Essential Tsunami Preparedness: Tsunami Evacuation Plans, Maps, and Procedures
Training 1: Tsunami Inundation Modeling using ComMIT - 27-31 July 2015 - Tegulcigalpa, Honduras

Earthquake Tsunami Sources: Characterization and Sensitivities

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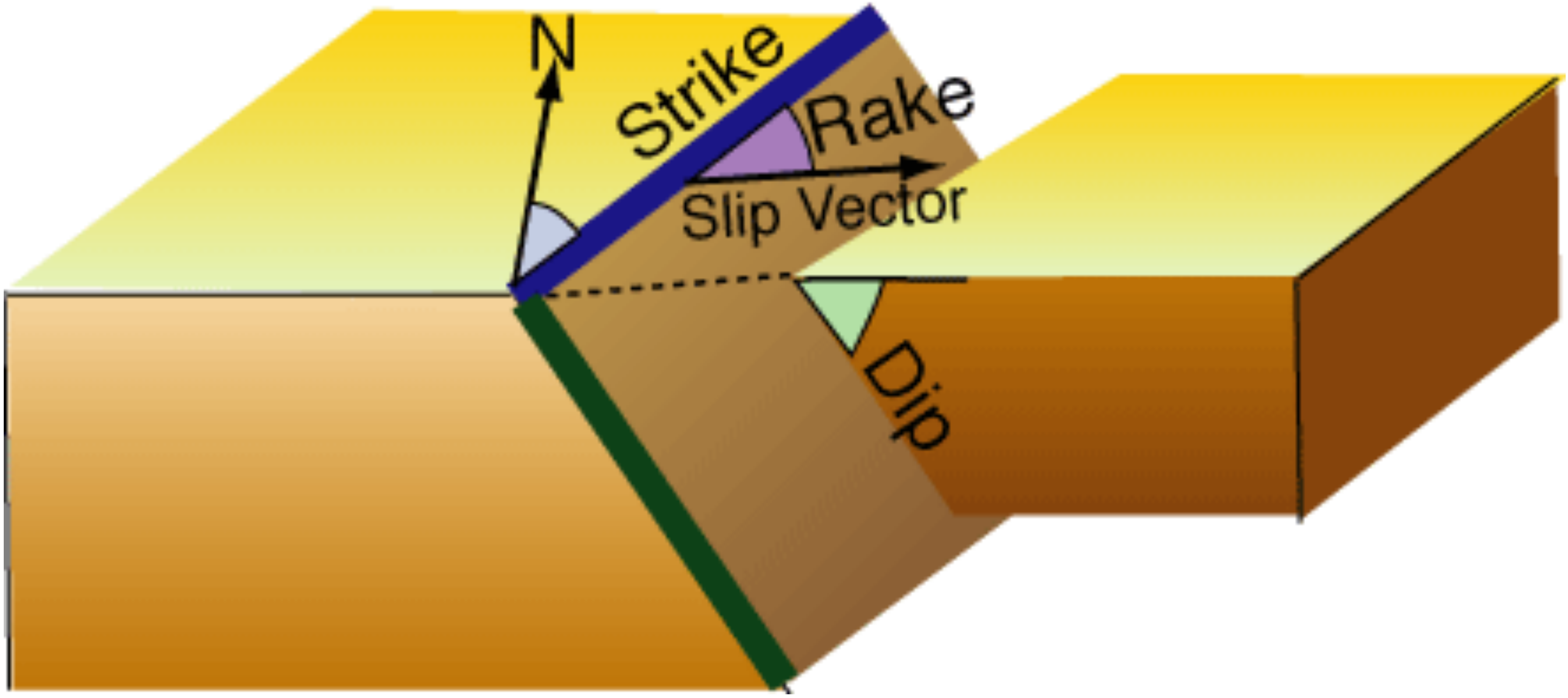
Parameterizing Earthquakes

- Determine location and depth of the epicenter from arrival times of first seismic wave on nearby stations.
- Estimate the earthquake moment magnitude from the amplitude of the first seismic waves on nearby stations (Mwp).
- Compute the location and depth of the centroid of the earthquake along with a focal mechanism (strike, dip, rake, slip) and a moment magnitude with a W-phase Centroid Moment Tensor analysis.
- Estimate the rupture area along with the spatial distribution and timing of slip along the fault using a finite fault analysis.

