High precision $^{40}Ar/^{39}Ar$ dating of <100 ka basalts using an ARGUSVI multi-collector mass spectrometer

E. MATCHAN[1]* AND D. PHILLIPS[1]

[1]School of Earth Sciences, The Univerity of Melbourne, Parkville, VIC, 3010, Australia
(*correspondence: ematchan@unimelb.edu.au)

Obtaining high precision $^{40}Ar/^{39}Ar$ geochronological data for young basalts, particularly low potassium examples <500 ka old, is a non-trivial task. This is due to low ^{40}Ar radiogenic argon yields, high atmospheric argon levels and, sometimes, extraneous argon contamination. The advent of new generation, high sensitivity, multi-collector mass spectrometers (e.g., ARGUSVI, HELIX) significantly enhances our ability to date young volcanic rocks with extremely high analytical precision (<1%). The ultra-high analytical precision achievable with this instrument has already been illustrated using $^{40}Ar/^{39}Ar$ dating standards [1]. We demonstrated recently that the ARGUSVI multi-collector system achieves an order of magnitude improvement in analytical precision and a concomitant improvement in our ability to detect minor isotopic disturbances in ~285 ka alkali basalts, compared to 'conventional' single-collector mass spectrometry [2].

We will present new ARGUSVI $^{40}Ar/^{39}Ar$ data from laser step-heating analyses on groundmass samples from several <100 ka basalt flows from the Newer Volcanic Province, southeastern Australia. We demonstrate that by using 100 mg aliquots of samples with radiogenic $^{40}Ar^*$ yields of ~5%, it is possible to achieve age precision levels typically better than 10% (2σ) for individual heating steps, leading to overall precision levels of less than a few percent for weighted mean ages calculated from step-heating data across several aliquots. For example, the Tyrendarra flow (Mount Eccles) gives a weighted mean age of 37.6 ± 0.3 ka (0.8%, 95% CI), from step-heating analyses on three aliquots.

[1] Phillips & Matchan(2013). *Geochim. et Cosmochim. Acta* **121**, 229-239. [2] Matchan, & Phillips, *Quat. Geochron.* (accepted).