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Constraining the post-eruptive evolution of LIP: low temperature thermochronology of the Hebridean Igneous Province

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Despite the tight chronometric constraints typically placed on the eruption of LIP's, the former extent and thickness of lava pile lost through subsequent erosion, and the rate and timing of this removal are poorly understood in many provinces. This has direct consequences on the rate of cooling of intrusive units and our understanding of the total volume of eruptive products, and of sediment supply into the surrounding basins. Reconstruction of the former thickness based on zeolite mineral assemblages and other indicators of palaeo-temperature require an accurate knowledge of the geothermal gradient through time, and can lead to dramatic errors in estimates of the former thickness. Furthermore, in many cases the thickness lost ($<$2 km) is too small to be resolved using fission track analysis. However, the application of multiple low temperature thermochronometers, in particular apatite (U-Th)/He, to the underlying intrusives and basement allows a more complete understanding of the post-eruptive evolution of the province.

In the Hebridean Igneous Province (HIP) the basal lavas were erupted into a marginal marine environment, and remain at, or near, sea level today. The lack of permanent uplift coupled with a well constrained eruptive and intrusive chronology from U-Pb and ^{39}Ar-^{40}Ar age determinations, gives an ideal opportunity to investigate the rate, timing and extent of denudation across the Province, and to reconstruct the former thickness and volume of the basaltic lava pile. Initial results have identified hitherto unrecognised thermal events late in the evolutionary history by combining zircon and apatite (U-Th)/He and apatite fission track with published U-Pb, ^{39}Ar-^{40}Ar and zircon fission track data. We are starting to separate the plutonic cooling from the denuda-

tional history, and beginning to understand an added level of complexity in the low temperature evolution of the HIP.