Tsunami Source from EQ Parameters

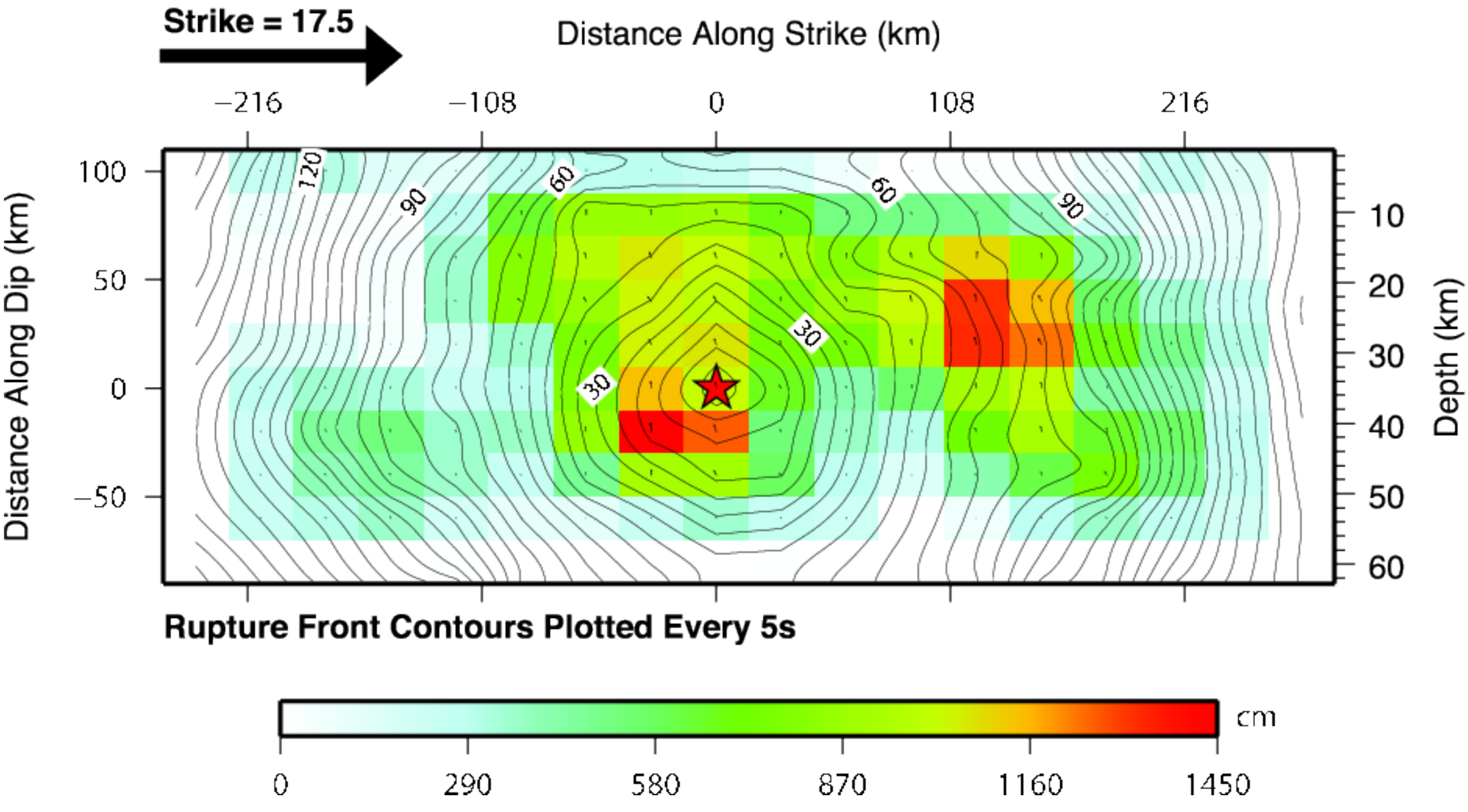
- Try to determine how the seafloor was displaced to generate a tsunami.
- If you know the centroid of the earthquake and its moment magnitude as well as the strike and dip of the fault plane and the rake angle of the slip, then you can estimate seafloor displacement using the Okada method.
- The seafloor displacement generates the tsunami.
- For great earthquakes with large and complex rupture, you need these parameters over space and time (finite fault analyses).

