The secular change of S-MIF in the late Archean, the Dharwar Supergroup, Southern India

KAORU MISHIMA[1*], M. SATISH-KUMAR[2], TOMOKAZU HOKADA[3], TSUYOSHI TOYOSHIMA[2], YUICHIRO UENO[1,4]

[1]Department of Earth & Planetary Sciences, Tokyo Institute of Technology, Tokyo, 152-8551, Japan. (mishima.k.ab@m.titech.ac.jp)

[2] Department of Geology, Faculty of Science, Niigata University, Niigata, Japan

[3] National Institute of Polar Research, Tachikawa, Tokyo, Japan

[4] Earth-Life Science Institute (WPI-ELSI)

Sulfur mass-independent fractionation (S-MIF) seems to increase in the late Archean when the atmospheric chemistry may have been unique. The S-MIF signiture possibly reflect many factors, including paleogeography, atmospheric composition, tectonics, and microbial activity. Thus, global trend of S-MIF signature has not yet established. Here, we reported the sulfur isotopic study of Archean volcano-sedimentary sequences of Dharwar Supergroup, occured in the Chitradurga Schist Belt (CSB), Southern India. New systematic field mapping and zircon U-Pb dating allows us to reconstruct detailed lithostratigraphy of the Dharwar Supergroup. The lower unit consists of post-3.0 Ga basal conglomerate, stromatolitic carbonate, siliciclastics with diamictite, chert/BIF, pillowed basalt and pyroclastic sediment in ascending order. Especially, the diamictite layer in the lower unit show dropstone structure, suggesting glaciation in the late Archean. The upper unit consists of 2.6-2.5 Ga conglomerate, heavily carbonated basalt, BIF and silici-clastic sequence in ascending order. This Dharwar sequence preserve the Archean rifting and collisional tectonics. Sulfides in the stromatolitic carbonates show enriched $\delta^{34}S$ values (+19‰) with negative $\Delta^{33}S$, suggesting microbial reduction in the carbonate platform. Considering the microbial processes, the original $\Delta^{36}S/\Delta^{33}S$ is estimated as –1.5 in the lower unit. On the other hand, the upper unit show the $\Delta^{36}S/\Delta^{33}S$ slope of –0.9. This change in $\Delta^{36}S/\Delta^{33}S$ ratio is roughly consistent with those recorded in the other late Archean sequences from Kaapvaal and Pilbara, suggesting the $\Delta^{36}S/\Delta^{33}S$ ratio records global signal, probably reflecting the change in atmospheric chemistry and climate during the late Archean period.