Episodic, post-supereruption resurrection of the Peach Spring magmatic system (western Arizona, USA) over ~2 Ma

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The Silver Creek caldera (southern Black Mountains, western Arizona) is the source of the 18.8 Ma supereruption that produced the Peach Spring Tuff (PST), a ≥700 km^3 ignimbrite that crops out in northwestern Arizona, southern Nevada, and southeastern California [1, 2, 3]. Intruding the caldera's eastern margin is a ~30 km^2 epizonal, intermediate to felsic plutonic complex. The complex reveals a ~2 Ma history of episodic, post-PST magmatic recharge, suggesting that this magmatic system was periodically revitalized long after its colossal eruption.

Indications of magmatic rejuvenation are evident throughout the intrusive complex, which consists of two primary, texturally-diverse units: the coarse-grained Moss porphyry (~62-68 wt. % SiO_2) in the north, and the fine- to coarse-grained, commonly granophyric Times porphyry (>70 wt. % SiO_2) in the south. The Moss displays locally abundant, 2-10 cm rounded enclaves (59 wt. % SiO_2). Near the Moss/Times contact along Silver Creek, a crystal-rich Times matrix consisting of rounded feldspars set in a fine-grained groundmass hosts 0.5-2 m enclaves with intermediate compositions. Rapakivi feldspars appear in both units, and mafic, intermediate, and felsic porphyry dikes crosscut the entire complex.

U-Pb SHRIMP zircon ages and mineral geochemistry support field evidence for magmatic recharge. The Times, the Moss, and a distinctive porphyry similar to the Moss yield zircon age spectra of ~16.8-19 Ma (coeval with nearby volcanics), though PST-age zircons are notably scarce. Probability density analysis indicates two main age peaks at ~17.4 and ~18.2 Ma, with the Moss containing a larger population of older grains than the Times. Moss zircon and sphene record increasing concentrations of Ti and Zr, respectively, from core to rim, consistent with reheating.

A preliminary interpretation of the data is that the Moss was emplaced in the shallow crust at ~18 Ma and substantially reheated and reactivated at ~17.4 Ma, roughly coincident with emplacement of the Times. The wide zircon age spread may reflect other recharging events that are irresolvable via SHRIMP dating. Regardless, the shallow subvolcanic system appears to have been sporadically resurrected over one to two million years following the PST supereruption.

[1] Ferguson et al. (in review) *Geology*. [2] Buesch et al. (1992) *GSA Bulletin* **104**, 1193-1207. [3] Glazner et al. (1986) *Geology* **14,** 840-843.

Lacustrine cave carbonates: novel, absolute-dated paleohydrologic archives in the Bonneville Basin (Utah, USA)

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Records of past changes in closed basin lake levels and lake water isotopic composition provide key insights into past variations in the hydrological cycle; however, these records are often limited by dating precision and temporal resolution. Here we present data from lacustrine cave carbonates, a novel class of carbonates that comprise a promising new archive of past hydrologic changes in the Bonneville Basin of the northeastern Great Basin (U.S.A.). These dense carbonates precipitated within caves, crevices and other protected spaces flooded by Lake Bonneville during its highstand in the last glacial period. We focus on deposits in Cathedral and Craners caves, located ~50 km apart at a similar elevations approximately 100 m above the modern Great Salt Lake and almost 200 m below Lake Bonneville's highstand shoreline. Carbonates from the two caves show similar chronologies, mineralogical transitions, isotopic compositions and trace element concentrations. These findings suggest that lacustrine cave carbonates record changes in lake level and in the isotopic composition and chemistry of lake water. Importantly, the deposits can be precisely dated by U-Th methods, providing the first high-precision, absolute-dated records of Lake Bonneville's water balance changes.

We use dates for the onset and cessation of lacustrine cave carbonate deposition to offer new constraints on past changes in lake level and the carbonate saturation state of lake water. We also present precisely dated, high-resolution oxygen and uranium isotope records from the deposits. Within a first phase of deposition reflecting the lake's transgression between 26 and 18 ka, our isotopic data suggest a large influx of freshwater during Heinrich Stadial 2. A hiatus in deposition beginning 18.2 ± 0.3 ka may be the result of freshening related to the lake's overflow. Calcite deposition resumes at Cathedral Cave at 16.4 ± 0.2 ka, suggesting that basin overflow had ceased by this time and that the lake re-entered calcite saturation; this interpretation implies that the lake's deglacial regression began well before the Bølling warming. Cessation of this second phase of deposition at 14.7 ± 0.2 ka may reflect the lake's drop below Cathedral Cave's elevation.

We have located similar deposits at over forty locations in the basin spanning almost the entire ~270 m elevation range between the modern Great Salt Lake and the highstand shoreline. We present data from several elevations that offer additional constraints on changes in lake level and lake chemistry during the last glacial period and deglaciation.