What mantle source for Nulliak ultramafic rocks (3.78 Ga, Labrador)? A combined Hf and Nd isotopic approach

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Coupled ^{146,147}Sm-^{142,143}Nd systematics provide constraints on the timing of the earliest events in Earth history. Positive $\varepsilon^{143}Nd_i$(1.5±0.2) and ε^{142}Nd(8.6±2 ppm) determined in 3.78±0.09 Ga well-preserved ultramafic rocks from the Nulliak assemblage of Labrador allow the calculation of a model differentiation age for the Earth's mantle at 4.40±0.05 Ga (assuming a BSE with chondritic Sm/Nd and ε^{142}Nd=0). Nulliak ultramafic rocks provide a differentiation age 100 Ma older than those estimated from Akilia tonalites[1].The surprising similarity between the positive ^{142}Nd signature of Eoarchean ultramafic rocks from Nulliak and that estimated from the 2.7 Ga Theo's flow (Abitibi)[2] invites discussion of the mechanism for creating positive ε^{142}Nd.

Traditionally, ^{142}Nd anomalies were considered to be generated by mantle-crust differentiation processes, but modeling shows that the Nulliak ^{142}Nd anomaly could be generated by slow crystallization of a basal magma ocean. In this scenario the Lu-Hf system is expected to be negatively correlated with the Sm-Nd system. This study is aimed at establishing a coherent Lu-Hf dataset on Nulliak ultramafic rocks. First results will be presented during the meeting.

[1] Bennett et al.,2007, [2] Debaille et al 2013