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near the Mackenzie Mountain front, Northwest Territories**

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## **Abstract**

Three sandstone samples were collected from lower Cretaceous strata in the northern Mackenzie Valley region. The sampled stratigraphy includes: the Tukweye Member of the Martin House Formation, which is an incised valley deposit at the base of the Cretaceous succession; marine facies of the Martin House Formation, a widespread transgressive sandstone above the sub-Cretaceous unconformity; and the Sans Sault Member of the Arctic Red Formation, which is a marine sandstone at the top of the lower Cretaceous (Albian) succession. These samples were analysed at the University of Alberta for U-Pb detrital zircon isotopic age dating. The analytical results are presented here and the full provenance interpretation will be presented in a subsequent publication.

## **Introduction**

This work was part of the Geomapping for Energy and Minerals (GEM) program at the Geological Survey of Canada. The U-Pb detrital zircon data presented here are part of a regional study of the Cretaceous stratigraphy of the northern Mackenzie Valley near the front of the Mackenzie Mountains (Fig. 1). The geological framework derived from the project is outlined in Hadlari et al. (2014) and the full interpretation of the data are in Davison et al. (2024). The Martin House Formation is a transgressive sandstone interval generally less than 20 m thick that is very widespread and nearly ubiquitously overlies the sub-Cretaceous unconformity in the study area (Fig. 2). In some areas are fluvial facies that are interpreted as incised valley deposits that are very locally preserved below the sheets of marine sandstone. Above the Martin House Formation is a succession of marine shale forming the Arctic Red Formation, near the top of which are shallow marine sandstones of the Sans Sault Member.

