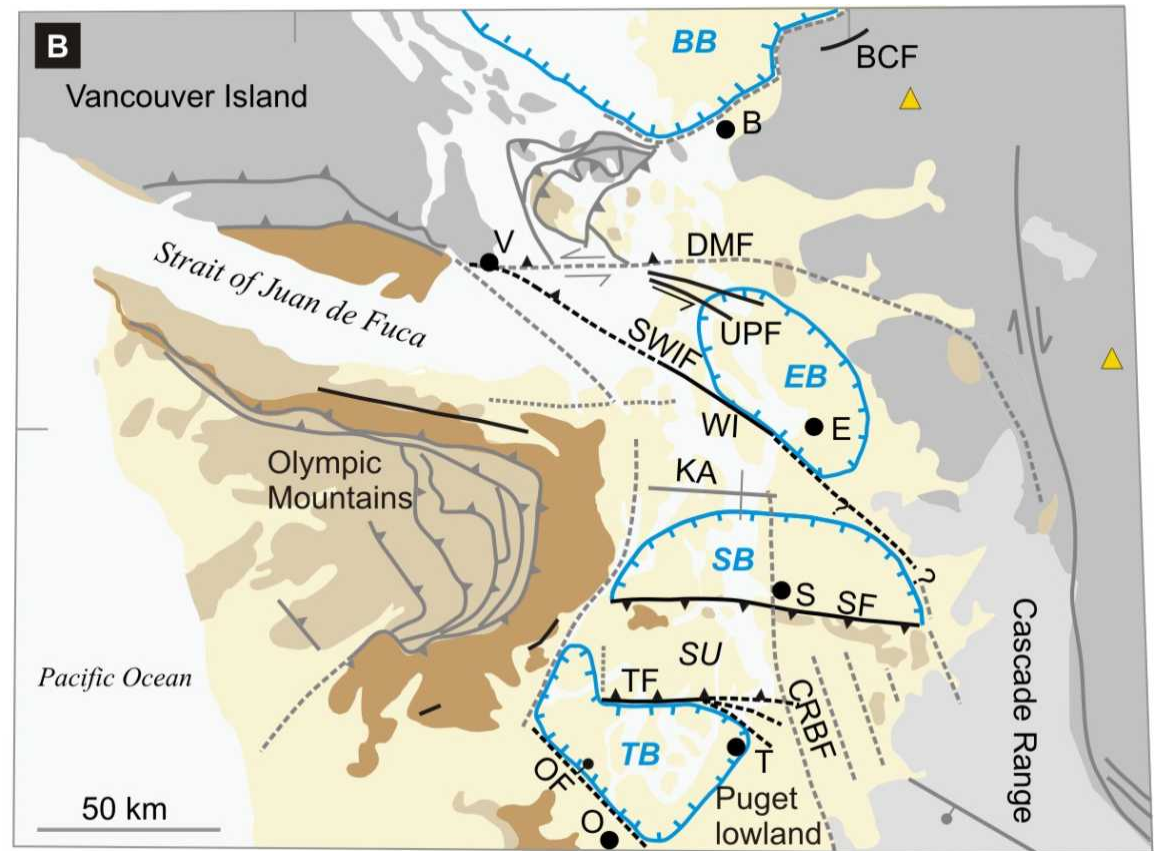
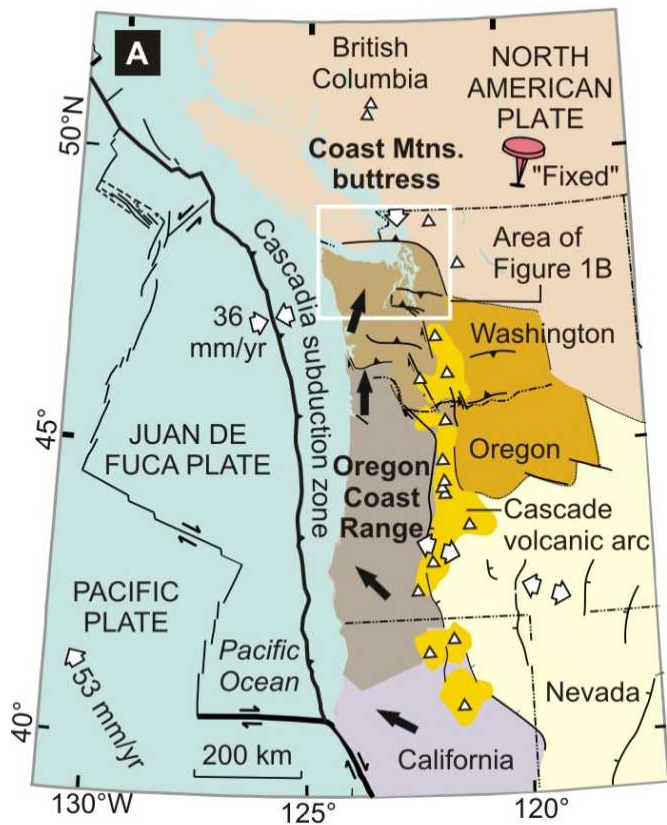


An aerial photograph of a mountain range covered in dense evergreen forests. A large, dark lake is situated in a valley between the mountains. The text is overlaid on the image.

