Geophysical Research Abstracts
Vol. 20, EGU2018-891, 2018
EGU General Assembly 2018

A transition from Court Jester to Red Queen in the ecological success of Phanerozoic marine calcifiers

Kilian Eichenseer (1), Uwe Balthasar (2), Christopher Smart (3), Julian Stander (4), and Wolfgang Kiessling (5)

(1) School of Geography, Earth and Environmental Sciences, Plymouth University, Plymouth PL4 8AA, United Kingdom (kilian.eichenseer@plymouth.ac.uk), (2) School of Geography, Earth and Environmental Sciences, Plymouth University, Plymouth PL4 8AA, United Kingdom (uwe.balthasar@plymouth.ac.uk), (3) School of Geography, Earth and Environmental Sciences, Plymouth University, Plymouth PL4 8AA, United Kingdom (C.Smart@plymouth.ac.uk), (4) School of Computing, Electronics and Mathematics, Plymouth University, Drake Circus, Plymouth PL4 8AA, United Kingdom (J.Stander@plymouth.ac.uk), (5) GeoZentrum Nordbayern, Department of Geography and Geosciences, Universität Erlangen-Nürnberg, 91054 Erlangen, Germany (wolfgang.kiessling@fau.de)

The vast Phanerozoic fossil record of marine calcifiers allows for quantitative assessment of environmental influences on past life. Calcifying organisms build their shells from calcite and/or aragonite, and the metabolic cost of shell secretion is influenced by the interplay of mineralogy and environment. Mg:Ca ratio and temperature control whether abiotic calcium carbonate is precipitated as calcite or aragonite, and variations in those conditions are likely to have affected calcifying organisms throughout Earth history. Here, we combine a model of seawater Mg:Ca ratio with δ^{18}O temperature reconstructions to quantify calcite-aragonite sea conditions from the Ordovician – Pleistocene. We correlate calcite-aragonite sea conditions with the ecological success of aragonitic taxa at stage resolution, calculated as Summed Common species Occurrence Rate (SCOR) based on genus-level occurrences from the Paleobiology Database. Calcite-aragonite sea conditions significantly co-vary with the ecological success of aragonitic taxa in the Palaeozoic, but correlation ceases in the Mesozoic. We attribute this to the escalation of marine life through time: The end-Permian mass extinction and subsequently the Mesozoic Marine Revolution led to the prevalence of increasingly mobile, metabolically active, and predatory taxa. A Palaeozoic Court Jester world, in which environmental constraints shaped the success of marine calcifiers, gave way to the modern Red Queen world, where biotic interactions reign.