

Updates in Maritime Hazard Mapping Efforts in CA

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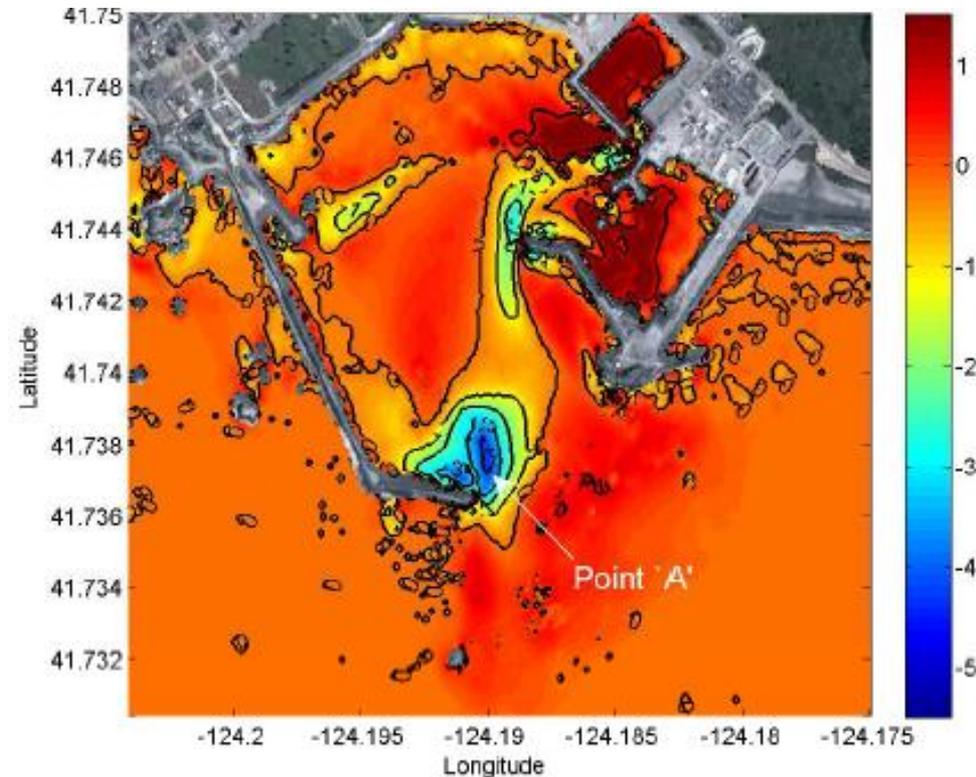
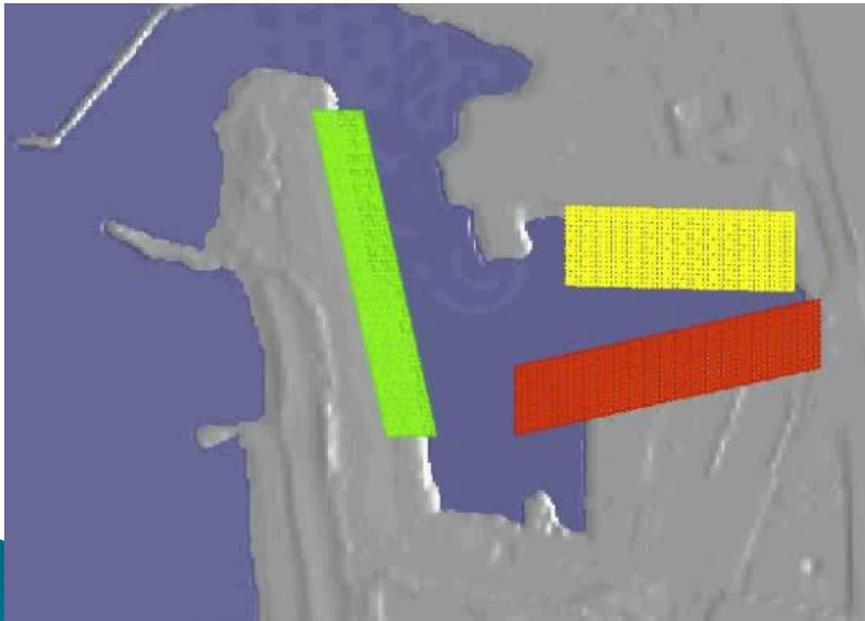
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Management
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Assessment of the Tsunami-Induced Current Hazard

OUTLINE

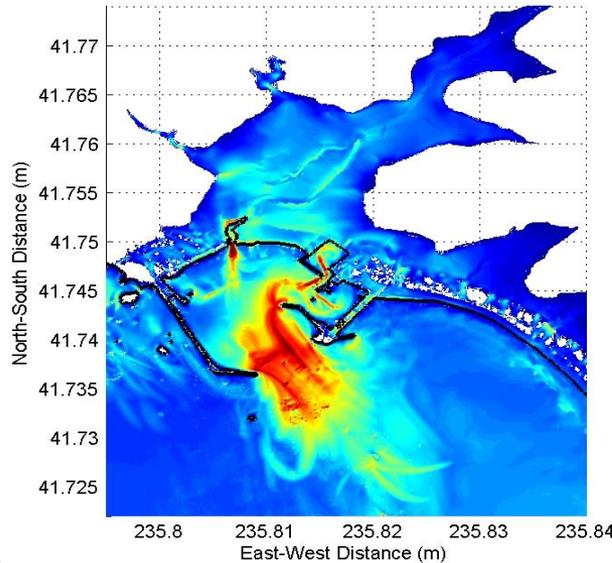
- *Quick Review of Background & Methods*
- *California Harbor Modeling*
 - *2011 Hindcasting and Damage-Current Relation*
- *Ongoing “next steps”*



