

California Office of Emergency Services Tsunami Inundation Mapping Program



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With figures from K. Miller, CA OES and A. Barberopoulou, USC

Photo Rick Hiser,
inset photo Lori Dengler



Project purpose:

- Provide “... a uniform set of ... inundation maps ... representing a worst case scenario for tsunami evacuation and emergency planning.”

(Current project work plan)

A Quick History

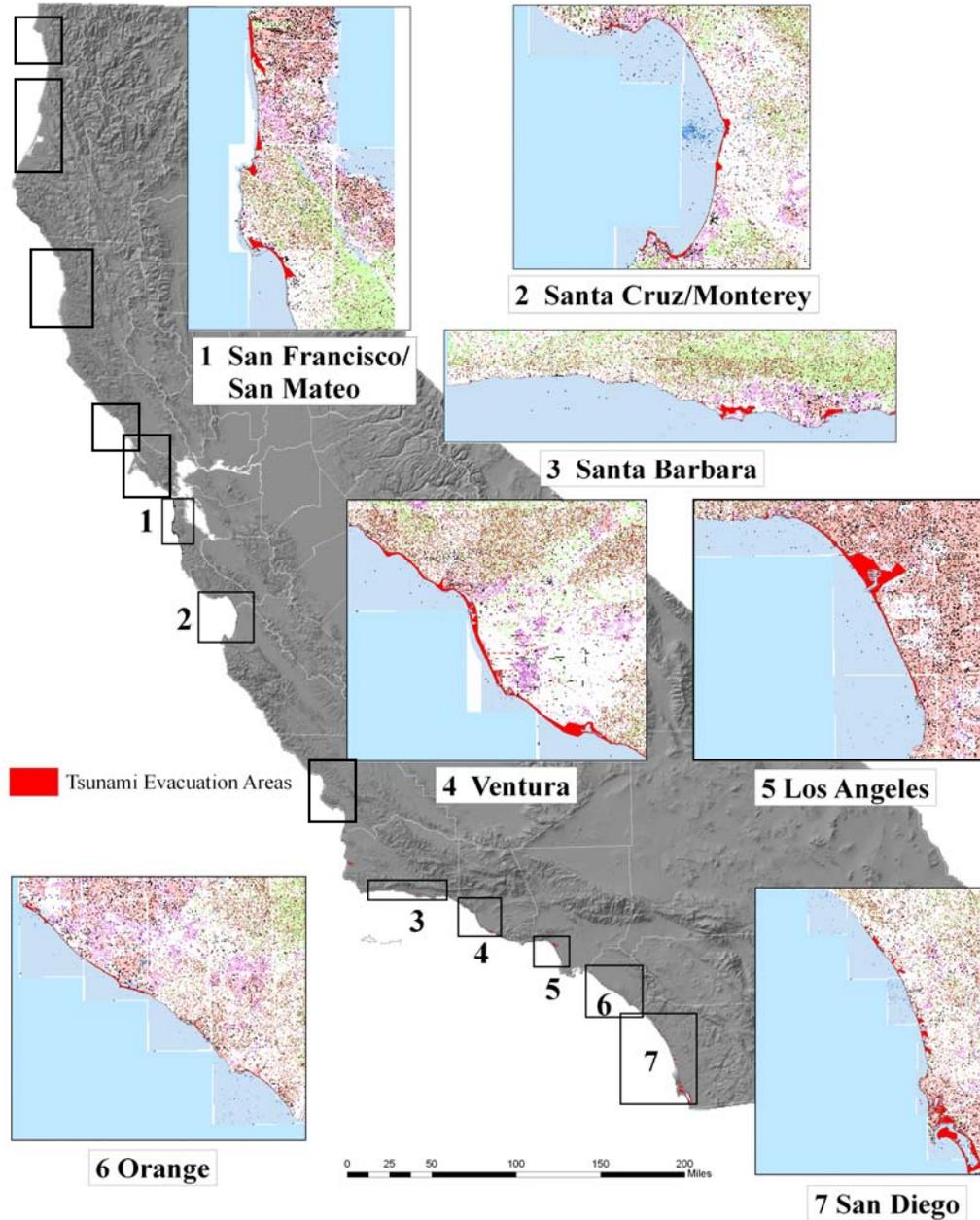
- Contracts with University of Southern California (USC) Tsunami Research Center, 2002 – 2005
- ~ \$300,000 (NOAA)
- Covered populated areas of coast – many data gaps
- During contract period, modeling methods changed



