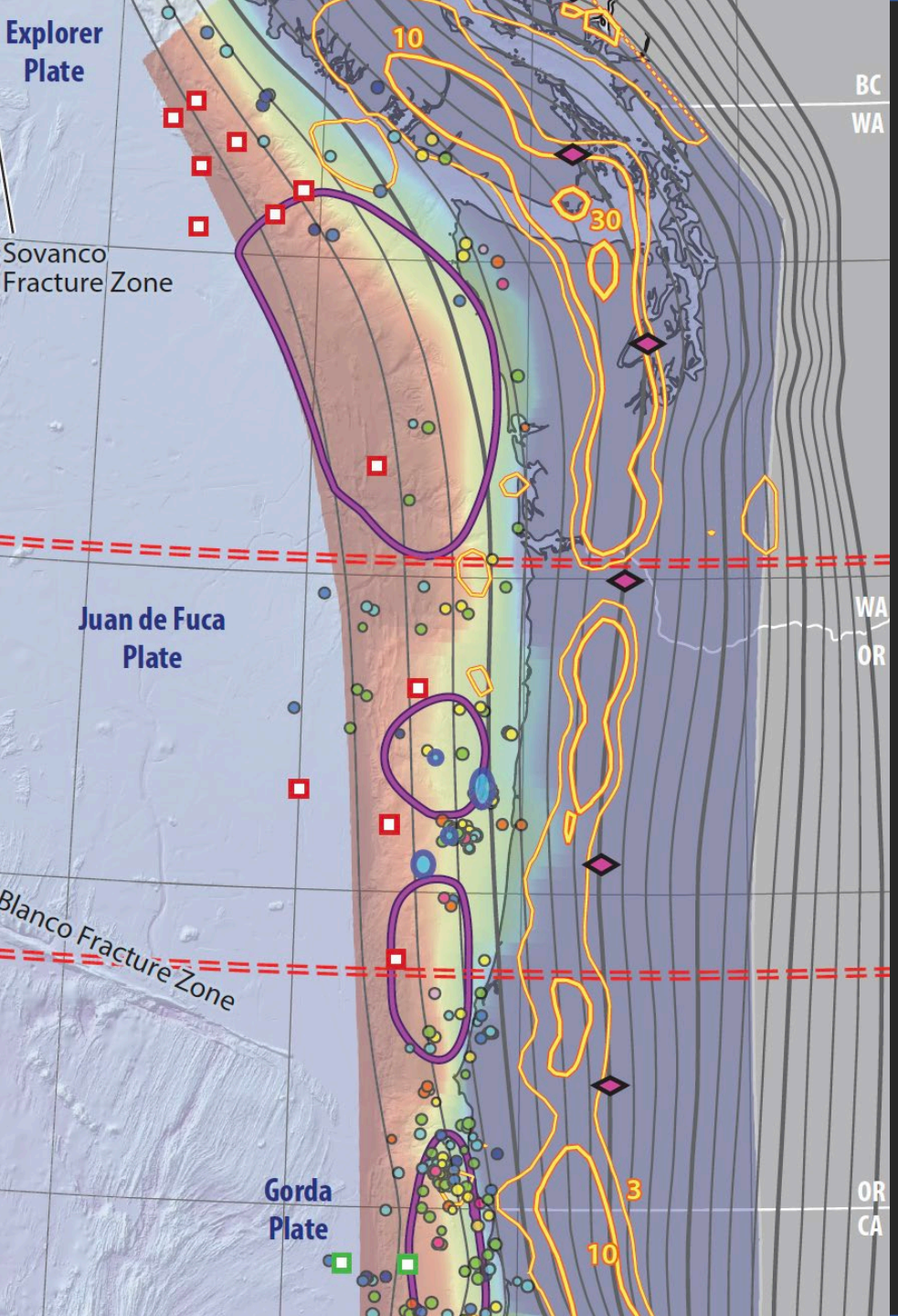

Discordances in Cascadia's disparate datasets

How can we leverage discrepancies in diverse observations?

discord noun

Save Word

dis·cord | \ ˈdi-ˌskȯrd \

Definition of *discord* (Entry 1 of 2)

1 **a** : lack of agreement or harmony (as between persons, things, or ideas)

// ... must we fall into the jabber and babel of *discord* while victory is still unattained?

