Mapping, dating, and modeling of prehistoric tsunami inundation and frequency at Cascadia

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(pre-tsunami view looking west from Craig Weaver’s cabin at Long Beach, WA)
BIG SCIENCE QUESTIONS THAT NEED ANSWERING

- How high and far inland have tsunamis from the greatest (>M8.6) Cascadia earthquakes extended, how often have they occurred, and have the frequency of such events changed over time?

- What are the characteristics and probabilities of tsunamis accompanying smaller great earthquakes (<M8.6)?

- How does local coastal bathymetry, as well as different models of megathrust rupture, affect tsunami inundation at different kinds of sites?

- How do locations and characteristics of source earthquakes for prehistoric tsunamis, obtained through inverse simulation modeling, compare with paleogeodetically determined models for the same earthquakes?
Mapping

Tsunami deposits in Cascadia freshwater sequences

- better preservation of deposits
- deposits nearer limit of inundation
- host sediment has uniform rates of deposition, which improves age models

(Kelsey et al., 2005; Peterson et al., 2006; 2008; 2009; 2010; 2011; 2013; 2014; 2015)

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Tsunami deposits in freshwater peat, Crescent City (Hemphill-Haley et al., in progress)

Mapping

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Mapping

CT scans (gray-scale) of tsunami deposits in cores of freshwater peat from Umnak Island, Aleutians
Max and min $^{14}$C ages make times of earthquakes more precise

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Single-grain laser OSL dating

(courtesy Shannon Mahan, USGS)