The Lifecycle of the Oligocene Schoolhouse Mountain Caldera, Southwest New Mexico

Vanessa M Swenton¹, Jeffrey Amato¹ and William McIntosh²

¹New Mexico State University, Las Cruces, NM, 88003, vswenton@nmsu.edu
²New Mexico Institute of Mining and Technology, Socorro, NM, 87801

The Oligocene Schoolhouse Mountain Caldera (SMC) in the southernmost Mogollon-Datil volcanic field exposes pre-caldera dacite flows, collapse megabreccias, and a series of mostly undated rhyolite tuffs. The pre-, syn-, and post-caldera volcanic units are preserved within normal-fault blocks, making the SMC an excellent site for a combined field-mapping, geochronology, and geochemistry case study of the lifecycle of a caldera. All thickness estimates are from Finnell (1987). Dacite lava flows are the oldest caldera unit in the area, and these are overlain by rhyolite flows of Saddlerock Canyon, which measure up to 125 m thick. The next unit may represent the collapse of the caldera, which produced the tuffs, flows, and megabreccias of the Kerr Canyon sequence. The megabreccia is up to 220 m thick between Schoolhouse Mountain and Saddle Rock Canyon, and consists of a lithic-rich, highly altered, rhyolitic matrix containing ash, quartz, biotite, sanidine, and plagioclase. Matrix material is stained orange-brown and pale green in areas of great weathering, most significantly in samples with abundant biotite and pumice. Clasts within the matrix consist of rhyolite, flow-banded rhyolite, and pumice ranging in size from 2 cm to ~ 2.5 m. Other clasts are Cretaceous quartzarenite and Proterozoic granite. The largest clasts are composed of crystal-rich rhyolite, containing sanidine, biotite, plagioclase, and quartz phenocrysts that are ≤ 2 mm in size and minimally altered, which is ideal for argon dating. The next unit is the Mangas Creek, largely composed of intermediate to felsic tuffs, and the regionally significant McCauley Ranch Tuff. Individual flows of Mangas Creek measure up to 300 m thick, and the McCauley Ranch Tuff is exposed up to ~ 343 m thick. The Cherokee Canyon Tuff and Greenwood Canyon Tuff are the youngest units postulated to be associated with the SMC. Outflow sheets are located ~ 20 km south of the SMC in the Eye Peak and Knight’s Peak regions. These may have been derived from the SMC or from a caldera in the Boot Heel volcanic field. The Kneeling Nun Tuff is interbedded with these tuffs. Results from high-precision, single-crystal 40Ar/39Ar dating on all of the tuffs and on the megabreccia will provide a more precise timeline for the history of this caldera. Dating of sanidine phenocrysts from the large, crystal-rich clasts in the megabreccia can constrain a time window for the possible age of the collapse breccia, which is a critical stage in the volcanic history of the SMC. The entire caldera history is postulated to have occurred within 2-3 million years based on existing geochronology (Jonell, 2012) and regional relationships.

References:


2016 New Mexico Geological Society Annual Spring Meeting
April 8, 2016, Macey Center, New Mexico Tech campus, Socorro, NM