— Sir Winston Churchill

b : active quarreling or conflict resulting from discord among persons or factions : STRIFE

// marital *discord*

// *discord* between the two parties

2 **a** *music*

(1) : a combination of musical sounds that strikes the ear harshly

(2) : DISSONANCE

// The song ends on a *discord*.

b : a harsh or unpleasant sound

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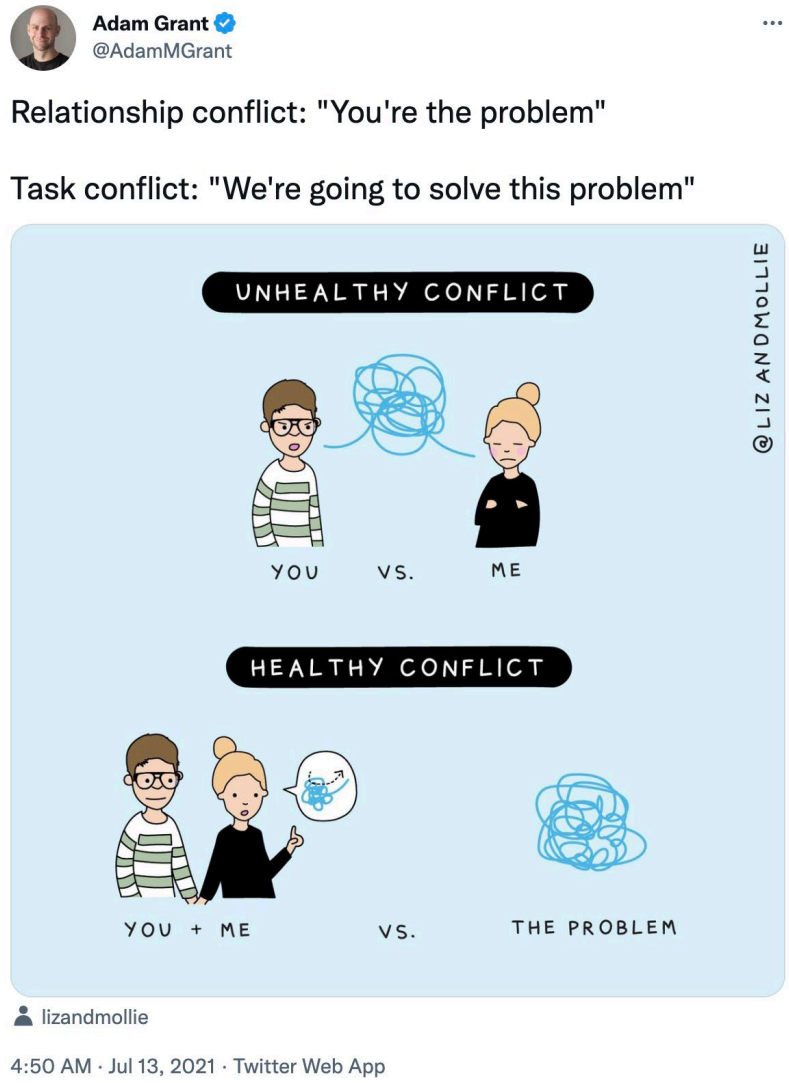
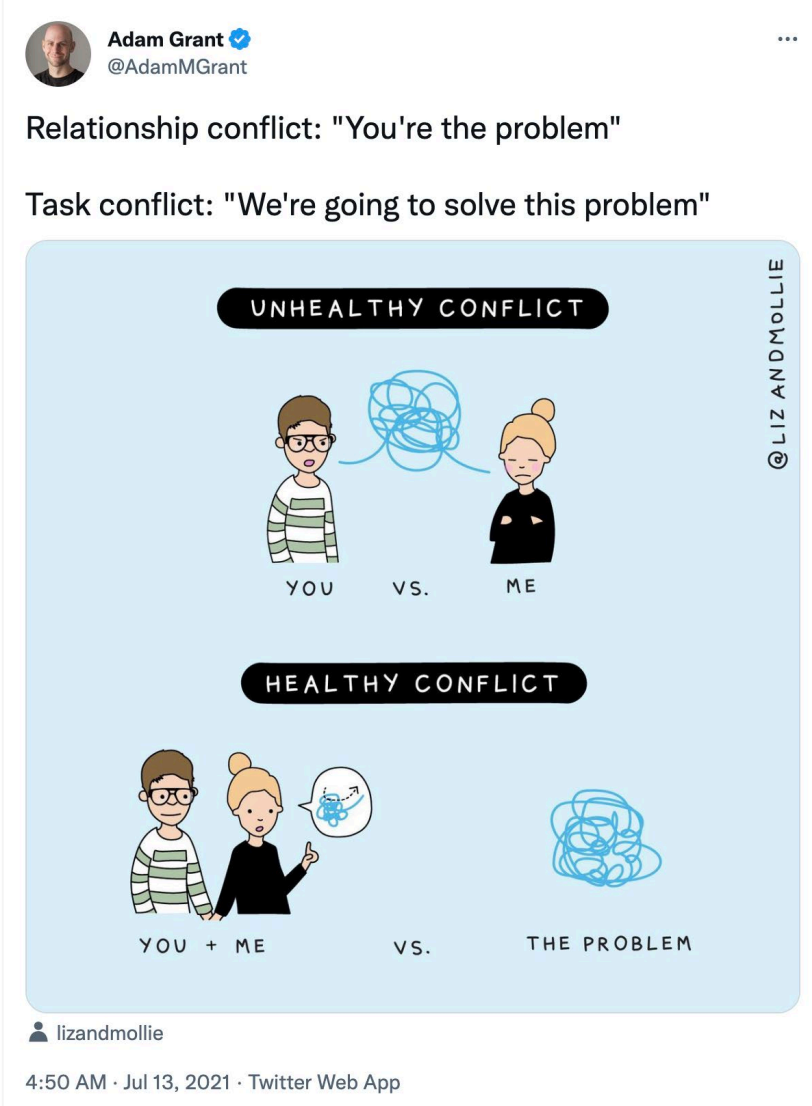