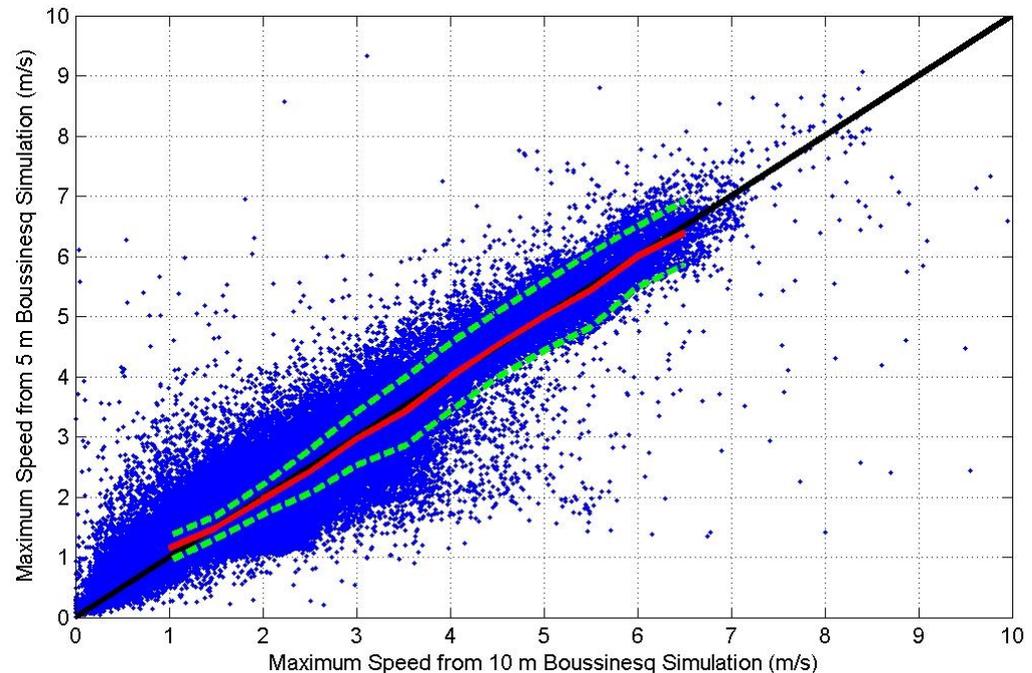
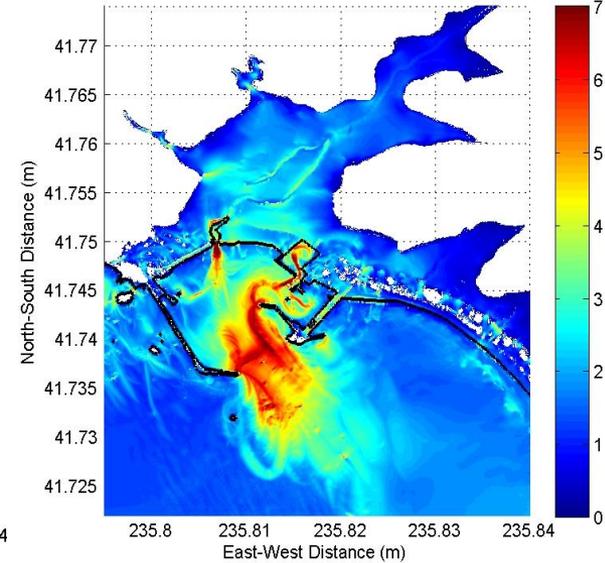
Tsunami Current Hazard Maps: Map Generation

- **First, a baseline for a converged model result**
 - **5 m Boussinesq vs 10 m Boussinesq**
- **Compared MOST with Boussinesq model @ 5 m resolution at set of 5 pilot harbors in CA**
 - **Statistically similar in mean sense for speeds < 3 m/s.**
 - **MOST gives larger velocity predictions for speeds > 3 m/s**
- **Compared simulations at MHW vs MLW**
 - **Statistically similar for speeds < 4 m/s**
 - **MHW gives slightly larger predictions for speeds > 4 m/s**

