Changes in size distribution of the Early Jurassic nannofossil *Schizosphaerella* sp.: a new proxy for paleoenvironmental reconstructions?

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Experimental studies suggest that increasing carbon dioxide concentrations due to anthropogenic emissions will likely decrease the saturation state of the ocean with respect to calcium carbonate. This in turn should affect calcification of calcareous phytoplankton and could have profound and detrimental consequences for marine ecosystems (Orr *et al*., 2005). However, relationships between environmental conditions and phytoplankton calcification are still unclear, and remain, furthermore, largely untested in the geological record. *Schizosphaerella incertae sedis*, a probable calcareous dinoflagellate, whose range is earliest Jurassic to Late Jurassic, was one of the most important carbonate pelagic producers during the Jurassic period and thus represents an ideal nannofossil taxon to address the response of calcareous phytoplankton to past environmental changes.

Here we report size distribution measurements of *Schizosphaerella*, calcium carbonate contents, and stable isotopic compositions ($\delta^{18}O$ and $\delta^{13}C$) of well-preserved brachiopod shells from Lower Pliensbachian to Lower Toarcian hemipelagic deposits of the reference section of Peniche, Portugal. Nannofossil quantification indicates that most of the carbonate mud was not produced by nannofossils and was thus most likely imported from adjacent shallow-water platforms. The carbonate content and the size variations of *Schizosphaerella* both show a close parallelism all along the studied interval, and largely co-vary with the oxygen isotopic compositions of brachiopod shells. Maximum mean diameters of *Schizosphaerella* are recorded in the Late Pliensbachian, a period of cool climatic conditions, characterized by low carbon dioxide concentrations, while minimum sizes are recorded during the Early Toarcian oceanic anoxic event, which is commonly interpreted as a time of elevated seawater temperatures and exceptionally high carbon dioxide concentrations (McElwain *et al*., 2005). Though it is tempting to attribute these size variations in terms of changes in carbon dioxide concentrations and calcium carbonate saturation, it is still unclear if carbon dioxide directly controlled the biocalcification of this genus *via* carbonate saturation decrease, or indirectly via CO_2-induced changes in environmental conditions (*e.g*., temperature, salinity, runoff and nutrient input).

References

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