REE and Nd isotope geochemistry of the felsic granitoids in the Acasta Gneiss Complex, Canada

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The Acasta Gneiss Complex (AGC), located in the western part of the Slave Province, Canada, is one of the oldest crust remmants on Earth. A lot of the geochemical data from the AGC have provided an information to understand the chemical differentiation of the Hadean silicate Earth. Recently, Reimink et al. [1] suggested that, based on the geochemistry of the Acasta tonalite gneiss, the oldest evolved crust on Earth was generated from an older ultramafuc or mafic reservoir that probably surfaced the earth crust. Reimink et al. [2] also proposed that the AGC had homogeneous sources isotopically in tunsten and oxygen isotope composition. This suggests that AGC might be derived from the same source materials.

Therefore, in this study, under assumption that the AGC rocks were derived from the same sources basically, we tried to find a systemamtic change of the geochemical characterstics of the ACG rokcs from ultramafic rock to granitoids. Firstly, we divided the felsic granitioids into three group according to Fe_2O_3 contents (high, medium and low). This grouping showed a good relationship with chondrite-normalized REE pattern and the degree of Eu anomaly. The felsic granitoids with high Fe_2O_3 show relatively flattend REE patterns and have almostly no Eu anomaly whereas those with low Fe_2O_3 have LREE-enriched and strongly large positve Eu anomaly. And then, we could obtain the ^{147}Sm-^{143}Nd whole-rock error-chron age of ca 3.4 Ga from felsic rocks, which was consistent with the data by Moorbath[3]. Admittedly, it is true that our understanding of the formation processes for early Hadean crust in early Earth is open to further studies. But, this kind of geochemical characteristics of felsic granitoids seems to suggest that, though the source material of the felsic rocks is the same, they may experience different differentiation processes during early Hadean continental crust formation.

[1] Reimink et al. (2016) Nature Geosci. 9, 777-780. [2] Reimink et al. (2018) EPSL 494, 12-22. [3] Moorbath et al. (1997) Chem. Geol. 135, 213-231.