Max Current (m/s) Alaska Source - Boussinesq 10 m Simulation

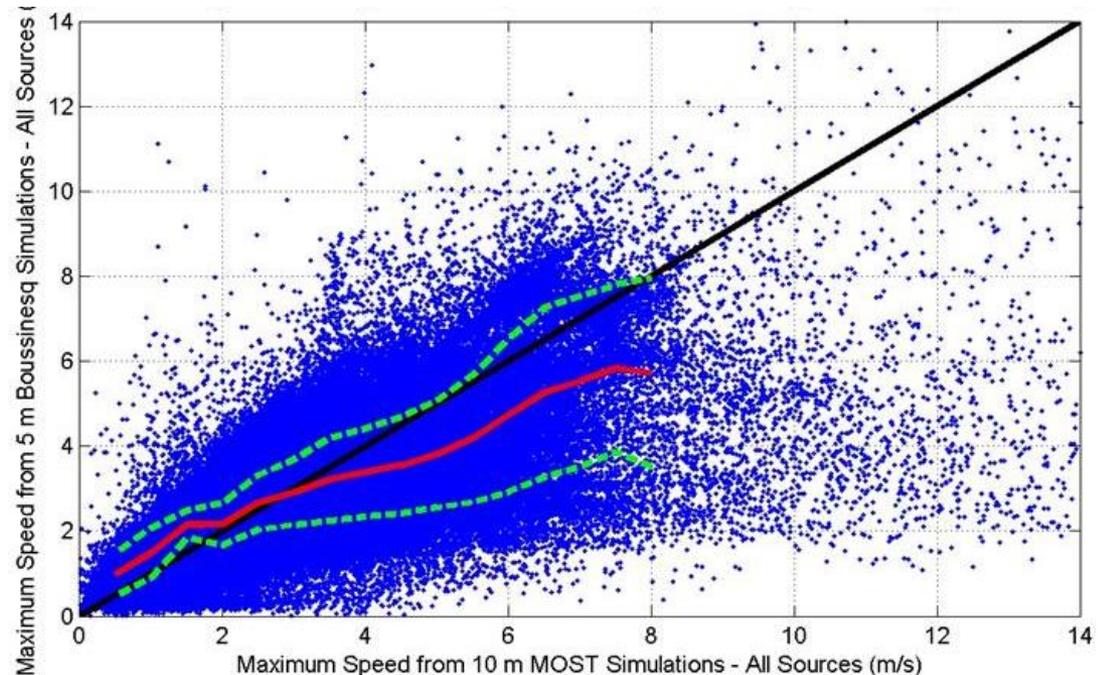
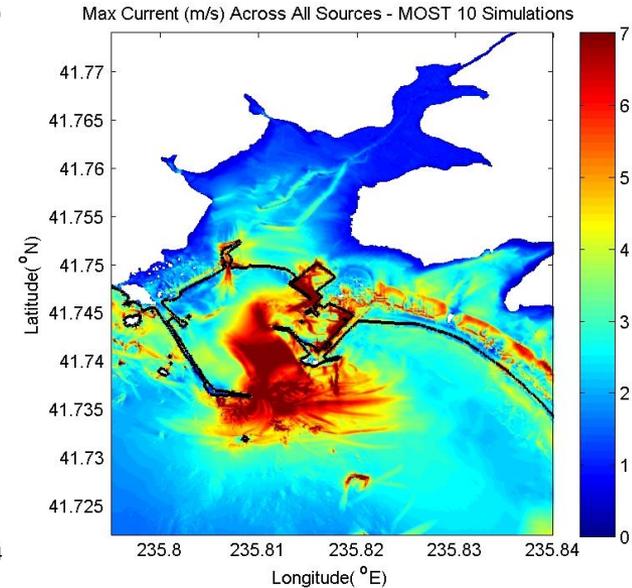
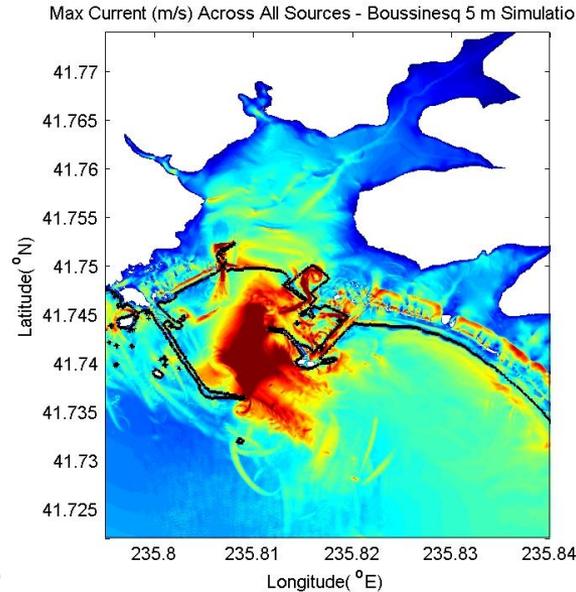


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Tsunami Current Hazard Maps: Map Generation

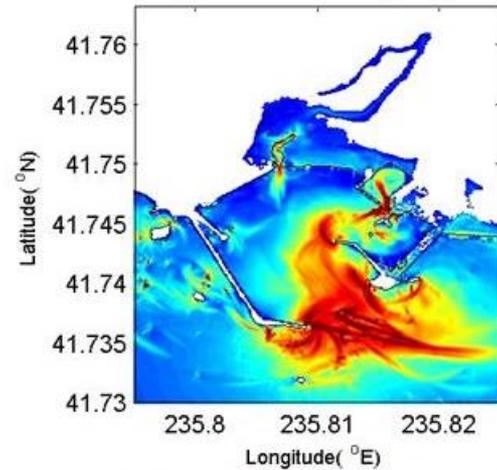
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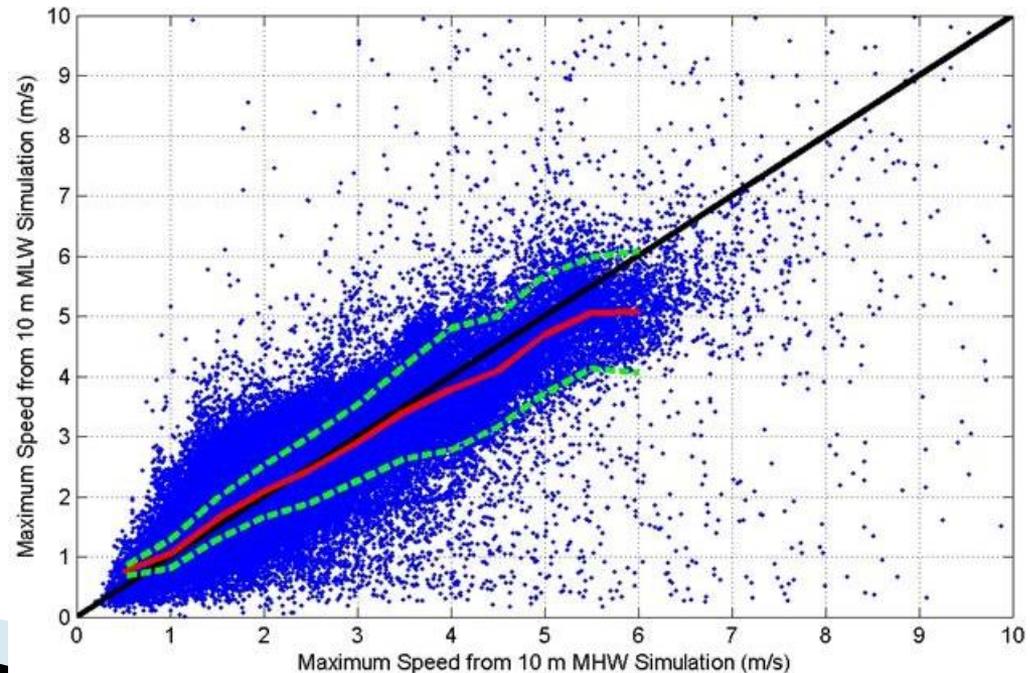
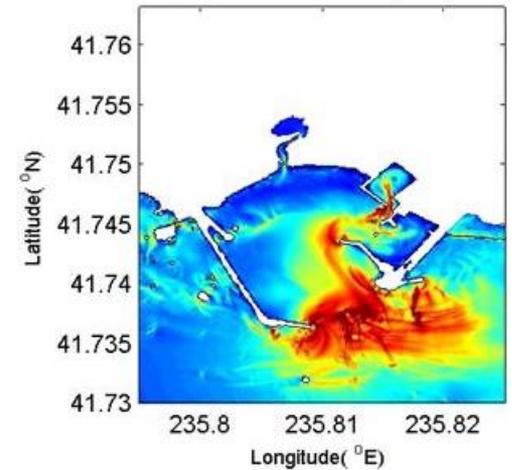
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Max Current (m/s) for source 2011-Japan @ MHW 10m

