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S-MIF geochemistry of the Early Archean in the Onverwacht Suite, South Africa

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The recent study of sulfur mass independent fractionation (S-MIF) in the Archean sedimentary rocks represented that multiple sulfur isotope ratios (32S/33S/34S/36S) could be useful new tracer for Archean sulfur cycles. Farquhar et al. (2000) first discovered that Archean sedimentary rocks before 2.4 Ga have Δ^{33}S anomaly, whereas no such anomaly was found in younger samples. This contrast implies the rise of atmospheric oxygen content that fundamentaly changed atmospheric sulfur cycle. The hypothesis are based on the studies from Western Australia and South Africa (Kaufman et al., 2007; Ono et al., 2009; Zerckle et al., 2013). High-resolution stratigraphic studies provide a detailed view into the late Archean marine sulfur cycle, which can help our understanding of both atmospheric and biological processes. In the early Archean, S-MIF data are almost from hydrothermal sulfate and sulfide. For comparing early nad late Archean data precisely, it is necessary to investigate stratigraphical and petrological distributions and variations of the multiple sulfur isotopes. We have studied Early Archean sedimentary sulfides which are well preserved in the Barberton Greenstone Belt, South Africa. Sulfur isotope analysis of extracted sulfide of sedimentary rocks from Barberton Greenstone Belt, show a clear MIF ($>$1 ‰) and δ^{34}S-Δ^{33}S, Δ^{33}S-Δ^{36}S correlation. The Noisy Complex whchi is consist of fluvial sediments and diamictite show negative δ^{34}S-Δ^{33}Scorrelation, and Δ^{36}S/Δ^{33}S slope of -0.72. On the other hand, the Kromberg Formation which compose of deep marine sediments show positive δ^{34}S-Δ^{33}S, and scattered Δ^{36}S/Δ^{33}Sslope. δ^{34}S-Δ^{33}S, Δ^{33}S-Δ^{36}S relation from each stratigraphic level shows somewhat different trend, possibly reflecting local environment and/or bacterial sulfate reduction activity.

Keywords: South Africa, Sulfur, MIF