Compositional Evolution of the Long-Lived Craters of the Moon Magmatic System, Idaho, U.S.

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The Craters of the Moon volcanic field in southern Idaho, U.S. has produced at least 60 basaltic lava flows over the past 15,000 years, with a total erupted area of about 1600 km^2 and volume of lavas and pyroclastic deposits of 30 km^3 [1,2]. This volcanism is part of the larger region of Snake River Plain basaltic volcanism that developed in the wake of the Yellowstone hotspot.

Craters of the Moon lava compositions are largely alkalic, ranging from basalts to trachytes [2], in contrast to the mostly monogenetic volcanism with tholeiitic compositions erupted elsewhere on the Snake River Plain [1,3,4]. Craters of the Moon volcanism has been divided into eight major eruptive periods, A through H, with the earliest Period H flows erupted 15,000 years ago and the most recent Period A lavas erupted between 2500-2000 years ago [1]. The youngest flows are the most extensively studied and show the most chemical diversity [1,4].

Fractional crystallization and assimilation of shallow crustal rocks have previously been invoked to account for the compositional diversity observed at Craters of the Moon over its history [2,3,4]. However, the Sr-Nd-Pb isotopic record for the system is relatively sparse, and the time scales and relative importance of these and other magmatic processes remain poorly understood. A recent study of the largest Period A flow shows significant intra-flow isotopic variability, reflecting binary mixing of components with differing amounts of crustal assimilation [5]. This investigation is the first comprehensive isotopic analysis of inter- and intra-flow variability for the Craters of the Moon lavas, and reveals the varying roles of crustal assimilation as well as recharge of juvenile magma and magma mixing over the history of the system.

[1] Kuntz *et al*., (1986) *Quatern. Res.,* 25, 163-176; [2] Putirka *et al*., (2009) *Jour. Petrology* 50, 1639-1665; [3] Leeman *et al*., (1976), *Contrib. Min. Pet*. 56, 35-60; [4] Stout *et al*., (1994) *Jour. Petrology*, 35, 1681–1715; [5] Chadwick et al., in review, *Jour. Volcan. Geotherm. Res*.