

Neogene magmatism and coeval crustal extension in Death Valley, CA, Part 2: Geochemistry of the Shoshone Pluton

CALZIA J. P¹* AND RÄMÖ O. T²

¹U.S. Geological Survey, 345 Middlefield Rd, Menlo Park, CA 94025 (*correspondence: jcalzia@usgs.gov)

²Geosciences, University of Helsinki, PO Box 64, FI-00014, Finland

The 9.76Ma Shoshone Pluton intrudes the 9.74Ma Shoshone Volcanics at the southern end of the Greenwater Range. The Shoshone pluton consists of monzogranite (MG) and cogenetic monzodiorite (MD). MG is subalkalic, straddles the metaluminous-peraluminous boundary, and is strongly enriched in LREE (chondrite normalized La/Yb=15.9±6.1). REE patterns are characterized by subtle negative Eu anomalies and almost flat HREE. The MD includes Ne-normative monzodiorite, quartz monzodiorite, and monzogranite. Although most MD samples are subalkaline, Ne-normative MDs are alkaline. A/CNK ratios vary from 0.77 to 1, normalized La/Yb average 16.3±0.3, and REE patterns are characterized by flat to negative Eu anomalies.

The Shoshone Volcanics consist of lithic-rich tuff, vitrophyres, and andesite flows. The vitrophyres are high silica (40-55 percent normative Q relative to feldspars) subalkaline rhyolites; A/CNK ratios and REE patterns are similar to MG.

ϵ_{Nd} values and the geochemical data define a mixing line between the Ne-normative MD and MG + vitrophyres. ϵ_{Nd} of the MD range from -2.3 to -6.3 (SiO₂ from 54.9 to 67.2 wt percent, respectively); ϵ_{Nd} of MG range from -6.6 to -7.2 (SiO₂ from 70.5 to 72.3 wt percent). Initial Sr isotopic ratios vary from 0.7072 to 0.7082 and 0.7080 to 0.7095 for Si-poor to Si-rich MD and MG, respectively. Comparison of these data with regional geochemical and isotopic data suggest that MD and MG magmas were derived from heterogeneous lower crust and subcontinental mantle source rocks during Neogene extension of the Greenwater Range.