Paleoseismology of Saddle Mountain faults, southeast Olympic Peninsula, Washington

Jonathan F. Hughes
U.S. Geological Survey

Pacific Northwest Workshop for the Update
of the National Seismic Hazard Maps
March 28, 2006

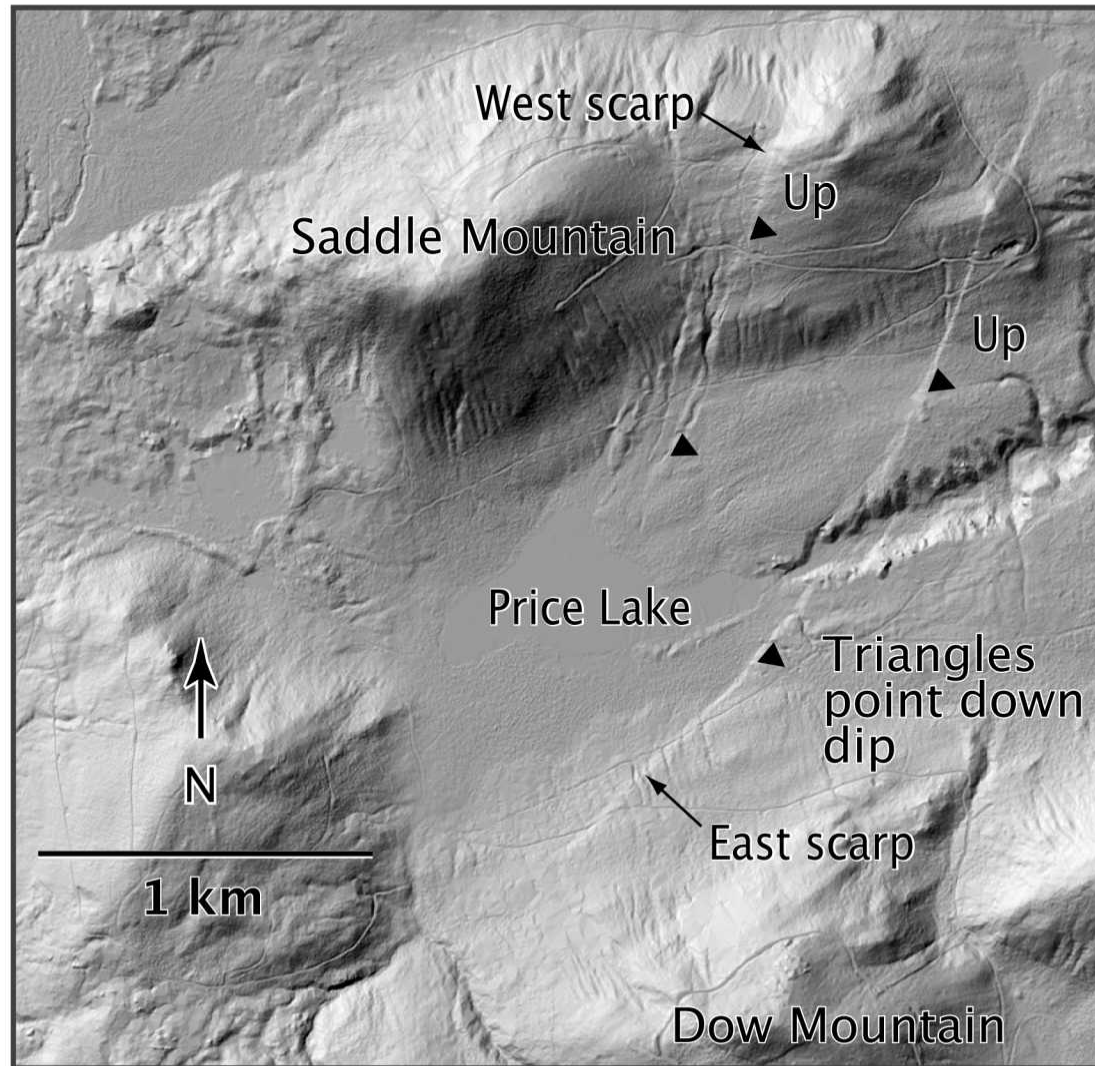


- Structural basin
- Thrust fault (teeth on upthrown block), black where Holocene movement is known or suspected
- Fault, black where Holocene movement is known or suspected
- Fault (bar and ball on downthrown side), black where Holocene movement is known or suspected
- Concealed fault, black where Holocene movement is known or suspected

- Quaternary deposits
- Sedimentary rocks (Paleogene to Neogene)
- Cascade igneous rocks (Oligocene and younger)
- Crescent Formation and other Eocene volcanic rocks
- Basement rocks (pre-Tertiary)
- Quaternary volcano

(Slide courtesy of Brian Sherrod)

