Biosilicification drives a decline of dissolved Si in the oceans through geologic time

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Biosilicification has driven variation in the global Si cycle over geologic time. The evolution of different eukaryotic lineages that convert dissolved Si (DSi) into mineralized structures (higher plants, siliceous sponges, radiolarians and diatoms) has driven a secular decrease in DSi in the global ocean leading to the low DSi concentrations seen today. Recent studies, however, have questioned the timing previously proposed for the DSi decreases and the concentration changes through deep time, which would have major implications for the cycling of carbon and other key nutrients in the ocean. We combine relevant genomic data with geological data and present new hypotheses regarding the impact of the evolution of biosilicifying organisms on the DSi content of the oceans throughout deep time. Although there is no fossil evidence for true silica biomineralization until the late Precambrian, the timing of the evolution of silica transporter genes suggests that biosilicification has been present in the oceans since the Archean. We hypothesize that oceanic DSi concentrations have been influenced by biological processes since the beginning of oxygenic photosynthesis.

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