

Abstract

Flat-slab subduction, a unique form of subduction where the downgoing oceanic plate assumes a horizontal or sub horizontal geometry within the upper mantle, is thought to have played an important role in the shut-off of volcanism, and elevated topography, in the Talamanca Cordillera of southeastern Costa Rica. While this process is commonly associated with the migration of deformation inboard from the plate margin and the shut-off of the volcanic arc, the driving mechanisms behind flat-slab subduction are still poorly understood. Proposed controls on low-angle subduction include a thickened oceanic crust, young slab ages, high convergence rates, and increased crustal hydration. Flat-slab subduction in southeastern Costa Rica provides insight into these mechanisms and how they affect lithospheric deformation.

We use ambient noise tomography to calculate a shear velocity model for Costa Rica to assess how flat slab subduction is initiated and maintained. We specifically address how hydration and subsequent dehydration of the subducting slab can affect oceanic plate buoyancy and control slab geometry and volatile release. Initial results show high velocities interpreted as the downgoing Cocos slab throughout Costa Rica that shallow where flat-slab subduction is inferred. We also image high velocity zones underneath the backarc and estimate crustal thicknesses of ~30 km beneath the region. Further analysis will include incorporating sediment thickness and Moho depth from P-wave receiver function analysis to aid in determining the location and quantity of water within the crust, and examining the effects of the Cocos-Nazca spreading center on flat-slab subduction geometry.