Lidar imagery of Price Lake area and local faults



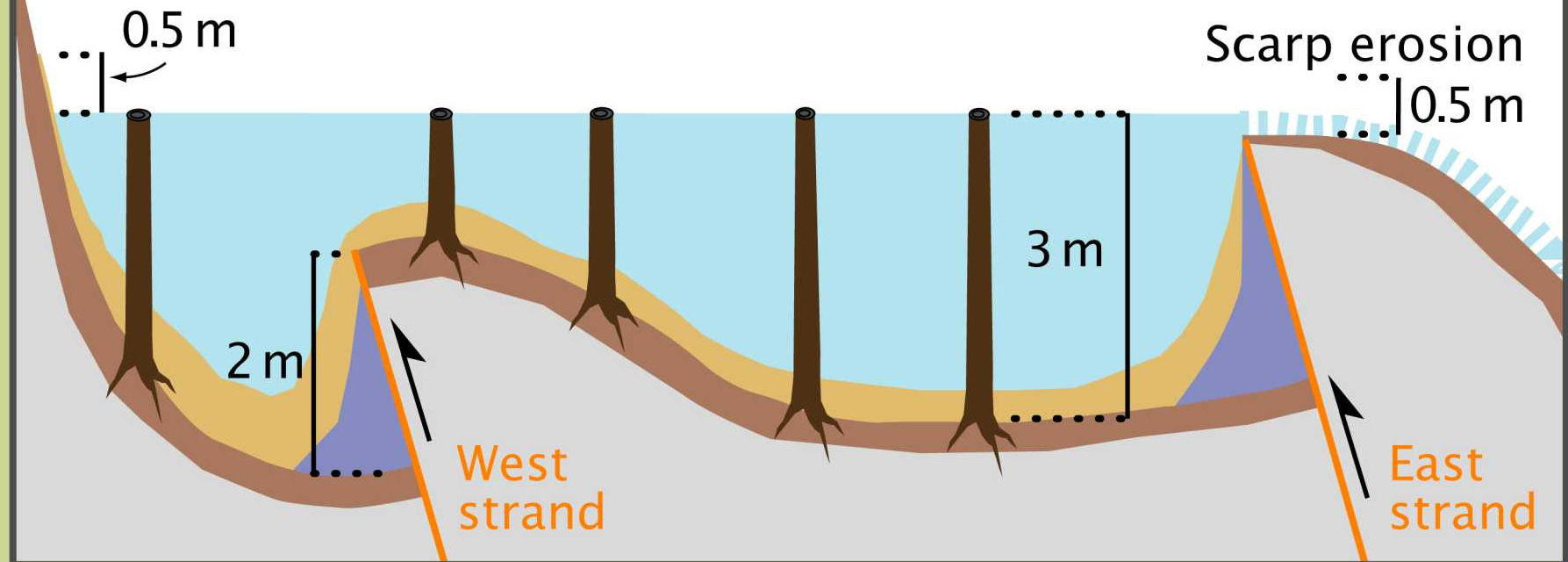
(Lidar composite courtesy of Bob Carson)

Earthquake-formed lake preserves stumps

1290–970 Cal yr BP

Gyttja
Scarp colluvium
Soil
Glacial

Gyttja preserved above lake



Vertical exaggeration x 50

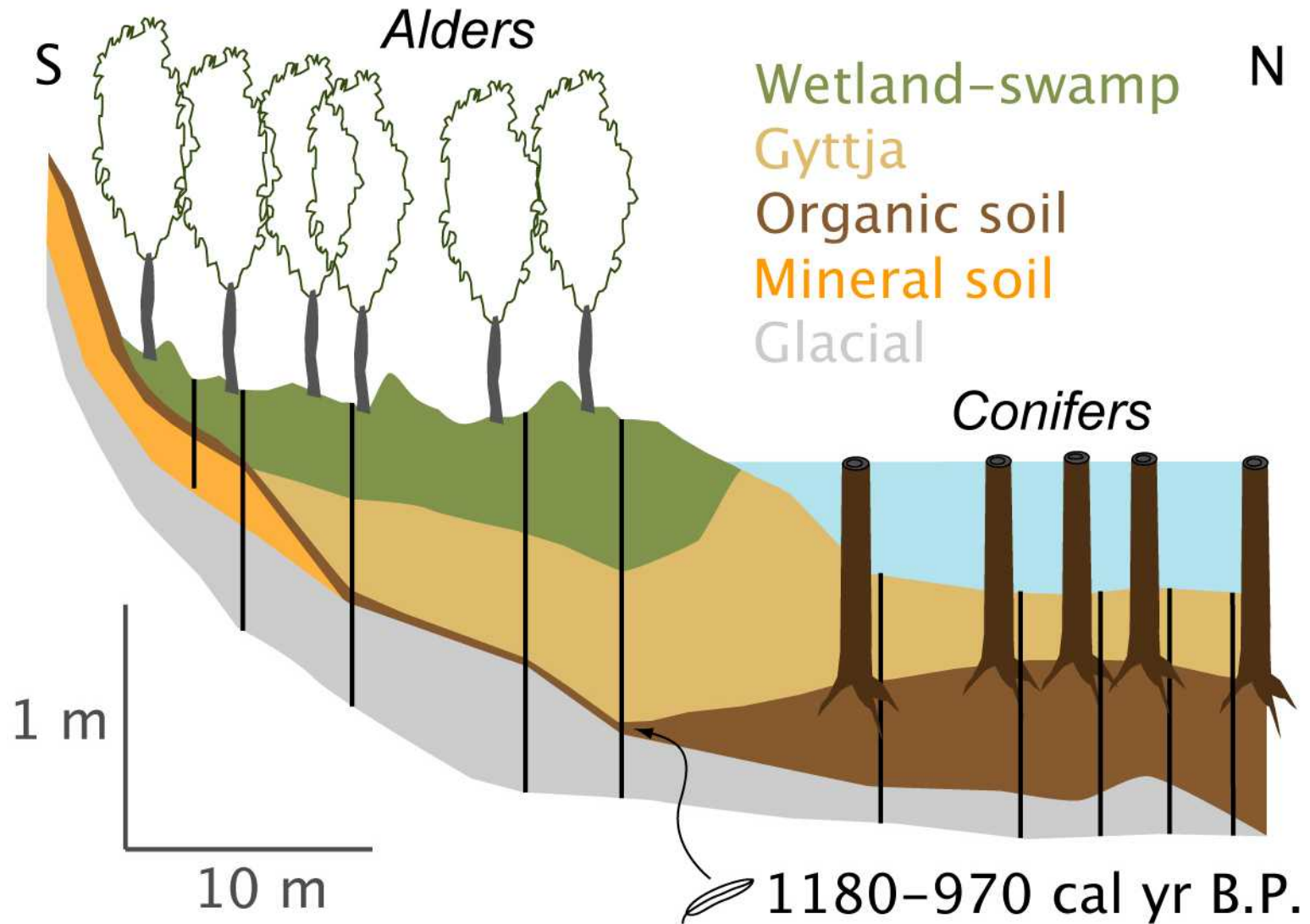
~1 km

Stumps in lake: looking east toward outlet



(Photo courtesy of Bob Carson)