Earthquake Fault Parameters

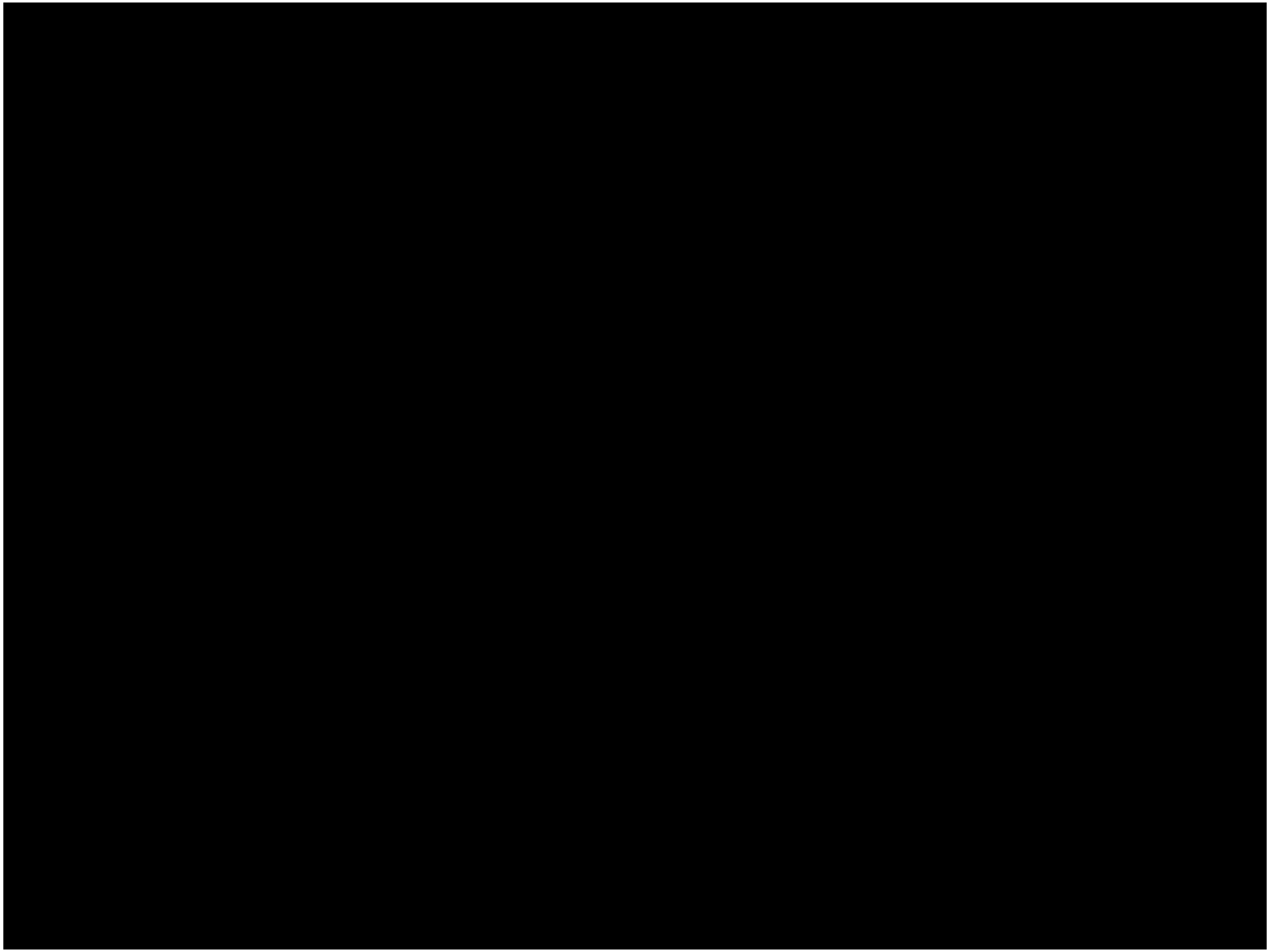


Earthquake Finite Fault

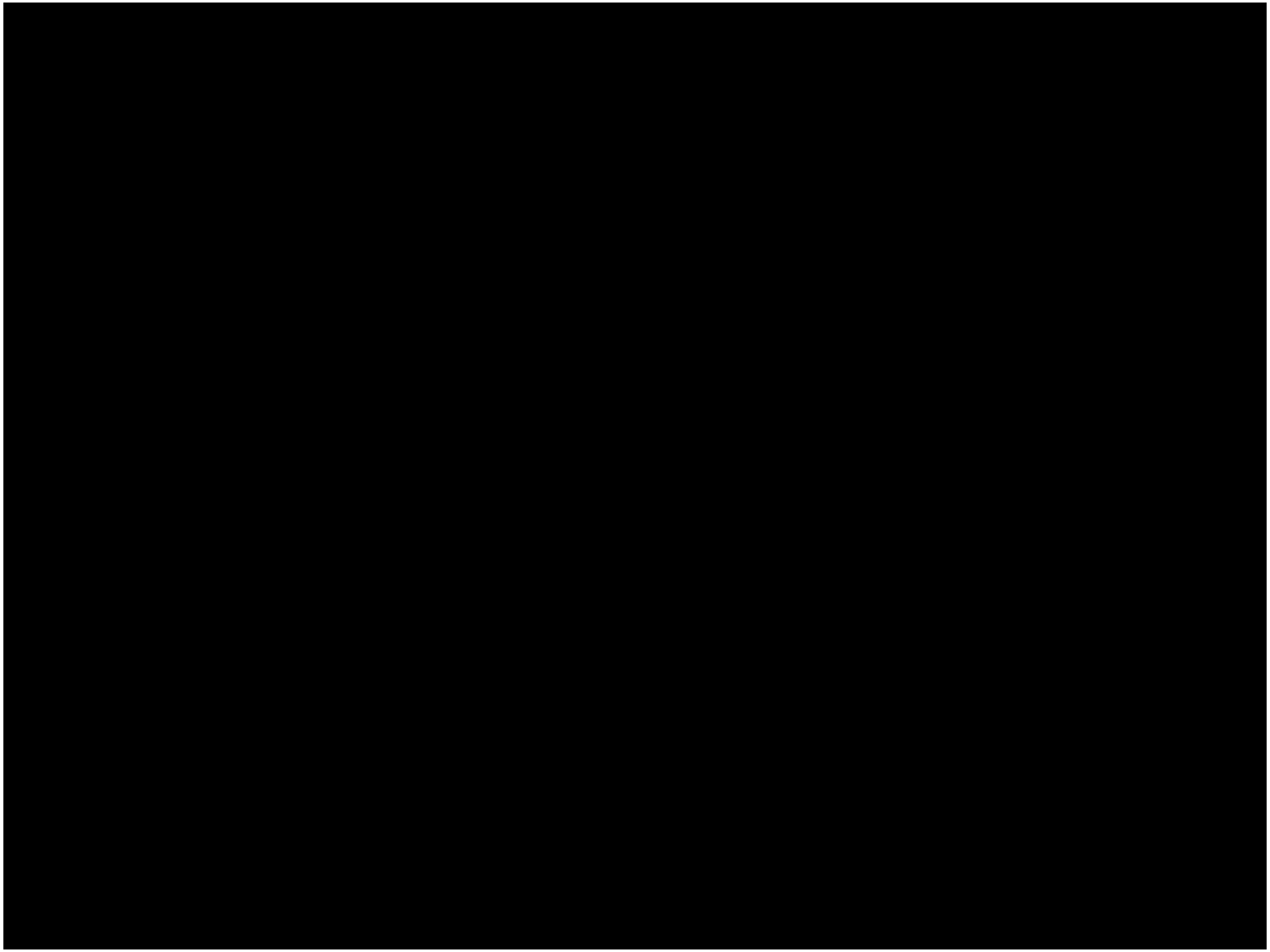
2010 Chile Earthquake Mw 8.8



Earthquake Mechanisms Explained



