” of tsunami events:
Large Advisory Warning
Large Warning

Time-threshold map for strong currents in Ventura Harbor from large Aleutian Island event (Pat Lynett)
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1 fathom = 1.8 meters = 6 feet
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PRELIMINARY Offshore Safety Zone Analysis

Potential New Guidance

Existing NOAA Guidance
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<thead>
<tr>
<th>Crescent City</th>
<th>Alert level</th>
<th>Magnitude</th>
<th>Source location</th>
<th>Peak Amp. (m)</th>
<th>Tidal condition (first 5 hrs)</th>
<th>Peak Vel. (knots)</th>
<th>Damage summary</th>
<th>Damage Index (USC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>Advisory</td>
<td>8.0</td>
<td>Sanca</td>
<td>0.33</td>
<td>High</td>
<td></td>
<td>No damage</td>
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<tr>
<td>2012</td>
<td>Advisory</td>
<td>7.7</td>
<td>BC</td>
<td>0.46</td>
<td>High</td>
<td></td>
<td>No damage</td>
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<tr>
<td>2010</td>
<td>Advisory</td>
<td>8.8</td>
<td>Chile</td>
<td>0.64</td>
<td>Low</td>
<td></td>
<td>No damage</td>
<td>0</td>
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<tr>
<td>2006</td>
<td>Advisory</td>
<td>8.3</td>
<td>Kuril Isl.</td>
<td>0.88</td>
<td>Low</td>
<td></td>
<td>$28M in damage; three docks</td>
<td>4</td>
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<tr>
<td>2011</td>
<td>Warning</td>
<td>9.0</td>
<td>Japan</td>
<td>2.47</td>
<td>Low</td>
<td>10</td>
<td>$26M in damage; all docks</td>
<td>5</td>
</tr>
<tr>
<td>Modeled Scenario #1</td>
<td>(Warning)</td>
<td>(9.0)</td>
<td>2011 Japan at high tide</td>
<td>(2.47)</td>
<td>High</td>
<td>(12)</td>
<td></td>
<td></td>
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<tr>
<td>Modeled Scenario #2</td>
<td>(Warning)</td>
<td>(9.2)</td>
<td>(Aleutians)</td>
<td>(+4m)</td>
<td></td>
<td>(+12)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Example Maritime Response Plan “Cheat Sheet” and Mitigation Guidance
Maritime Work Update/Schedule

- Completion of video evaluation (HSU; Admire and Dengler), modeling (USC; Lynett and Borrero), and evaluation in pilot study areas

- Held meetings with Crescent City and Ventura harbors

- Plan meetings with Santa Cruz Harbor and San Diego Bay entities, and follow through meetings with Port of LA and Port of LB, all over next couple months

- Feedback leading to creation of:
  - Hazard maps (in-harbor and offshore) for FEMA RiskMAP interface
  - Playbooks (hazard maps and guidance) on various scenarios for planning
  - One-page guidance (“Cheat-sheet”) for real-time response activities
  - Guidance for mitigation and recovery activities (Martin Eskijian, retired CSLC)

- Pilot projects completed this summer

- Production for rest of the state from fall 2013 to summer 2015
Maritime Work by Others
Should NTHMP Guidance be developed?

- Hawaii plan
- Puerto Rico plan
- Oregon plan
- NOAA/PMEL (forecast)
- Others?
Maritime Work Summary

- Ready for implementation or still demonstration project?
  - Offshore and guidance being implemented
  - NEEDS: 1) In-harbor work and response cheat-sheet and mitigation work needs feedback from NTHMP; 2) Models for currents needs benchmarking; and 3) all products need standardization (guidance for production and use)

- Importance to NTHMP: HIGH, based on 1) historical damage and life safety issues; 2) high value of coastal assets; and 3) discussed in Strategic Plan