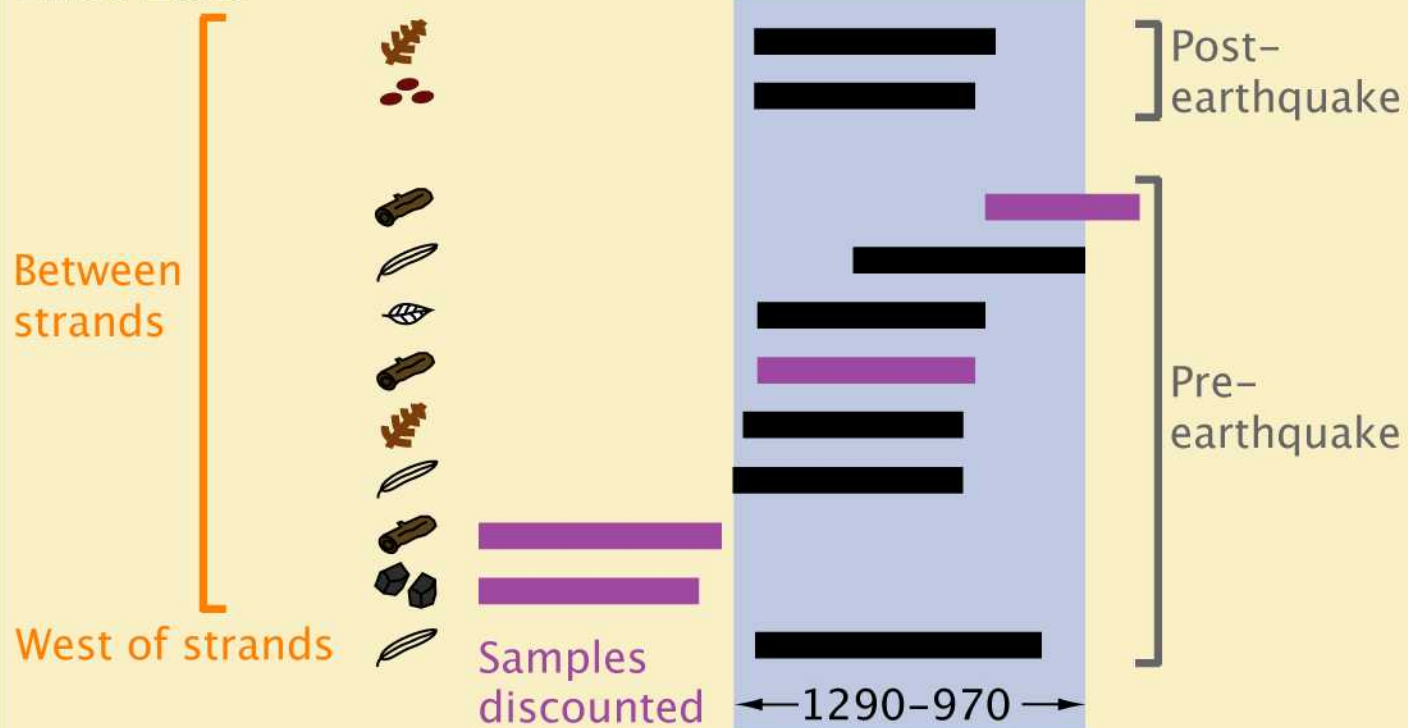
Gouge-core transect, drumlin to lake



RADIOCARBON AGES

- Seattle fault (Atwater 1999)
- Olympia fault (Sherrod 2001)
- Tacoma fault (Sherrod et al. 2004)
- Cascadia (Atwater et al. 2004)

Price Lake



Calibrations made with OxCal v3.10 (Bronk Ramsey 2001).
 Calibration data set: intcal04.14c (Reimer et al. 2004).

1400 1200 1000 800
 Cal yr B.P. (1950), 2 sigma

RADIOCARBON AGES

Seattle fault (Atwater 1999)

Olympia fault (Sherrod 2001)

