Along-Trench Structural Variations of Downgoing Juan de Fuca Plate: Insights from Multichannel Seismic Imaging

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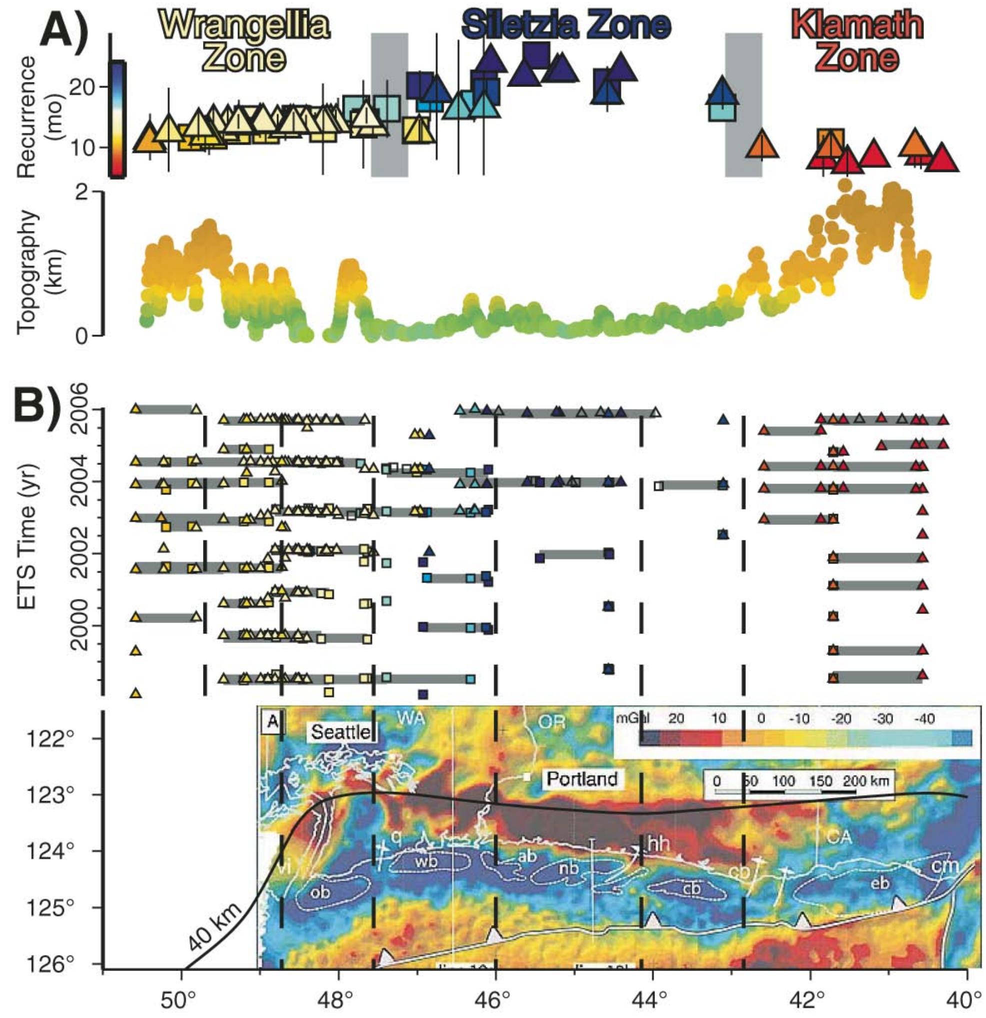
Along Strike Variation of Cascadia Subduction Zone

