Overview:

- Authors used data gathered by the CASC array to image the detailed structure of the Cascadia subduction zone.
- They observed significant velocity contrasts including one they refer to as the “inverted Moho”
- The authors interpret the inverted Moho to be caused by a high % composition of serpentine in the forearc mantle. Serpentinization is thought to significantly reduce shear wave velocities, to a point lower than the typically low crustal velocities, giving an inverted velocity contrast.

Data:

- Researchers at OSU, as part of IRIS/PASSCAL experiment, installed 40 sensors in 69 (5 km intervals) sites to investigate structure of the Cascadia subduction zone.
  - 1993-1994 operation
  - Recorded high-quality P waveforms from 31 earthquakes

Methods:

- The dense and linear array allowed them to perform formal waveform inversions of scattered waves that arrive after P. Scattered waves are sensitive to discontinuities in shear-wave velocity and density.
- They plotted velocity perturbations and a thermal model of the subduction zone.

Interpretations:

- The authors observed a steep increase in angle of the subduction slab and inferred it to be caused by eclogitization.
- The process of basaltic crust $\rightarrow$ eclogitized crust releases $\text{H}_2\text{O}$ into the forearc wedge, allowing the stabilization of serpentinite.
- At higher quantities of serpentinite, the shear velocity is greatly decreased.
- The thermal model indicates that the forearc wedge is 200º-400º cooler and can support stable serpentinite.
- In the perturbation plot, an inverted Moho is observed in the corner of the forearc wedge. This could be explained by the significant decrease in shear velocity caused by a high % composition of serpentine. The velocity perturbation decreases to the east and eventually reverts to normal polarity ~ -122.3º longitude. This is due to the gradual decrease in hydration and increase in temperature in the mantle wedge moving eastward. Serpentinite will no longer be stable and velocities will increase.
Implications:

- Serpentine and its alteration products are thought to exhibit stable sliding properties and will impede rupture into the forearc mantle
- Mantle flow into the wedge may be modified by the presence of the serpentinized forearc mantle
  - The weak rheology and positive buoyancy will cause isolation from the mantle-wedge corner flow system

Additional Thoughts:

- To what depth is the perturbation plot reliable?
- How different would the velocity contrasts be when plotted with a different scale?
- Are there other possible explanations for such a decreased velocity within the forearc?