Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

BPT23-17 Room:411 Time:April 30 14:45-15:00

Timing of late veneer on Earth: a siderophile element perspective

ISHIKAWA, Akira[1*] ; KOSHIDA, Keiko[1] ; SUZUKI, Katsuhiko[2] ; KOMIYA, Tsuyoshi[1]

[1]The University of Tokyo, [2]JAMSTEC

The short-lived ^{182}Hf-^{182}W decay system (half life is ca. 9 Myr) has long been recognised as a powerful tracer for accretionary and differentiation processes on the early Earth. Recent advances in analytical technique made it possible to conduct high-precision ($\pm$ 5 ppm or better) W isotope ratio measurements and have allowed exploitation of ^{182}W/^{184}W variations (expressed in the conventional ϵ^{182}W notation) in a wide variety of geological samples. To date, the presence of ϵ^{182}W anomalies have been documented for the 3.8 Ga Isua supracrustal belt in West Greenland, the 2.8 Ga Kostomuksha komatiites, the $\geq$ 3.8 Ga Nuvvuagittuq greenstone belt in Northeastern Canada and the 4.03 Ga Acasta gneiss complex in Northwestern Canada, all of which exhibit similar positive ϵ^{182}W anomalies up to 15 ppm relative to modern terrestrial samples (ϵ^{182}W $\simeq$ 0). These ^{182}W enrichments have been interpreted to represent the composition of anciently isolated domains in Earth's mantle that escaped addition of the chondritic late veneer (ϵ^{182}W $\simeq$ -2). This hypothesis is apparently consistent with the idea that $\sim$0.5% of the Earth's mantle was added after the cessation of core formation, required to account for the overabundance of highly siderophile elements (HSEs) in modern mantle. In order to test this hypothesis, we produced the HSE concentration data for basaltic amphibolites in the 4.03 Ga Acasta gneiss complex, meta-komatiites and meta-dunites in the $\geq$ 3.8 Ga Saglek-Hebron segment in Northern Labrador, Canada with the motivation in the search for the pre-late veneer mantle almost devoid of HSEs. The results demonstrated that the relative and absolute HSE abundances in all these rocks are akin to their late Archean to modern equivalents, indicating the delivery of late-accreted materials prior to 3.8-4.0 Ga at the period of late heavy bombardment on the Earth-Moon system. Considering the results of other studies demonstrating high-HSE contents of the mantle sources for the 3.8 Ga Isua rocks and the 2.8 Ga Kostomuksha komatiites, we can now conclude that ^{182}W enrichments are largely decoupled from HSE depletions, inconsistent with the pre-late veneer hypothesis. Further studies are necessary focusing on the siderophile element behaviors in Eoarchean rocks to advance in the knowledge of late accretion on Hadean mantle and the source of ^{182}W enrichments.

Keywords: siderophile element, late veneer, Archean, mantle