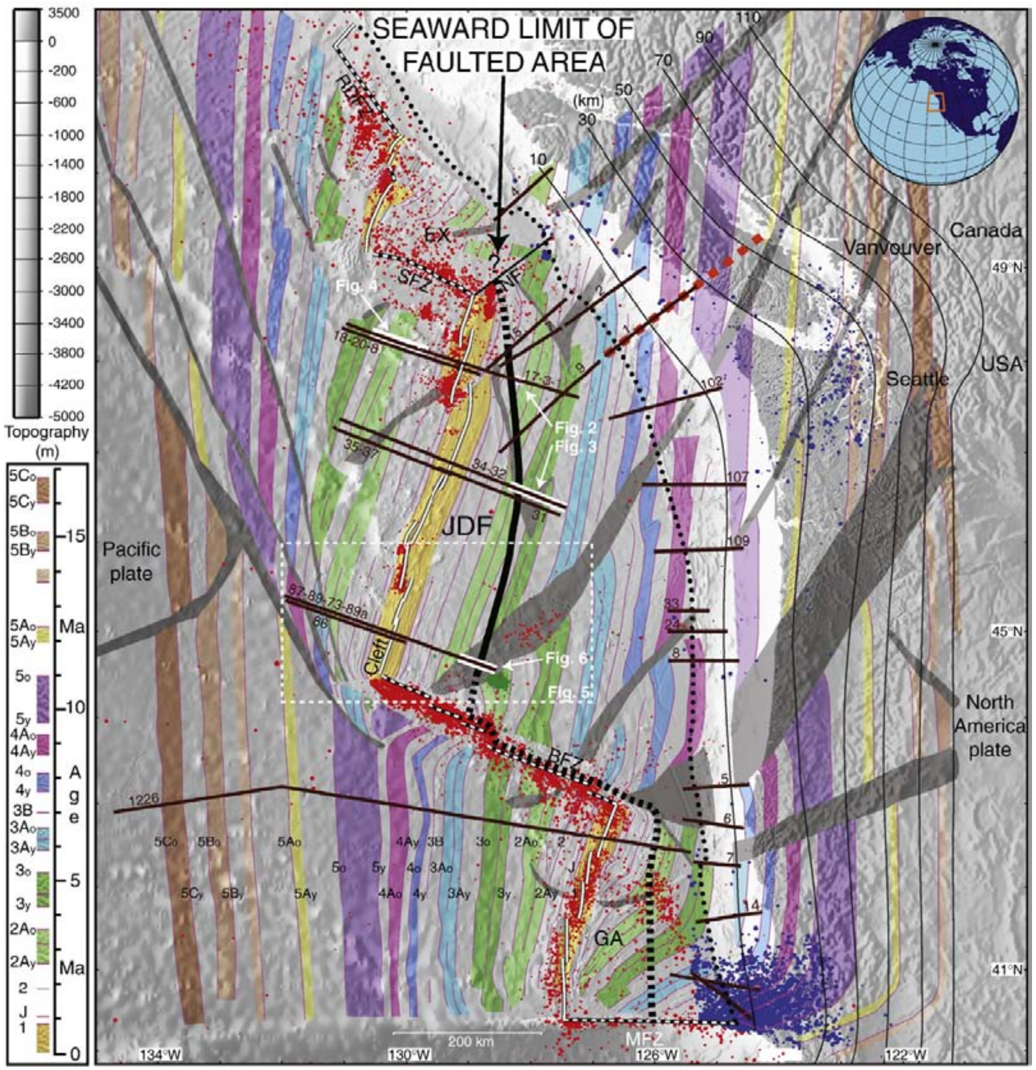
- Cascadia Subduction Zone has along-strike variation in
  - Intra-slab seismicity and Episodic Tremor and Slip
  - Arc magma composition
  - Total heat production

- What contribute to this along strike variation and how large are these contributions?
  - Overriding plate
  - Downgoing plate



