

New active-source seismic constraints on the Alaska-Aleutian subduction zone

Donna J. Shillington

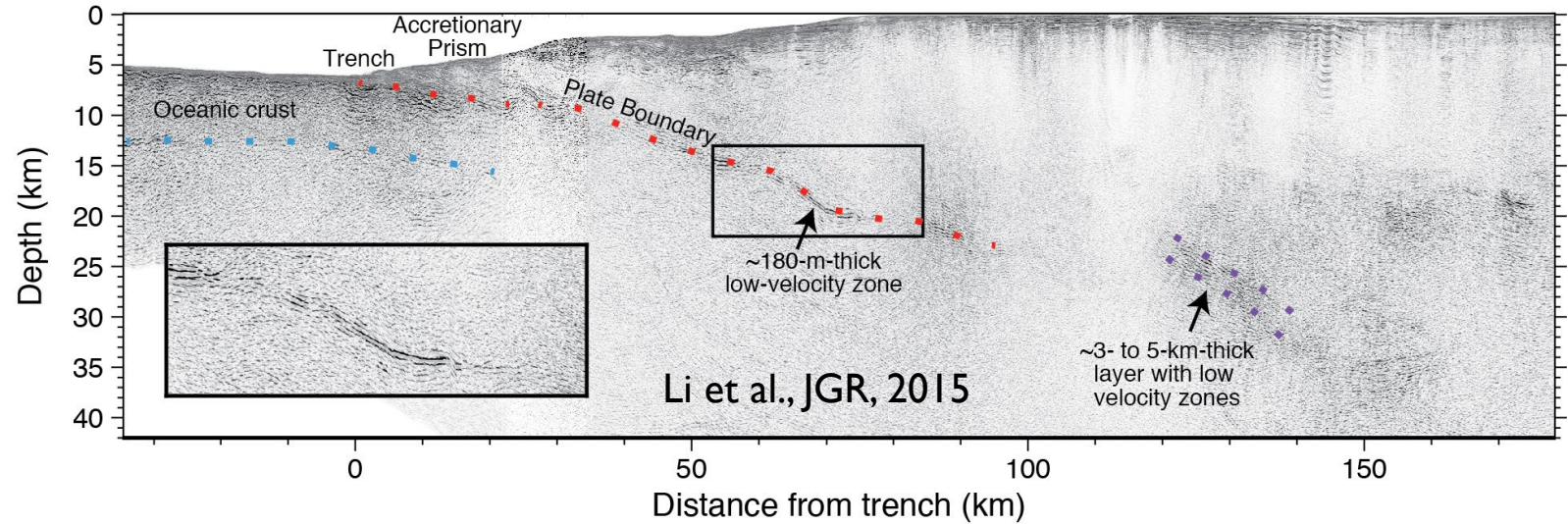
Alaska Peninsula: Anne Bécel, Mladen R. Nedimović, Harold Kuehn, Jiyao Li, Tanner Acquisto, Demian Saffer, Josh Burstein, Jacob Clarke, Peter Miller, Geoffrey A. Abers, Spahr C. Webb

