115-9 - EFFECTS OF A CALDERA-FORMING ERUPTION ON THE CONDITIONS OF MAGMA STORAGE: POCO CANYON CALDERA SYSTEM, NEVADA

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Abstract

Large volume eruptions undoubtedly affect conditions within the un-erupted portion of a magma reservoir. One potential scenario is that significant volumes of melt remain in an eruptible state in shallow intrusive reservoirs after eruption, leaving the system primed for additional volcanic activity. Alternatively, the remaining magma will not be eruptible without remobilization through magma recharge. To test these hypotheses, we present results of high-precision geochronology, and geothermometry and hygrometry calculations from the Oligocene Poco Canyon Caldera system and the associated Freeman Creek pluton in the Stillwater Range, central Nevada. This system is ideal for understanding magmatic evolution in response to an eruption as it is exposed in a tilted upper crustal section (maximum 10 km paleodepth; John 1995) such that coeval, and likely cogenetic, intrusive and extrusive magmatic products can be readily compared.

Our field observations suggest the following series of magmatic events: 1) eruption of the rhyolitic Tuff of Poco Canyon (~360 km^3 erupted) that generated the Poco Canyon caldera, 2) at least two successive silicic injections into a caldera margin dike (~0.5 by 6 km), and 3) intrusions at the shallowest levels of the granitic Freeman Creek pluton, which is thought to represent a section of the shallow magma storage system that produced the caldera forming eruption (John 1995; Colgan et al, 2013). New CA-ID-TIMS U-Pb zircon geochronology indicate that all of these units intruded or erupted at ~25.3 Ma, with the minimal intra- and inter-sample age dispersion seen indicating that magmatic activity persisted over timescales on the order of 10s of ka. Mineral grains within each eruptive and intrusive unit record a snapshot in the evolution of the magma storage system, allowing us to assess changes to the thermal state (thermometry) and volatile content (hygrometry) of magmas over a brief period of time between eruption and subsequent emplacement of the dike and pluton. We test hypotheses about the necessity of thermal rejuvenation in mobilizing magmas to produce multiple giant eruptions over a relatively short period (10s to 100s of kyr).

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