Brudzinski & Allen 2007

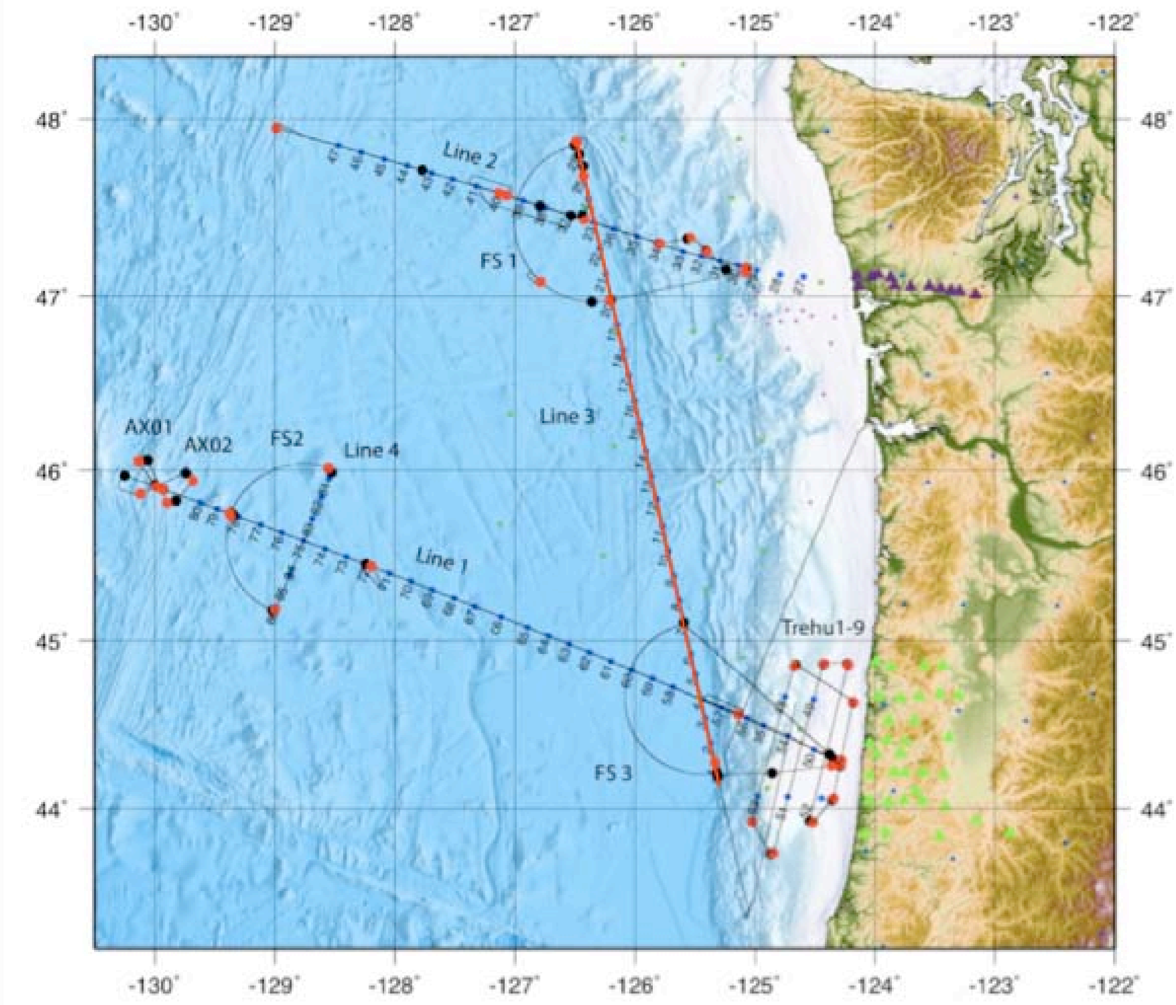
Juan de Fuca Plate



Nedimovic et al 2009

- Remnant of Farallon Plate along with Explorer & Gorda
- Generated at intermediate spreading Juan de Fuca Ridge, which consists 7 morphologically distinct segments
- Propagator wakes

