



Observations of D'' reflections in the Pacific using PLUME OBS data

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The seismic investigation of the lowermost mantle is in many places hampered by the lack of suitable source-receiver combinations that sample the D'' region and have to meet the requirements of a narrow epicentral distance range. The low velocity regions beneath the Pacific and Atlantic Oceans in particular have been sampled in fewer places than circum Pacific regions. Here we use data from two recent Ocean Bottom Seismometer (OBS) deployments for the Plume-Lithosphere Undersea Mantle Experiment (PLUME) around Hawaii to increase the coverage of the lower mantle with reflected P waves. Through stacking of the data we achieve significant reduction in noise levels in the data. Using array methods, we test approximately 70 events for arrivals with slowness values and arrival times that would be consistent with a reflection off a possible D'' structure (PdP wave). Since the epicentral distance to detect D'' reflections is around 70 degrees but most of our source-receiver combinations have distances less than that, we find a rather limited number of possible reflections. Nevertheless, modeling these data with a 1D reflectivity method, we are able to identify a few places of detectable PdP waves, for which the velocity contrast in P and S-wave velocity across the D'' reflector have to be relatively large (around 3-5 percent increase and decrease, respectively) compared to other regions (e.g. beneath the Caribbean or Eurasia where the contrast is closer to 1-2 percent). This study shows that it is possible to use relatively short-period waves from OBS experiments with dominant periods as short as 3 to 7 s (as comparison: for land based stations filters around 1-3 s can be used). Our findings suggest that, with future such deployments, we will be able to extend D'' studies to previously unmapped regions.