UC **SANTA BARBARA**

Department of Earth Science

Speakers Club

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Variable, ultra-enriched $^{87}Sr/^{86}Sr$ in Samoan OIB-hosted plagioclase

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Nearly the entire terrestrial mantle is inaccessible, so its composition must be studied using indirect methods (e.g., geochemical measurements of mantle-derived rocks). Geochemists have long recognized that ocean island basalts (OIB) erupted at different oceanic hotspot localities can host unique radiogenic isotopic signatures. Such signatures have been interpreted to reflect the presence of distinct compositional domains in the Earth's mantle. Many prior geochemical studies of OIB have implemented whole-rock isotopic measurements; although such measurements provide valuable information about the mantle sources of OIB, whole-rock techniques homogenize potential isotopic heterogeneity hosted between different mineral phases or within individual minerals. Crystal-scale isotopic analyses thus have the potential to reveal information that would otherwise be lost during sample homogenization.

Here, I will present $^{87}Sr/^{86}Sr$ and trace-element measurements of compositional zones in Samoan OIB-hosted plagioclase collected by laser-ablation split-stream ICP-MS. I will focus on two salient findings: first, some of the plagioclase crystals we measured host significant (>4,000 ppm) ranges in $^{87}Sr/^{86}Sr$, perhaps the result of magma mixing processes. Second, the Sr isotopic and trace-element signatures of the plagioclase crystals we targeted trend towards an ultra-enriched common component marked by higher $^{87}Sr/^{86}Sr$ than any whole rock or mineral phase measured in OIB to date. We suggest that in situ studies of plagioclase in OIB can shed new light on magma chamber processes, and on the mantle sources of OIB.

The geochemical evolution of a Samoan shield volcano:

evidence from a 645 meter drill core from Tutuila, American Samoa

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The modern model for the evolution of ocean island volcanism is based largely on observations made at the Hawaiian volcanoes. However, the applicability of this model to other oceanic hotspots remains uncertain. Testing this model at other hotspots is challenging due to the inherent sampling difficulties associated with ocean islands. In 2015 a geothermal exploration well was drilled on the island of Tutuila, American Samoa, subsequently sampled, and geochemically characterized. This sample suite provides a complete ~645 m of volcanic stratigraphy from a Samoan volcano and offers a rare opportunity to test the Hawaiian shield volcano evolution model. Within the lavas of the Tutuila drill core we observe the transitions from shield to late shield volcanism followed by ~1.1 Ma of quiescence and the initiation of rejuvenated volcanism at ~24 ka. While the broad stages of Samoan volcanism generally correspond with those predicted by the Hawaiian model, the geochemistry of the Tutuila lavas is more variable and the geochemical evolution more complex than what has been observed at Hawaiian volcanoes. Notably, the Samoan rejuvenated lavas have enriched isotopic compositions distinct from the shield stage lavas. These rejuvenated lavas are isotopically similar to lavas observed at a several seamounts and ocean islands unrelated to mantle plumes. The geochemical similarities of these lavas suggest the possibility of a wide spread enriched component in the upper mantle.