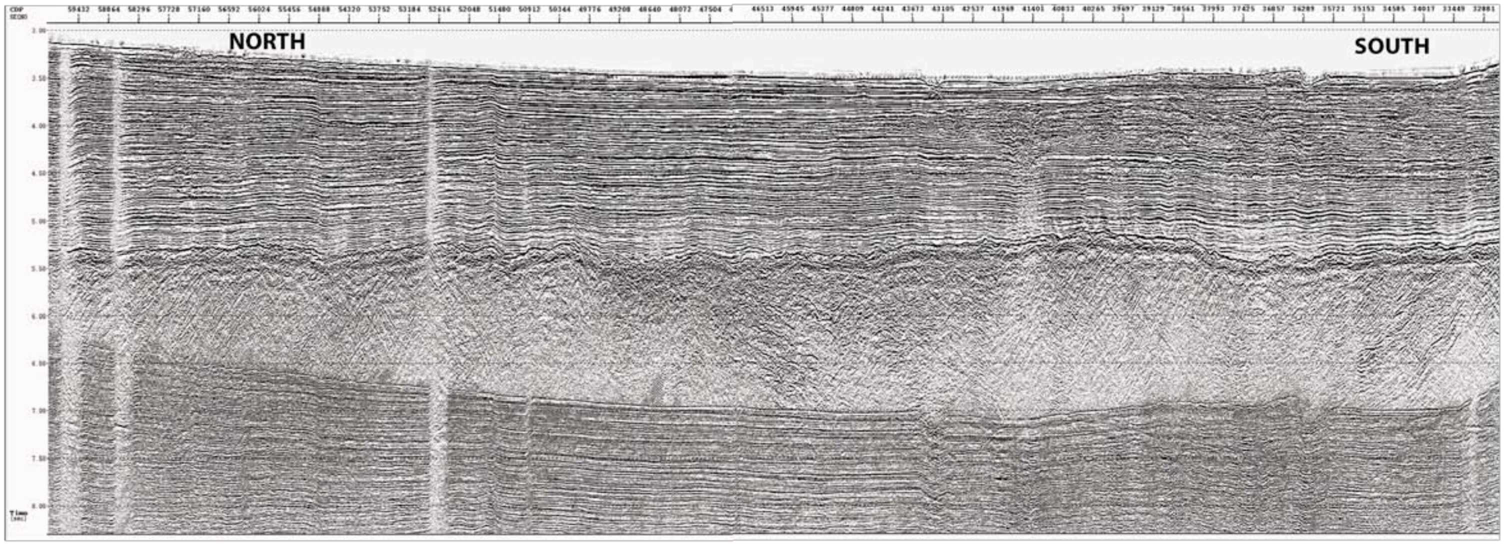
Multichannel Seismic Survey MGL1211



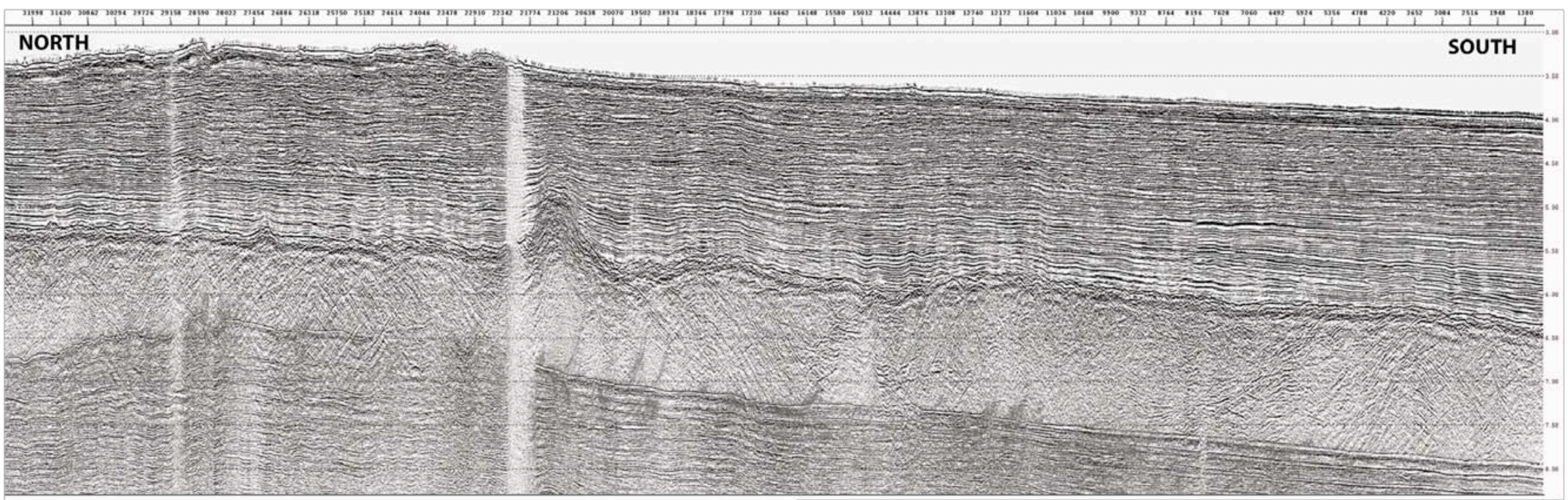
- Cascadia Ridge-to-Trench Experiment
  - June – July 2012
  - aboard R/V Langseth
- Line 3
  - along trench line
  - ~410 km-long
  - ~10 km seaward from Cascadia deformation front

