

AGU 2011  
Abstract V51A-2506

Accurate and precise  $^{40}\text{Ar}/^{39}\text{Ar}$  dating by high-resolution, multi-collection, mass spectrometry

Storey, M., Rivera, T.A., Flude, S.

New generation, high resolution, multi-collector noble gas mass spectrometers equipped with ion-counting electron multipliers provide opportunities for improved accuracy and precision in  $^{40}\text{Ar}/^{39}\text{Ar}$  dating.

Here we report analytical protocols and age cross-calibration studies using a NU-Instruments multi-collector Noblesse noble gas mass spectrometer configured with a faraday detector and three ion-counting electron multipliers. The instrument has the capability to measure several noble gas isotopes simultaneously and to change measurement configurations instantaneously by the use of QUAD lenses (zoom optics). The Noblesse offer several advantages over previous generation noble gas mass spectrometers and is particularly suited for single crystal  $^{40}\text{Ar}/^{39}\text{Ar}$  dating because of: (i) improved source sensitivity (ii) ion-counting electron multipliers, which have much lower signal to noise ratios than analog enabling precise measurement of very small  $^{36}\text{Ar}$  signals for accurate correction for atmospheric-derived  $^{40}\text{Ar}$ ; (iii) higher mass resolution allows pseudo resolution of hydrocarbon isobaric interferences from  $^{36}\text{Ar}$  through to  $^{40}\text{Ar}$ ; (iv) multi-collection, allowing more data to be gathered in a fixed time in comparison with single-collector peak-switching measurements; (v) a dedicated detector for radioactive  $^{37}\text{Ar}$ .

Our cross-calibration experiments indicate high-resolution, multi-collector, noble gas mass spectrometers can facilitate an improvement in accuracy and precision of  $^{40}\text{Ar}/^{39}\text{Ar}$  dates compared to previous generation single collector instruments, in ideal cases the ages approaching the  $\pm 0.1\%$  goal of EARTHTIME.