UC **SANTA BARBARA**

Department of Earth Science

Speakers Club

WEBB 1100 • THURSDAY April 25th. • 2:00 PM

Identification of two geochemically-distinct high-$^3He/^4He$ components at the Iceland hotspots: Constraining the composition of the high-$^3He/^4He$ mantle domain.

Lori Willhite
Department of Earth Science
UC Santa Barbara

The Icelandic mantle plume has erupted the highest $^3He/^4He$ ratios of any known hotspot over a period spanning from the early Cenozoic (Stuart et al., 2003) to the mid-Miocene in northwest Iceland (Hilton et al., 1999; Mundl et al., 2017), and lavas in Iceland's neovolcanic zone continue to erupt with $^3He/^4He$ as high as 34.3 Ra (Macphrson et al., 2005). The earliest erupted lavas, on Baffin Island, Canada, are geochemically important because they host the highest observed terrestrial-mantle-derived $^3He/^4He$ (Stuart et al., 2003; Starkey et al., 2009). Baffin Island lavas transited through, and assimilated variable degrees of, Precambrian continental basement, thereby potentially obscuring the primary mantle signature carried by these key lavas. We use trace element ratios sensitive to continental crust assimilation—e.g., Nb/Th, Ce/Pb—to identify the least crustally-contaminated lavas in the suite. The compositions of these lavas provide the best information about the early Iceland high-$^3He/^4He$ plume source. To evaluate whether the high-$^3He/^4He$ domain in the plume exhibits a continuous composition over time, the isotopic compositions of the least contaminated Baffin Island lavas are compared to mid-Miocene and neovolcanic lavas from Iceland. Lithophile radiogenic isotopes in the least contaminated Baffin Island lavas indicate that the $^3He/^4He$ component in the early Iceland plume is compositionally distinct from the mid- to late-Miocene high-$^3He/^4He$ Icelandic lavas. Isotopic heterogeneity among high-$^3He/^4He$ localities has been previously observed; this study, however, is the first to identify geochemically distinct high-3He/4He components within one hotspot through time.

Relative sea-level record on Joinville Island, Antarctica

Julie Zurbuchen
Department of Earth Science
UC Santa Barbara

Our understanding of the response of the Antarctic Ice Sheet to past climate changes is limited by the scarcity of paleoenvironmental records. One of these critical needs are better sea-level records for constraining glacial-isostatic adjustment (GIA) models. Here, a new, and arguably the best-dated, RSL curve for Antarctica is presented based on beach ridges from Joinville Island on the Antarctic Peninsula. We find that sea level has fallen ~5 m over the last 3100 years, with a significant increase in the rate of RSL fall from 1320 ± 125 to 1540 ± 125 cal yr BP. This increase in the rate of RSL fall is likely due to the viscoelastic response of the solid Earth to terrestrial ice mass loss from the Antarctic Peninsula, similar to the Earth response experienced after ice mass loss following acceleration of glaciers behind the collapsed Larsen B ice shelf in 2002. Additionally, slower rates of beach-ridge progradation from 695 ± 190 to 235 ± 175 cal yr BP, were potentially caused by a glacial advance during the Little Ice Age. This rapid response of the Earth recorded in the sea-level record further supports recent assertions of a more responsive Earth to glacial unloading than currently assumed and the need to use a lower upper mantle viscosity in GIA models for the Antarctic Peninsula. Thus, currently used GIA models may not accurately capture the ice mass changes of the Antarctic ice sheets at Holocene time scales.