

## Geology of the Nain complex in Labrador, Canada: Discovery of the oldest oceanic crust

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The Hadean is the most mysterious period because no rocks and geologic bodies are preserved except for only the zircons in Western Australia, Canada, China and Greenland (Froude et al., 1983, *Nature*; Nelson et al., 2000, *EPSL*; Mojzsis & Harrison, 2002 *EPSL*; Iizuka et al., 2006, *Geology*; Wang et al., 2007, *CSB*). But, it is the most important period because the early evolution possibly clinched the history of the earth. We try to find the earliest supracrustal rocks in the world to investigate the Hadean tectonics and decode surface environments. As far, the oldest supracrustal rocks are found in Akilia association in West Greenland, Nuvvuagittuq in Quebec, and Nain Complex in Labrador (Nutman et al., 1996, *Precamb. Res.*; O'Neil et al., 2008, *Science*; Schiote et al., 1989, *Can Jour Earth Sci.*). Because the Akilia association suffers from severe metamorphism and alteration, the precursors are highly in debate (e.g. Fedo & Whitehouse, 2002, *Science*). Recent geological works in the Nuvvuagittuq, Quebec showed the sequence contains amphibolite with a pyroclastic rocks affinity, ultramafic sills, felsic sediment, BIF and conglomerate. Although a pseudoisochron age of  $^{147}\text{Sm}/^{144}\text{Nd}$ - $^{142}\text{Nd}/^{144}\text{Nd}$  implies the Hadean age (O'Neil et al., 2008, *Science*), the supracrustal belt possesses 3811 Ma by conventional U-Pb zircon ages (David et al., 2009, *GSAB*).

We made geological survey in the Nain Complex, and reinvestigated the occurrence of the supracrustal rocks and their relationship with the ambient orthogneisses. Previous works focused on distribution of the supracrustal belts within the orthogneisses (e.g. Bridgwater et al., 1974 *Geol Surv Canada, Paper*), but the detailed field occurrence of the supracrustal rocks within the belts is still ambiguous. Therefore, we focus on their internal structures.

The supracrustal belts are repeatedly intruded by granitic intrusions with some ages and their original structures are obscured, but their lithostratigraphies are relatively well preserved in Nulliak, Big and Shuldham islands and St Jones Harbor. The supracrustal belts in Nulliak and Big islands comprise ultramafic rocks, mafic rocks and mafic sediments intercalated with feldspathic sediments and banded iron formations in ascending order. In the St Jones Harbor, it is composed of ultramafic rocks, mafic rocks, banded iron formation, and clastic sediments, intercalated with chert in the middle and with bedded carbonate rocks in the upper part, respectively, in ascending order. In the Shuldham Island, it consists of ultramafic rocks, layered gabbro with precursors of plagioclase and pyroxene accumulation layers, mafic rocks and terrigenous sediments in ascending order. The lithostratigraphies are very similar to oceanic plate stratigraphy. The fact that some supracrustal belts are intruded by Uivak I orthogneisses, and presence of  $>3.86$  Ga zircons in the supracrustal rocks suggest that the supracrustal belts have early Archean ages. In addition, despite of the still ambiguous relationship between Nanok Gneiss and supracrustal rocks, presence of Nanok Gneiss (3.85 to 3.91 Ga) in this area (Collerson, 1983 in *Abstracts for Early Crustal Genesis Field Workshop, LPI, Technical Report 83-03*; Shimojo et al., 2012, *Goldschmidt Conf.*) implies that the supracrustal belts date back to the earliest Archean.

Keywords: Hadean, Nain Complex, Labrador, Early Earth, zircon, supracrustal rocks, banded iron formation