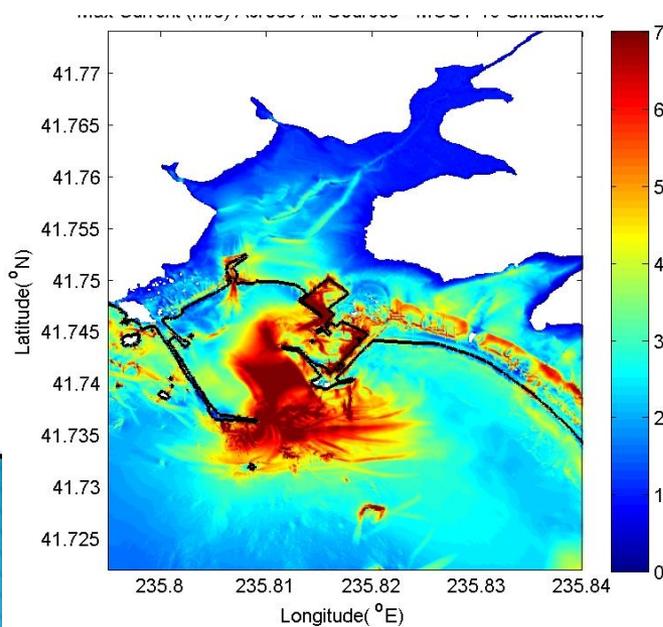


Max Current (m/s) for source 2011-Japan @ MLW 10m

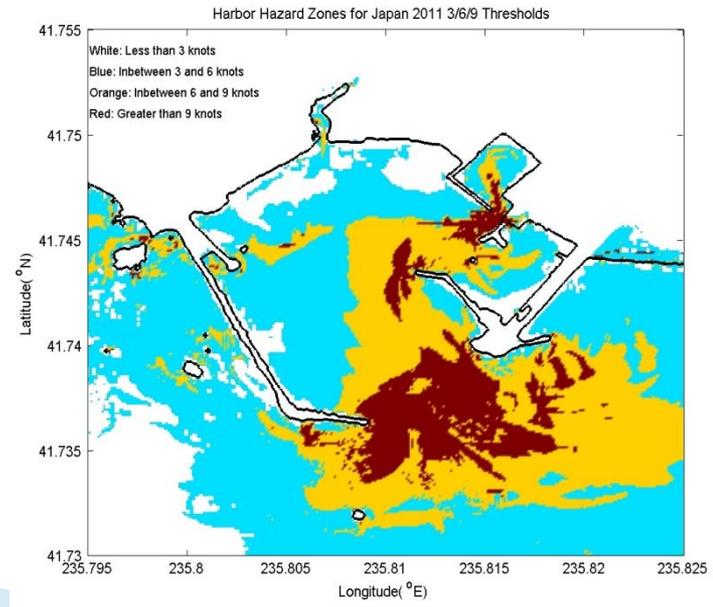


Tsunami Current Hazard Maps: Map Generation

- **Maritime Modeling Status:**
 - Performed 10-m MOST simulations at ~35 port/harbor/marina areas
 - 5-6 Source scenarios for each location
 - Includes 2010 and 2011 events for all harbors
 - This hindcast allows us to match the modeled velocity at the exact (to within a grid point) location of the observed damage
 - Extract the maximum simulated current at the damage location, assume that current is the cause of the damage
 - Connect damage to current
 - Expect that maps of “damage / hazard potential” for a given scenario are more useful than maps of maximum current