Aleutians: Dan Lizarralde, Valeria Cortés Rivas, Hannah Mark, Justin Estep

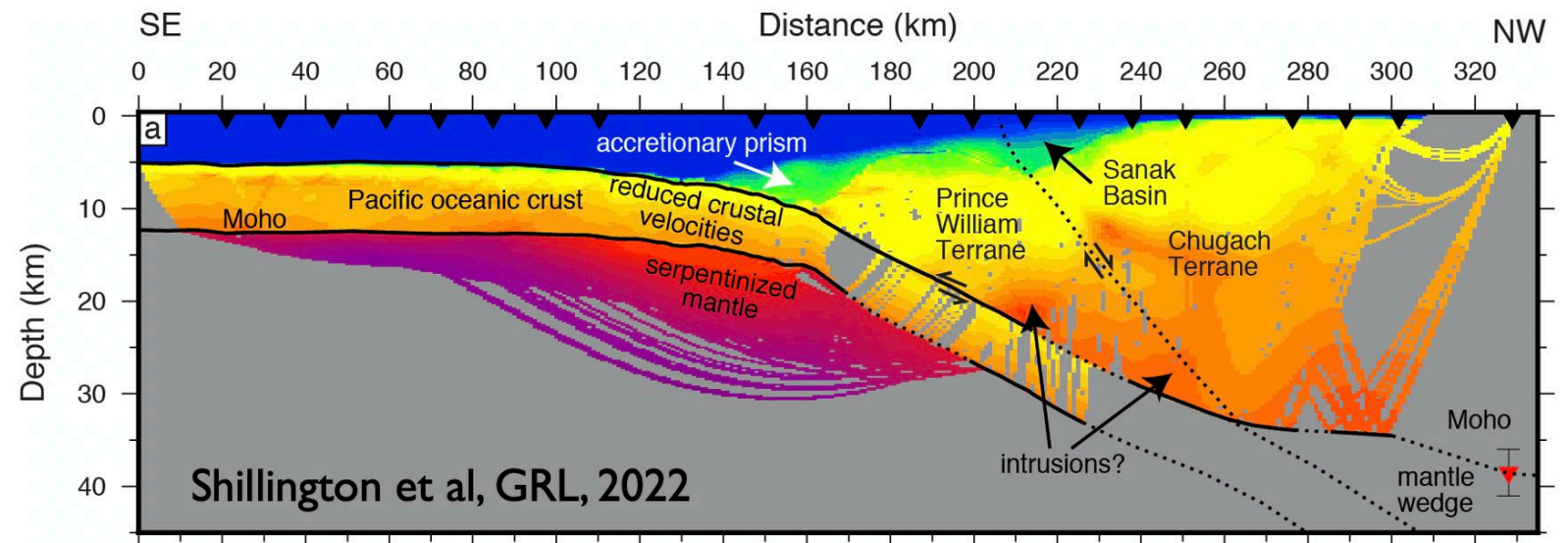


Discussion points

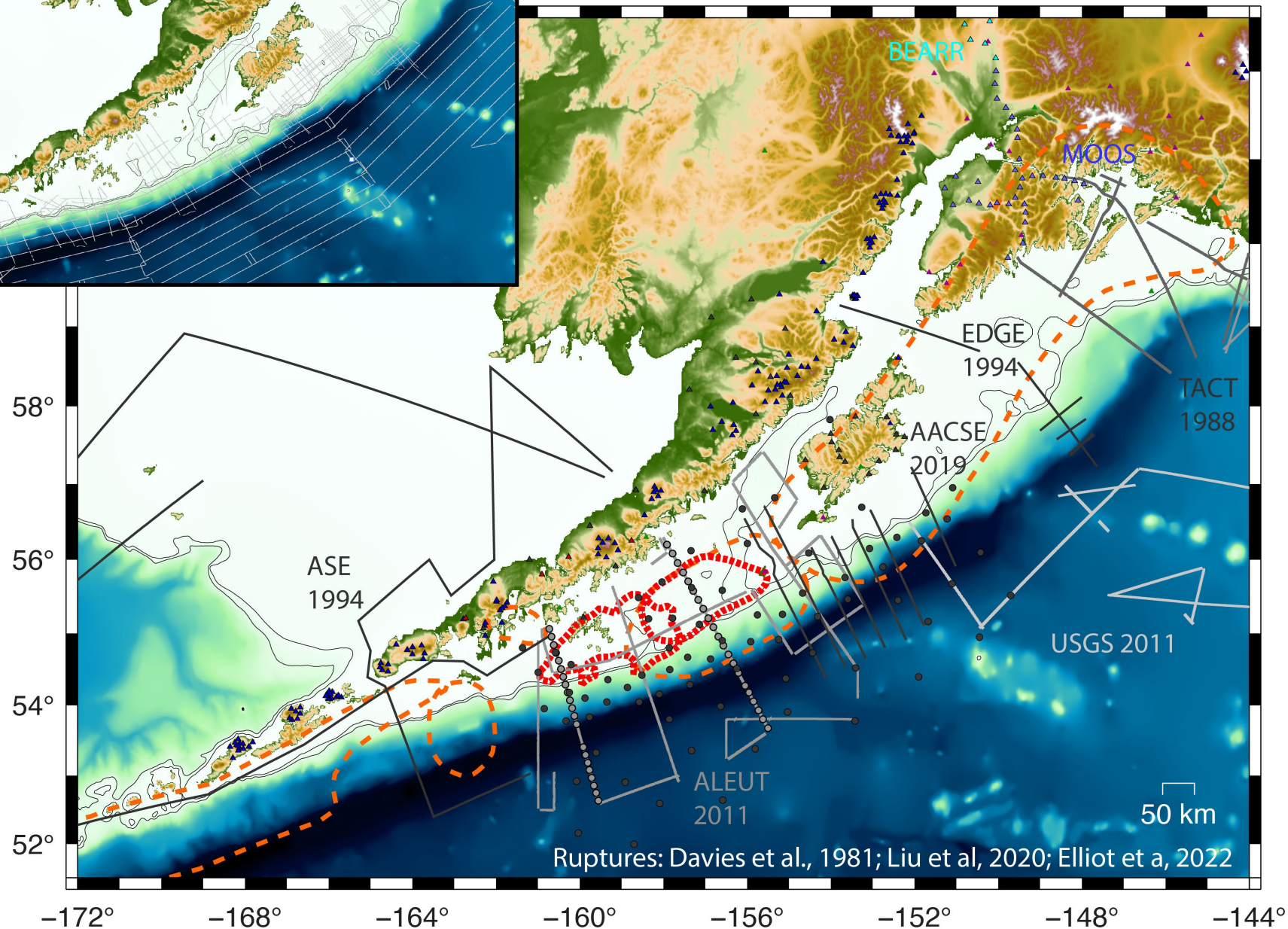
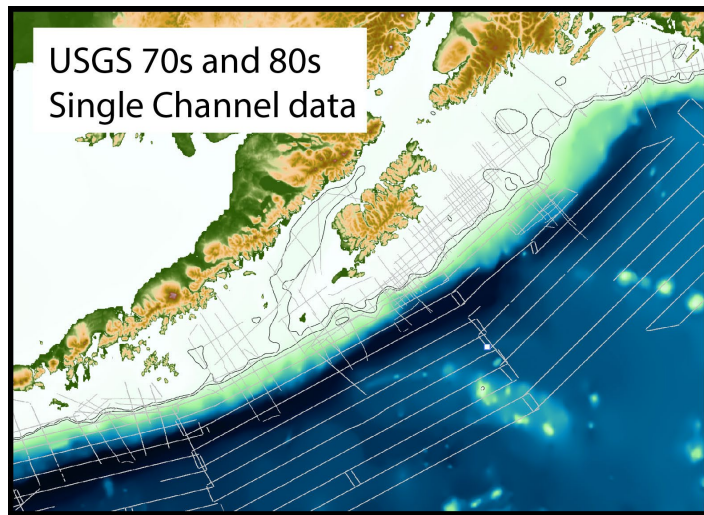
- Existing, modern data are high quality but sparse. Major data gaps (and opportunities for future work...)



- How could existing information be better incorporated into USGS efforts including hazards assessment?

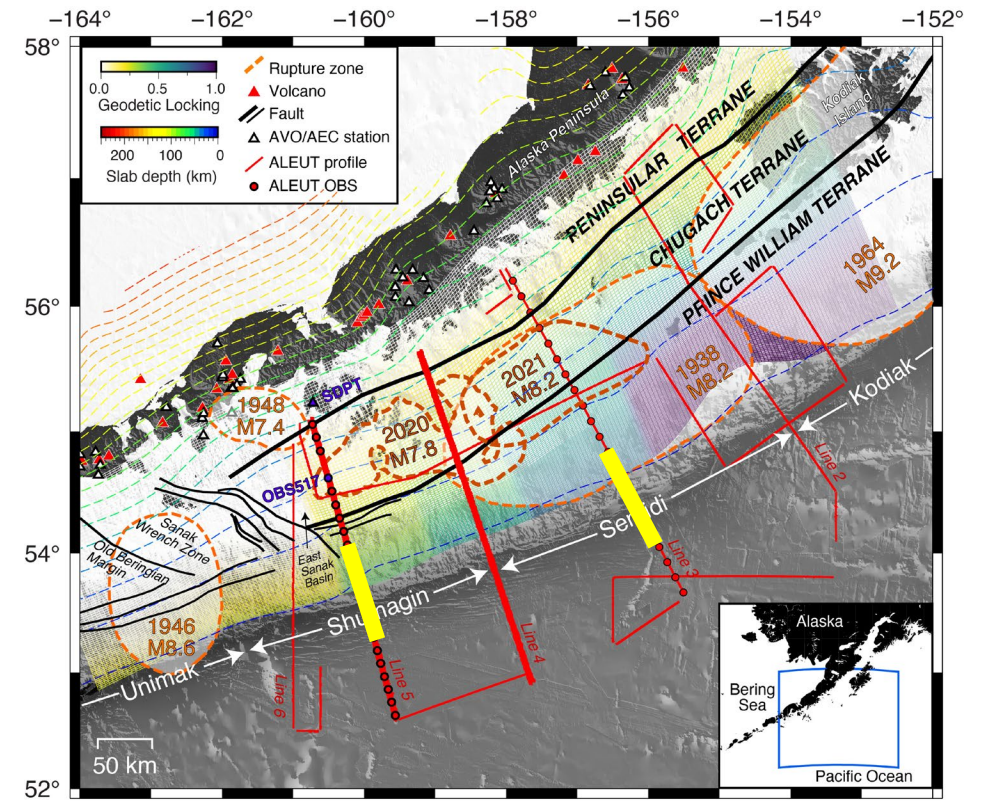
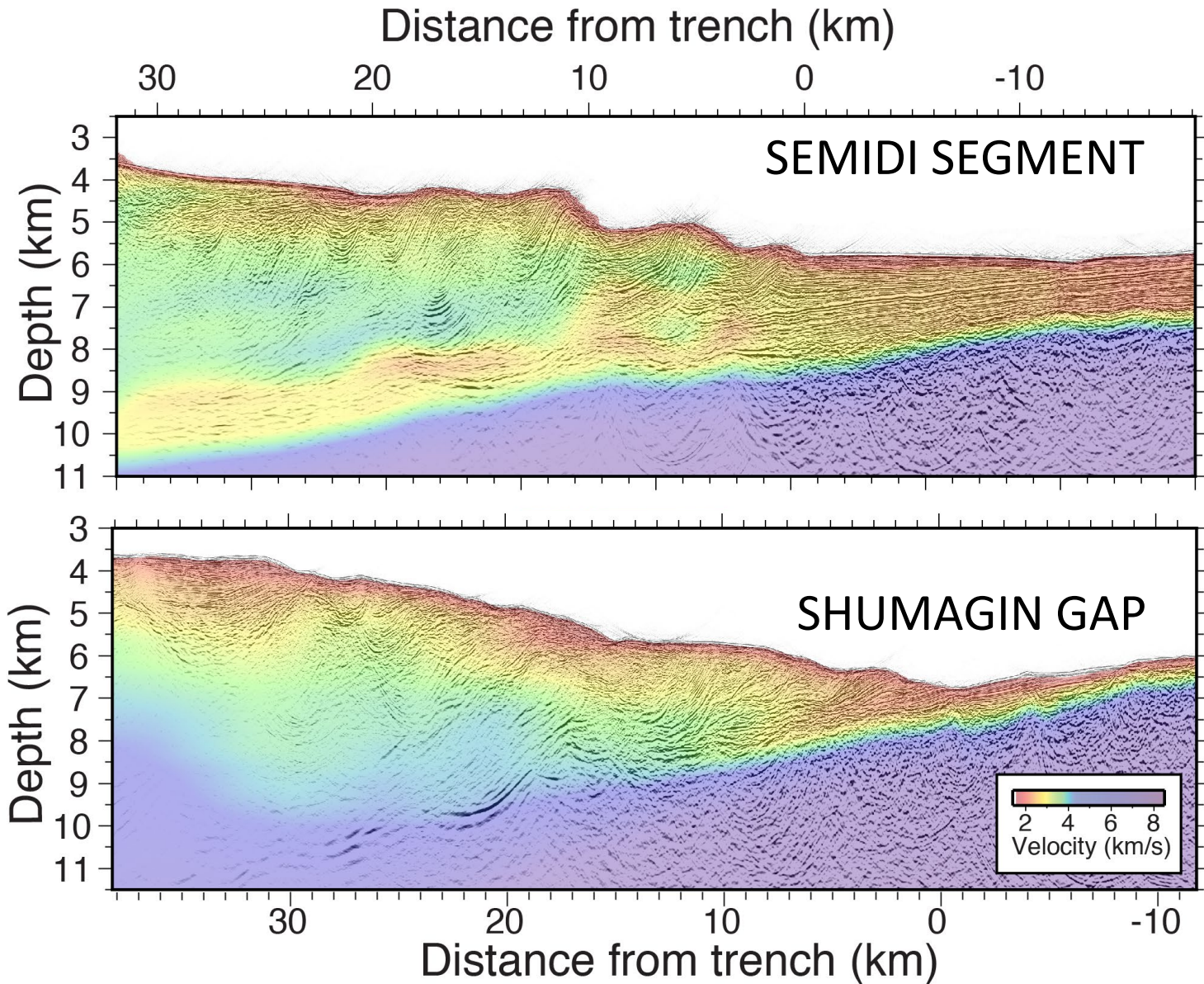


