

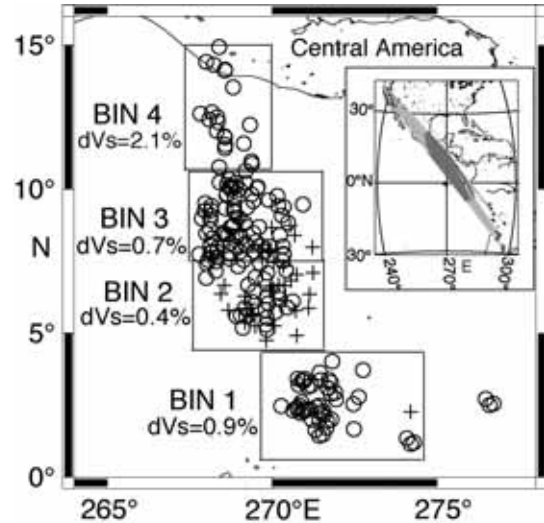
Lateral Variation of the D'' Discontinuity Beneath the COCOS Plate

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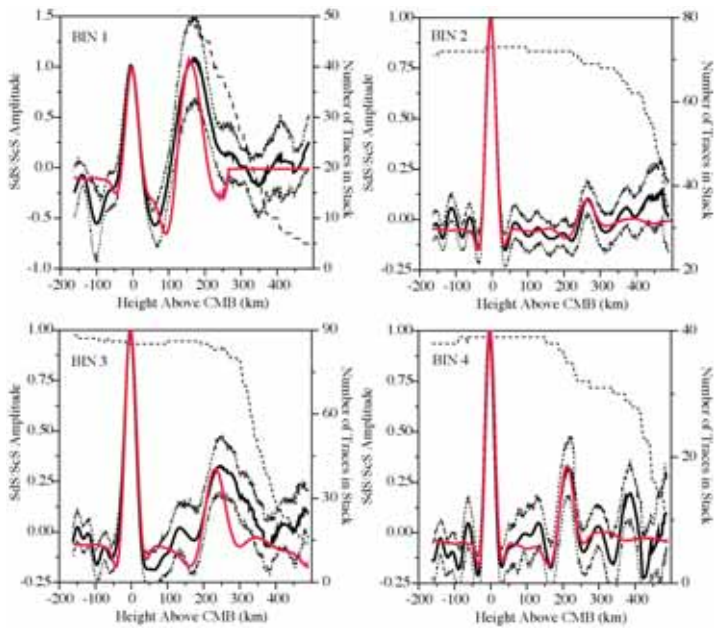
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Broadband shear-wave signals from 15 deep South American earthquakes reveal small-scale variations in the D'' shear-velocity discontinuity beneath the Cocos Plate. The data, from GSN, BDSN and TRInet stations in the western U.S., provide imaging for a preliminary stage of the USArray deployment. This dense distribution of stations is used for double-array stacking procedures, using suites of observations from different sources and receivers that sample common mid-points in spatially localized bins. The data sampling each of 4 bins provide coherent stacks of energy turning at depths above the core-mantle boundary, which is associated with ScS reflections observed in all of the data. When the data are processed using a uniform reference model for stacking, reflections of varying strength are detected at apparent depths that vary by over 100 km. Models that match the amplitudes require lateral variations in the structure above or below the reflector. If all the variations are mapped into the D'' layer, satisfactory models are found for a discontinuity at uniform depth of 264 km above the CMB, with laterally varying velocities of 0.9% to 2.6% within D''. This set of models matches all of the data except in the southernmost region, where differential times suggest a somewhat deeper discontinuity (by 50 to 100 km), with some velocity decrease above the D'' region.



Map indicating the raypath configuration and fine scale bins used for double-array stacking of the recordings in the western U.S. for South American earthquakes. The average velocity anomaly for each bin inferred from ScS travel time anomalies is shown.



Double array stacks of energy relative to ScS (imaged at the core-mantle boundary) as a function of depth relative to the CMB, for each of the 4 bins (dark solid lines, with bootstrap variances in dotted curves). The number of traces contributing to the stack at each depth is shown in dashed lines. The red lines are stacks of synthetics for a uniform discontinuity depth 264 km above the CMB, with laterally varying velocity in the D'' layer.

Lay, T., Edward J. Garnero, S. A. Russell, Lateral variation of the D'' discontinuity beneath the Cocos plate, *Geophys. Res. Lett.*, 31, L15612, doi:10.1029/2004GL020300, 2004.

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