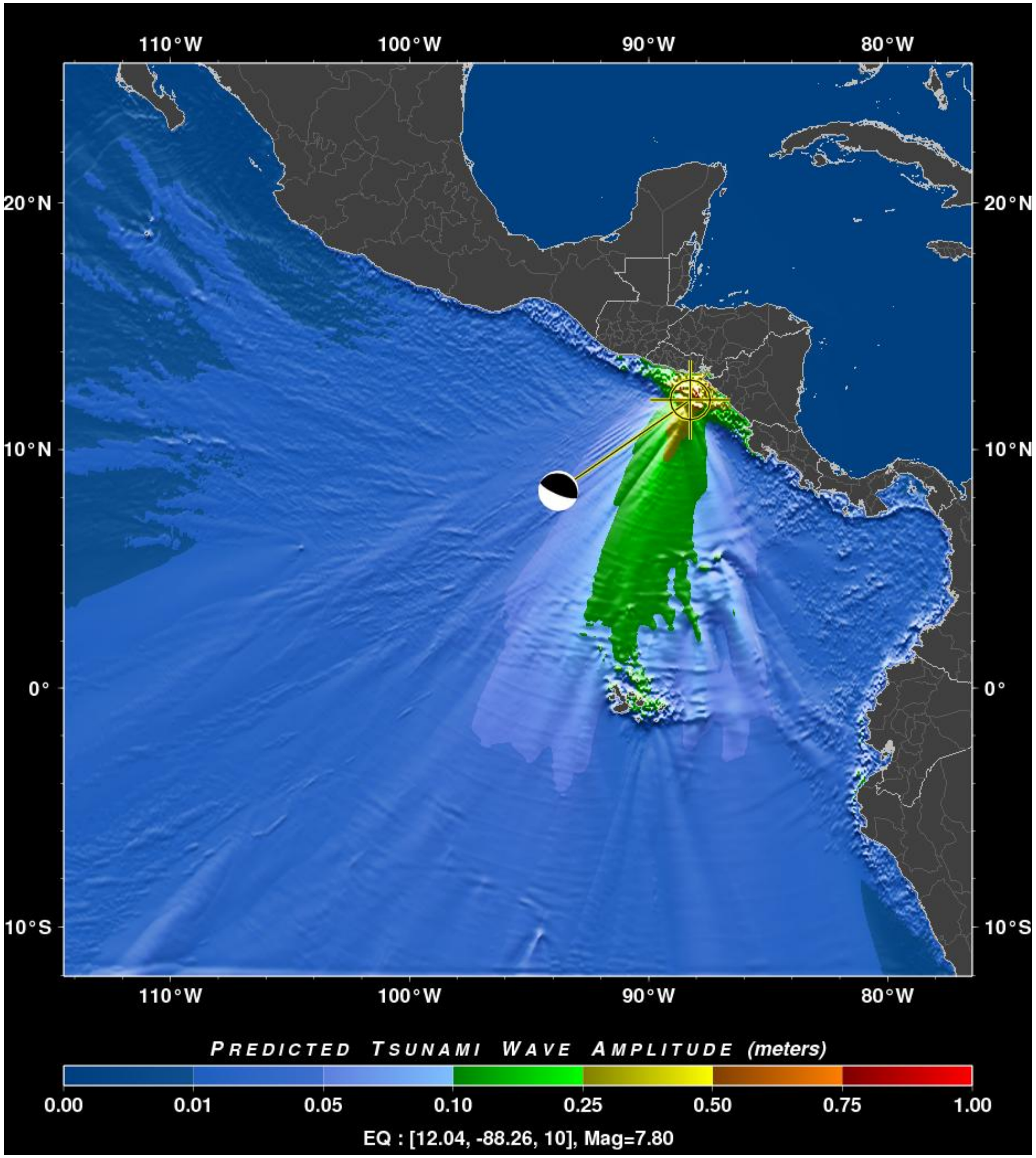
Meaning of the Earthquake Moment



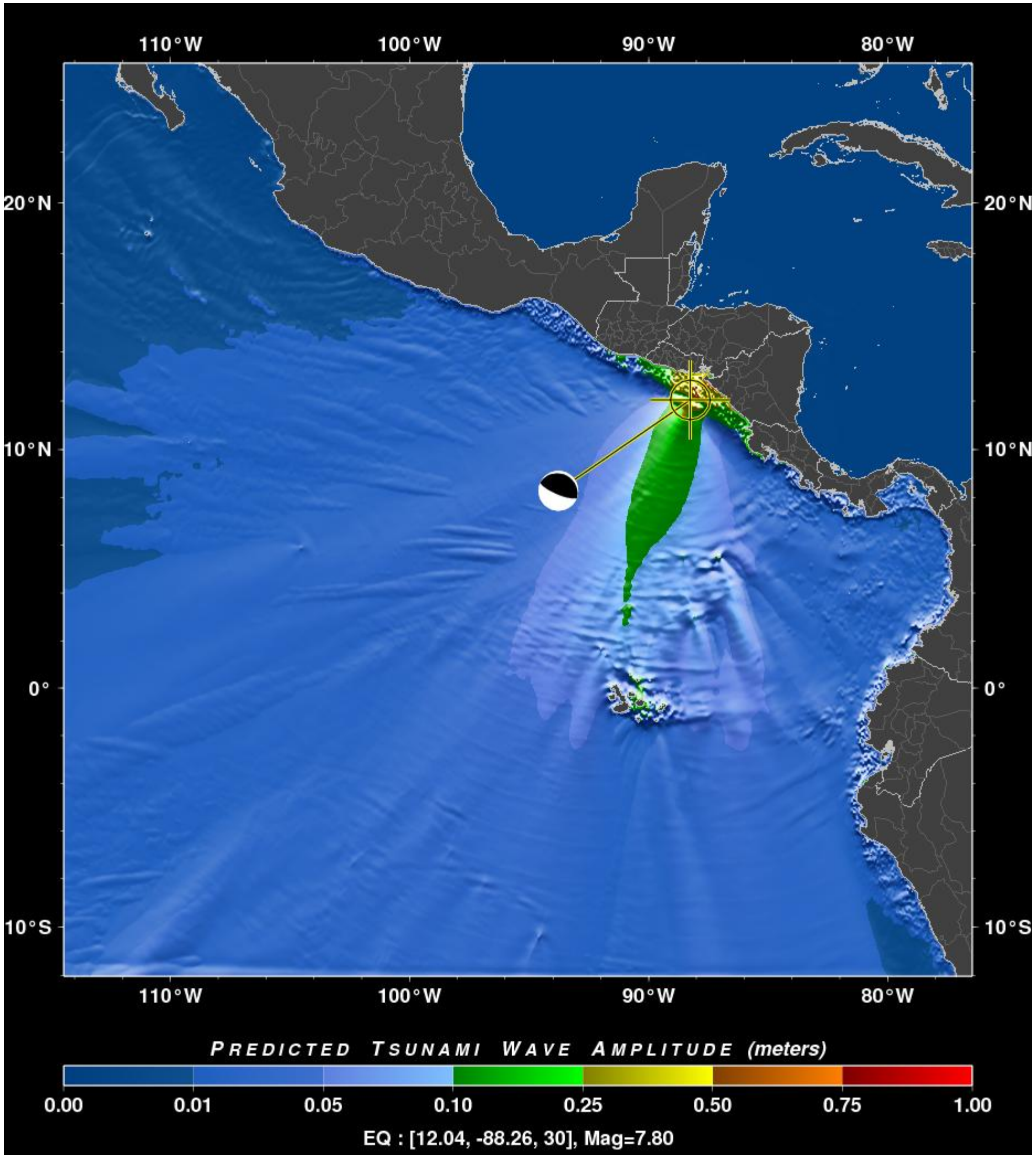
Sensitivities

- The larger the fault area, the larger the seafloor displacement area and the longer the tsunami periods.
- The deeper the centroid, the larger the seafloor displacement area and the longer the tsunami periods.
- The deeper the centroid, the smaller the displacement amplitudes.