TEAM WORK

- The Scientific Method
- Humility
- Uncertainty and testing hypotheses
- Science communication



QUATERNARY RESEARCH 38, 74–90 (1992)

Discordant ^{14}C Ages from Buried Tidal-Marsh Soils in the Cascadia Subduction Zone, Southern Oregon Coast

ALAN R. NELSON

U.S. Geological Survey, MS 966, P.O. Box 25046, Denver, Colorado 80225

Received January 28, 1991

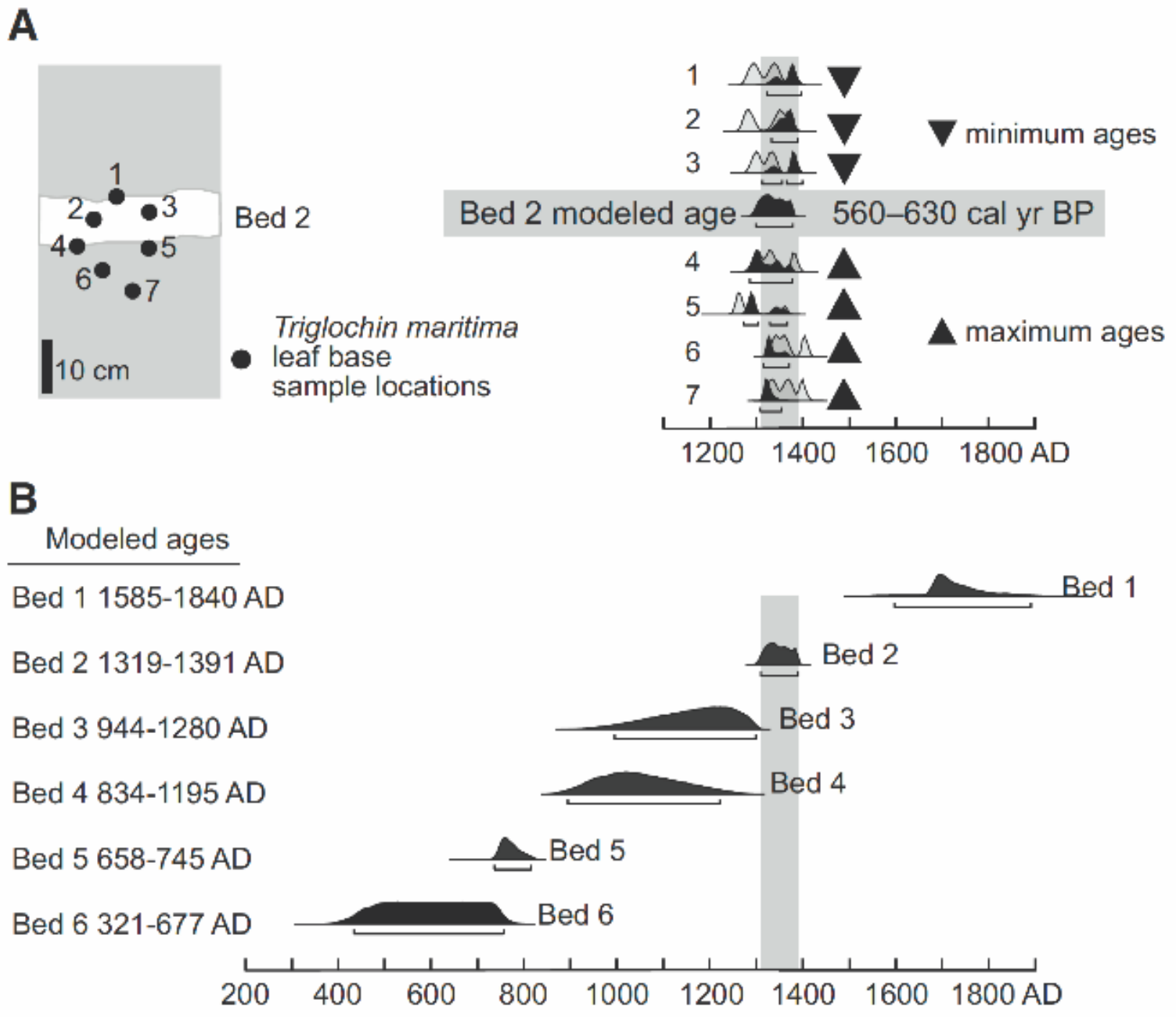
Peaty, tidal-marsh soils interbedded with estuarine mud in late Holocene stratigraphic sequences near Coos Bay, Oregon, may have been submerged and buried during great ($M > 8$) subduction earthquakes, smaller localized earthquakes, or by nontectonic processes. Radiocarbon dating might help distinguish among these alternatives by showing that soils at different sites were submerged at different times along this part of the Cascadia subduction zone. But comparison of conventional ^{14}C ages for different materials from the same buried soils shows that they contain materials that differ in age by many hundreds of years. Errors in calibrated soil ages represent about the same length of time as recurrence times for submergence events (150–500 yr)—this similarity precludes using conventional ^{14}C ages to distinguish buried soils along the southern Oregon coast. Accelerator mass spectrometer ^{14}C ages of carefully selected macrofossils from the tops of peaty soils should provide more precise estimates of the times of submergence events.

1. Geochronology

Can discordances in age models rule out M9 rupture?

