MRes opportunity: Tracking marine excursion of Baffin Bay during the Cretaceous

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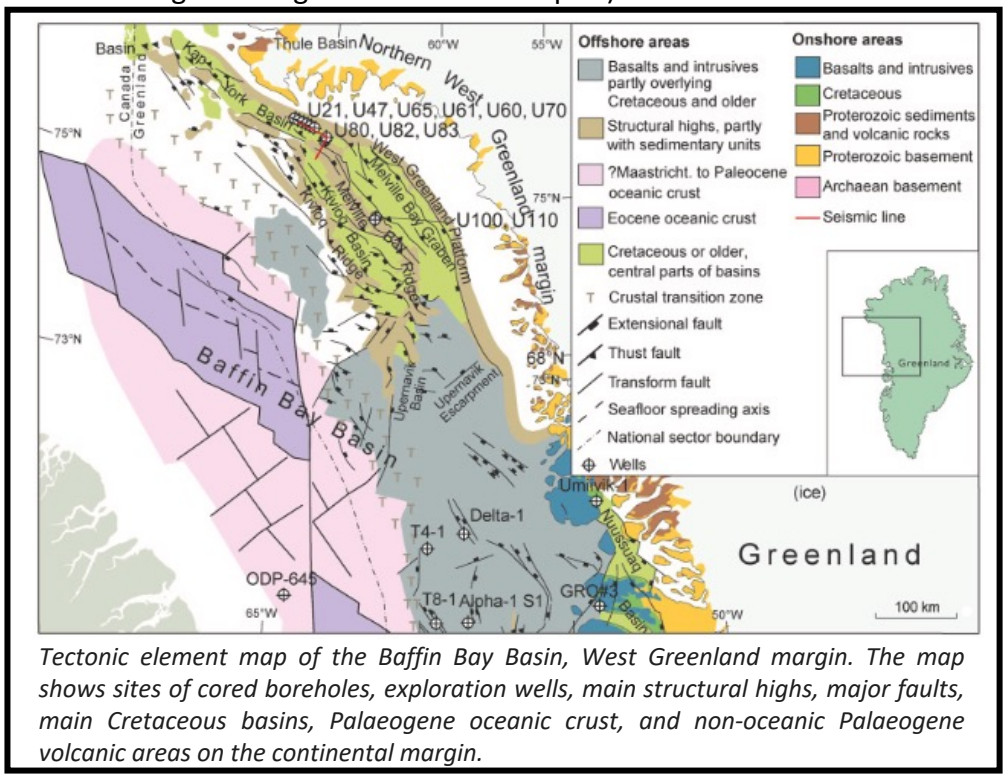
Background: Knowledge of the geological history of Baffin Bay has remained limited unit the 2012 344S expedition (e.g., doi: 10.1016/-j.marpetgeo.2021.105108). Drill core analysis shows that a Lower Cretaceous succession comprises sandstones, mudstones, and minor coal beds of Albian age unconformably overlying Proterozoic strata. The Lower Cretaceous sedimentary environments range from floodplain to a deep bay and suggest deposition in a large non-marine to brackish embayment. Overlying the latter is an Upper Cretaceous sedimentary succession of Cenomanian-Turonian age consisting of black marine mudstone interbedded with discrete sand layers. A marine transgression between the Lower and Upper Cretaceous successions caused dramatic changes in depositional environments, thus marks the marine excursion during the rifting of Greenland from North America (Baffin Island, Canada).

Aims and Method: This project will investigate sediment cores from the 344S expedition - principally through geochemical analyses (rhenium-osmium geochronology and osmium -isotope stratigraphy) but will also include additional sedimentological and geochemical analysis (e.g. carbon-isotope, total organic carbon). Rhenium-osmium geochronology will target key mudstone intervals to provide time-markers on the sediments which are currently poorly constrained by biostraigraphical markers. Osmium-isotope stratigraphy will be used to reconstruct environmental changes namely the transition from non-marine to marine deposition. Absolute chronology coupled with the osmium-isotope stratigraphy will provide key timings of full marine transition in Baffin Bay during the rifting of Baffin Island and Greenland. The sensitivity of the osmium-isotope signature to terrestrial-sourced vs open ocean sourced material will provide a detailed understanding of the more subtle changes in sediment provenance. It will further permit investigation of the possible Oceanic Anoxia Event 2 interval.

Scientific benefits: Development of chronology and isotope stratigraphy to aid in reconstructing the evolution of Baffin Bay during Late Cretaceous.

Training: Training in core analysis and in sediment core description (Durham and GEUS), state-of-the-art rhenium-osmium isotope geochemical analyses at the world leading laboratory in the Department of Earth Sciences, Durham, and in additional techniques (carbon-isotopes, sedimentological and geochemical techniques).



Tectonic element map of the Baffin Bay Basin, West Greenland margin. The map shows sites of cored boreholes, exploration wells, main structural highs, major faults, main Cretaceous basins, Palaeogene oceanic crust, and non-oceanic Palaeogene volcanic areas on the continental margin.