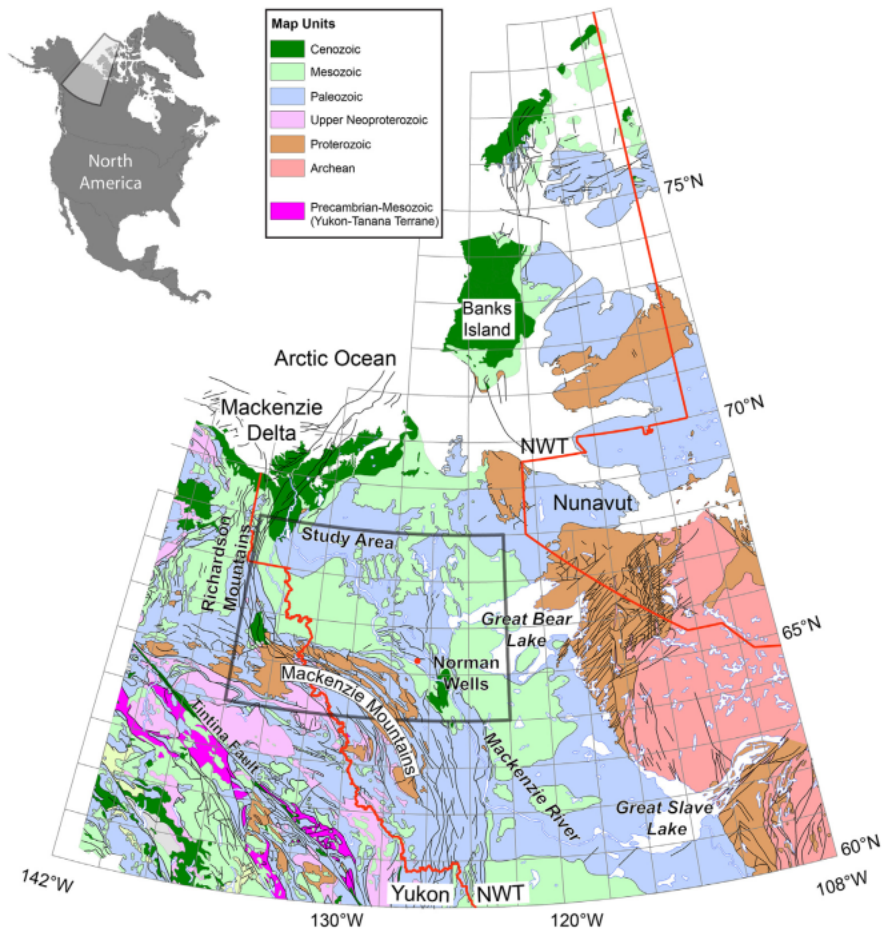


Figure 1: Geology of the Mackenzie Mountains and northern Mackenzie Valley area, showing the present study area (from Hadlari et al., 2014).

| Period     | Ma   | Stage         | Peel Plateau           | Mackenzie Plain                           | Great Bear Plain                               |
|------------|------|---------------|------------------------|-------------------------------------------|------------------------------------------------|
| Cretaceous | 70.6 | Maastrichtian |                        | Summit Creek Fm                           |                                                |
|            |      |               |                        | East Fork Fm                              |                                                |
|            | 83.5 | Campanian     |                        | Little Bear Formation                     |                                                |
|            | 85.8 | Santonian     |                        |                                           |                                                |
|            | 89.3 | Coniacian     |                        | Little Bear Fm                            |                                                |
|            |      | Turonian      | Trevor Formation       | Slater River Formation                    | Slater River Formation                         |
|            | 93.5 |               |                        |                                           |                                                |
|            |      | Cenomanian    | Slater River Formation |                                           |                                                |
|            | 99.6 |               |                        |                                           |                                                |
|            |      | Albian        | Arctic Red Formation   | Sans Sault Member<br>Arctic Red Formation | Mahoney Lake Formation<br>Arctic Red Formation |
|            | 112  | Aptian        | Martin House Formation | Martin House Formation                    | Martin House Formation                         |

Figure 2: Cretaceous stratigraphy of the study area (from Hadlari et al., 2014).

## Methods

Detrital zircon grains were isolated using standard mineral separation techniques (e.g., Simonetti et al., 2005). All samples yielded euhedral to anhedral, colourless to pink or yellow, well-rounded zircons. Grains selected for analysis were free of fractures, inclusions, and any other apparent alteration effects. U-Pb zircon analyses for samples 09-TH-01 and 11-HSB-300-B1 were conducted using laser ablation multi-collector inductively coupled plasma mass spectrometry techniques (LA-MC-ICP-MS) at the Radiogenic Isotope Facility at the University of Alberta using analytical procedures outlined by Simonetti et al. (2005). Individual analyses involved ablation of zircons using a 40 µm laser beam diameter for 30 second intervals. Analytical sessions included ablation of zircon reference materials after every 12 unknown grains to correct for instrumental drift. Reference zircons used for analyses at the University of Alberta to monitor age accuracy included LH-94-15 (Simonetti et al., 2005), OG1 (Stern et al., 2009), and GJ-1 (Jackson et al., 2004) and were in good agreement with their accepted published dates (Data Table). All results were corrected for common Pb using an initial Pb composition reported by Stacey and Kramers (1975). Detrital zircon ages considered for geologic interpretations employed  $^{206}\text{Pb}/^{238}\text{U}$  ratios in cases where ages <1000 Ma and  $^{207}\text{Pb}/^{206}\text{Pb}$  ratios for cases where ages were >1000 Ma. All ages used have a probability of concordance >5% (cf. Ludwig, 1998).

## Results

Sample numbers and formations of the sandstone samples are:

Sample 09-TH-01: Martin House Formation; fluvial (Tukweye Member); 65.3536°N, 129.8922°W

Sample 11-HSB-300-B1: Arctic Red Formation; shallow marine (Sans Sault Member); 65.148°N, 127.828°W

Sample 11-HSB-305-A1: Martin House Formation; shallow marine; 67.2648°N, 129.8856°W

U-Pb data are included in this report as an Excel file.

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