EARTHSCOPE SEMINAR
PAPPER SUMMARY
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Paper title: Low-velocity zone atop the 410-km seismic discontinuity in the northwestern United States

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Overview

This paper shows a low–velocity zone (LVZ) on the top of 410 seismic discontinuity by comparing the synthetics from several hybrid velocity models and the observed of the refracted and scatter waveforms in the northwestern United States. The authors interpret the LVZ as a compositional anomaly. The authors infer that LVZ may form by upwelling materials dehydrating at 410 km.

Data

Events used in this study were located offshore of Washington and Oregon and were recorded by the Trinet broadband network and temporary PASSCAL broadband arrays, including XM, XL, and XK arrays.

Methods

- S-wave triplications:

  The authors model the direct S-wave triplications from several hybrid models, including the variations of 410 topography and of the thickness of LVZ. The authors compare the synthetic and recorded data to seek the best-fit velocity model around 410.

- Receiver function:

  The authors also produce a synthetic receiver function and compare it with the results of previous receiver function study in the closest region in order to examine the preferred velocity model.

Results

A low velocity zone exists on the top of 410, with a shear-wave velocity drop of 5% beneath the northwestern United States. The LVZ thickness has rapid lateral variations and varies in thickness from 20 to 90 km.

Implications

- LVZ is a compositional anomaly. LVZ may be due to the dense partial-melt layer.
- A partial melt layer could mean that the Earth's transition zone has high water content.

Additional Thoughts

- A LVZ atop the 410 exists in some regions but may be too thin to be detected.
- Is there a possibility of detecting the LVZ with short-period data?