Existing active-source data off Alaska & Alaska Peninsula



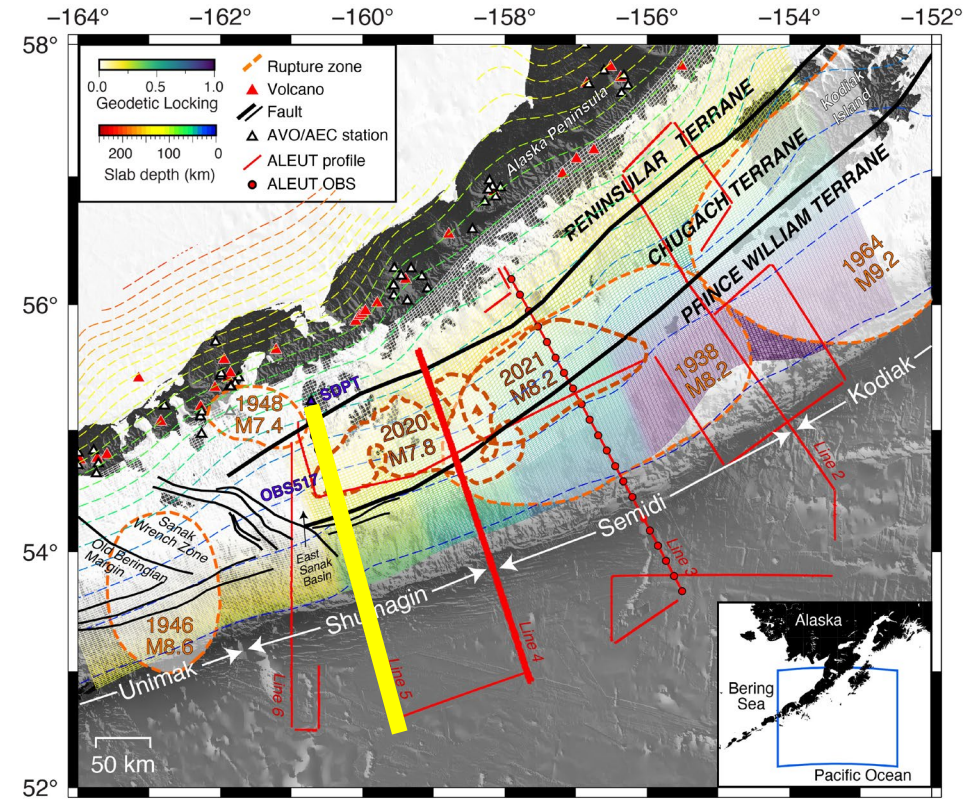
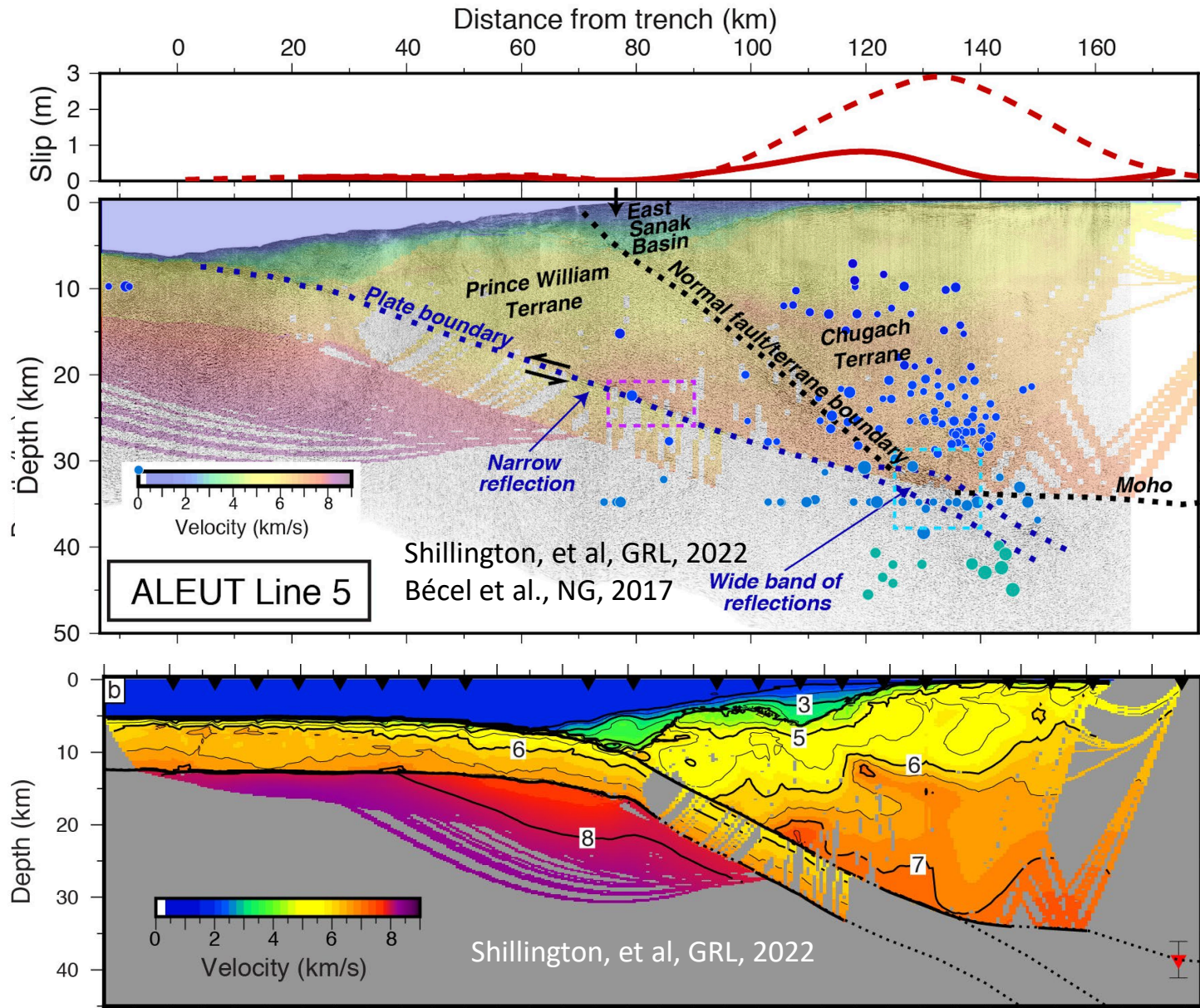
- Irregular coverage and important gaps
- Where modern data exist, very high quality
- Reveal variations in upper plate & lower plate structure, megathrust geometry and properties

Subduction zone inputs influence megathrust heterogeneity & behavior



2020 M7.8 slip model: Liu et al., 2020
 1938, 1964 ruptures: Davies et al., 1981
 2021 rupture: Liu et al., in review
 Locking: Drooff & Freymueller, 2021
 Faults: Brun et al., 1987

