Main point: Need to consider differences in types and quality of evidence, lengths of records, sizes of earthquakes, and recurrence over shorter intervals of time.
Can large jerks of relative sea-level rise be distinguished from small-to-medium jerks?

Earthquake stratigraphy exposed in southern Washington, Niawiakum River estuary
AD 1700 tsunami deposit near mouth of Salmon River, central Oregon coast

Grant et al., 1988; Nelson et al., 2004
Bradley Lake cores
12 tsunamis since 4.6 ka

Tsunami sand beds in coastal lakes

Kelsey et al., 2005; Nelson et al., 2006
Probability distributions for times of sudden subsidence about 1.6 ka (correlated with turbidite T5) in Oregon tidal marshes (methods of Parnell et al., 2008)
Overlaps on radiocarbon age distributions are merely consistent with correlations of subsidence stratigraphy from site to site.
Cox Island, Siuslaw River
(USGS-NSF-GSJ supported – May 2008)

Which peaty beds record jerks of sea-level rise during earthquakes?

Sand bed deposited by AD 1700 tsunami

9 peaty beds since 2 ka
12 peaty beds since 2 ka

Vibracore 105 m east of outcrop

Rob Witter
Yuki Sawai
Andrew Kemp

Ben Horton
Andrea Hawkes
Andrew Horton

Jerks?

More jerks

Which peaty beds record jerks of sea-level rise during earthquakes?
Taking a break from diatom paleogeodesy in 1990

(Jennings and Nelson, 1992; Nelson and Kashima, 1993)

**Transect across modern marsh**

<table>
<thead>
<tr>
<th>Mud Flat</th>
<th>Low Marsh</th>
<th>High Marsh</th>
</tr>
</thead>
<tbody>
<tr>
<td>As</td>
<td>Mf</td>
<td>Tm</td>
</tr>
<tr>
<td>Mf</td>
<td>As</td>
<td>Ti</td>
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<tr>
<td>Rn</td>
<td>Ti</td>
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</tr>
</tbody>
</table>

**Forest woodland (no foraminifera)**

**Siuslaw River estuary, Oregon**

**Fossil foraminifera from core**

**Reconstructed sea-level changes**

<table>
<thead>
<tr>
<th>Mud Flat</th>
<th>Low Marsh</th>
<th>High Marsh</th>
<th>Upland</th>
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<tr>
<td>As</td>
<td>Mf</td>
<td>Tm</td>
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</tr>
<tr>
<td>Mf</td>
<td>As</td>
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<tr>
<td>Rn</td>
<td>Ti</td>
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**Vertical change**

<table>
<thead>
<tr>
<th>0.5 m RSL</th>
<th>500 yr Time</th>
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<tbody>
<tr>
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</tbody>
</table>
South Slough, Coos Bay

Discriminant analysis used to classify fossil assemblages into tidal elevational zones

Of 10 buried marsh soils, only 3 clearly submerged suddenly
Transfer function analysis
(Guilbault et al. 1995, 1996)
Coseismic subsidence in AD 1700
Foraminiferal transfer function analysis

from Leonard et al., 2010
data of Hawkes et al., in press
Modeled coseismic subsidence in AD 1700 (Pei-Ling Wang, 2011)
Preliminary foraminiferal transfer function results, Siletz Bay spit

Great earthquakes of different sizes or differences in post-seismic land-level change and (or) tidal sedimentation?

(Engelhart et al., unpublished)

(NSF-USGS supported – 2009-2010)