

UC **SANTA BARBARA**
Department of Earth Science

Speakers Club

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Volcano Variety: Understanding Arcs with Multi-Scale Seismic Imaging

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While evidence for variety in volcano structure and eruptive styles abounds at the earth's surface, magmatic architectures at volcanoes tens of kilometers beneath the earth's surface and the ultimate causes of such variety remain enigmatic. At individual volcanoes, magmatic structures in the mid- to lower-crust have typically been difficult to geophysically or petrologically constrain. New results at two volcanoes in the Aleutian island arc - Akutan and Cleveland, which despite being only ~ 300 km from each other have different recent eruptive histories - reveal seismically low-velocity regions in the mid- to lower-crust, likely caused by a region of partial melt. However, the spatial and vertical extents of these low velocity zones beneath the two volcanoes vary substantially implying differing magmatic architectures. The causes are still unknown, although the depth to the top of the subducting crust varies by nearly 20 km perhaps implying different structures in the downgoing lithosphere beneath these volcanoes. The seismic structure of the downgoing Pacific plate in this region of the Aleutians is relatively poorly constrained at the scale of arc-volcano spacing. Instead we investigate the Cascadia subduction zone, where the recent onshore-offshore Cascadia Initiative seismic experiment has allowed seismic imaging at these scales. Prior to subduction, the oceanic plate deviates from simple thermal cooling models with along-strike variation observed at scales similar to variation in arc properties, suggesting that there may be more heterogeneity in oceanic lithosphere than previously thought. This represents an important consideration for understanding many tectonic phenomenon, including the input to volcanic arc systems, and demonstrates the need for future experiments both focused on understanding the role of structures in the subducting plate in conjunction with detailed imaging of individual volcanoes.