State of California Tsunami Evacuation Planning Maps



Areas modeled under initial contract



Current Contract

- September 2006 – June 2008
- ~ \$300,000 (NOAA)
- Finer scale (~75m x 90m grid)
- Fill in gaps
- Model some ports and harbors at higher resolution (~25 m grids)

Process

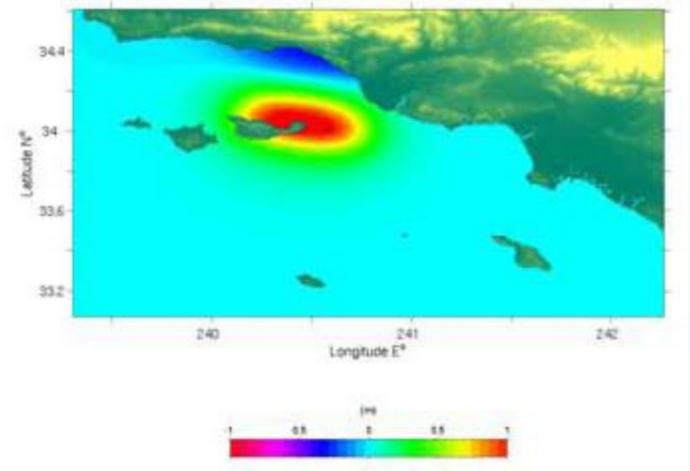
1. USC models inundation
2. OES imports results into GIS
3. Field check
4. Finalize inundation line
5. Maps and data provided to local governments

1. USC models inundation

- Method
 - Numerical modeling
 - Generation - input of initial water surface displacement
 - Propagation - equations of motion using MOST model
 - Runup - inundation

*MOST – Method of Splitting Tsunami
For more information see <http://nctr.pmel.noaa.gov/model.html>

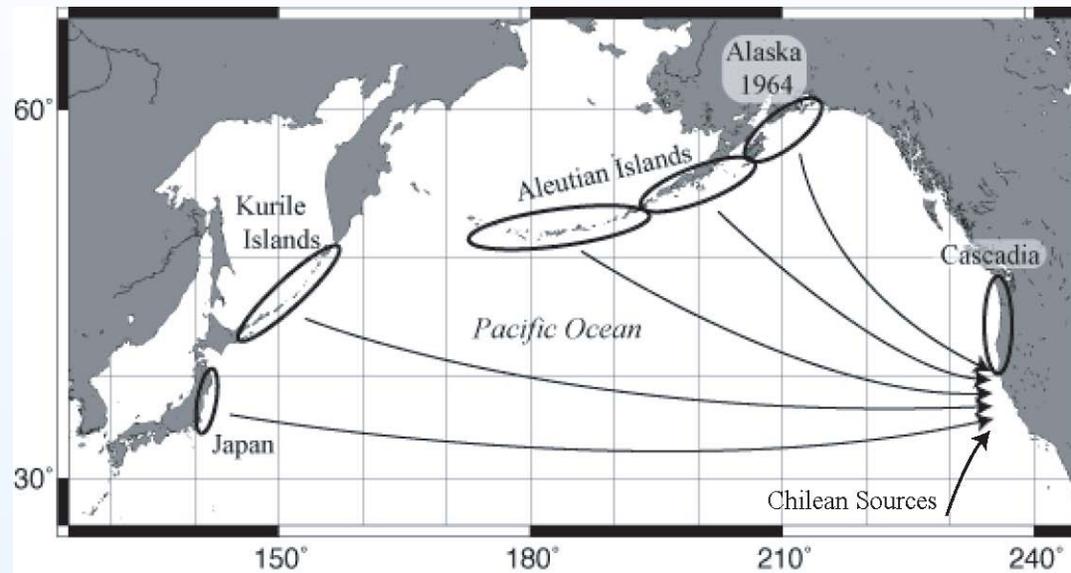
Initial condition for an earthquake on
Channel Islands Thrust Fault



1. USC models inundation

- Sources

- Local tectonic
- Local landslide
- Far field



Far field source regions in the North Pacific .