> " ...more precise but discordant ages might show that soils [evidence] at different sites are not the same age. "
>
> —Nelson (1992)

Careful sampling and analyses of growth-position plants yields a precise age for a Discovery Bay tsunami deposit that implies partial rupture in northern Cascadia



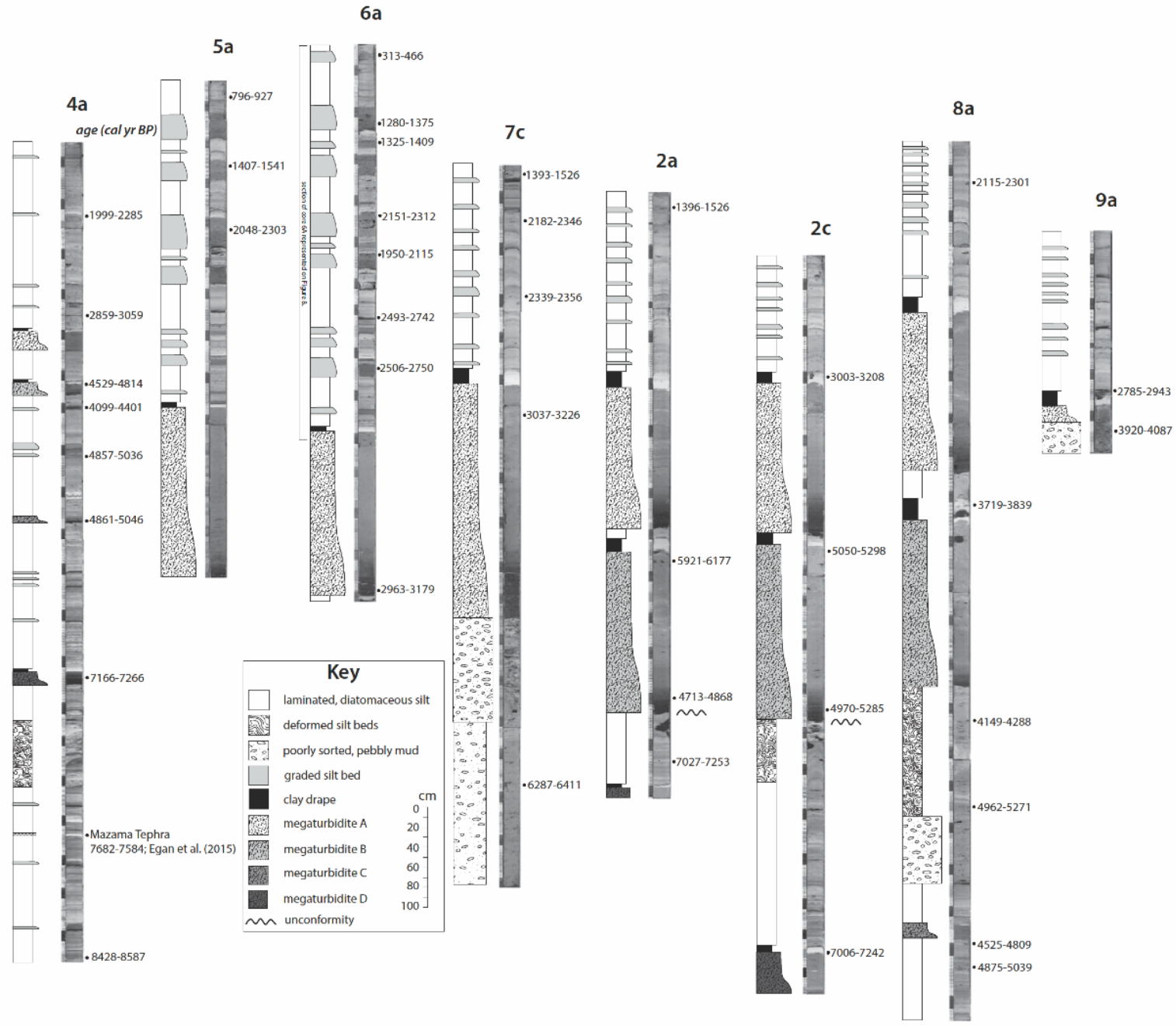
Garrison Laney and Miller (2017)

2. Shaking evidence

Can shaking evidence (on/offshore) differentiate earthquake source?