Along Trench Line – Line 3

Offshore Washington

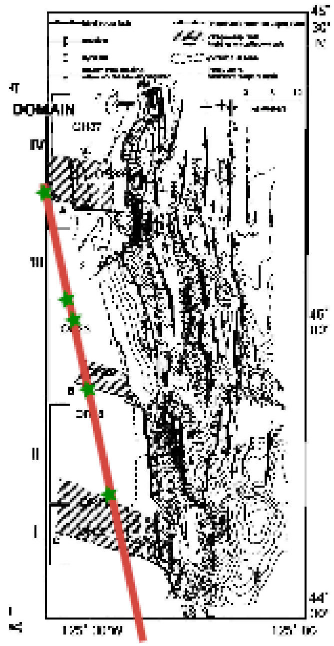


Offshore Oregon

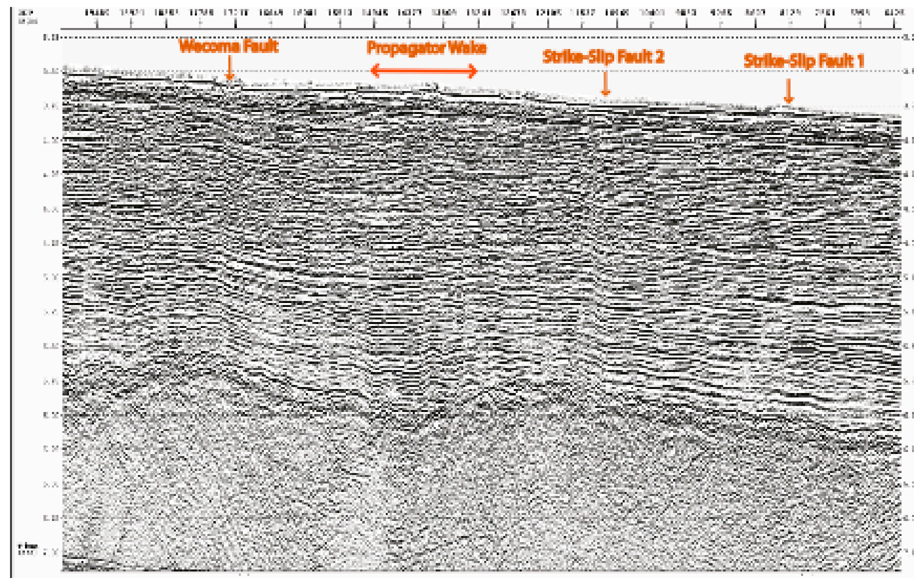


Faults in the Sediments

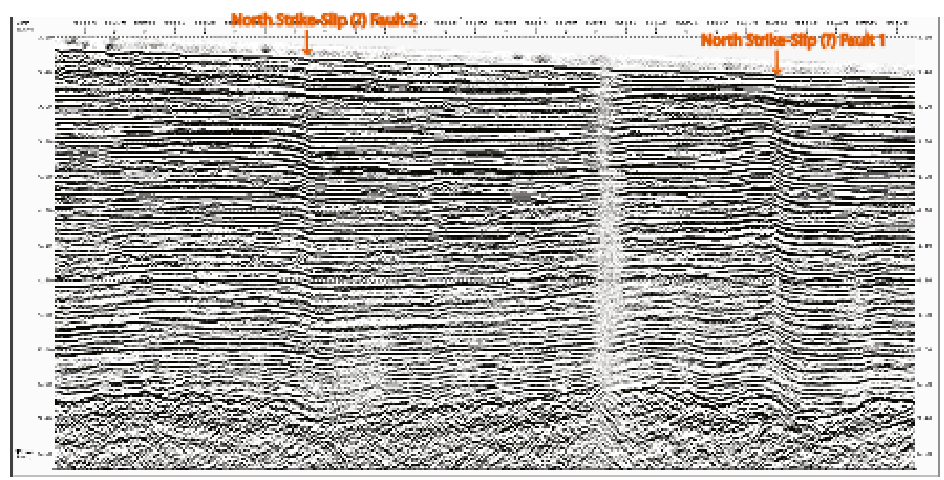
The faults mapped around 45˚N correspond well with previous mapping (e.g. MacKay 1995), indicating these faults extend further seaward.