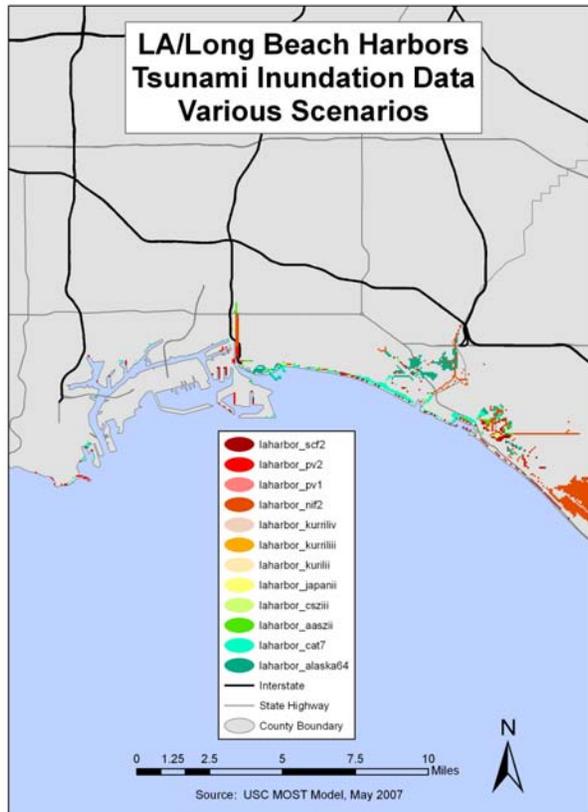
1. USC models inundation

- Products
 - Inundated areas
 - Flow depths
 - Animations



2. OES imports results into GIS

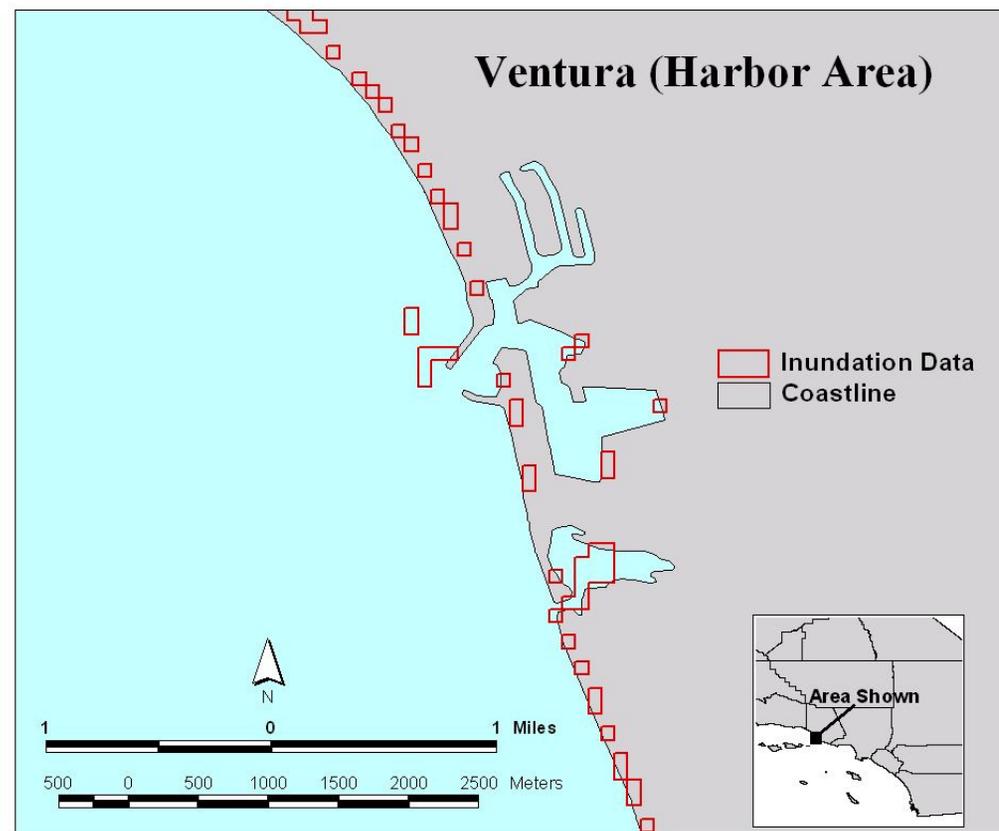
- Data is transferred as ASCII files



2. OES imports results into GIS

Challenges:

- Coastlines used for model do not match OES GIS data
- Conversion of coarse raster data to a single inundation line



3. Field check

- USC, OES, and Local Government personnel walk/drive the coast to:
 - Check actual conditions against modeled results
 - Observe natural and man-made barriers to flow not accurately modeled
 - Take measurements of local slopes and elevations to compare with modeled results