The Lake Creek-Boundary Creek fault intersects Lake Crescent on the Olympic Peninsula. Earthquakes on the fault are recorded in lake sediment.

Megaturbidites record landslides triggered by strong shaking and displacement on a local fault. Graded silt beds ('turbidites') record shaking from a variety of other earthquake sources.



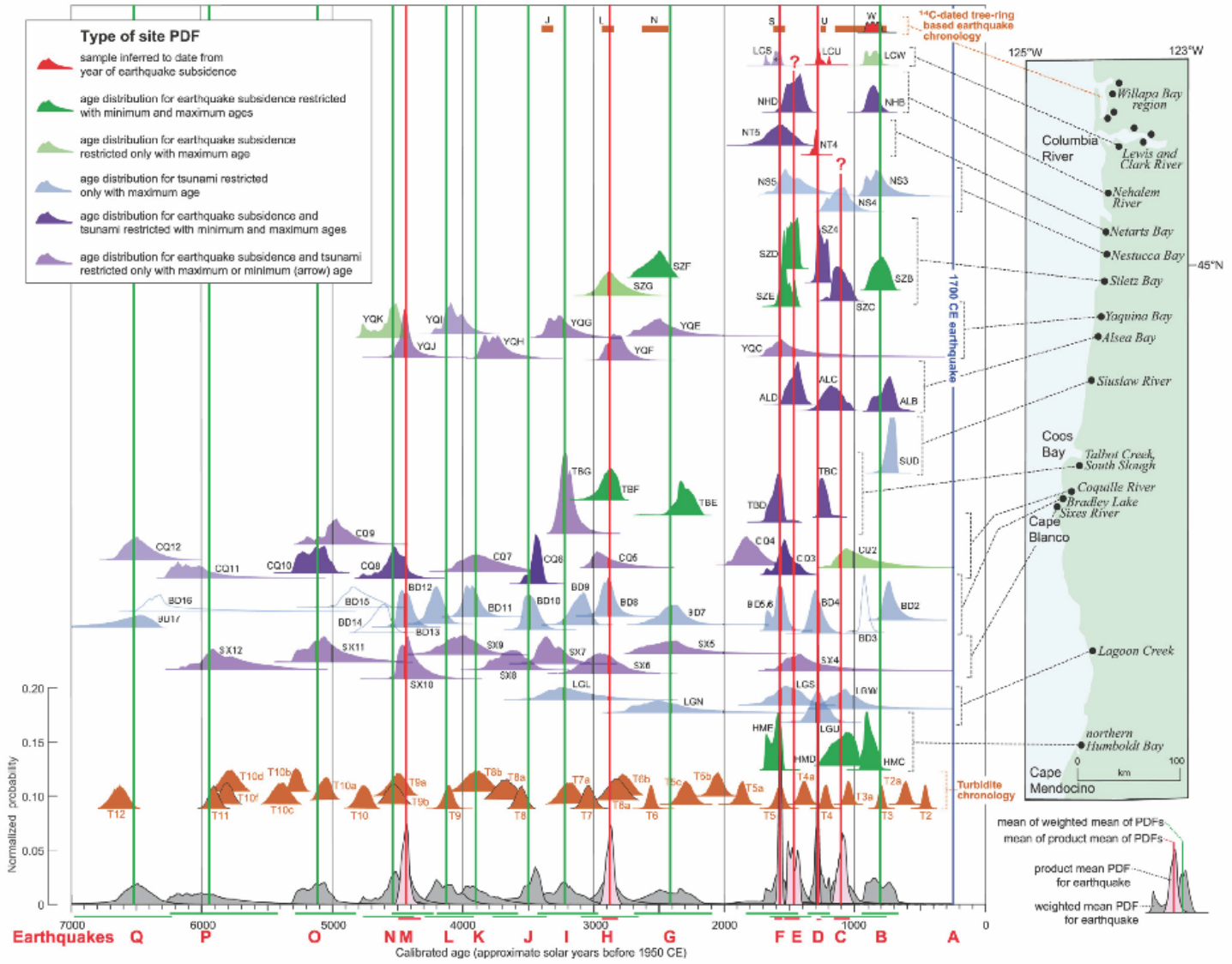
Leithold et al. (2019)

3. Coastal evidence

Can coastal subsidence/tsunami evidence identify partial megathrust ruptures?

