SIMS analysis of Si isotope for radiolarian test in Mesozoic bedded chert, Inuyama, central Japan

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The global silica cycle is an important component of the long-term climate system, yet its controlling factors are largely uncertain due to poorly constrained proxy records. Because radiolarians and other organisms preferentially extract lighter ^{28}Si from the ocean, the $\delta^{30}Si$ of biosiliceous tests can thus be used as a potential proxy of productivity. Additionally, $\delta^{30}Si$ of oceanic silica could have reflected changes in the isotopic ratio of sources and sinks.

We measured $\delta^{30}Si$ records by secondary ion mass spectrometer (SIMS) in radiolarian silica, precipitated inside radiolarian molds in early Mesozoic bedded chert of the Inuyama section, central Japan [1]. Range of measured $\delta^{30}Si$ between -0.3 and 2 ‰ is consistent with that of modern and Cenozoic radiolarian tests. Relatively large intra-chert bed variability up to ~ 0.8 ‰ (1SD) supports that $\delta^{30}Si$ of the Mesozoic radiolarian molds are not perfectly homogenized in a chert bed during diagenesis. We found an overall inverse correlation between 10-Myr scale $\delta^{30}Si$ and biogenic silica (BSi) burial flux [2], which contradicts with a conventional interpretation of $\delta^{30}Si$ as paleoproductivity proxy, despite the low-resolution and scattered our $\delta^{30}Si$ records. Although most of the factors controlling oceanic $\delta^{30}Si$ are difficult to be constrained, this inverse relation might be explained by changes in weathering rate of highly-weatherable basaltic rock with light $\delta^{30}Si$ [1, 2]. Further high-resolution $\delta^{30}Si$ records will allow a better understanding of the past silica cycle.

[1] Bôle *et al.* (2020) *Bull. Geol. Sur. Japan in press*. [2] Ikeda *et al.* (2017) *Nature comm.* 15532.