

Detrital Zircon Analysis Applied to the Neoproterozoic-Devonian Franklinian Basin, Canadian Arctic Islands

Owen A. Anfinson and Andrew Leier
Geoscience, University of Calgary, Calgary, AB, Canada.

Detrital zircon U-Pb ages collected from Neoproterozoic to Late-Devonian clastic strata of the Franklinian Basin clarifies the depositional history of these sediments and provides new information about potential source areas. In addition, because detrital zircons are often recycled from older strata into younger deposits, these data provide the basis for understanding the sedimentary provenance of overlying units in the oil and gas rich Sverdrup Basin.

Nearly 2000 individual detrital zircon U-Pb ages derived from 20 samples collected from a broad geographic (latitudinal range 82° N to 75° N; longitudinal range- 69° W to 120° W) and stratigraphic (9 formations) range provide new insight into the major sediment source areas, pathways, and depocenters in the region, and enable improved reconstructions of basin paleogeography over this time interval. The scope of this endeavor far exceeds all previous geochronologic provenance studies in the Franklinian Basin.

Detrital zircon provenance studies entail the determination of U-Pb ages of 100 to 120 individual grains from each sample, and the correlation of these grain populations to specific sediment source areas. The detrital zircon U-Pb ages demonstrate the Franklinian Basin succession is composed of strata with three distinctly different provenance signatures. Samples collected from the Neoproterozoic Kennedy Channel and Cambrian Archer Fjord formations include prominent populations of Paleoproterozoic and Neoarchean detrital zircons, and lack grains younger than the Paleoproterozoic. By the time the Silurian Danish River Formation was deposited and until the Late-Devonian Beverly Inlet Formation was deposited the population of detrital zircon ages encompasses the Devonian and Mesoproterozoic, yet the samples continue to contain large populations of Paleoproterozoic ages. A dominant population of Late Devonian to Cambrian detrital zircon with secondary populations of Neoproterozoic to Mesoarchean detrital zircon in the Upper Devonian Parry Islands Formation suggests a potential shift in sediment source relative to the underlying sedimentary units. Additionally, detrital zircon U-Pb ages from the Parry Islands Formation help constrain the depositional age of this formation.

These data provide a baseline for ongoing detrital zircon research in the Franklinian and Sverdrup Basins, and will soon be supplemented by U-Th/ He thermochronologic data to constrain depositional sources and timing of basin uplift.