Southern Oregon coastal sites record more events than northern sites, implying shorter recurrence intervals in southern Cascadia.

The Maximum Rupture Model for Cascadia implies shorter, partial ruptures in southern Cascadia.



Nelson et al. (2021)

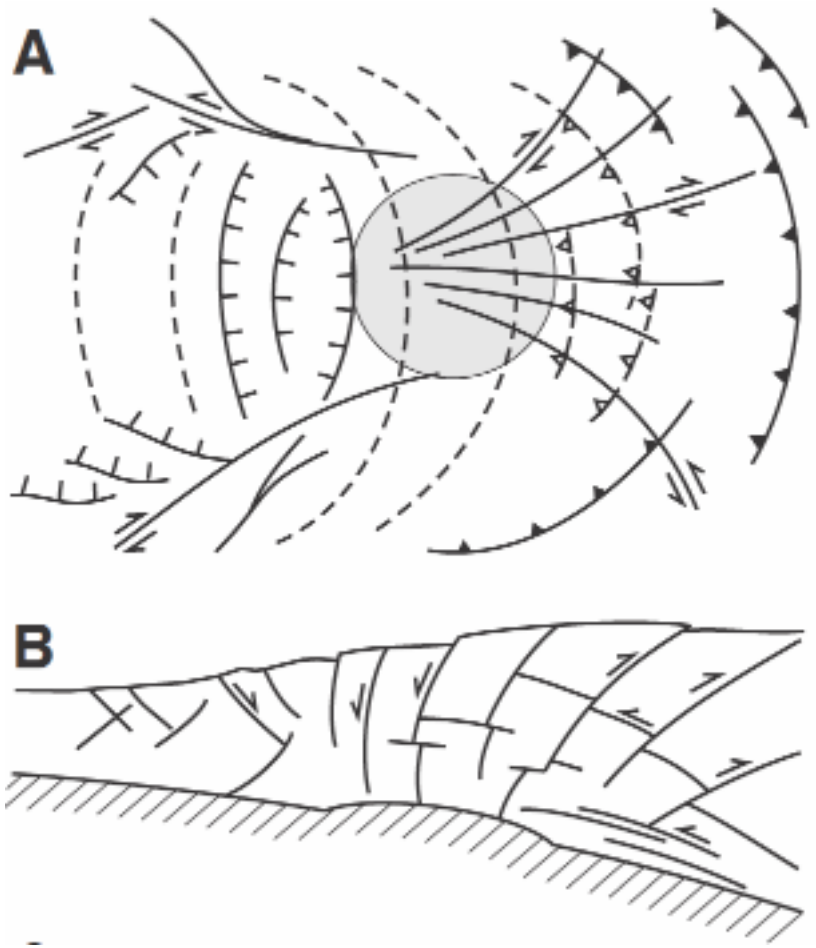
4. Structural/geophysical features

Can structural/geophysical features reflect persistent rupture barriers?

