Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.17554

Effects of the K-Pg Boundary Event on the Ocean Silicon Cycle: What sponge spicule and radiolarian silicon isotopes can show us

MS. TJOERDIS STOERLING, PHD[1], LISA FRIBERG[2], LUCIE CASSARINO[3], REBECCA A PICKERING[1], DR. KRISTIN DOERING[1], FRANZISKA M. STAMM[4], KATHARINE R. HENDRY[5], SYLVAIN RICHOZ[1] AND DANIEL J. CONLEY[1]

[1]Lund University
[2]University of Bristol
[3]University of Brest, CNRS, IRD, Ifremer, Institut Universitaire Européen de la Mer, LEMAR
[4]Graz University of Technology
[5]British Antarctic Survey

Presenting Author: Tjordis.storling@geol.lu.se

The global silicon (Si) cycle has been strongly impacted by biosilicification since the Phanerozoic[1] and has been closely coupled to carbon drawdown, the biological pump, and climate change through geological times. A significant drawdown of oceanic dissolved silica (DSi) to modern levels was suggested to have occurred between the Cretaceous and the Cenozoic due to the evolutionary expansion of diatoms. Insights into how the Si cycle changed are gained by analyzing silicon isotope ratios (δ^{30}Si), especially in sponge spicules and radiolaria. The δ^{30}Si of siliceous marine sponges and radiolaria is correlated to DSi concentration in the oceans[2] and can be used as a DSi paleo-proxy. This study aims to expand our knowledge about the marine silica cycle back to the Cretaceous- Paleogene boundary (K-Pg, 66 Ma) that is marked by a rapid climate change, mass extinction of life, and severe disruption of the oceanic biogeochemical functions caused by a meteorite impact. Although sedimentary material containing suitable biogenic silica is scarce from this time interval, we reconstructed the ocean Si cycle across the K-Pg boundary from the upper Cretaceous to the Palaeocene based on δ^{30}Si compositions of sponge spicules and radiolaria from DSDP site 208 (Leg 21) in the Southwest Pacific. These are the oldest Si isotope measurements on biogenic material measured from the deep ocean to date. Our results show that sponge spicule δ^{30}Si compositions before the 66 Ma extinction event are very homogeneous at about – 0.86 ±0.2‰ before declining to lower values between -2.60‰ to -1.51 ‰ after the boundary. Nevertheless, the DSi concentrations can be reconstructed from our results for the beginning of the Paleocene showing that the Southwest Pacific was already depleted in DSi.

[1] Conley et al. (2017) *Frontiers in Marine Science 4.*

[2] Hendry & Robinson (2012) *Geochimica Et Cosmochimica Acta 81*, 1-12.