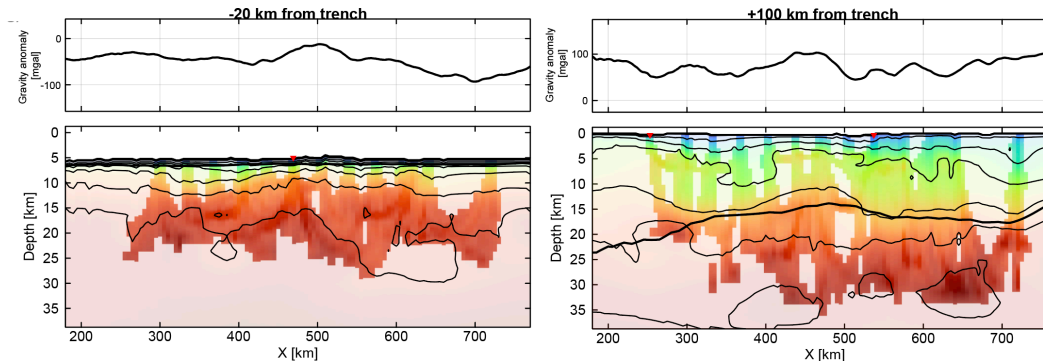
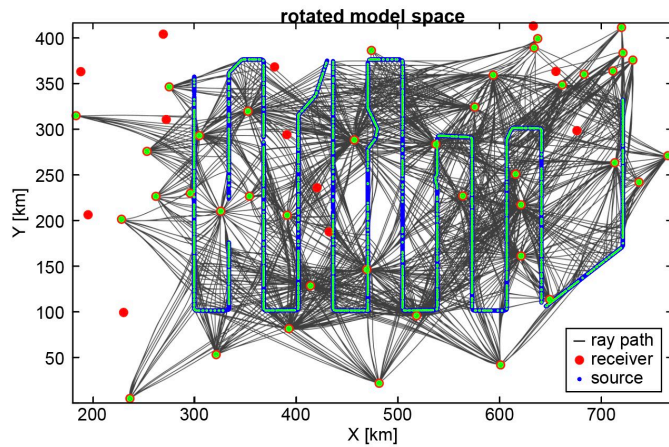
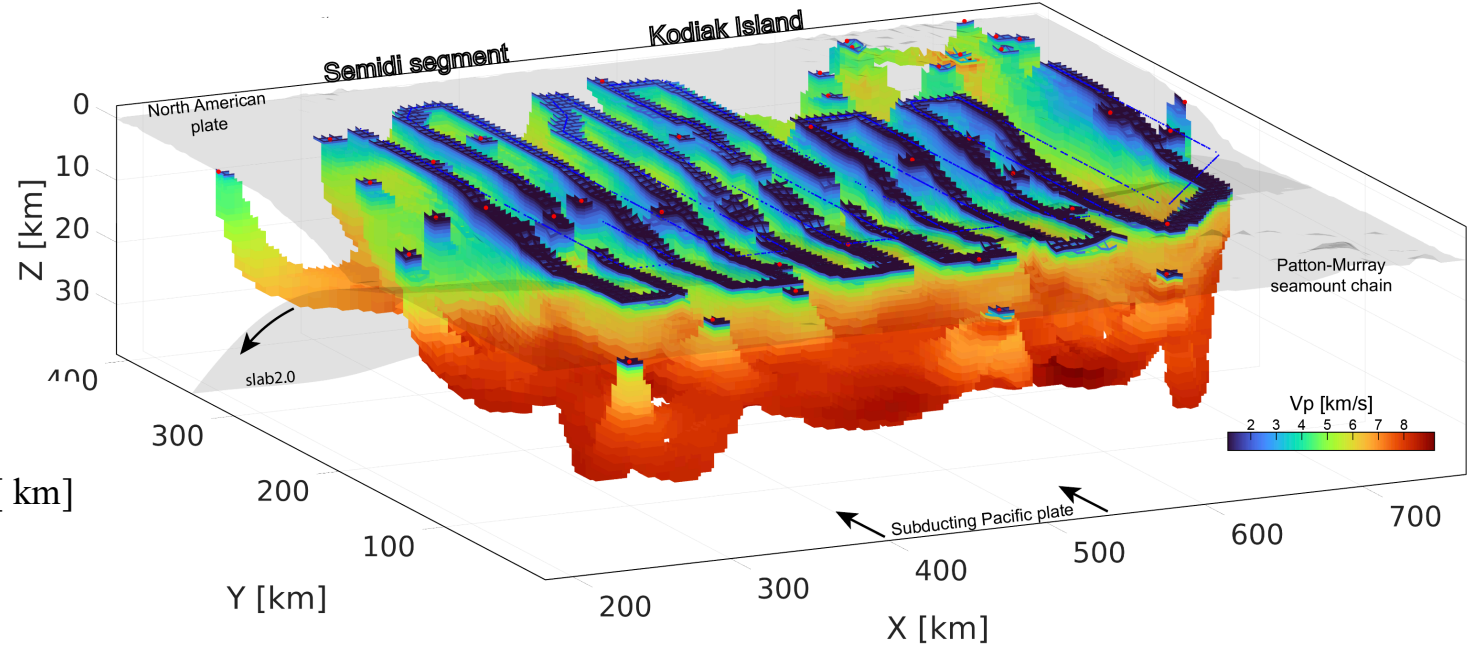
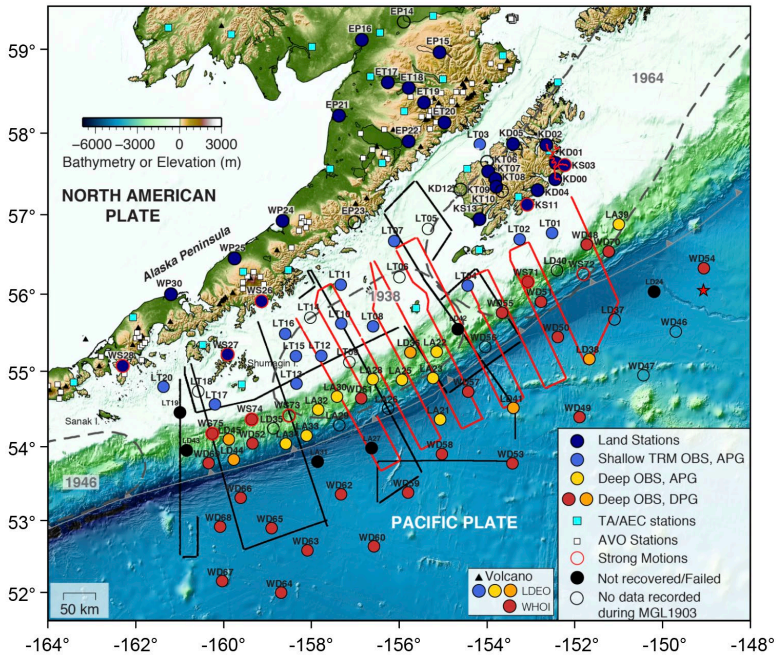
Downdip changes in upper plate rigidity & megathrust properties: influence on depth extent and character of recent earthquakes?



