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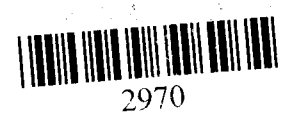
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①
⁴⁰Ar/³⁹Ar dating of the Bandelier Tuff and San Diego Canyon ignimbrites, Jemez Mountains, New Mexico: temporal constraints on magmatic evolution

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Abstract

Spell, T.L., Harrison, T.M. and Wolff, J.A., 1990. ⁴⁰Ar/³⁹Ar dating of the Bandelier Tuff and San Diego Canyon ignimbrites, Jemez Mountains, New Mexico: temporal constraints on magmatic evolution. *J. Volcanol. Geotherm. Res.*, 43: 175-193.

The Jemez Mountains volcanic field (JMVF), located in north-central New Mexico, has been a site of basaltic to rhyolitic volcanism since the mid-Miocene with major caldera forming eruptions occurring in the Pleistocene. Eruption of the upper Bandelier Tuff (UBT) is associated with collapse of the Valles Caldera, whereas eruption of the lower Bandelier Tuff (LBT) resulted in formation of the Toledo Caldera. These events were previously dated by K-Ar at 1.12 ± 0.03 Ma and 1.45 ± 0.06 Ma, respectively. Pre-Bandelier explosive eruptions produced the San Diego Canyon (SDC) ignimbrites. SDC ignimbrite "B" has been dated at 2.84 ± 0.07 Ma, whereas SDC ignimbrite "A", which underlies "B", has been dated at 3.64 ± 1.64 Ma. Both of these dates are based on single K-Ar analyses.

⁴⁰Ar/³⁹Ar dating of single sanidine crystals from these units indicates revision of the previously reported dates. Isochron analysis of 26 crystals from the UBT gives a common trapped ⁴⁰Ar/³⁶Ar component of 304.5, indicating the presence of excess ⁴⁰Ar in this unit, and defines an age of 1.14 ± 0.02 Ma. Isochron analysis of 26 crystals from the LBT indicates an atmospheric trapped component and an age of 1.51 ± 0.03 Ma. An age of 1.78 ± 0.04 Ma, based on the weighted mean of 5 individual analyses, is indicated for SDC ignimbrite "B", whereas 3 analyses from SDC ignimbrite "A" give a weighted mean age of 1.78 ± 0.07 Ma. Evidence for xenocrystic contamination in the SDC ignimbrites comes from analyses of a correlative air-fall pumice unit in the Puye Formation alluvial fan giving ages of 1.75 ± 0.08 and 3.50 ± 0.09 Ma. The presence of xenocrysts in bulk separates used for the original K-Ar analyses could account for the significantly older ages reported.

Geochemical data indicate that SDC ignimbrites are early eruptions from the magma chamber which evolved to produce the LBT, as compositions of SDC ignimbrite "B" are virtually identical to least evolved LBT samples. Differentiation during the 270-ka interval between eruption of SDC ignimbrite "B" and the LBT produced an array of high-silica rhyolite compositions which were erupted to form the LBT. Mixed pumices associated with eruption of the LBT indicated an influx of more mafic magma into the system which produced shifts in some incompatible trace-element ratios. Lavas and tephros of the Cerro Toledo Rhyolite record the geochemical evolution of the Bandelier magma system during the 370-ka interval between eruption of the LBT and the UBT.

The combined geochronologic and geochemical data place the establishment and evolution of the

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