4. Finalize inundation zone

San Mateo County Tsunami Evacuation Planning Map

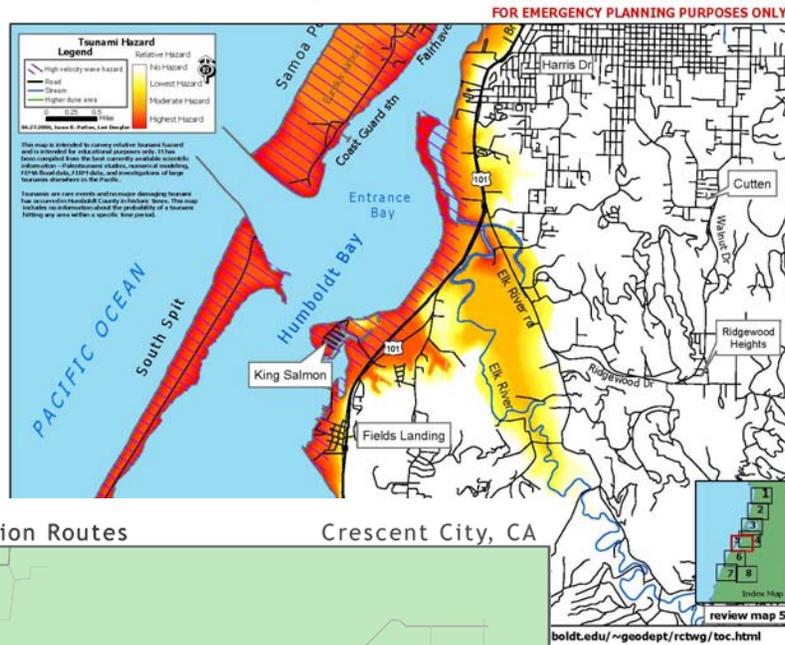


5. Maps and data provided to local governments

- Roads and landmarks are chosen as evacuation guides
- Evacuation areas, routes and destinations are identified
- Tsunami evacuation map is produced by the local government

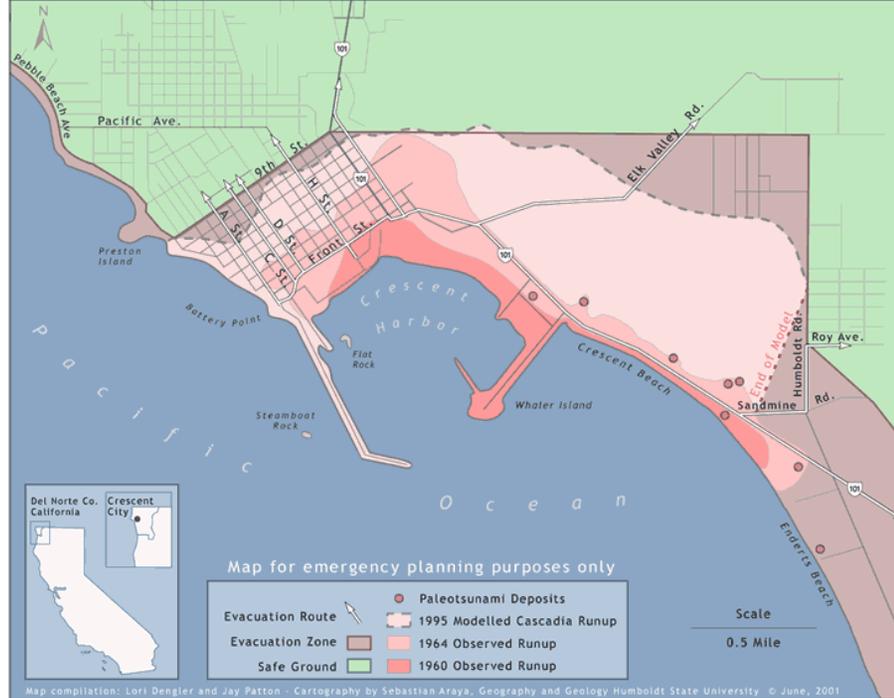


Sample Tsunami Maps



Bandon, OR. Full brochure available at
<http://www.oregongeology.com/sub/earthquakes/Coastal/tsubrochures/BandonEvac.pdf>