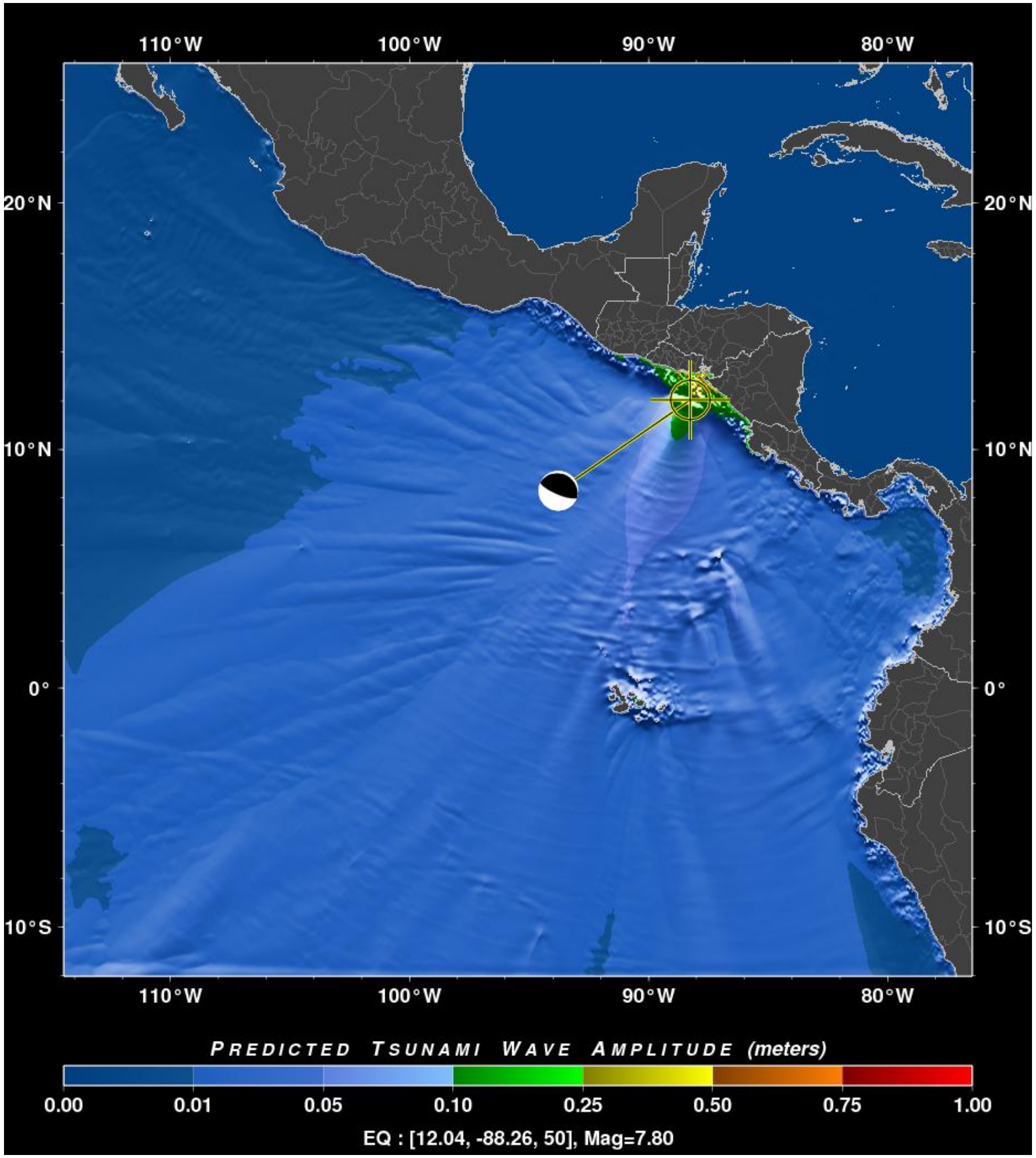
Mw 7.8 Sensitivity to Depth – 10km



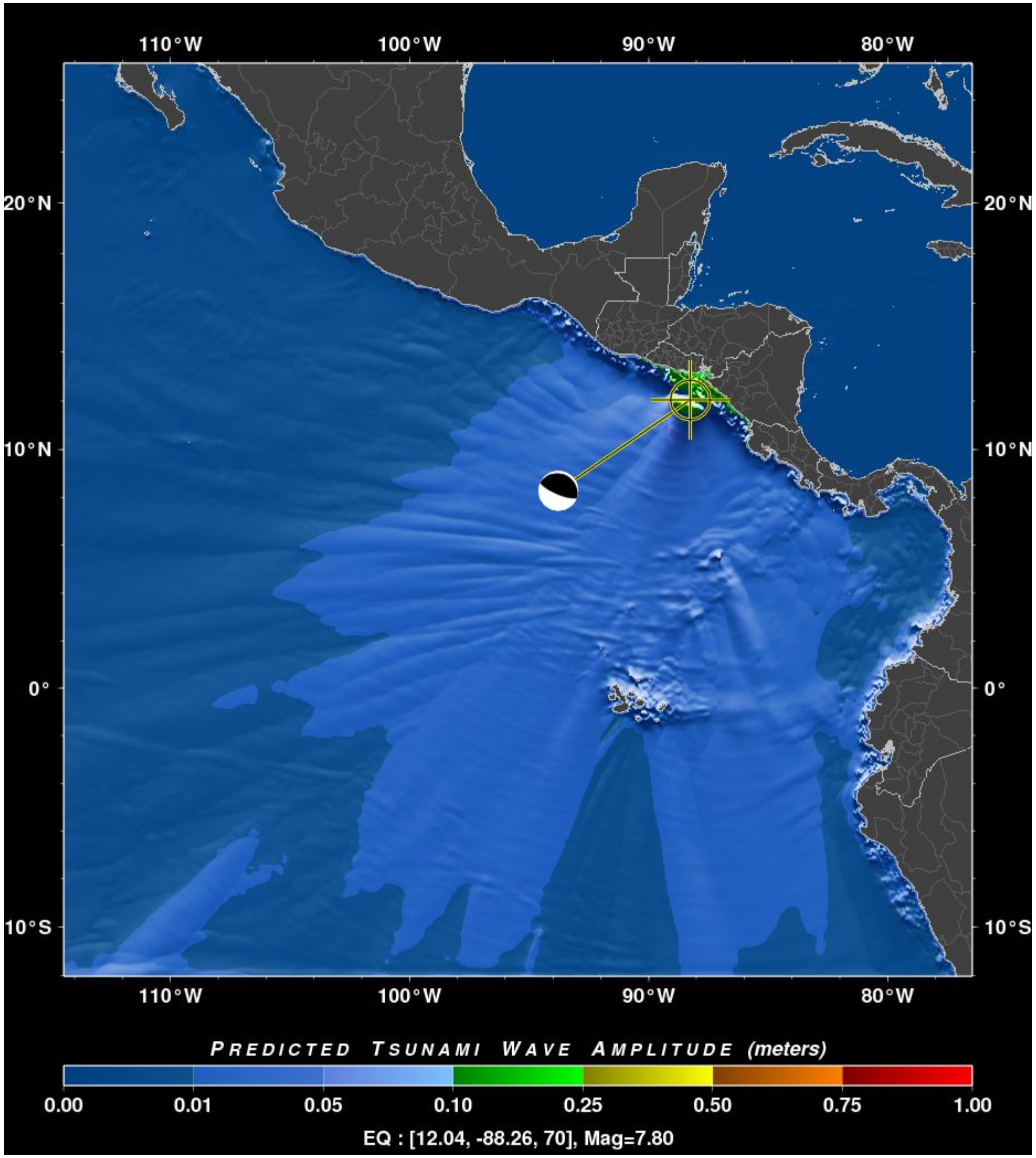
Mw 7.8 Sensitivity to Depth – 30km



