Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.31666

The Bourne Complex of northern Ellesmere Island, Canada

VICTORIA PEASE[1] AND LUKE BERANEK[2]

[1]Stockholm University
[2]Memorial University

The largest exposure of the Bourne Complex (BC) occurs on the Kleybolte Peninsula, northwestern Ellesmere Island, Canadian Arctic; lesser exposures occur on nearby Krueger and Fjeldholmen islands. The BC is a package of greenschist-facies mafic volcano-plutonic rocks with subordinate tuffaceous and sedimentary rocks intruded by dikes and sills. The Kleybolte fault zone defines the eastern limit of the BC and Trettin (1998) suggested that the ultramafic rocks along the fault zone might represent 1) the sub-arc root of the Bourne Complex, or 2) define part of a suture zone. We sampled the BC across the Kleybolte Peninsula for U-Pb zircon geochronology and geochemistry to test these hypotheses.

The protolith age of the BC is unknown: geological relationships indicate that the BC is likely pre-Carboniferous in age, $^{40}Ar/^{39}Ar$ dates from Fjeldholmen Islands constrain metamorphism to the Late Devonian (378 ± 12 Ma, 1σ, n=2 hbl grains), and $^{40}Ar/^{39}Ar$ muscovite total fusion ages from a volcaniclastic rock on the Kleybolte Peninsula yield a Silurian weighted average (439 ± 2 Ma, 2σ, n=6, MSWD= 16). Previous work on Fjeldholmen and Krueger islands in the late-1980's recognised three compositional groups within the BC: 1) subduction-related calc-alkaline andesites, 2) transitional subduction to back-arc related subalkaline dikes, and 3) alkaline dikes of within-plate character. The alkaline dikes cross-cut the Carboniferous Nansen Fm. and therefore post-date to the BC (most likely associated with later rifting and formation of the Sverdrup Basin).

Our preliminary results suggest that the BC subalkaline basalts and gabbro/diorites are late Neoproterozoic (c. 570 Ma) in age and derive from a shallow, enriched MORB-type source with a 'crustal' component, most likely an arc setting proximal to a continental margin. Isotopic analyses, e.g.- zircon Hf, whole-rock Nd or Pb, etc., are needed to refine and quantify the nature of this 'crustal' component.