Obsidian textures in Ar/Ar dating: Big Obsidian Flow, Newberry, OR

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The ^{40}Ar-^{39}Ar technique has the potential to be the most accurate method of directly dating obsidian, but poses a number of technical problems centered on the incorporation of trapped gases. Trapped (non-radiogenic) argon can be >95% the total gas budget, leading to large $^{40}Ar^*$ corrections. Step-heating of samples 'un-mixes' radiogenic and trapped components and relies on the variable degassing temperatures of different phases. In contrast, glasses are structurally uniform and therefore gases trapped in obsidian glass can be difficult to un-mix. Emplacement processes may fractionate the trapped components (air argon and/or magmatic argon). These features can individually or in concert lead to significant imprecision in age determination [1].

The Big Obsidian Flow (BOF) is well exposed along the southern rim of the Newberry Caldera, covers approximately 3 km^2 and consists of distinct flow lobes. Carbon-14 dating of an underlying ash flow places the age of the BOF at ≤1310 years. We have sampled at the middle and ends of two flow lobes and at the vent, with various textures selected at each site. Each sample was sectioned for two ~ 1x1x0.3 cm chips, adjacent to each other. One chip was irradiated; both un-irradiated and irradiated chips were analysed by CO_2 laser step heating and argon was measured on an ARGUS V multi-collector instrument.

Two irradiated chips yielded results consistent with the ^{14}C age; a composite plateau age of 0±20 ka (MSWD=0.61, p=0.88, n=18, 2σ). Other samples had high contents of trapped argon and did not yield sensible age information. Un-irradiated samples are dominated by $^{40}Ar/^{36}Ar$ and $^{38}Ar/^{36}Ar$ of atmospheric composition, but subsequent post-heating blanks reveal enrichment of ^{38}Ar and ^{36}Ar that can be explained by hydrocarbon contamination. Hydrocarbons are sourced in the cooling samples, rather than the extraction line, providing an explanation for sub-atmospheric $^{40}Ar/^{36}Ar$ observed in some volcanic glasses.

[1] Morgan *et al* (2009) *Quaternary Geochronology* **4**, 193–203