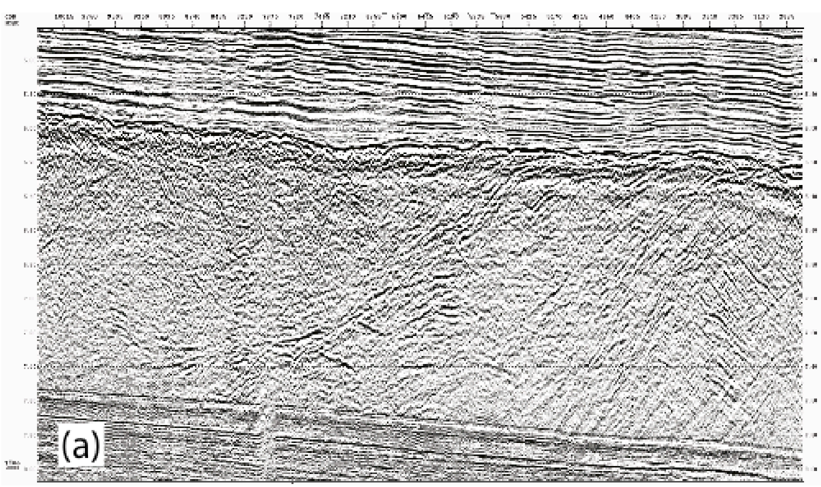
MacKay 1995

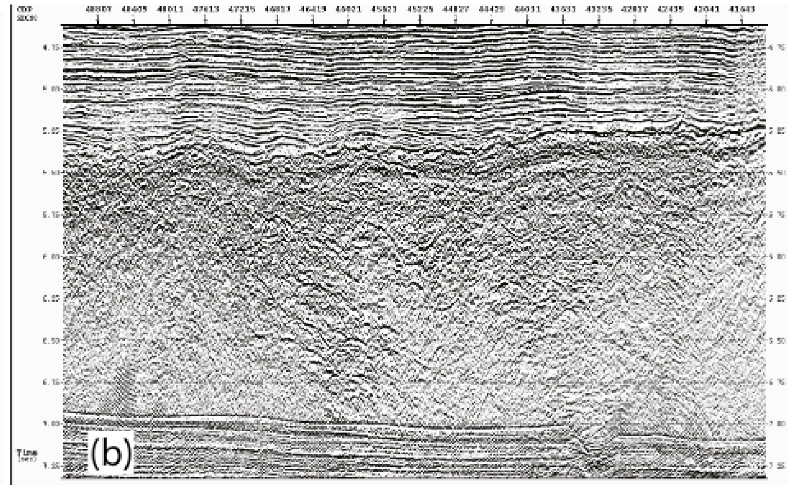


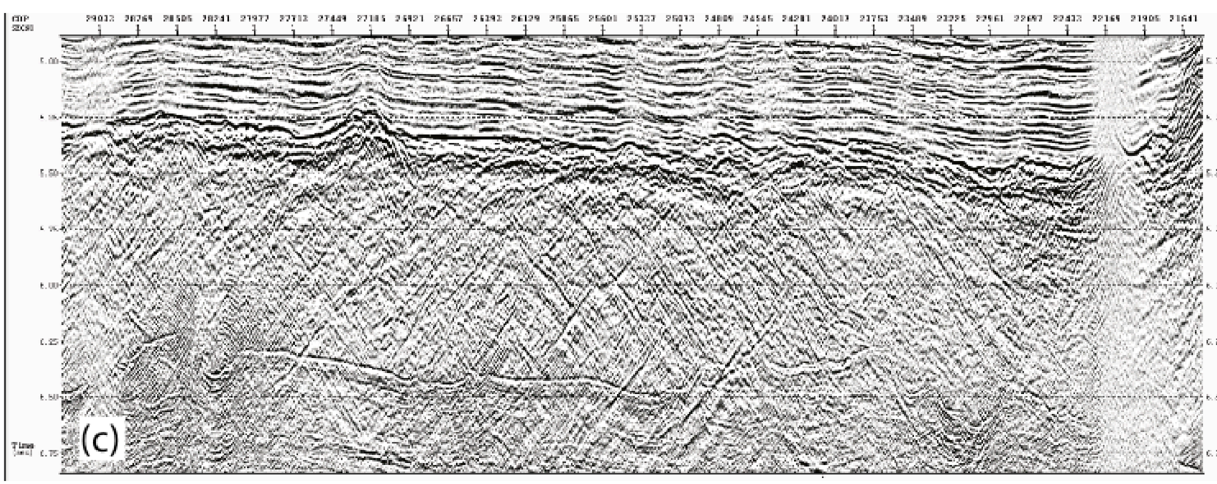
Two faults that cut through the whole sediment section are mapped around 47˚10’N. They might be strike-slip faults based on their similarity to the southern faults , although there are no obvious surficial offset in the seafloor above these faults.



