Geology of the Eoarchean Nuvvuagittuq supracrustal belt: Constraints on the geochemical signatures of ^{142}Nd anomaly and a geochemical variation of volcanic rocks.

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The Nuvvuagittuq supracrustal belt is one of the oldest supracrustal belts so that the geology, geochemistry and geobiology provide important insights into the early evolution of the earth. The minimum age (*ca.* 3.8 Ga) of the supracrustal rocks are provided by U-Pb dating of zircons from surrounding granitic gneisses and thin felsic intrusions into the supracrustal belt. Besides, the mafic and ultramafic rocks were suggested to be formed in the Hadean as old as 4.2 Ga based on a pseudo-isochron of ^{147}Sm/^{144}Nd–^{142}Nd/^{144}Nd. However, the interpretation of the pseudo-isochron of ^{147}Sm/^{144}Nd–^{142}Nd/^{144}Nd is highly controversial; the apparent good correlation between them is also regarded as mixing between chondritic ^{142}Nd/^{144}Nd and low ^{142}Nd/^{144}Nd sources. The geological interpretation of the felsic intrusions is also on debate, and felsic volcaniclastic sediments intercalated with the supracrustal rocks are also proposed for the protoliths. In this case, the age of zircons from the rocks is interpreted as a depositional age of the sediments, namely the age of the supracrustal belt.
The Nuvvuagittuq supracrustal belt (NSB) is located on the eastern coast of Hudson Bay, in the Inukjuak Block of the Hudson Bay Terrane of the Northeastern Superior Province of Canada, and contains ultramafic rocks, mafic rocks, banded iron formation (BIF), chert, conglomerate, gabbroic and felsic intrusions. The belt forms an arcuate structure with moderately dipping and NW-plunging hinge line. In addition, the belt was also tightly to isoclinally folded before the folding to form a syncline structure. Previous work suggested three groups of mafic-ultramafic suites with different chemical compositions such as TiO_2 contents and REE patterns: High-Ti, depleted Low-Ti and enriched Low-Ti Ujaraaluk units in ascending order, respectively, and considered the ultramafic rocks as sills.
We made a detailed geological map of the southwestern part of the NSB at a 1:5000 scale, and found many geologic differences from the previous works. The belt comprises ultramafic volcanic rocks, mafic volcanic rocks, mafic intrusions, BIF, chert, “carbonate rocks”, “putative” conglomerates and fine-grained felsic intrusions, and pegmatitic intrusions.
The previous work suggested that the southwestern part forms the synclinal structure, but our geologic reappraisal shows that the volcanosedimentary sequences of ultramafic and mafic volcanic units overlain by the BIF and chert mostly strike NS and dip to the east. The stratigraphy that ultramafic rocks are overlain by the BIF layers indicates that they are not sills but flows under the water. Although there are some coarse-grained amphibolites, possibly originating from gabbroic intrusions, many NS-trending structures are not due to the gabbroic intrusions but due to the felsic intrusions. Many of the gabbroic intrusions, interpreted by previous works, are not intrusions, but they originate from mafic volcanic rocks and apparently form linear structures due to felsic intrusions on both sides. It is because there are no chilled margins along the rims and the grain sizes are varied within the linear structures. Although a banding structure occurs along the boundary with mafic rocks in some places, a large chert layer (silica formation) should be referred as a pegmatitic intrusion, which is one of many large pegmatite intrusions in the belt. Two types of felsic intrusions are ubiquitously distributed over the belt: pegmatite and fine-grained felsic intrusions. The felsic intrusions are quite enigmatic; the felsic intrusions fade away into conglomerate-like structures in some places and form many linear structures within the mafic rock units. We, preliminarily, consider that the felsic intrusions account for the conglomerates and three geochemical

groups of basaltic volcanics due to assimilation of the felsic rocks into the mafic rocks as well as a pseudo-isochron of $^{147}Sm/^{144}Nd$-$^{142}Nd/^{144}Nd$.

Keywords: 142Nd isotope anomaly, Early differentiation, Eoarchean