VS

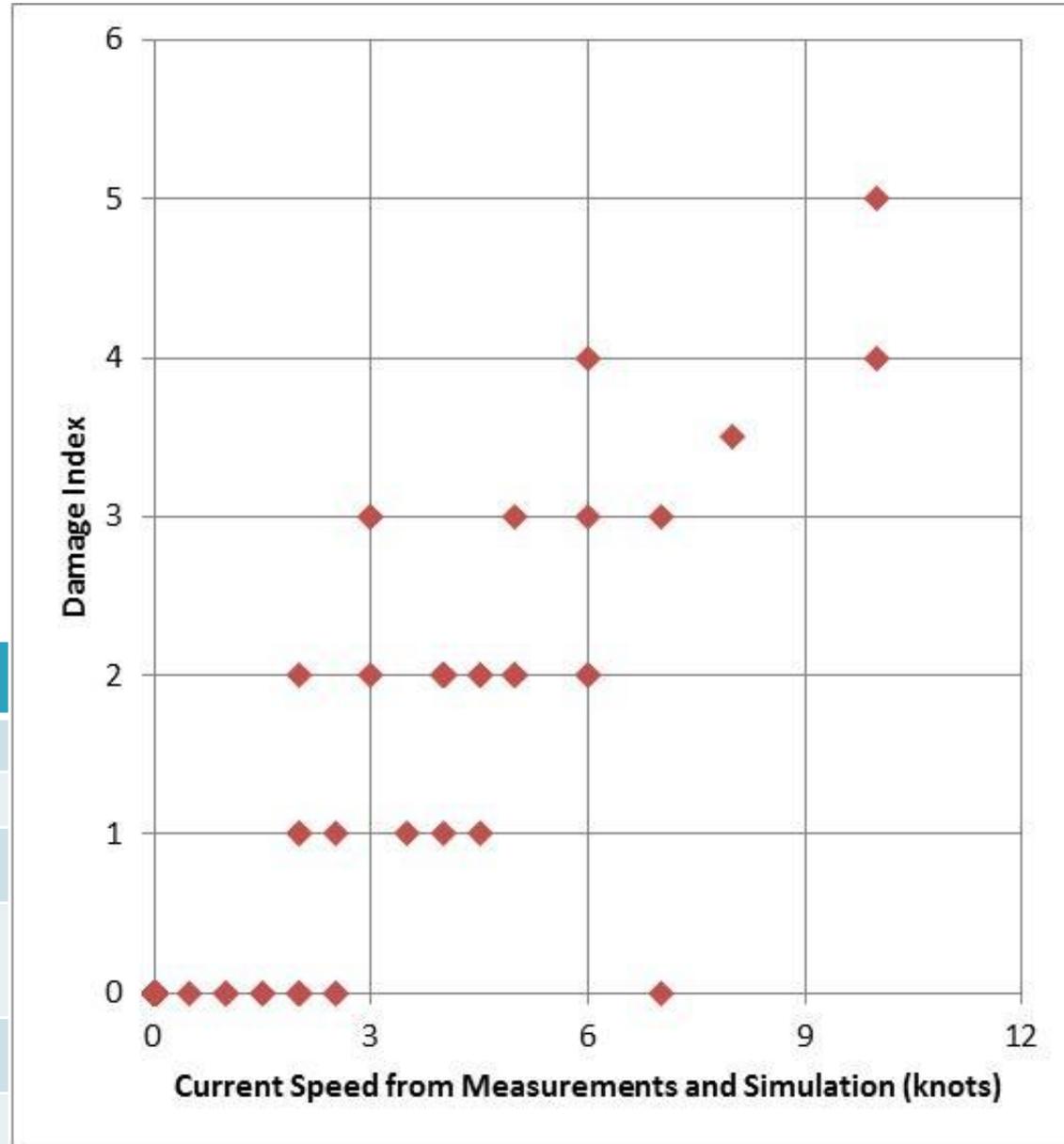


Tsunami Current Hazard Maps

Map Generation

- **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**

Damage Index:	Damage Type:
0	no damage
1	small buoys moved
2	1-2 docks/small boats damaged, large buoys moved
3	Moderate dock/boat damage, mid-sized vessels off moorings
4	Major dock/boat damage, large vessels off moorings
5	Complete destruction

