The Carbon-Silicon cycle coupling: insight from in situ $\delta^{30}Si$ in Mesozoic radiolarites.

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Long-term (>105 yr) changes in Earth's climate are regulated by the global carbon and silicon cycles through the negative feedback between silica weathering followed by carbonate and BSi precipitation trapping CO_2 and SiO_2, respectively. The silica weathering depends on the kind and amount of silica rock exposed on continents and to climate, which is it-self induced by atmospheric CO_2 and astronomical cycles (Milankovitch cycles). However, many works need still to be done to constrain the temporal relation between the carbon and silicon cycles due to poorly constrained proxy record for the past controlling factors.
Radiolarian and other biosiliceous organisms incorporate preferentially lighter ^{28}Si from the ocean implicating that $\delta^{30}Si$ is, at least partially, a proxy of productivity for biosiliceous organisms similar to $\delta^{13}C$. Other parameters influencing $\delta^{30}Si$ are the isotopic ratio of the sources, the weathering intensity and the Si recycling in the water column. As silicon is commonly undersaturated in the water column, this proxy is very sensitive to input/output fluxes but has also fever pools that carbon at the Earth's surface. In addition, silica is more resistant to isotopic resetting/homogenisation than carbonates.
Here, we show $\delta^{30}Si_{radiolaria}$ of Triassic to Cretaceous bedded chert with bio-astrochronology, in Franciscan, Japan, Italy and Turkey. We found an overall inverse correlation between $\delta^{30}Si$ and biogenic silica (BSi) burial flux on 10-Myr timescale, which contradicts with a conventional interpretation of $\delta^{30}Si$ as paleoproductivity proxy, despite of the low-resolution and scattering of our $\delta^{30}Si$ records. Although most of factors controlling oceanic $\delta^{30}Si$ are difficult to be constrained, this inverse relation might be explained by changes in $\delta^{30}Si$ of mafic/felsic rock weathering ratio, inferred from paleogeographic distribution of Mesozoic volcanic rocks. We will also discuss $\delta^{30}Si$ variations within chert beds.

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