



Lateral heterogeneity of the upper oceanic crust and sediments

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We present new constraints on the seismic structure of marine sediments and crust surrounding the Hawaiian Islands derived from seafloor compliance measurements. We analyze long-period seismic and pressure data collected during the Plume-Lithosphere Undersea Mantle Experiment [Laske et al, 2009], a deployment consisting of nearly 70 broadband ocean-bottom seismometers with an array aperture of over 1000 kilometers. Our results are supported by previous reflection & refraction studies and by direct sampling of the crust from regional drilling logs. We demonstrate the importance of simultaneously modeling density, compressional velocity, and shear velocity, the former two of which are often ignored during compliance investigations. We also include measurements of Ps converted phases originating at the bedrock-sediment interface to further constrain sedimentary structure. We find significant variations in sedimentary thickness and shear velocity across the array. We also find lateral variations in the seismic velocities and Poisson's ratio of Layer 2A. These changes may reflect crustal formation processes or may be the result of secondary alteration. Improved resolution of near-surface structure of the Hawaiian Swell is crucially important to improve tomographic images of the underlying lithosphere and asthenosphere and to address outstanding questions regarding the size, source, and location of the hypothesized mantle plume.