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The hidden past of Continental Flood Basalts; Multiple plagioclase antecryst populations in the Hare Fiord Sill, High Arctic Large Igneous Province, Ellesmere Island, Canada

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The Mesozoic High Arctic Large Igneous Province (HALIP) is dominated by evolved continental tholeiitic basalts. To reveal the magmatic processes preceding emplacement and eruption we investigated plagioclase antecrysts from a 17m, 5.5% MgO, undifferentiated sill (Hare Fiord, Ellesmere Island). This sill contains 5-10% macrocrysts (plagioclase > clinopyroxene > olivine) comprising both phenocrysts and antecrysts. We focus on the magmatic history of the sill as revealed by plagioclase. Euhedral plagioclase phenocrysts and rims on antecrysts are defined as Type 1 (An_{72-60}), and have low $^{87/86}Sr_{initial}$ (0.7042 - 0.7044 at 90 Ma). Diabasic and groundmass plagioclase (An_{66-26}) show increasing $Sr_{initial}$ (≤0.7055) as An-content decreases, suggesting crustal contamination occurred during magma emplacement and crystallization. Diverse plagioclase antecrysts and antecrystic glomerocrysts occur within feldspar phenocrysts, and overgrowth relationships imply all were assembled immediately prior to sill emplacement. Type 2 plagioclase antecrysts are more calcic (An_{86-72}) and have $Sr_{initial}$ scattering from values similar to Type 1 phenocrysts to 0.7056. Type 2a calcic antecrysts are weakly zoned and rounded, indicating dissolution into a feldspar-unsaturated melt. Type 2b calcic antecrysts are euhedral, and contain older antecrysts, including partly-resorbed sieved calcic Type 3 antecrysts (An_{68-84}). Type 4a antecrysts are sodic (An_{61-43}). Type 4b resemble Type 1 compositionally, but are surrounded by resorptions surfaces. The diverse antecrystic cargo in the Hare Fiord Sill suggests that a primitive mantle-derived replenishment fed into a complex multi-stage lower crustal magma reservoir containing an evolved basalt. The feldspar-unsaturated replenishment disrupted and resorbed solidified, heterogeneously crustally-contaminated cumulates or mushes (Type 2a), and then mixed with the resident magma, resorbing or reacting with (Type 3) existing plagioclase phenocrysts. An_{72-86} plagioclase (Type 2b) began to crystallize from the primitive hybrid magma, overgrowing older antecrysts. The resulting mixed magma ascended into the shallow plumbing system, exploiting pre-existing partly-solidified conduits and acquiring Type 4 antecrysts en route to the site of sill emplacement. During and after emplacement of the now-homogenized magma, the antecrystic cargo was enveloped by euhedral equilibrium Type 1 plagioclase. Textures imply that chamber replenishment immediately preceded Hare Sill emplacement and may have triggered eruptions to the surface.