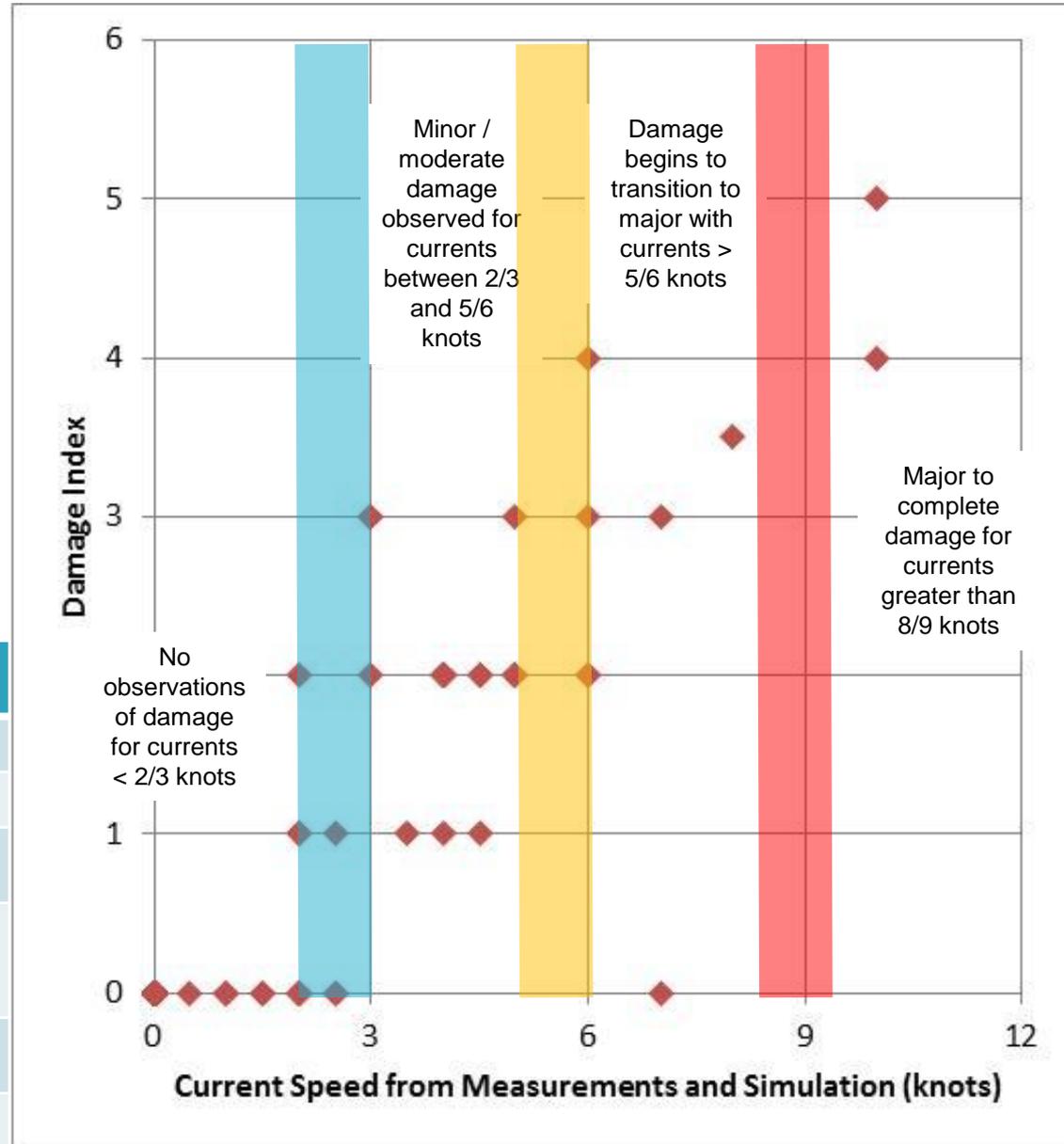


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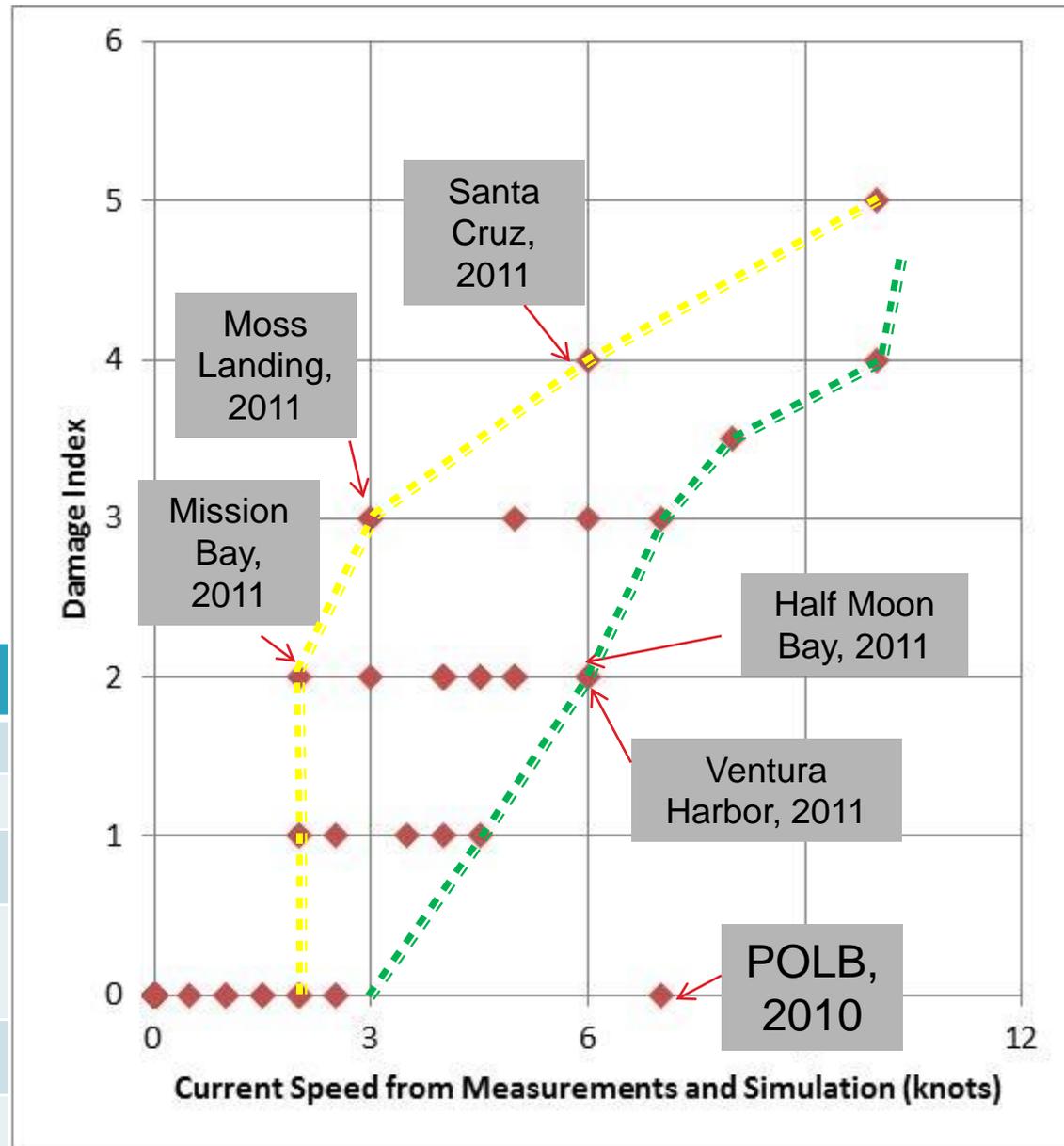