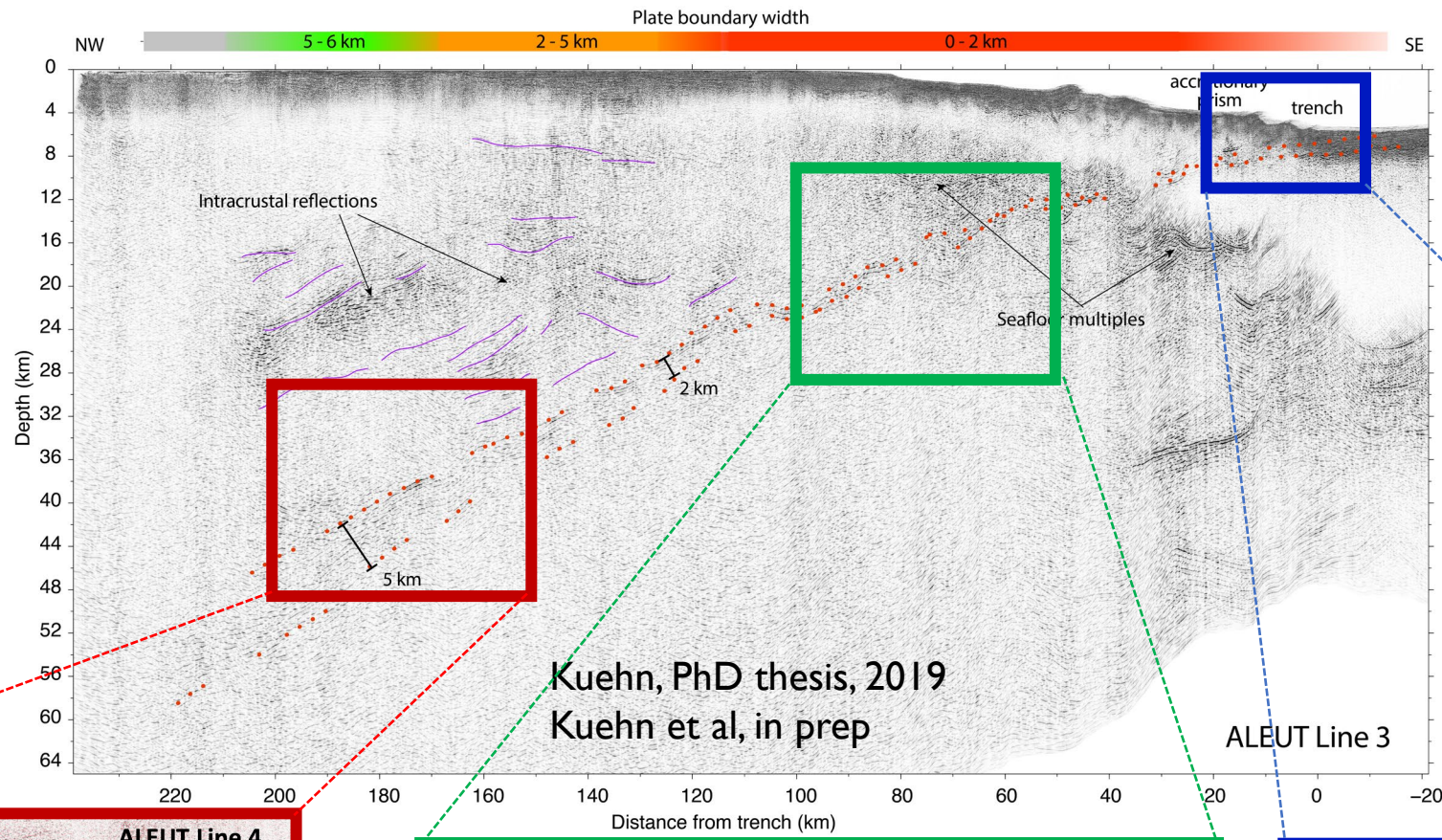
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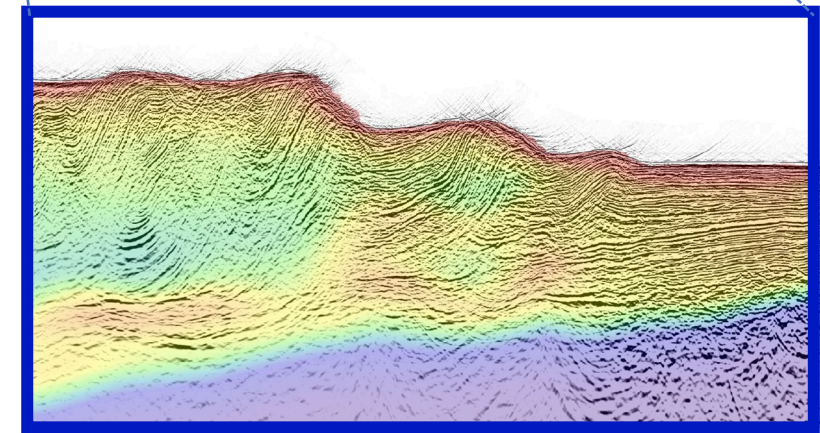
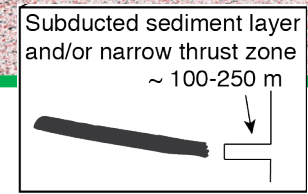
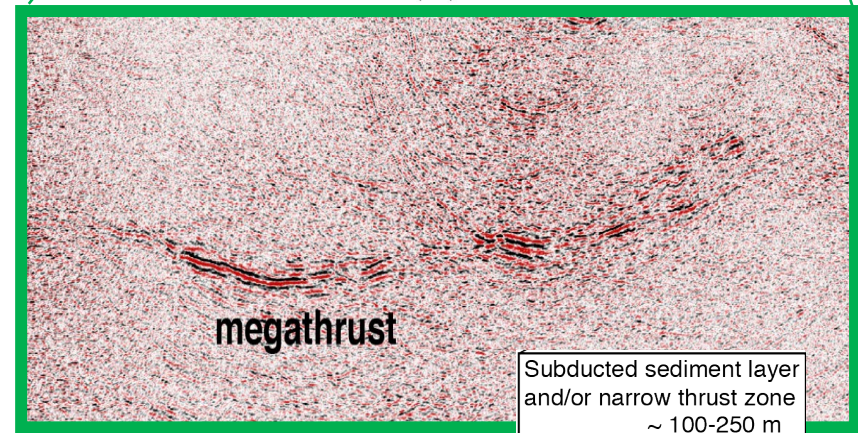
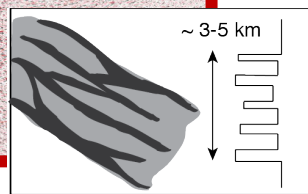
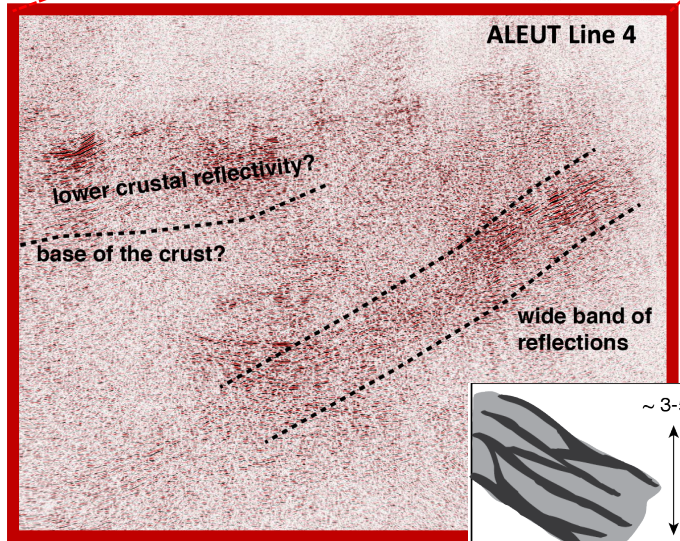
- 3D P-wave model derived from active source seismic data acquired during the 2018-2019 Alaska Amphibious Community Seismic Experiment (AACSE)



- Provide new constraints on along-strike variations in structures and properties across both the overriding and incoming plates

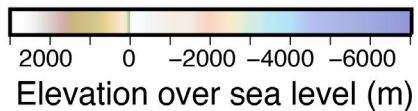
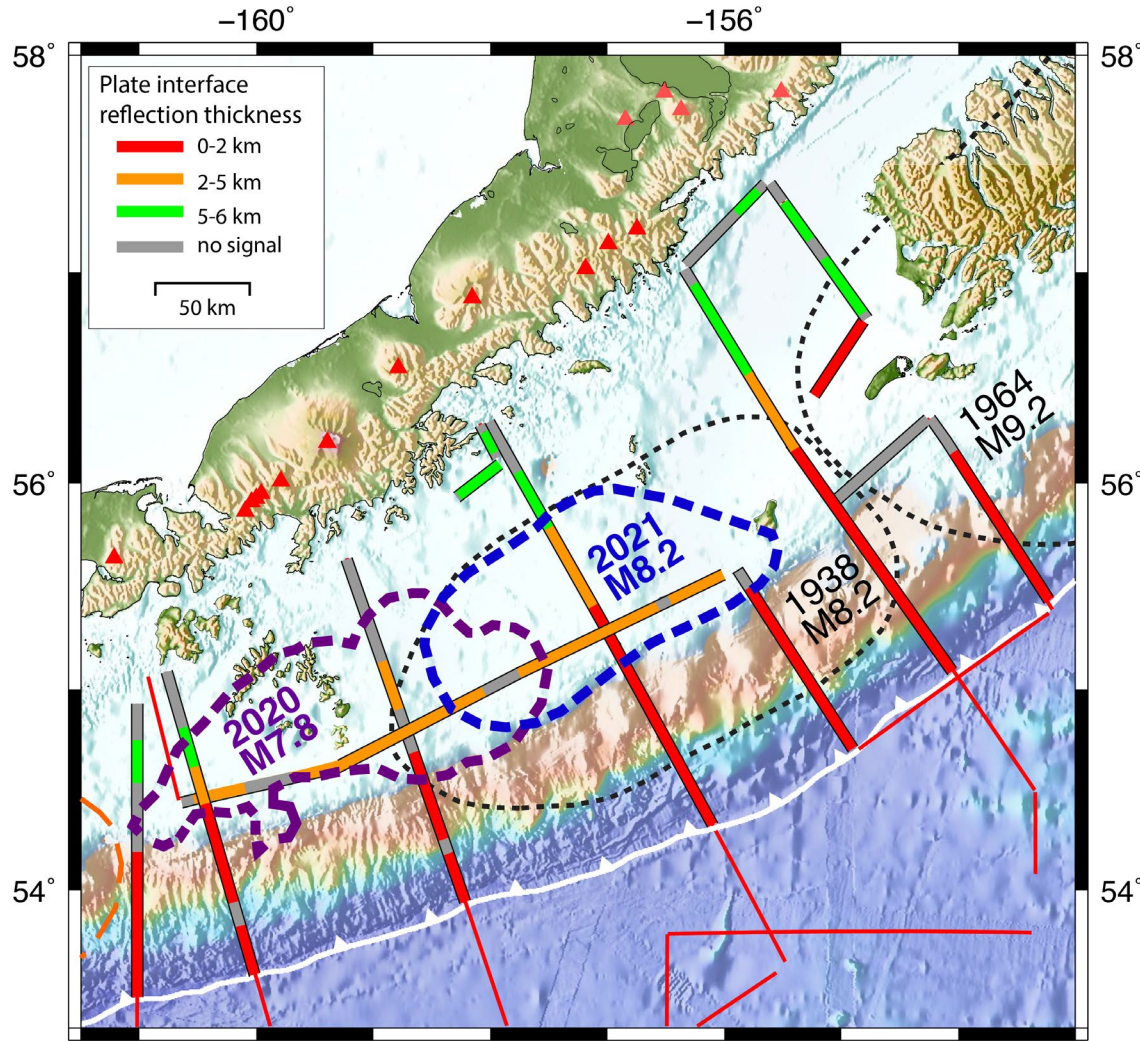