Tsunami Hazards & Evacuation Routes Crescent City, CA



Map compilation: Lori Denler and Jay Patton · Cartography by Sebastian Araya, Geography and Geology Humboldt State University · © June, 2001
 1960 Tsunami runup data: Wallace Griffin personal communication
 1964 Tsunami runup data: Lander and others, 1983
 1995 Modelled runup data: Bernard and others, 1994
 Evacuation Zone data: Del Norte Co. Office of Emergency Services
 Paleotsunami deposit data: Gary Carver personal communication
 Streets and coastline: ESRI data



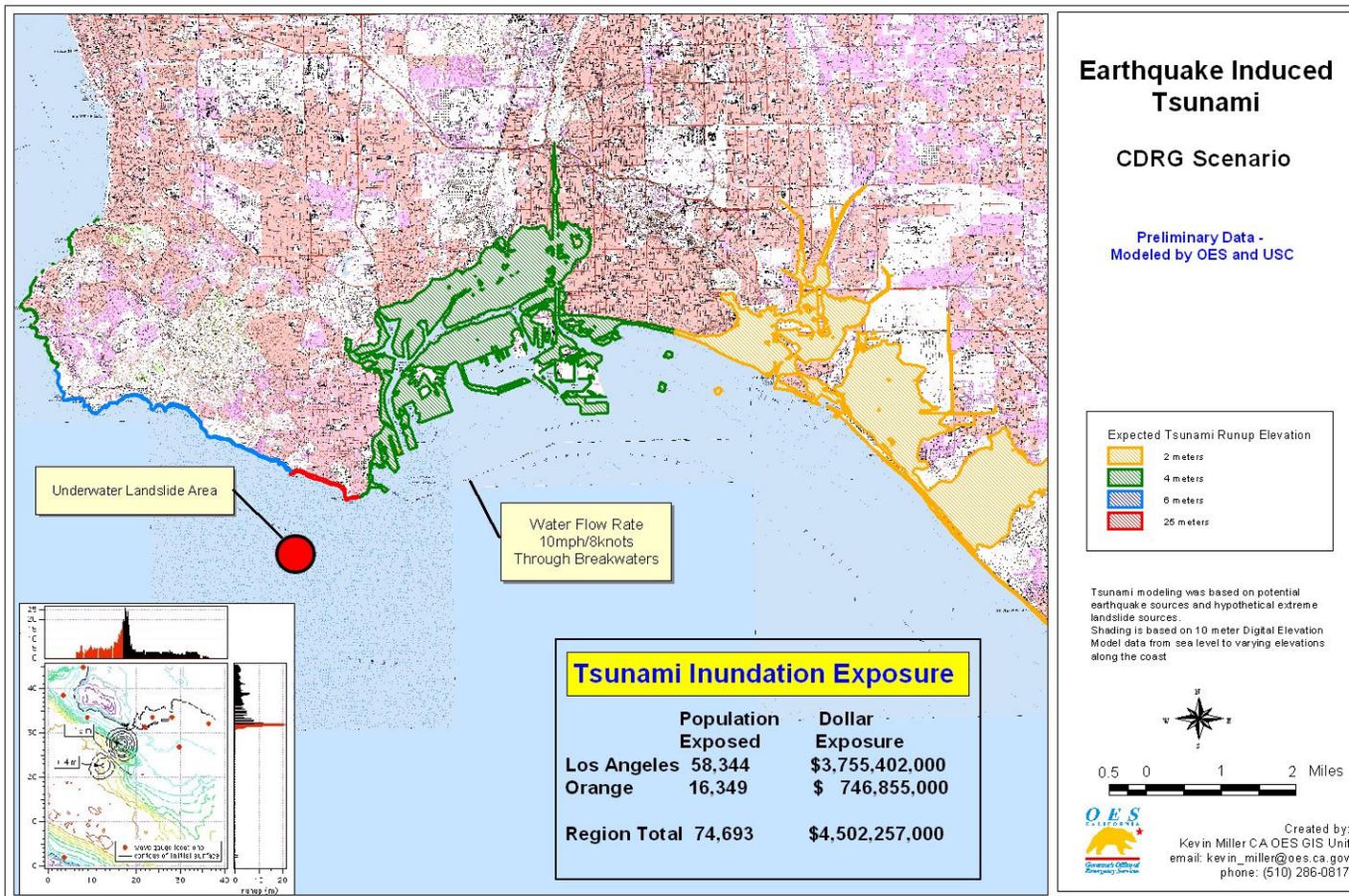
Analysis

Create inundation or evacuation area polygons to determine:

- Population at risk
- Infrastructure at risk
- Evacuation routes
- Warning & notification protocols

Analysis

- HAZUS





Questions?

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