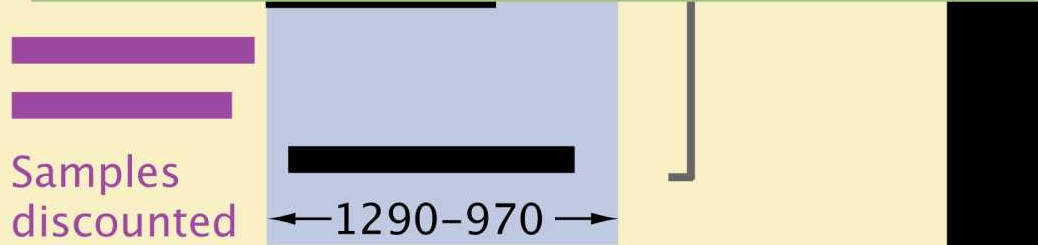
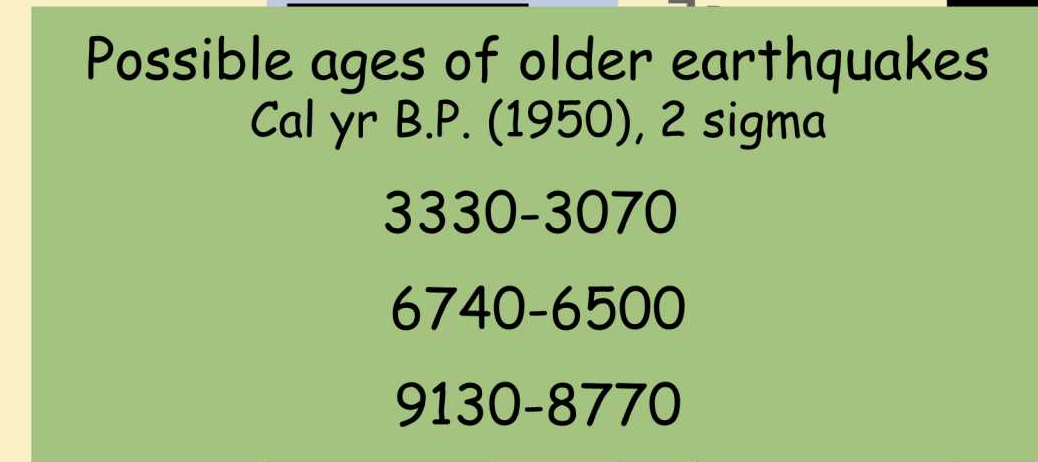
Tacoma fault (Sherrod et al. 2004)

Cascadia (Atwater et al. 2004)