Kuehn, PhD, 2019
 Kuehn, Nedimović et al,
 in prep
 Li, Shillington et al.,
 Geology, 2018
 Li, Shillington et al., JGR,
 2015

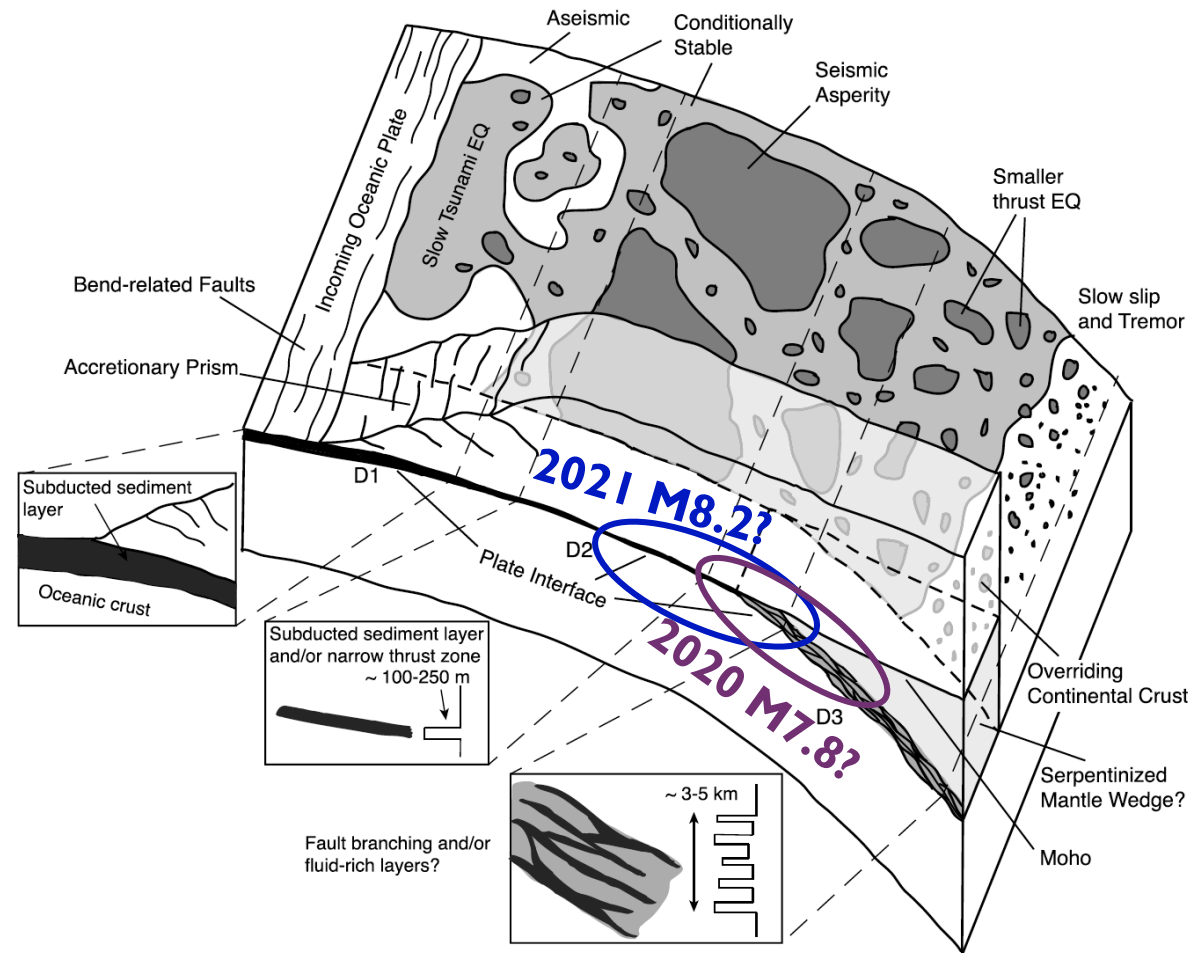


Downdip changes in upper plate rigidity & megathrust properties: influence on depth extent and character of recent earthquakes?

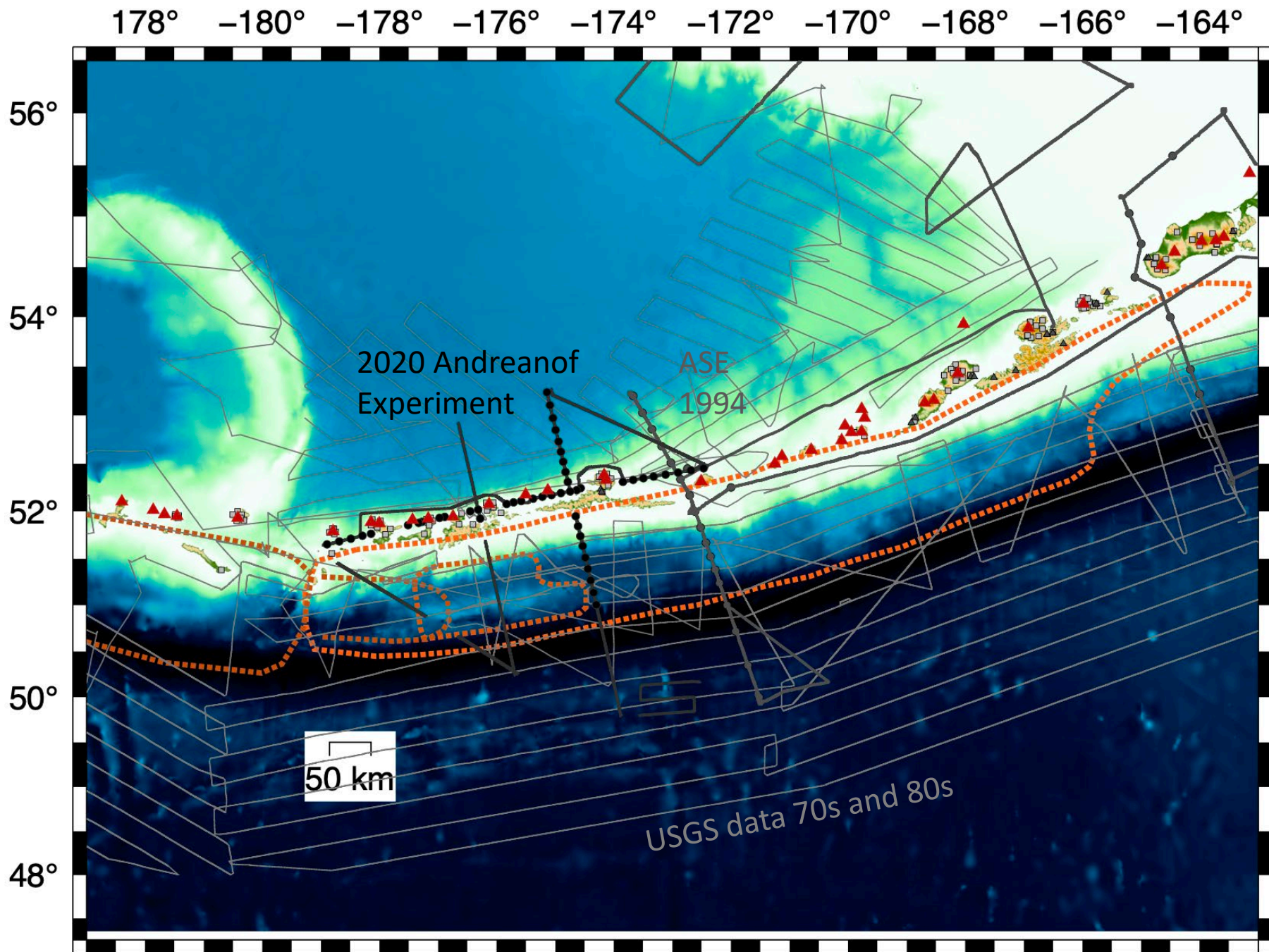
Kuehn, PhD thesis, 2019; Kuehn et al, in prep