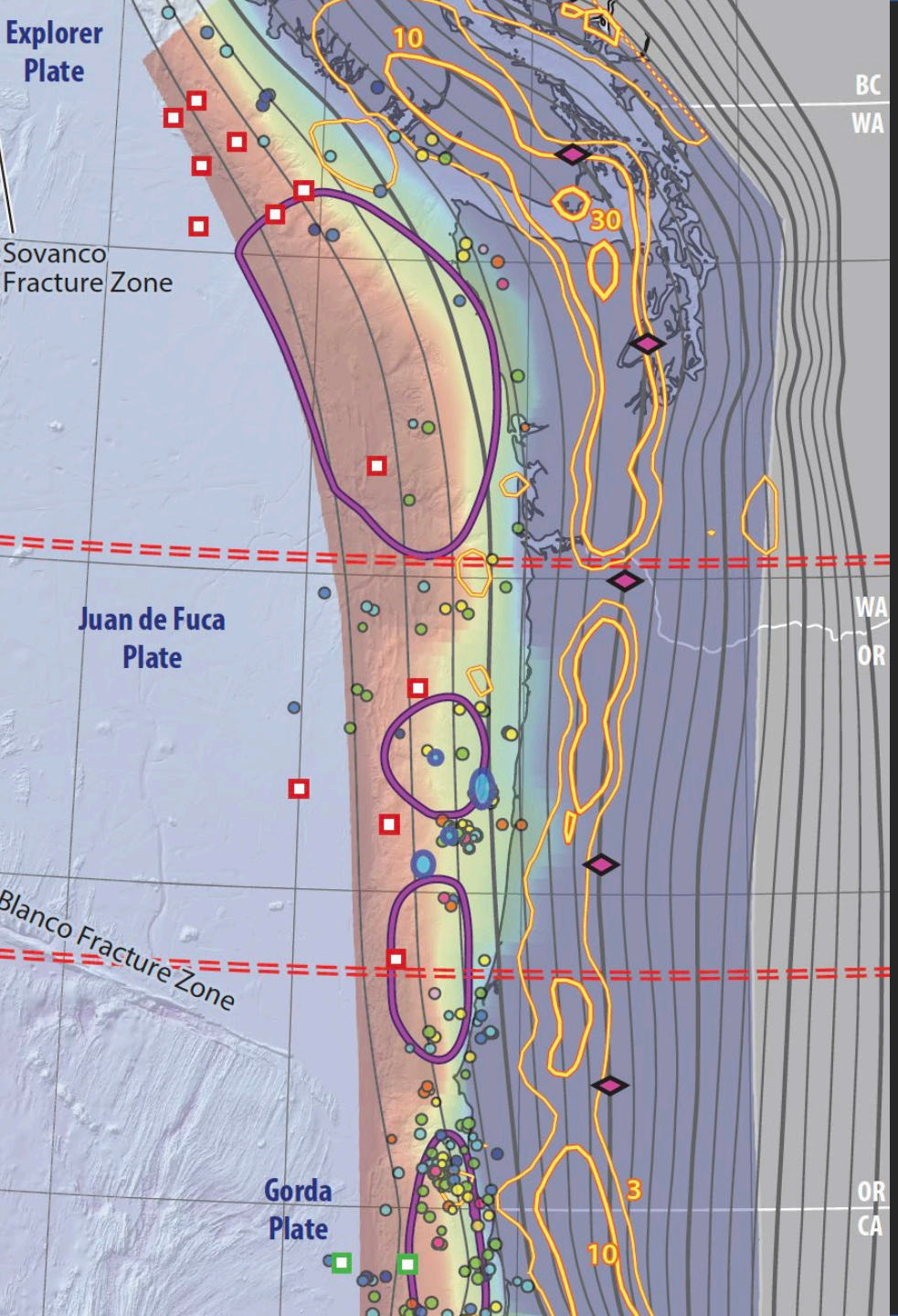
Coseismic subsidence at Alsea Bay (and megathrust slip) during the CE 1700 earthquake was small (Kemp et al., 2018)

Paleogeodetic data from Alsea Bay shows subsidence during the past four Cascadia earthquakes was small, implying a persistent barrier to rupture at the latitude of subducting seamounts.

SUBDUCTING SEAMOUNTS



Wang and Bilek (2011)
Trehu et al. (2012)



Leveraging discordances in Cascadia's datasets

Through teamwork, applying our collective capabilities to conduct smarter science