

## Neogene magmatism and coeval crustal extension in Death Valley, CA, Part 1: Geology of the Greenwater Range

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Magmatic rocks in the Greenwater Range vary in age from ~10 to 4 Ma and comprise several cogenetic plutonic-volcanic assemblages. In the southern part of the range, the Shoshone (9.7Ma), Miller Spring (9.5Ma), and Deadman's Pass (10.6Ma) plutons intrude or are overlain by Shoshone Volcanics (9.7-7.8 Ma). Major and trace element geochemistry as well as Nd and Sr isotopes indicate that the plutons are cogenetic with the volcanic section (Calzia and Rämö, this session). These rocks defined a negative isostatic gravity anomaly suggesting that a larger pluton or plutonic complex resides in the shallow crust, and that the Shoshone, Miller Spring and Deadman's Pass plutons are stocks related to a larger batholith.

In the northern Greenwater Range a bimodal suite (rhyolite-basalt) of the Funeral Formation (4.9-4.0 Ma) forms the second cogenetic suite (Smith *et al* this session). 4.9Ma rhyolite originated by partial melting of Mesozoic crust and may represent the surface expression of shallow granitic pluton. 4.0Ma basalt originated in the asthenosphere and forms a field of monogenetic volcanoes partially surrounding rhyolite exposures. The 8.6-6.7 Ma Greenwater Volcanics comprise a third magmatic assemblage but were not studied for this report.

Crustal extension in the Greenwater Range continued from ca 10 Ma to pre- or early-Greenwater Volcanics time. The Shoshone Volcanics are cut by numerous listric normal faults and are unconformably overlain by the 8.6-7.9 Ma dacite of Brown's Peak. The dacite as well as the Greenwater and Funeral Volcanics are tilted to the east (dips decrease upsection) and cut by high-angle normal faults, but are not nearly as extended as older magmatic rocks in the Greenwater Range.