2021 rupture: Elliott et al., 2022
2020 rupture: Liu et al, 2020
Other ruptures Davies et al. 1981



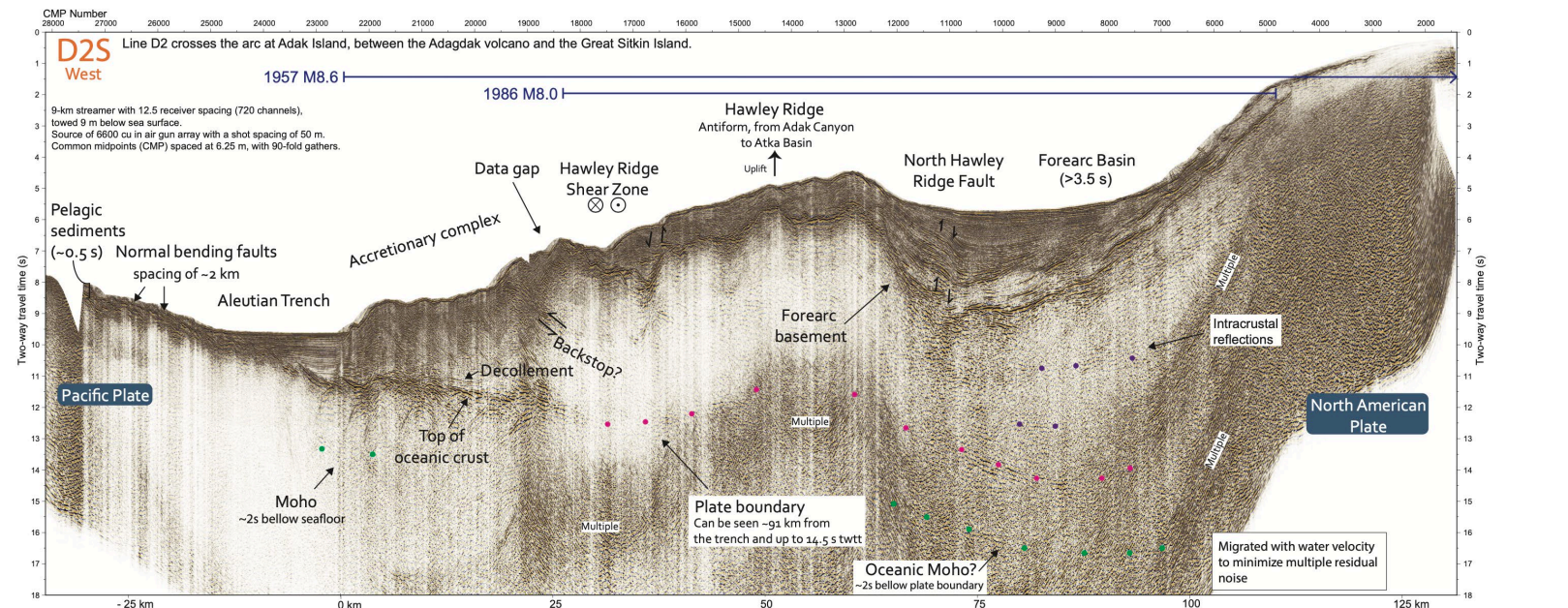
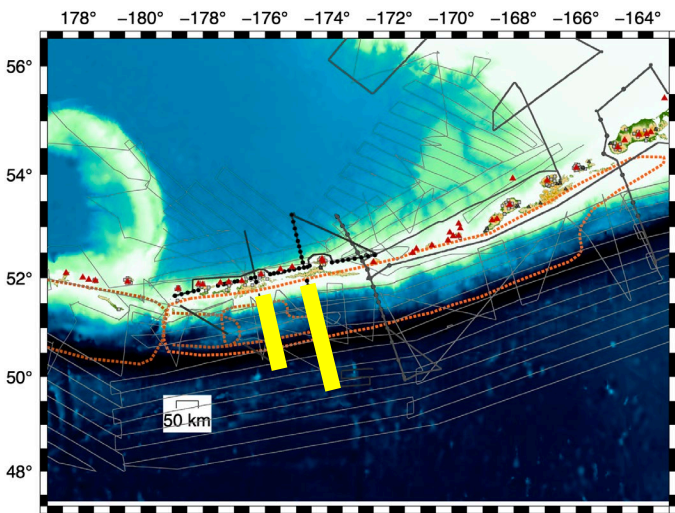
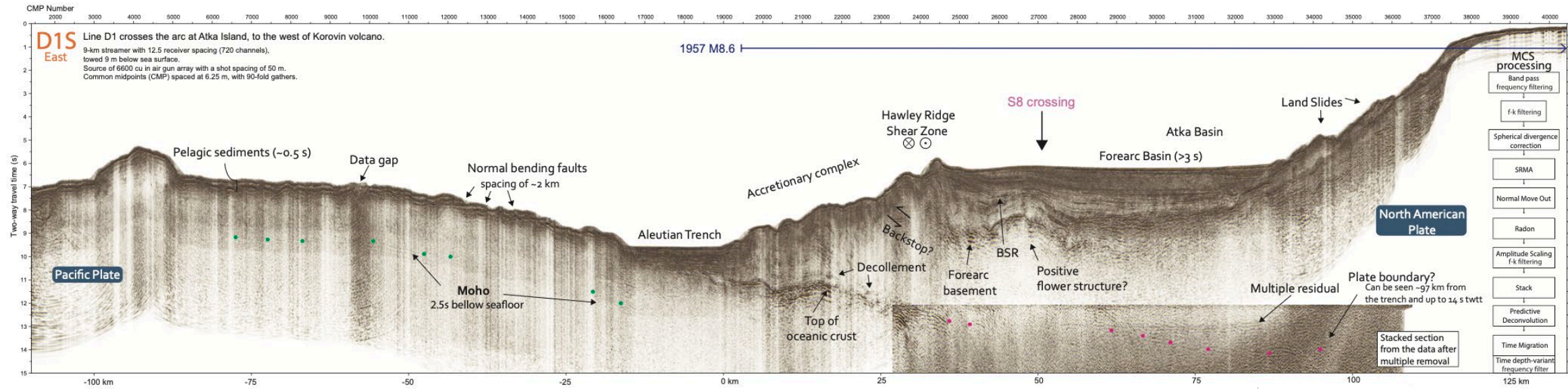
Li, Shillington et al, *JGR*, 2015
Modified after Lay et al., *JGR*, 2012



