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Tracing crust-mantle interactions along the Yellowstone Hotspot Track

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The Yellowstone Caldera formed approximately 640,000 years ago, when the Yellowstone Volcano catastrophically erupted >1000 km^3 of rhyolitic magma to the surface [1]. A trail of progressively younger north-eastward trending volcanic centres leads to the current position of the Yellowstone Caldera. This trail of volcanic centres, otherwise known as the Yellowstone Hotspot Track, formed as the North American plate moved across the stationary Yellowstone mantle plume. Despite the lack of an active magmatic system beneath the Yellowstone Hotspot Track at present, there are multiple active hydrothermal degassing sites dotted along the track. The Yellowstone Hotspot Track therefore represents an ideal location to investigate crust-mantle interactions as these hydrothermal sites provide a unique opportunity to investigate how the sources of volatiles released at the surface evolve as the distance from magmatic centres increases.

In this study, we will present a comprehensive overview of the major gas chemistry and noble gas isotope compositions of gases collected from several hydrothermal degassing sites dotted along the Yellowstone Hotspot Track. Using a combination of traditional static noble gas mass spectrometry and a recently developed technique for the analysis of heavy noble gases using dynamic mass spectrometry [2], we are now able to identify the sources of these gases better than ever before, whilst providing unprecedented insights into the physical processes occurring in the subsurface as mantle and crustal volatiles migrate towards the surface.

[1] Christiansen et al. (2001), *US Geol. Surv. Prof. Pap.* (2001)
[2] Seltzer and Bekaert (2022), *Int. J. Mass Spectrom.*