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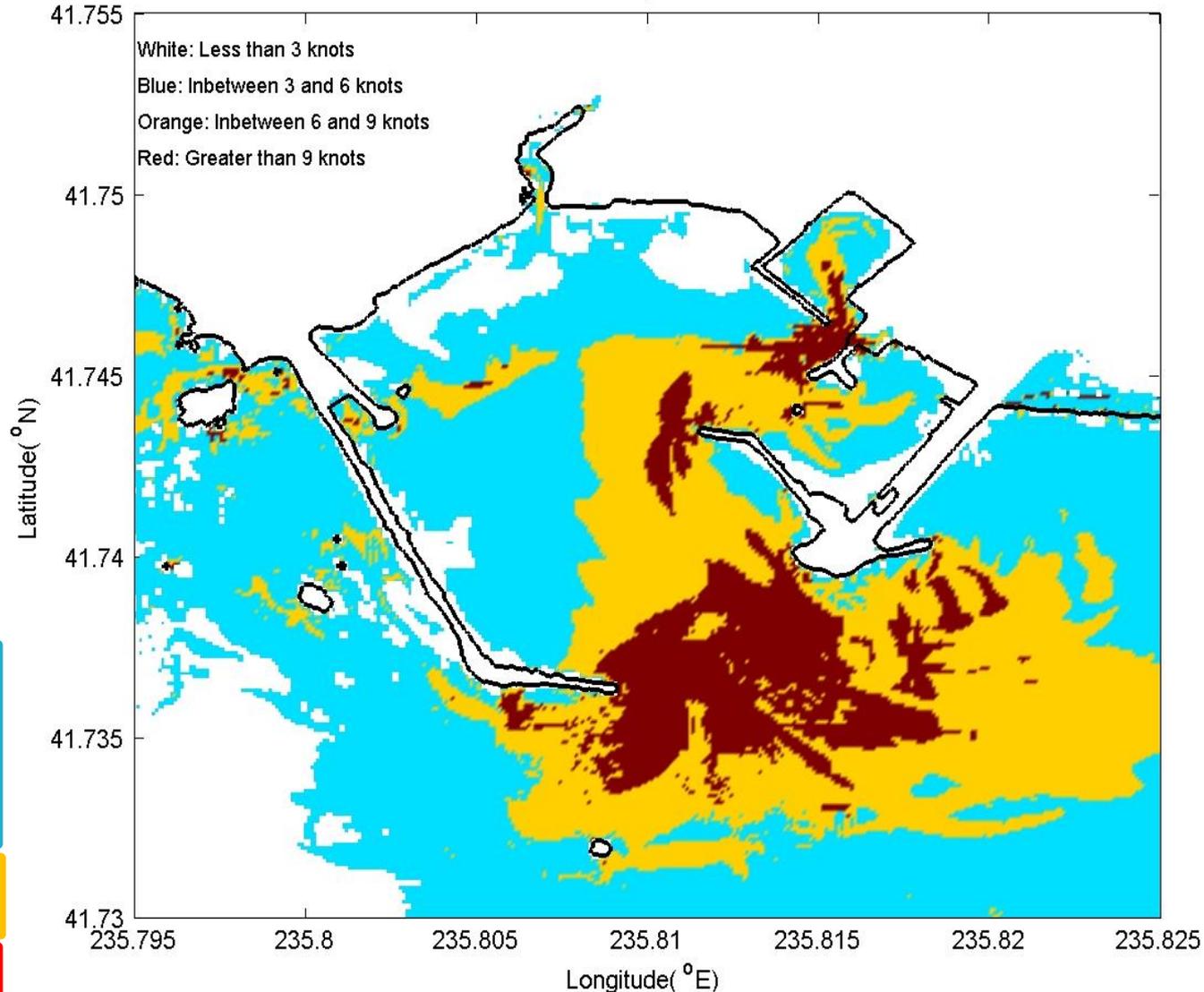
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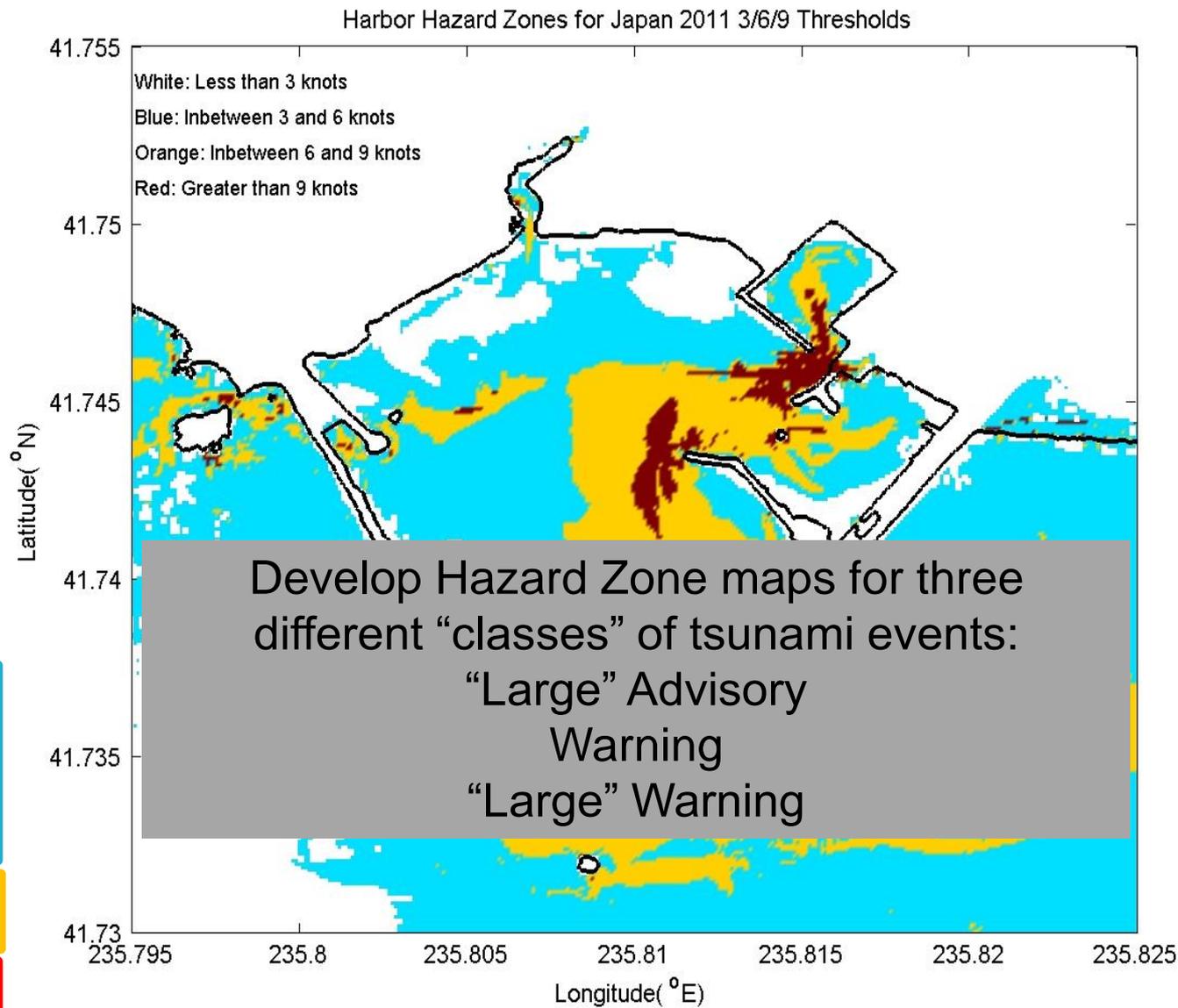
Harbor Hazard Zones for Japan 2011 3/6/9 Thresholds



