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Planktic foraminiferal Sr/Li: a new Cenozoic DIC proxy?

WEI-NING FANG[1], JAMES W. B. RAE[2] AND OSCAR BRANSON[1]

[1]University of Cambridge
[2]University of St Andrews

The boron isotope composition of foraminifera provides key records of past ocean pH. These records can be combined with a second carbonate parameter to calculate atmospheric CO_2. However, our knowledge of this 'second parameter' is limited, as it is generally inferred from indirect observations or modelling studies. We currently lack a direct proxy for the second carbonate parameter.

Here, we propose a new proxy for dissolved inorganic carbon (DIC), based on the strontium-to-lithium (Sr/Li) ratio in planktic foraminifera. Our proxy is founded in culturing studies (*Orbulina universa* and *Trilobatus sacculifer*) where pH, carbonate ion concentration ($[CO_3^{2-}]$), and DIC were varied independently. The results reveal that Sr/Li correlates with DIC alone and is insensitive to pH and $[CO_3^{2-}]$. Comparison of Sr/Li in multiple species from core-top and sediment traps with modern DIC further validates a DIC-driven relationship, with species-specific offsets.

We combine our new Sr/Li-DIC correlations with other estimates of seawater chemistry to provide the first independent record of surface ocean DIC across the Cenozoic.