Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.22521

Magmatic Sources and Processes in Southwest Utah across the Basin and Range/Colorado Plateau Transition Zone

ZHIQING SU[1], ELISABETH WIDOM[2], DAVID KUENTZ[1], MARIA CLARA MURTA[3] AND GREG A. VALENTINE[3]

[1]Miami University
[2]Department of Geology and Environmental Earth Science, Miami University
[3]University at Buffalo
Presenting Author: SUZ19@miamioh.edu

The southwest Utah Volcanic Field, situated in the southwest United States, is located at the transition between the Basin and Range and the Colorado Plateau. We have collected a suite of lavas and tephra from young, mafic eruptive centers in the southwest Utah volcanic field to better constrain the nature of the mantle source(s), the petrogenetic processes associated with magma evolution, and the link to eruptive styles across this major tectonic transition zone.

So far, we have obtained major and trace element and Sr, Nd, Hf, and Pb isotopic data for a suite of lava samples representing eruptive centers that span much of the inferred transition zone from the Basin and Range to the Colorado Plateau. The samples range from basalt to trachyandesite, and major elements variations are consistent with variable degrees of fractionation of similar parental melts, although a range in La/Yb may reflect variable degrees of partial melting. Variations in Sr-Nd-Pb-Hf isotopic ratios, and a lack of correlation with MgO or crustal tracers (e.g., Nb/U or Ce/Pb), suggests that the magmas may be generated from a heterogeneous mantle source with a minimal role for crustal assimilation. Preliminary isotopic data for Santa Clara and Diamond, which erupted closely in space (2 km) and time (~30 ka), and Volcano Mountain (~28 km away, ~0.258-0.353 Ma) suggests that mantle heterogeneity occurs over a range of spatial and temporal scales.

Intermediate Ta/Th values (0.2-0.6) in all high MgO samples (>8%), low $^{143}Nd/^{144}Nd$, and positive $D\varepsilon_{Hf}$ suggest that the magmas are all derived from a lithospheric mantle source [1,2], although melting may occur at depths below the lithosphere as a result of local lithospheric mantle remobilization [2]. Although the samples span the transition zone from the Basin and Range to the Colorado Plateau, there is no clear correlation between source composition and longitude. Further study from additional samples will be crucial to more thoroughly evaluate variations in mantle sources with time and space, potential magma-crust interactions, and links to eruptive styles.

[1] Farmer et al. (2020), *Geochemistry, Geophysics, Geosystems* 21(5), e2019GC008499.

[2] Reid et al., (2012), *Geology* 40(5), 387–390.