COSMOGENIC HELIUM IN TERRESTRIAL BASALTS; M. D. Kurz, Woods Hole Oceanographic Institution, Woods Hole, MA 02543

Recent measurements on terrestrial igneous rocks have confirmed the presence of elevated $^3He/^4He$ ratios resulting from cosmogenic helium (1-2). Evidence for this effect comes from vacuum crushing and step-wise heating experiments on mineral separates of samples from Haleakala volcano. Step-wise heating of crushed olivine powder releases $^3He/^4He$ of up to 2600 x atmospheric (i.e. up to 3.6×10^{-3}) which is higher than solar helium. Strong isotopic heterogeneity is observed in the samples because inherited magmatic helium (8 x atmospheric) is present in melt inclusions, and is released by crushing. Available information regarding production rates is consistent with the presence of cosmogenic helium. The samples have been exposed at the surface for at least 500,000 years at an elevation of approximately 3 kilometers. Using available estimates (e.g. 3), the ^3He production rate from spallation is between 630 and 1100 atoms g^{-1} $year^{-1}$, which can readily explain the observed excess ^3He ($\sim 1 \times 10^{-12}$ cc $gram^{-1}$). Revised estimates of the production rate based on the method of Reedy and Arnold (4) will be presented. In an attempt to estimate the attenuation length of the cosmic ray secondaries, measurements have been made on a series of drill cores from Haleakala volcano. Preliminary results indicate an attenuation length of 180-200 g cm^{-2}. Cosmogenic helium can potentially be used to measure exposure ages and erosion rates of terrestrial lavas, and temporal variations in cosmic ray fluxes.

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