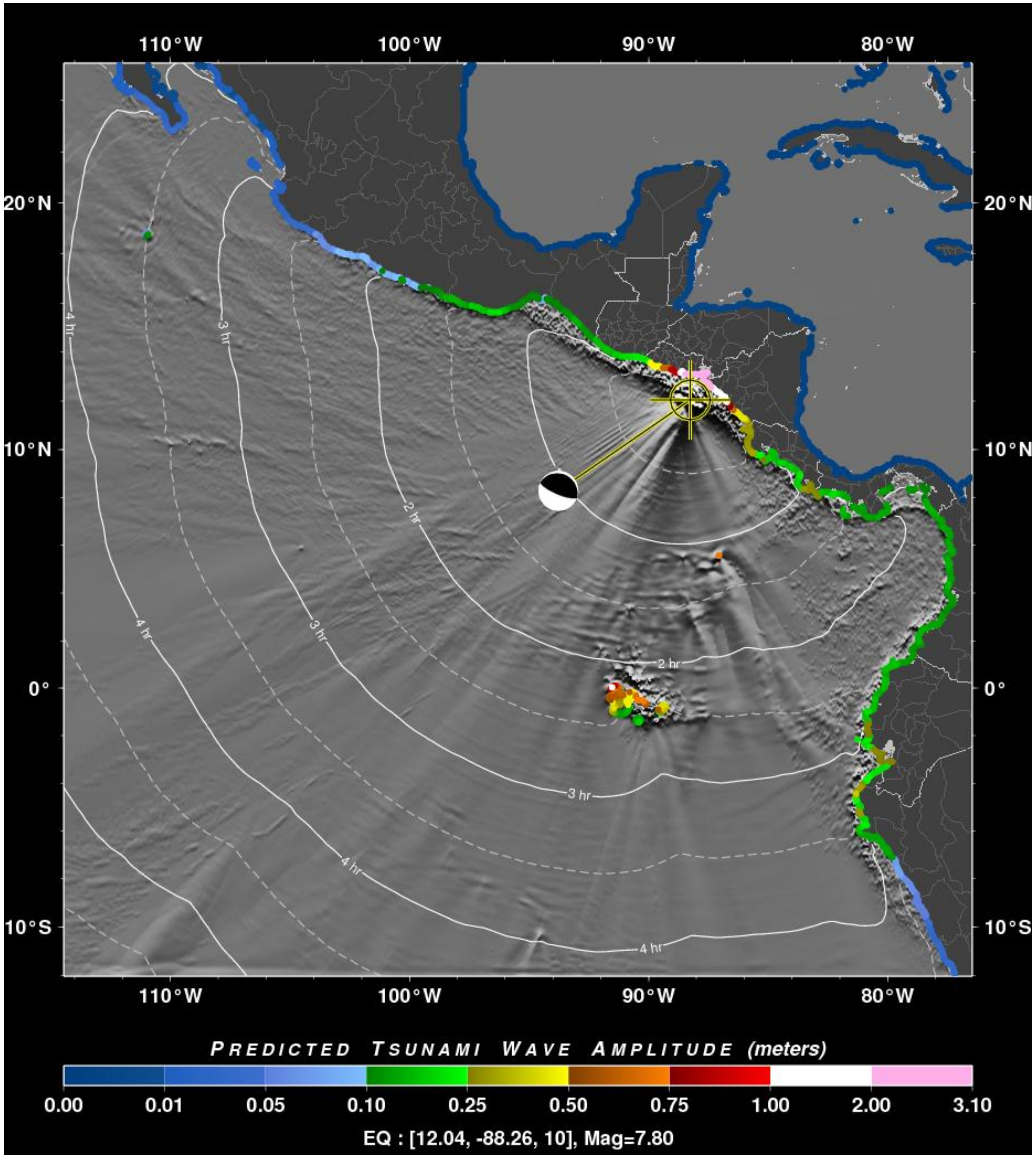
Mw 7.8 Sensitivity to Depth – 50km



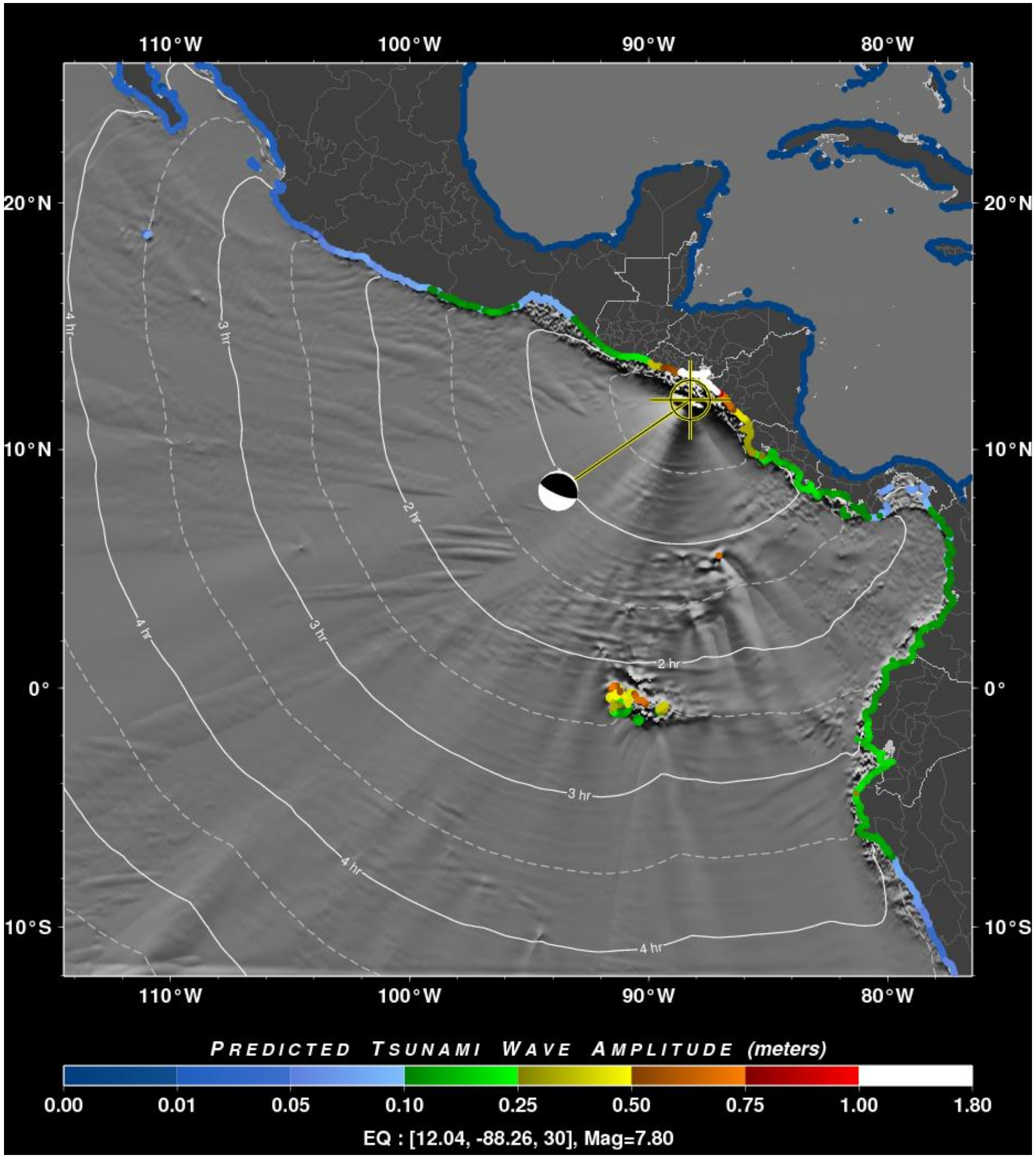
Mw 7.8 Sensitivity to Depth – 70km



