

500 million years of foraminiferal calcification

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Ongoing ocean acidification is affecting marine calcification and will thereby affect dissolved and atmospheric CO₂ concentrations. Reports on the exact impact of acidification on shell-building varies: while some marine calcifying organisms are hampered by a lower seawater pH, others increase their calcification at lower saturation states. Here, we investigate the evolutionary origin of shell building in foraminifera to understand the long-term interplay between ocean carbon chemistry and calcification. Our analysis of shell chemical composition reveals multiple, independent origins for foraminiferal calcification throughout the Phanerozoic. With the long timespan involved, variability in seawater chemistry provided contrasting environments for calcification to arise, resulting in the diverse calcification strategies that exist today. This, in turn, explains the opposite responses of shell building to carbon perturbations. Our results call for adopting an evolutionary perspective when predicting the impact of perturbations on marine calcification and thereby, on the global carbon cycle.