

カナダ北東部初期大古代ヌブアギツク表成岩帯の地質:堆積岩の原岩と年代の再検討

Geology of the Eoarchean Nuvvuagittuq supracrustal belt, northeastern Canada: Reappraisal of Protoliths and ages of the sedimentary rocks

*小宮 剛¹、山本 伸次²、上原 啓幹¹、吉田 聡¹、村上 葵¹、石原 湧樹¹

*Tsuyoshi Komiya¹, Shinji Yamamoto², Hiroki Uehara¹, Yoshida Satoshi¹, Aoi Murakami¹, Yuki Ishihara¹

1. 東京大学大学院総合文化研究科広域科学専攻、2. 横浜国立大学大学院環境情報研究院

1. Department of Earth Science & Astronomy Graduate School of Arts and Sciences The University of Tokyo, 2. Graduate School of Environment and Information Sciences, Yohohama National University

The Nuvvuagittuq supracrustal belt in the northeastern Canada is one of the oldest supracrustal rocks in the world, thus the geological, petrological and geochemical study allows us to constrain the evolution of surface environment and solid earth in the early earth. The belt consists of ultramafic rocks, coarse-grained and fine-grained greenstone, banded iron formation (BIF), siliceous rock, carbonate rock, and conglomerate. The ultramafic rocks and coarse-grained greenstone are considered as ultramafic and gabbroic intrusions, respectively. The fine-grained greenstone is classified into three types based on the petrography: cummingtonite-bearing amphibolite (faux-amphibolite), hornblende-bearing amphibolite (green-amphibolite) and actinolite-bearing greenschist. The greenschist occurs only in the southwestern area. The faux- and green-amphibolite are ubiquitously present over the belt. Moreover, O'Neil et al. (2011) classified the amphibolite into three types based on their TiO_2 contents and REE patterns. The BIF mainly occurs in three areas, and has different occurrence and petrography. The BIF in the northwestern area is accompanied with the ultramafic rocks, and comprises interlayering of magnetite and amphibole/serpentine/talc. The BIF in the southwestern area occurs together with fine-grained greenstone, and mainly contains hematite and quartz (jaspillite). Dodd et al. (2017) found possible biogenic fabric, formed by iron-oxidizing bacteria in the jaspillite. The BIF in the southeastern part is interlayered with the faux-amphibolite, and occurs above the siliceous rock. It mainly comprises magnetite and quartz.

The belt is intruded by some precursors of orthogneiss, whose igneous ages of ca. 3.8 Ga and constrain the minimum age of the belt. O'Neil et al. (2008, 2012) proposed that the igneous age of the fine-grained amphibolite is ca. 4.38 Ga based on a putative $^{147}\text{Sm}/^{144}\text{Nd}$ - $^{142}\text{Nd}/^{144}\text{Nd}$ isochron age. On the other hand, Cates et al. (2013) proposed that a felsic layer within the faux-amphibolite originates from a clastic felsic sedimentary rock, and the maximum age of the belt is ca. 3.78 Ga based on ages of the zircons. David et al. (2009) interpreted a felsic layer as a volcanosedimentary rock, and proposed that the supracrustal rock was formed at 3817 Ma based on the ages of zircons.

We made a quite detailed geological map using a drone, which enables easily to trace even tens centimeter layers and intrusions. Many tens centimeter thick intrusions with an intermediate composition are present in the faux-amphibolite, whereas no intrusions are apparently found in the green-amphibolite. The distribution of the two types of amphibolite corresponds to that of three geochemical types of greenstone proposed by O'Neil et al. (2011), suggesting that the geochemical signature is due to secondary alteration. In addition, the apparent isochron on the $^{147}\text{Sm}/^{144}\text{Nd}$ - $^{142}\text{Nd}/^{144}\text{Nd}$ diagram possibly originates from mixing between the mafic/ultramafic component and secondary intermediate

component. O'Neil et al. (2008) proposed that the Nd isochron age of gabbroic dikes is 4.3 Ga. But, the gabbroic dikes are younger than 3.8 Ga, and the isochron is putative because our map clearly shows that some thin gabbroic dikes are intruded into ambient orthogneiss, whose age is *ca.* 3.8 Ga. We found many conglomerate layers over the belt, but the layers finally change felsic intrusions. The occurrence means that they are putative conglomerate. In addition, the carbonate rocks occur along the felsic intrusions, suggesting they also have metasomatic origin. The petrography and occurrence of the BIF in the northwestern area indicate that the BIF was formed from metamorphism of the ultramafic rock. The siliceous rock is intruded by many felsic intrusions and quartz veins, but the detailed map can differentiate between the siliceous layers and intrusions, and shows that the siliceous layers originate from siliceous sediment.

キーワード：冥王代、初期地球、初期生命、表層環境

Keywords: Hadean, Early Earth, Early life, Surface environment