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Tracking compositional changes within the High Arctic Large Igneous Province using zircon Hf isotopes from altered volcanic ash layers of the Sverdrup Basin, Canada

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During Late Cretaceous times the Sverdrup Basin, Arctic Canada, received considerable air-fall volcanic material. This is manifested as numerous centimetre- to decimetre-thick diagenetically altered volcanic ash layers (bentonites) that occur interbedded with mudstones of the Kanguk Formation. Previous research on bentonite samples from an outcrop section in the east of the basin (Sawtooth Range, Ellesmere Island) revealed two distinct volcanic sources for the bentonites: most of the bentonites analysed (n=9) are relatively thick (0.1 to 5 m), were originally alkaline felsic ashes, and were likely sourced from local volcanic centres on northern Ellesmere Island or the Alpha Ridge that were associated with the High Arctic Large Igneous Province (HALIP). Two thinner (<5 cm) bentonites with contrasting subalkaline geochemistry were also identified. These were inferred to have been derived from further afield, from volcanic centres within the Okhotsk-Chukotka Volcanic Belt, Russia.

To better understand volcanism within the vicinity of the Sverdrup Basin during Late Cretaceous times, and further test the above interpretations, a larger suite of bentonite samples was investigated, drawing on samples from outcrop sections in the central and eastern Sverdrup Basin. Whole-rock geochemical analyses and combined zircon U-Pb age and Hf isotope analyses were undertaken. The vast majority of bentonites analysed to date have alkaline geochemistry and were likely sourced from proximal volcanic centres related to the HALIP. The combined U-Pb and Hf isotope data from these bentonites show a progression from evolved (-2 to 0) to moderately juvenile (+9 to +10) $\varepsilon Hf_{(t)}$ values between late Cenomanian and early Campanian times (*c*. 97–81 Ma). This is interpreted to record compositional change through time within the local HALIP magmatic system.