

New insight into the timing of volcanism at Salton Buttes, California from $^{40}\text{Ar}/^{39}\text{Ar}$ dating and paleomagnetism

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Five Quaternary rhyolite domes lie along the southern margin of the Salton Sea, California. The domes are aligned parallel to the axis of spreading along the boundary between the Pacific and North American plates in the Salton Trough pull apart basin. These volcanic domes are spatially associated with a broad area of high heat flow (tens of kilometers wide) and active geothermal energy production in the Salton Sea Geothermal Field. Magmatic rocks in the Salton Trough are bimodal in composition, including rhyolites and subsurface diabase dikes. Volcanism at the Salton Buttes is characterized by both magmatic and phreatomagmatic activity, where explosive activity preceded an effusive phase in at least two cases.

Given the surface expression of the low profile domes in an area of rapid sedimentation and subsidence ($\sim 0.2\text{-}2$ cm/yr; Schmitt and Hulen 2008; Brothers et al. 2009) and <15 ka U-Th ages for the rims of zircon crystals from two of the domes (Schmitt and Vazquez 2006; Schmitt et al. 2013), the domes are likely all latest Pleistocene to Holocene in age. Here, we add U-Th zircon rim ages for all of the domes and a new $^{40}\text{Ar}/^{39}\text{Ar}$ age for anorthoclase from Obsidian Butte, confirming latest Pleistocene to Holocene eruption ages. Further, by comparing independent paleomagnetic remanent directions from sites drilled in the domes with geomagnetic secular variation, we find that there were at least three distinct eruption periods. These distinct eruption dates are coincident with small variations in glass and whole-rock composition of domes.

Finally, over a longer timespan, volcanism in the Salton Trough apparently is markedly sporadic. The most recent known volcanism (small volume rhyolite domes akin to surface domes discovered by geothermal exploration drilling) occurred >420 ka (now at >1.6 km depth beneath the ground surface, Schmitt and Hulen 2008). We speculate that volcanism is reserved to periods when magma production rate outpaces extension rate.

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