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Mass extinctions, recovery and resilience

Building an accurate and precise chronological framework for the British Palaeogene Igneous Province

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Radioisotopic geochronology has provided a means to interpret the temporal coincidences of Large Igneous Provinces (LIP) (e.g., Deccan Traps, Columbia River Basalts, North Atlantic Igneous Province) with catastrophic global events, such as the late-Cretaceous mass extinction and the Palaeocene-Eocene Thermal Maximum. However, in addition to establishing cause-and-effect relationships, which require an age for an event, advances in geochronology are now allowing for the dissection of LIPs on sub-100 ka timescales. The ability to resolve the distribution of time within a LIP allows us to examine individual eruptive events, the frequency of eruptions and changes in eruption rate. Here we demonstrate the levels of precision that can be obtained using the $^{40}Ar/^{39}Ar$ dating technique for the dating of the British Palaeogene Igneous Province (BPIP). Despite being one of the most intensely studies regions in the world, the current geochronology for the BPIP is poor. $^{40}Ar/^{39}Ar$ data collected using a HELIX-platform noble gas mass spectrometer achieve total precisions of ca. 50 ka (2-sigma) for 60 Ma basalts and are revolutionising our understanding of the geodynamic setting of the region. This contribution will detail a study of the Staffa Formation, a basal lava sequence within the BPIP and highlight the potential of using $^{40}Ar/^{39}Ar$ geochronology to dissect other LIPs.