

Igneous and detrital zircon signatures of the Fire Bay Formation, Clements Markham Fold Belt, Northwest Ellesmere Island

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The Fire Bay Formation of the Clements Markham Fold Belt consists of sedimentary and volcanic rocks that have previously been described as Silurian in age. These strata were originally subdivided into three informal members (A-C), but only member C yielded Silurian graptolites in well-characterized stratigraphic sections (Trettin, 1997). Field relationships and U/Pb analysis of igneous and detrital zircon from volcanic and volcanoclastic units within this formation, as well as the overlying Danish River Formation, strongly suggest an Ordovician depositional age for the lower Fire Bay Formation. Detrital zircon U/Pb data from two samples in members A2 and B2 yield zircon ages that define dominant peaks at 465-470 Ma. Additional grains record minor peaks at approximately 1100-1200, 1800, and 2700 Ma. Felsic volcanic clasts from volcanoclastic conglomerate in members A4 and B1 yield SIMS (Stanford-USGS SHRIMP-RG Lab) $^{206}\text{Pb}/^{238}\text{U}$ weighted mean ages of 498 ± 6 , 478 ± 4 , and 477 ± 4 Ma. A lithic tuff at the top of member B1 defined a peak age of 474 ± 1 Ma (MSWD 2.0). The middle to late Llandovery member C of the Fire Bay Formation does not contain volcanoclastic rocks and more closely resembles strata mapped regionally as the Silurian Danish River Formation. A sample of micaceous lithic arenite from the overlying Danish River shows a similar distribution of Precambrian peaks at approximately 1000-1100, 1600, 1800, and 2700 Ma, but essentially lacks the Ordovician signature that is characteristic of the lower Fire Bay Formation. The Ordovician detrital signature is a close match with clastic units of the Cape Discovery and Taconite River Formation, suggesting association of the Fire Bay Formation with the Pearya terrane. Alternatively, the Fire Bay Formation may represent a separate Ordovician arc sequence within the Clements Markham Fold Belt, which may be supported by the distinct lack of Tonian zircon in the Fire Bay or Danish River Formation samples.