Price Lake

Between strands

West of strands

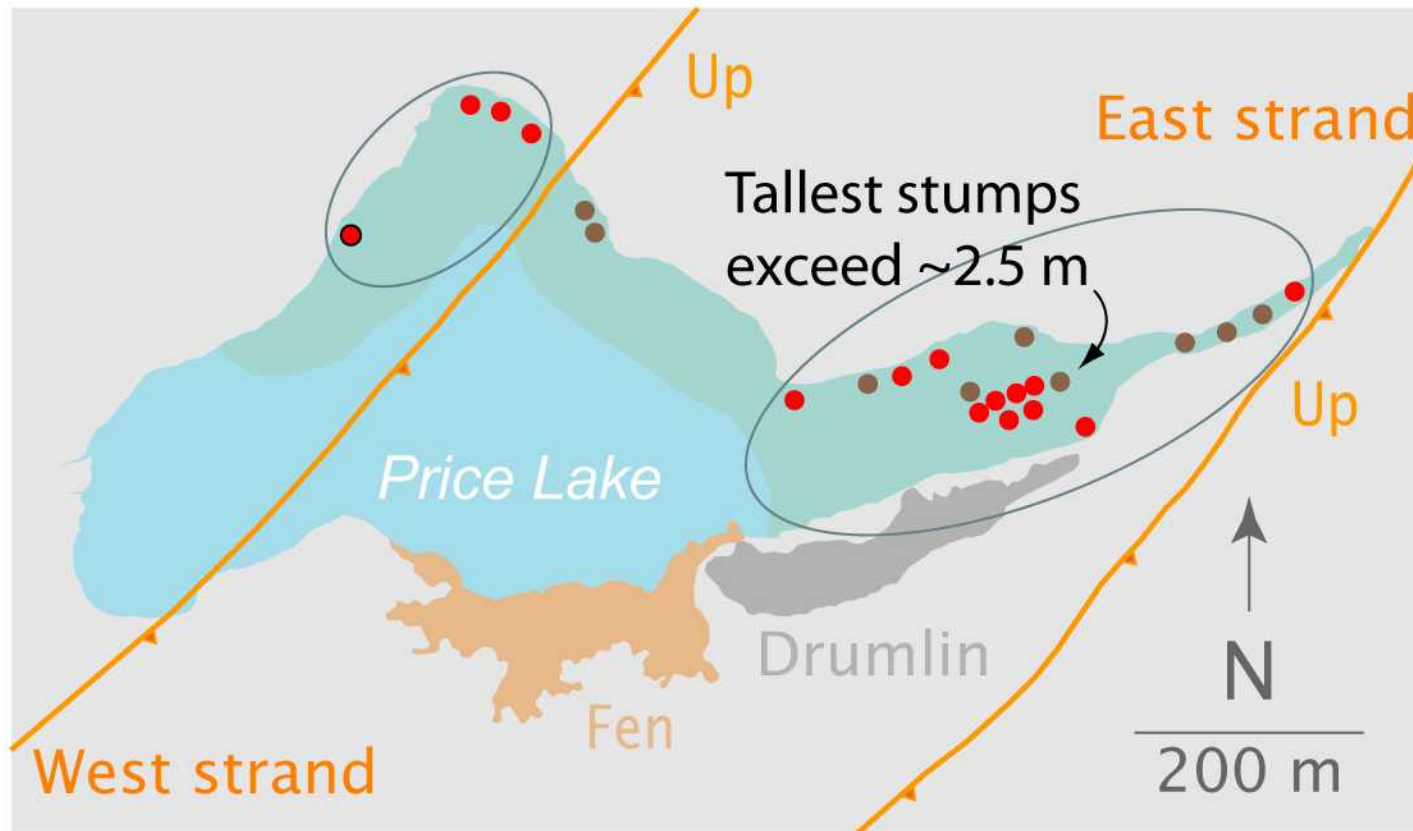


1400 1200 1000 800

Cal yr B.P. (1950), 2 sigma

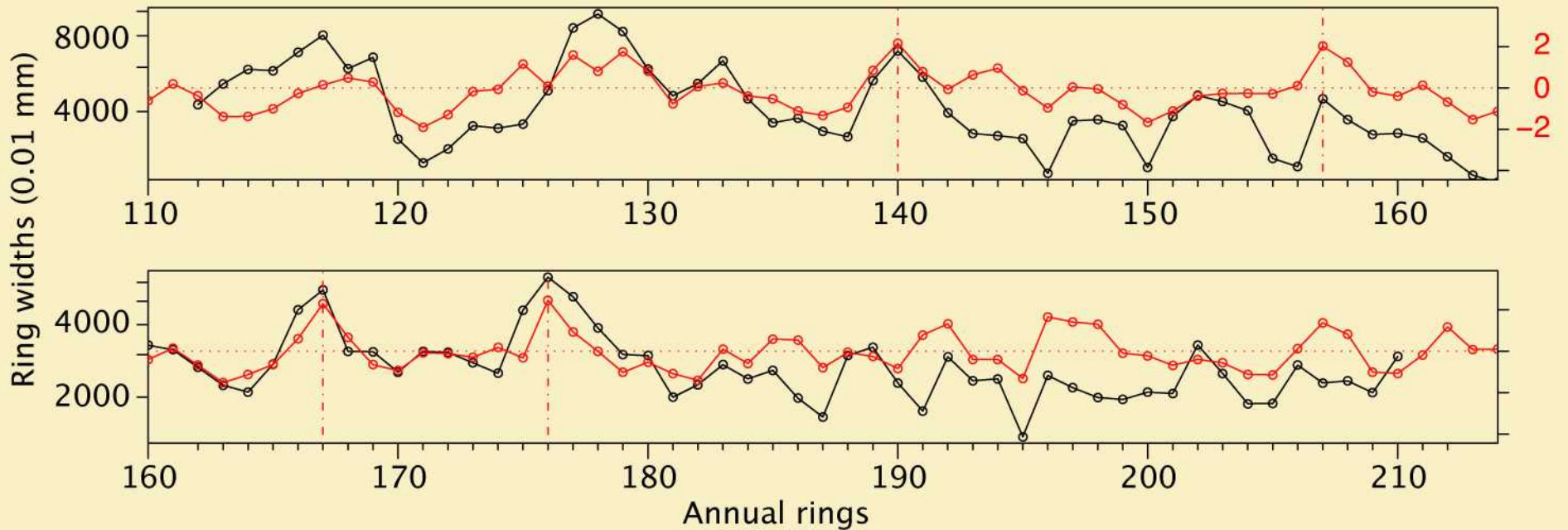