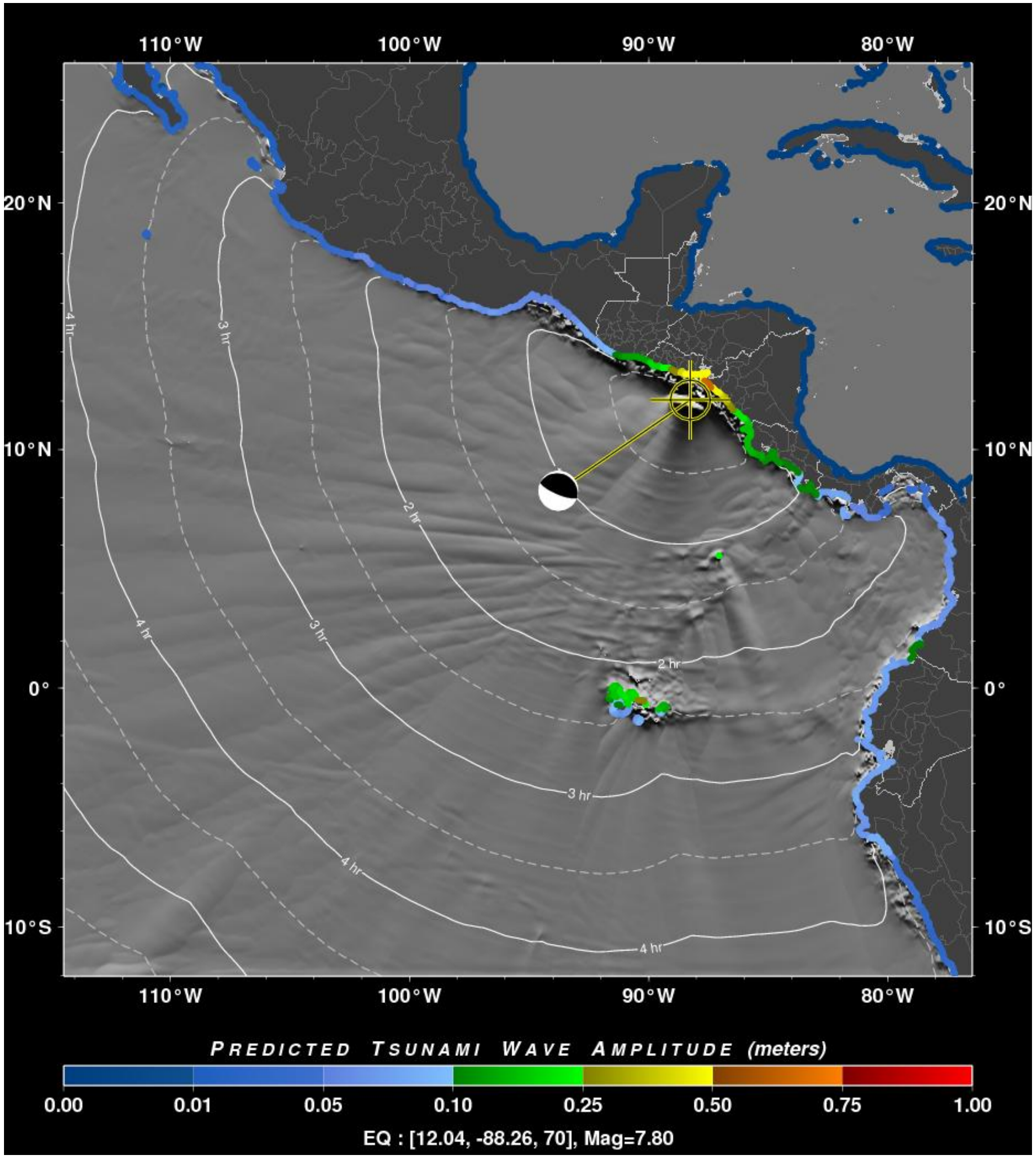
Mw 7.8 Sensitivity to Depth – 10km



Mw 7.8 Sensitivity to Depth – 30km



Mw 7.8 Sensitivity to Depth – 70km



Thank You