Geophysical Research Abstracts, Vol. 9, 04431, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04431

Evaluation of cosmogenic ^{3}He and ^{21}Ne concentrations in an olivine-rich Pleistocene basalt flow, western Grand Canyon National Park, Arizona, USA

C.R. Fenton (1), S. Niedermann (1), M. Goethals (1,2), B. Schneider (3)

(1) GeoForschungsZentrum Potsdam, Germany, (2) Westfälische Wilhelms-Universität Münster, Germany, (3) Vrije Universiteit Amsterdam, The Netherlands

(crfenton@gfz-potsdam.de)

The Bar Ten lava flow is a Pleistocene basalt flow located in the western margin of the Uinkaret Volcanic Field in Grand Canyon National Park (AZ, USA). It was chosen as a calibration site for the production of cosmogenic ^{3}He and ^{21}Ne (^{3}He$_c$ and ^{21}Ne$_c$) to investigate the reliability of different methods of scaling production rates for altitude and latitude. The lava flow erupted between 80 and 140 ka based on a previously reported ^{3}He$_c$ age (88 $\pm$ 6 ka) and a thermoluminescence (TL) age of 108 $\pm$ 29 ka. The presence of excess Ar and abundant glass in this basalt flow made it difficult to obtain a reliable ^{40}Ar/^{39}Ar age; there is one reported age of 190 $\pm$ 390 ka. Now, two samples yield preliminary ^{40}Ar/^{39}Ar ages of 80 $\pm$ 25 and 117 $\pm$ 32 ka. In this study, cosmogenic samples were collected from stable, primary surfaces at elevations from 1180 to 1820 m along a vertical transect between 36.2239 to 36.2417˚ N. He, Ne, and Ar were analyzed by stepwise heating of olivines and ^{3}He$_c$ and ^{21}Ne$_c$ components have been determined. Initial results show that ^{3}He$_c$ in olivine of new samples is higher than ^{3}He$_c$ concentrations in samples from the earlier study. Samples collected in the earlier study may have experienced more erosion. We also evaluated ^{21}Ne$_c$ /^{3}He$_c$ values, hypothesizing that eruption age and erosion should have no effect on the ratio, if ^{3}He$_c$ and ^{21}Ne$_c$ are produced at constant rates relative to each other. ^{21}Ne$_c$ /^{3}He$_c$ varies from 0.17 to 0.31 in these olivine and may be due to differences in mineralogy. Production rates and scaling methods produce cosmogenic ages that are bracketed by the ^{40}Ar/^{39}Ar and TL ages. Samples will be analyzed for chemical composition and evaluated using different scaling factors and production rates.