The eruptive history and evidence for protracted pluton emplacement associated with the Organ caldera, south-central New Mexico

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Ar/Ar dating of volcanic and plutonic rocks related to the Organ caldera, southcentral New Mexico, indicates that magmatism spanned at least 2 Ma between 36.4 and 34.4 Ma. The volcanic sequence consists of three zoned caldera-forming ignimbrites and small erosional remnants of pre- and postcaldera volcanic rocks. Numerous zoned and nonzoned plutons intruded the intracaldera sequence and are now exposed along the eastern caldera margin. Preliminary results constrain the timing of processes associated with compositionally zoned igneous suites.

Ages of the three caldera-forming ignimbrites provide the timing of peak magmatic activity. The oldest caldera-related ignimbrite is the Cueva Tuff, which erupted at 36.4 Ma. Following this eruption two larger volume ignimbrites, the Tuff of Achenbach Park and Squaw Mountain Tuff, were emplaced at 36.2 and 36.1 Ma, respectively. Numerous small-volume compositionally diverse lavas were erupted between 36.2 and 35.7 Ma. The ages of postcaldera lavas indicate that volcanism occurred immediately after caldera formation and continued for at least 500 ka. Precaldera andesites were dated, but age spectra are discordant and do not provide robust results.

Exposed caldera-related intrusions represent the remnants of the calderaforming magma chamber and the growth of a postcaldera batholith during the waning stages of magmatism. The largest intrusion is the Organ Needle pluton, which is compositionally zoned from a monzodiorite to an alkali feldspar granite (AFG). The AFG was previously interpreted to be nonerupted Squaw Mountain Tuff because of similarities in geochemistry. Biotite cooling ages of the AFG are indistinguishable in age to the Squaw Mountain Tuff, supporting that the two units are coeval intrusive/extrusive pairs. Thermally reset biotite from a Precambrian granite adjacent to the Organ Needle pluton yielded an age 36.1 Ma, which also supports that the Organ Needle pluton is related to the differentiation and eruption of the Squaw Mountain Tuff. Using biotite Ar/Ar ages, the younger postcaldera plutons were emplaced between 35.4 to 34.6 Ma. None of the exposed plutons are interpreted to be nonerupted remnants of the Cueva Tuff or Tuff of Achenbach Park. Pluton emplacement ages will be further evaluated using laser-ablation U-Pb dating of zircon.

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