Calibrations made with OxCal v3.10 (Bronk Ramsey 2001).
Calibration data set: intcal04.14c (Reimer et al. 2004).

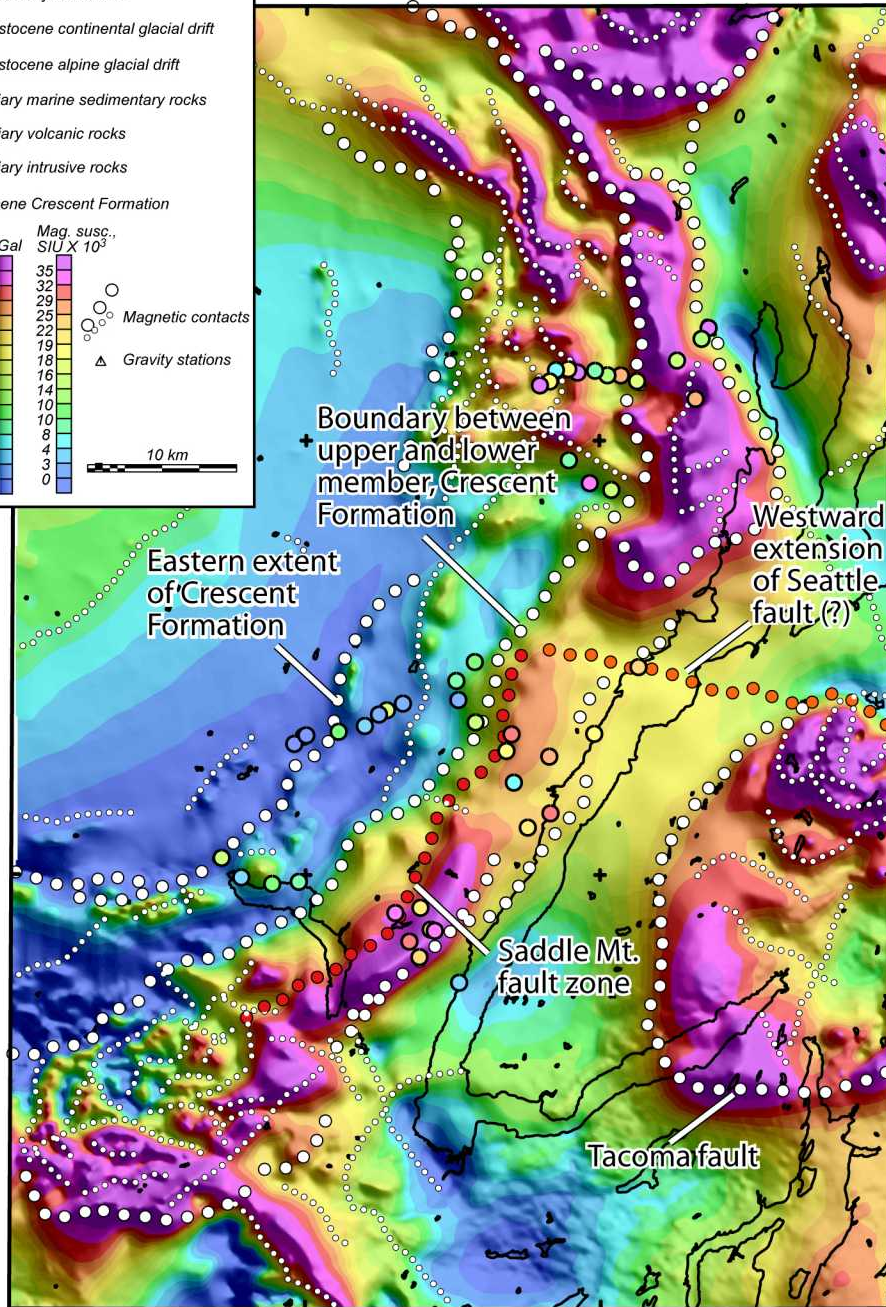
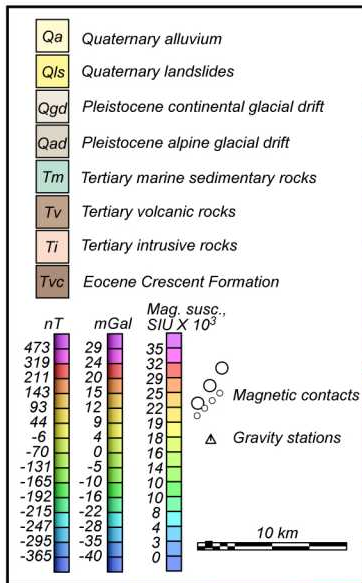
TREE-RING MATCHING



