27億年前のベリングウェーコマチアイトの質量非依存硫黄同位体分別：太古代における地殻物質のリサイクル
Mass-independent sulfur isotope signature from the 2.7 Ga Belingwe komatiite: Recycling of crustal material in Archean

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Recycling of the Earth's crustal material has long been discussed mainly through the radiogenic isotopes of modern Ocean Island Basalts (OIB). Recent finding of Sulfur Mass Independent Fractionation (S-MIF) from HIMU and EM I basalts supports recycling of crustal material in mantle (Cabral et al., 2013; Delavault et al., 2016). Since photochemical reactions under reducing Archean atmosphere are thought to be a plausible process of large S-MIF generation (Farquhar et al., 2001; Farquhar and Wings, 2003), these discoveries demonstrated that the S-MIF is a useful signature for tracing Archean crustal material. However, it has been difficult to estimate when the subduction started in the history of the Earth. Here, we report multiple sulfur isotope analysis of the 2.7 Ga Belingwe komatiites and related rocks, which has potential to elucidate earlier subduction or recycling of crustal material before 2.7 Ga. The Belingwe komatiite are one of the best-preserved Archean komatiites in the world. The results show clear S-MIF signature in several komatiites and basalts. Sulfide minerals in the S-MIF bearing samples occur as pyrrhotite and chalcopyrite scattered within groundmass around the quenched olivine and pyroxene crystals, indicating that the sulfides crystalized at the time of eruption. The original nature of the sulfide is also supported by the correlation between sulfur contents and magnesium number. Based on Nd, Sr, and Pb isotope composition measured in the previous study (Shimizu et al., 2005), the S-MIF bearing komatiites and basalts are likely to be derived from depleted mantle source, whereas more enriched samples do not show S-MIF. Therefore, the S-MIF component is not likely derived from assimilated crust at the time of the komatiite volcanism, but originally incorporated in the depleted source mantle. Consequently, our results suggest that subduction of S-MIF bearing surface material into the mantle had been operated at least prior to 2.7 Ga.

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