Ultra-precise $^{40}Ar/^{39}Ar$ geochronology and ^{38}Ar exposure dating on young basalts from the Newer Volcanic Province, Australia

K. F. OOSTINGH[1]*, F. JOURDAN[1], D. PHILLIPS[2] AND E. L. MATCHAN[2]

[1]Curtin University of Technology – West Australian Argon Isotope Facility, Kent Street, Bentley (*correspondence: k.oostingh@postgrad.curtin.edu.au)

[2]University of Melbourne, Parkville, Victoria 3010

New generation multi-collector mass spectrometers such as the ARGUSVI at Curtin University set a new benchmark for ultra-precise $^{40}Ar/^{39}Ar$ geochronology. Published data from the University of Melbourne shows a tenfold increase in analytical precision for dating very young (ka) basalts [1]. Our study reports new age data on very young (<600 ka) basalts from the intraplate Newer Volcanic Province (NVP) in Victoria, Australia. Eruption in the NVP has occurred intermittently from ~5 Ma to Recent, and the Province is still considered active.

Based on new ultra-precise ages obtained from more than 20 of the youngest volcanic centres and associated flows in the NVP, we 1) confirm the significant improvement in precision using the ARGUSVI (e.g. 527.9 ± 2.7 ka vs. 535 ± 27 ka [2] on a VG3600); and 2) show that previous K-Ar ages, reported for young NVP volcanic rocks are unreliable, as these typically suffer from excess $^{40}Ar^*$. For example, we obtained an age of 43.6 ± 1.8 ka for the Tower Hill complex previously dated at ca. 793 ka by the K-Ar technique. Our ages have important implications for the volcanology and archaeological history of the region. Furthermore, our data provides important age constraints for the cosmogenic ^{21}Ne, ^{36}Cl and ^{3}He data generated for lava flow surfaces in the region.

Finally, we have successfully resolved cosmogenic ^{38}Ar from atmospheric background on unirradiated pyroxene, which was not possible to achieve with older generation mass spectrometers. Small analytical errors (~0.5%) generated by step-heating are extremely promising for the development of this technique as a routine tool to date the exposure age of Ca-rich minerals. We will present $^{38}Ar_c$ "cosmochron" analyses on irradiated pyroxene which have the potential to easily bring this technique on par with other cosmogenic techniques.

[1] Matchan & Phillips (2014) *Quat Geochronol* **22**, 57-64 [2] Matchan & Phillips (2011) *Quat Geochronol* **6**, 356-368