Reflectors in the Oceanic Crust





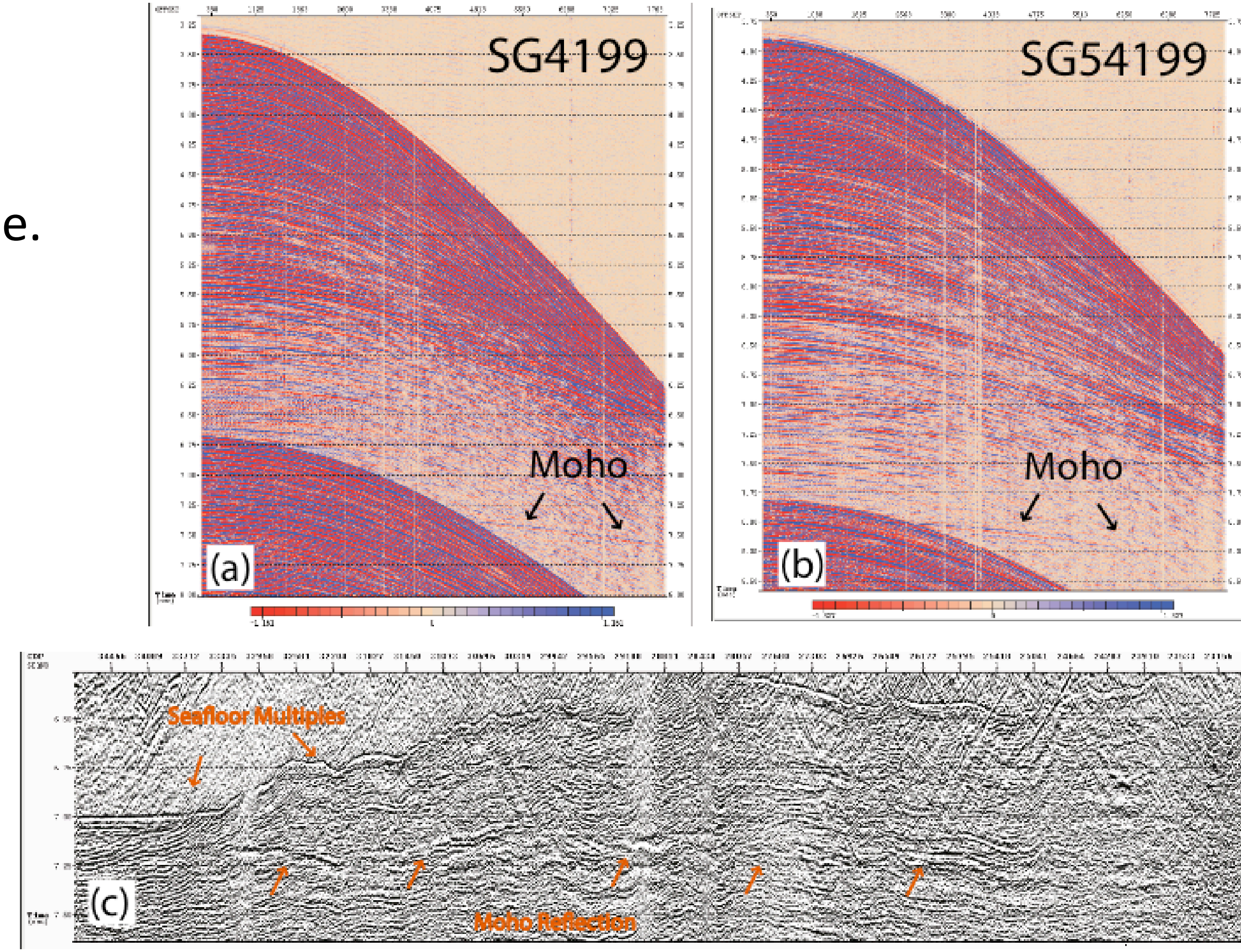


- Both southward and northward, as well as antithetic bright dipping reflectors in the oceanic crust.

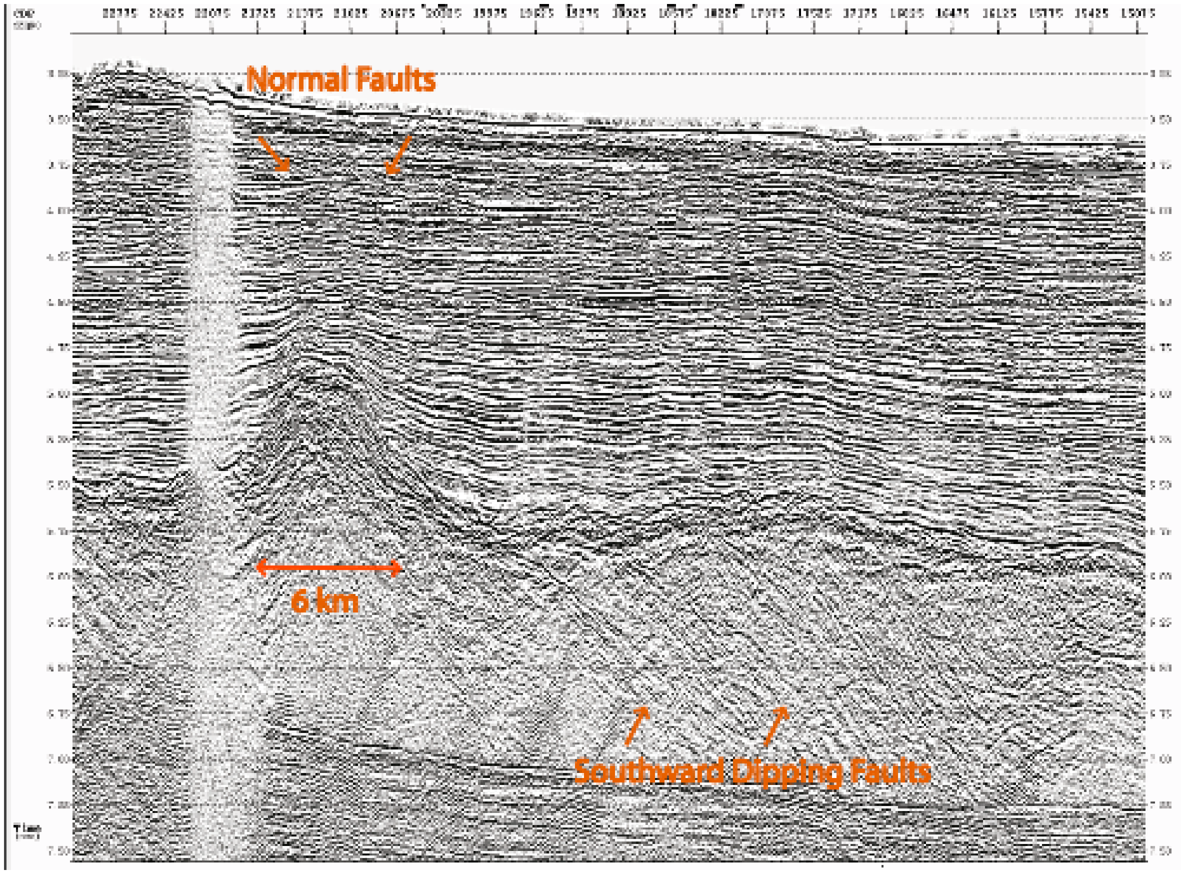
- The dipping direction of these reflectors seems to be correlated with propagator wakes.