Tsunami Current Hazard Maps Map Generation

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

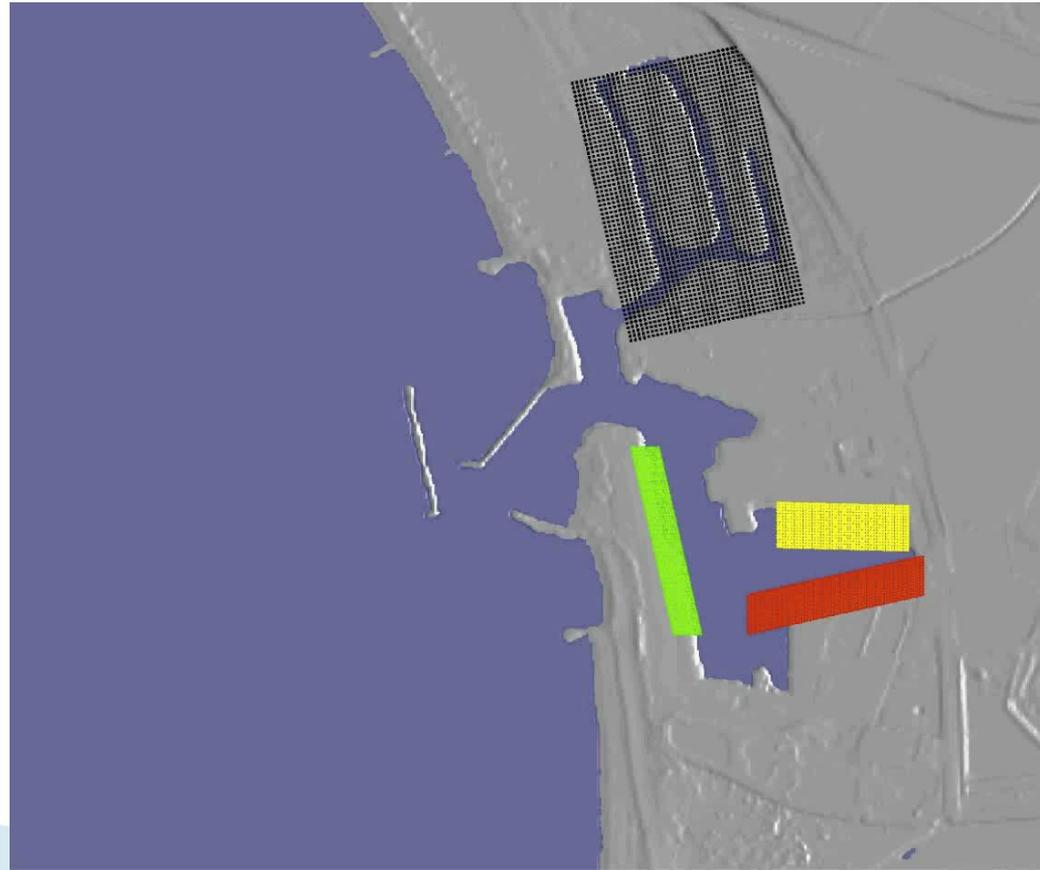
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Tsunami Current Hazard Maps

Map Generation

- **Pilot study concepts**
- **Debris transport**
 - Right now, massless Lagrangian particles
 - Provide visualizations of the possible spread (distance and rate) or debris and the more likely places for debris to settle
 - With no fluid-debris interaction
 - Post-processing



Tsunami Current Hazard Maps Map Generation

- **Pilot study concepts**
- **Sedimentation and Scour**
 - **Sediment pickup and transport models coupled with hydro equations**
 - **Provides estimates of scour depth and sedimentation thickness as a function of source scenario**
 - **Post-event channel navigability and long-term sediment management planning**
 - **Lots of choices for sediment models**
 - **Difficult topical area to enter**

