

Atom Trap Trace Analysis of Cosmogenic ^{39}Ar in Geologic Materials

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We present results from investigations into measurement of cosmogenic production of ^{39}Ar in the mineral phase using Atom Trap Trace Analysis (ATTA). We report on the extraction and analysis of ^{39}Ar from mineral phase, and the comparison of measured and theoretical cosmogenic ^{39}Ar concentration. Methods for the extraction of purified ^{39}Ar from geologic materials including bulk soil, bulk rock and mineral separates are discussed and initial measurements from a sample of geologic materials are presented. Measurements are then compared to theoretical production and age estimated from other means to investigate sample age and/or Ar closure. Our results show that cosmogenic ^{39}Ar from geologic samples can be measured, but calculation of age requires improvement in calculation of production and closure. Until recently, measurement of ^{39}Ar in the mineral phase was not possible due to the large gas requirements for low-level counting. With the recent advent of ATTA measurement of ^{39}Ar , cosmogenic production of ^{39}Ar can be measured in the mineral phase for the first time. Cosmogenic production of ^{39}Ar in the mineral phase could provide a new technique for exposure dating at high temporal resolution, useful for constraining active geomorphic and anthropogenic processes at the Earth's surface with timescales between 100 and 3000 years.