



Aragonite / Calcite seas and the evolution of biomineralization

Uwe Balthasar

Plymouth University School of Geography, Earth and Environmental Sciences, United Kingdom
(uwe.balthasar@plymouth.ac.uk)

The vast majority of marine invertebrate skeletons are composed of the CaCO_3 polymorphs aragonite and calcite, yet the influence of seawater composition on the evolution of calcareous skeletal composition is poorly understood. The main theoretical framework in which the evolution of CaCO_3 shell mineralogy is assessed is the aragonite-calcite sea hypothesis with conventional thinking suggesting that a threshold in the marine Mg:Ca ratio determines CaCO_3 polymorph formation. I present data from CaCO_3 precipitation experiments to show that the concept of a distinct threshold is misleading because Mg:Ca ratio and temperature combined result in a Phanerozoic continuum of co-existing aragonite-calcite seas with aragonite-facilitating conditions existing throughout the Phanerozoic in shallow warm-water ($>20^\circ\text{C}$) environments. The stable reservoir of aragonite-favouring conditions in shallow warm water environments potentially explains the trend of increasing occurrences of skeletal aragonite throughout the Phanerozoic, particularly in the context of the 'out of the tropics' hypothesis. By contrast, the most prominent fluctuations with respect to aragonite-calcite sea conditions can be expected to have occurred in mid- to high latitudes.