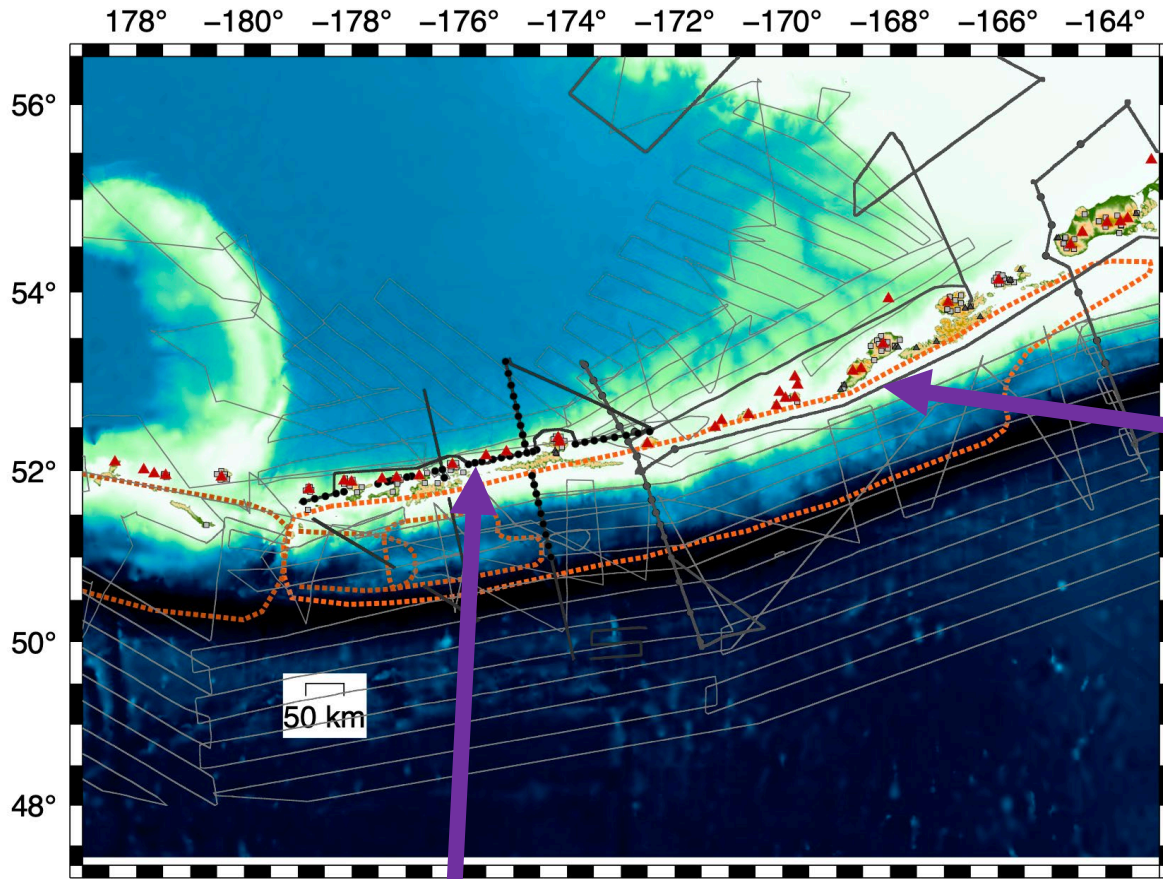
Existing active-source data in Aleutians

- Very sparse
- Where modern data exist, very high quality
- Reveal variations in forearc and arc structure, with relevance for seismogenesis and magmatism

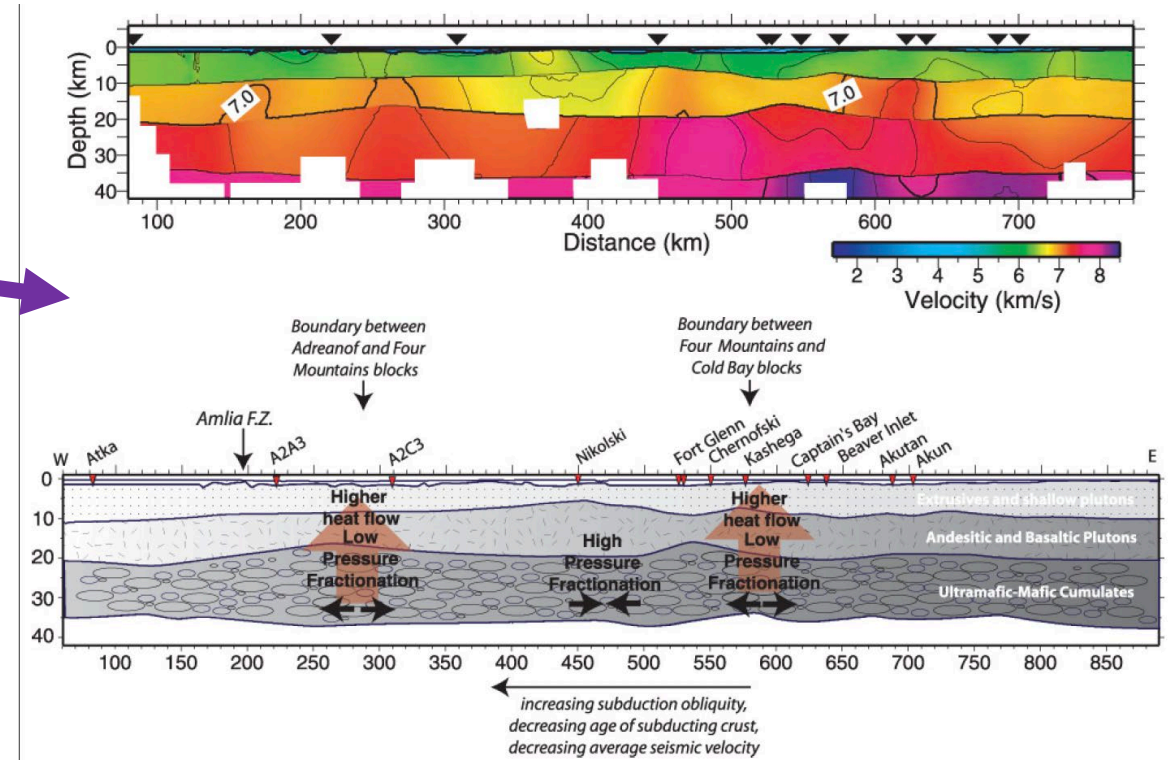
Along-strike variations in forearc structure



Along-strike variations in arc crustal composition



Old results from very sparse 1994 along-strike profile

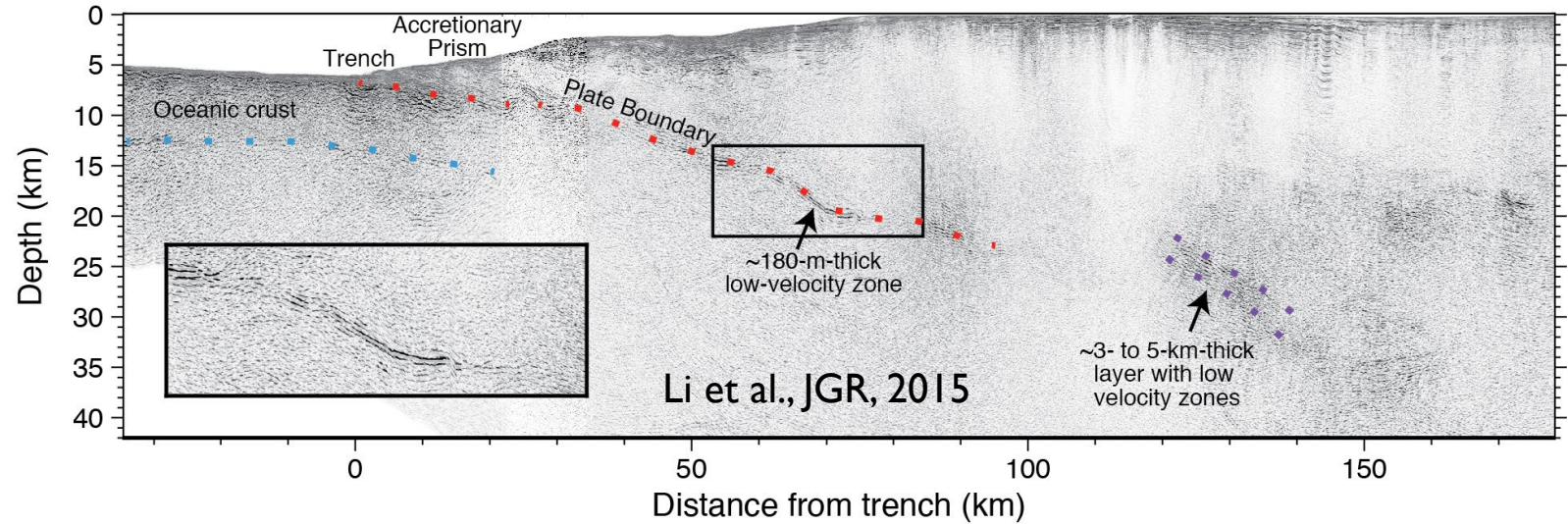


Higher-resolution constraints from region with more dramatic along-strike changes in arc volcanism in the works... (Mark, Lizarralde et al.)

Shillington et al., G3, 2004

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