Moho

- Moho reflection is beneath the 1st multiple at most places along the line.
- Strong Moho reflection can be seen at the crust away from the two propagator wakes.
- Further processing for multiple attenuation is needed to better reveal Moho.

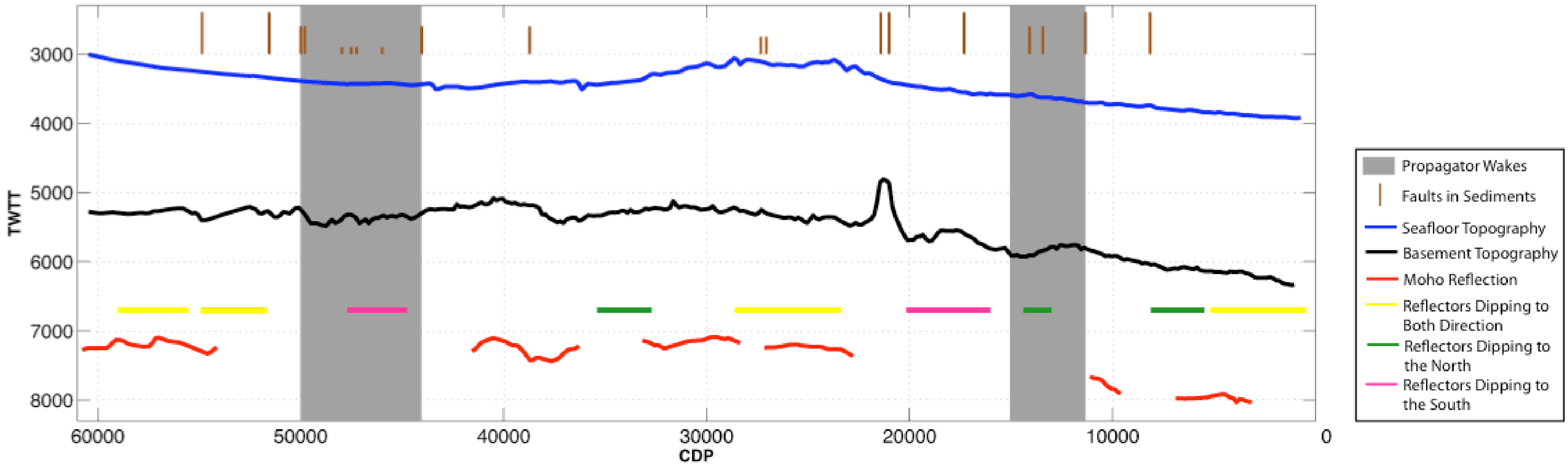


Subducted Seamount



- 45˚26’N
- ~ 6 km wide
- Normal faults in the sediments above the seamount
- Southward dipping reflectors starting from the base of the seamount and extending to deeper crust.

Summary



The preliminary results of a ~370 km-long trench-parallel MCS line ~10 km seaward of the Cascadia deformation front

1. Previously mapped strike-slip faults offshore Oregon and new faults offshore Washington
2. Both southward and northward, as well as antithetic bright dipping reflectors in the oceanic crust. The dipping direction of these reflectors and the strong Moho reflection seems to be correlated with propagator wakes.
3. A 6 km wide subducted seamount at 45˚26'N.

We think the along-trench variation of downgoing plate structure is mainly related to the segmentation of the JdF Plate defined by major propagator wakes.

Poster **T11A-2523**: (**Monday 8-11AM)** Along-trench Structural Variations of Downgoing Juan de Fuca Plate in relation to Regional Scale Segmentation of the Cascadia Subduction Zone: insights from Multichannel Seismic Imaging *Shuoshuo Han; Suzanne M. Carbotte; Juan Pablo Canales; Helene D. Carton; Mladen R. Nedimovic*

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Thanks!