Combined ^{182}W and ^{142}Nd study of mantle-derived rocks from the Saglek-Hebron Gneiss Complex

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The ^{182}Hf-^{182}W and ^{146}Sm-^{142}Nd short-lived isotope systems are useful tools to investigate the evolution of the Earth's primitive mantle. Because of the short half-life of the parent isotopes (^{182}Hf and ^{146}Sm), variations in the daughter products (^{182}W and ^{142}Nd) can only be produced by geological processes, respectively, within the first 50 Ma and 500 Ma of Earth's history. While the Sm-Nd system is only affected by silicate differentiation, the Hf-W system is also sensitive to metal-silicate segregation. Combining both isotopic systems in the same rocks may help us understand the nature and timing of early geological events. The Saglek-Hebron Gneiss Complex (SHC) in Northern Labrador is one of the few preserved Eoarchean terrains. Recent ^{142}Nd and ^{182}W work on separate SHC mantle derived rocks hint to a complex early history of their mantle source(s). Some of the rocks have ^{142}Nd and ^{182}W excesses whereas others have isotopic compositions indistinguishable from the modern mantle [1, 2]. The Nd isotope results suggest the possible involvement of distinct mantle sources, one of which would have been produced by silicate differentiation in the Hadean. Evidence for significant W re-mobilization in the SHC however suggests that the ^{182}W composition may not be directly reflective of the mantle source. Here, we present a combined ^{182}Hf-^{182}W and ^{146}Sm-^{142}Nd study of mafic and ultramafic rocks from the SHC. Analysed samples were collected from distinct metamorphic zones from granulite to amphibolite facies. In order to constrain the origin of W in these rocks, more than 50 samples were analysed for W contents by isotope dilution, yielding concentrations ranging from 1 to 825 ppb. Samples from the granulite facies exhibit the lowest W concentrations suggesting that W was remobilized from these rocks. Interestingly, W concentrations in amphibolite facies rocks correlate with other incompatible and relatively immobile elements, consistent with an indigenous origin. High precision W isotope analyses of these particular samples will be performed, that combined with high precision Nd isotope results, might shed light into the nature and timing of differentiation of the mantle beneath Northern Labrador.

[1] Morino et al., 2017, EPSL; [2] Liu et al., 2016, EPSL.