- Portion of lake with stumps
- Stumps sampled
- Stumps used for master chronologies
- Tree rings plotted against master chronology (right)

Ring widths of a stump west of West strand and the **master chronology** for trees between East and West strands



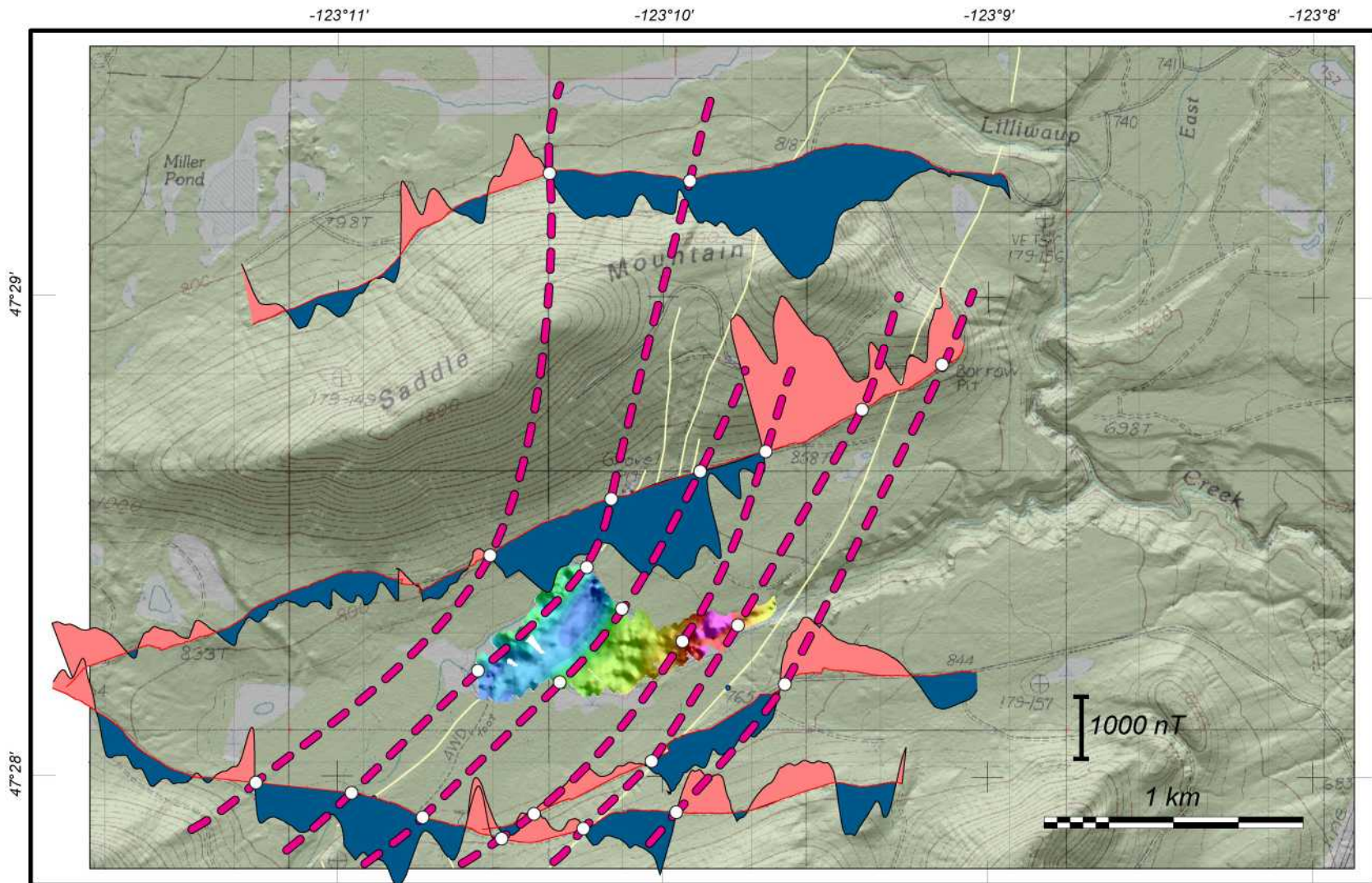


Aeromagnetic anomalies of the SE Olympic Peninsula

White dotted lines are contacts interpreted from "maxspot" analysis

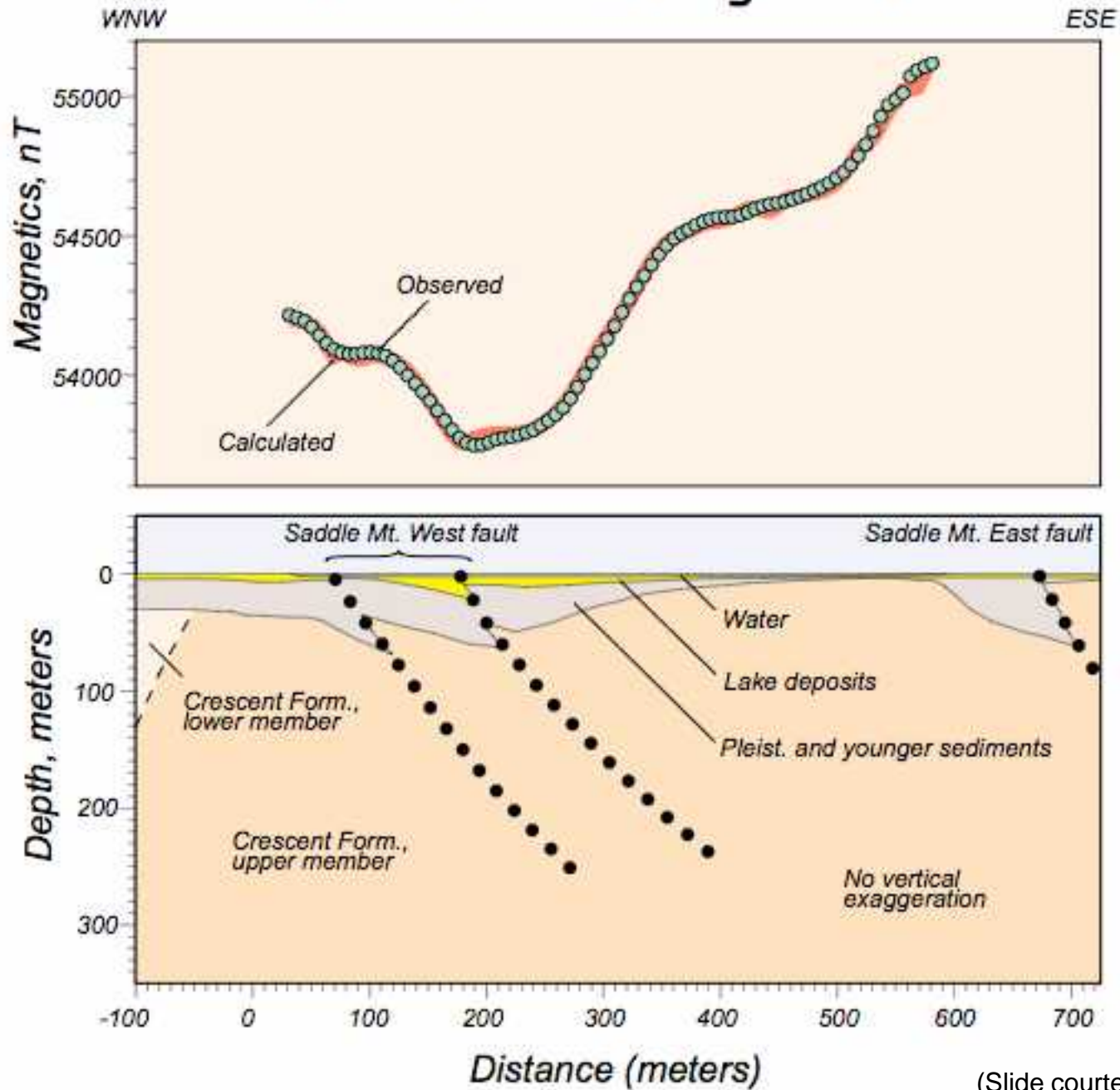
Circles are magnetic susceptibility measurements, color-coded by value

Ground-magnetic profiles
Red dashed lines = magnetic contacts
Pink anomalies, positive; blue anomalies, negative



(Slide courtesy of Rick Blakely)

Price Lake Ground-Magnetic Model



(Slide courtesy of Rick Blakely)

CONCLUSIONS

- Radiocarbon analyses of delicate plant remains show that the East and West strands ruptured in the same century or two 1300-1000 cal yr B.P.
- Crossdating tree rings of stumps preserved on either side of the West strand provides evidence that the East and West strands ruptured within decades of each other.
- Dip slip 1000-1300 cal yr B.P. likely exceeded 3 m on the East strand and 1 m on the West strand.

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