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Cordilleran Section - 112th Annual Meeting (4th April 2016)

Paper No. 12-3

Presentation Time: 2:10 PM

PETROLOGY AND ORIGIN OF 2.1 KA TRACHYBASALT AT UBEHEBE CRATERS, DEATH VALLEY, CA

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Ubehebe Craters in northern Death Valley, California, include 13 volcanic craters formed by phreatic, phreatomagmatic, and magmatic explosions at ca. 2.1 ka. The age of the basaltic magma involved in the genesis of the craters was determined by the correspondence between recorded remanent magnetic direction and reinterpretation of ^{10}Be age data. The magma contained 48-50 wt. percent SiO_2 , ca. 6 wt. percent total alkalis, abundant normative olivine (ca. 11 percent), and up to 3 percent normative nepheline. We have analyzed four samples of basaltic spatter for whole-rock geochemistry and Nd-Sr isotopes (one sample from Little Hebe crater, three from Ubehebe crater proper). These are trachybasalt with up to ca. 60 percent void space and are characterized by microphenocrysts of plagioclase, olivine, and clinopyroxene in an aphanitic groundmass. The samples also contain some siltstone microxenoliths, obviously derived from the vent region and incorporated into the basaltic magma by phreatomagmatic activity. Upon extrusion, the Ubehebe magma was moderately evolved with Mg numbers of ca. 50 and Ni values of 40-50 ppm. Incompatible trace element values were remarkably high, e.g. 1,000-1,400 ppm F, 1,500-1,600 ppm Sr, 1,300-1,400 ppm Ba, 180-190 ppm Ce, 75-80 ppm Nd, and 380-410 ppm Zr. The $\hat{\mu}_{\text{Nd}}$ and $^{87}\text{Sr}/^{86}\text{Sr}$ values of the analyzed samples vary from -11.1 to -9.6, and 0.7074 to 0.7076, respectively. Depleted mantle model ages for Nd (calculated according to the model of DePaolo, 1981; Nature 291, 193-196) are between 1,140 and 1,230 Ma. Owing to the presumed high content of incompatible trace elements in the primary magma, the Sm-Nd and Rb-Sr isotope systems of the Ubehebe magma were probably effectively buffered against any marked crustal or microxenolithic contamination, save for some local heterogeneity. They thus reveal a Precambrian mantle source in the Mojavia subcontinental lithosphere, characterized by relatively low time-integrated Sm/Nd and Rb/Sr ratios and resultant present-day $\hat{\mu}_{\text{Nd}}$ of ca. -10 and $^{87}\text{Sr}/^{86}\text{Sr}$ of ca. 0.7075.

Session No. 12

[T1. Neotectonics and Magmatism in Death Valley and Southwestern Basin and Range II](#)

Monday, 4 April 2016: 1:30 PM-5:30 PM

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