Oceanic distribution of dissolved silica through the Paleogene

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Despite being one of Earth's major biogeochemical cycles, the evolution of the silicon cycle has received little attention and changes in oceanic dissolved silica (DSi) concentration through geologic time remain poorly constrained. Silicon isotope ratios (expressed as $\delta^{30}Si$) in marine microfossils are becoming increasingly recognised for their potential to provide insight into silicon cycling. In particular, the $\delta^{30}Si$ of siliceous sponge spicules has been demonstrated to be useful for reconstructing past DSi concentrations [1, 2].

We analysed $\delta^{30}Si$ in radiolarian tests and sponge spicules from cores in the Atlantic Ocean (ODP leg 171B) and from the Pacific Ocean (ODP leg 199) covering the Paleogene period (ca. 23 to 65.5 Ma) and use a simple numerical model to estimate changes in seawater DSi concentrations and $\delta^{30}Si$.

The two datasets show a very similar isotopic signature from radiolarians in both oceans, evidence of a globally relatively homogenous surface ocean between the Atlantic and the Pacific Ocean during this time period. The sponge record however, shows discrepancies between the two oceans, with $\delta^{30}Si$ of sponge spicules in the Pacific generally being more negative than in the Atlantic - and therefore more DSi-replete. This provides evidence that the modern gradient of DSi concentration between the different ocean basins was already present during the Paleogene. We highlight differences between the two records as well as periods of major changes in the global oceanic distribution of DSi.

[1] Wille et al. (2010) EPSL **292**, 291-289. [2] Hendry and Robinson (2012) Geochimica et Cosmochimica Acta **81**, 1-12