



## Aragonite is calcite's best friend at the seafloor

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Aragonite is about 50% more soluble than calcite in seawater and its pelagic production is dominated by pteropods. Moreover, it could account for a large fraction of marine CaCO<sub>3</sub> export. The *aragonite compensation depth* (ACD, the depth at which accumulation is balanced by dissolution) is generally very close to the *aragonite saturation depth*, i.e. within a few hundred metres. Conversely, the *calcite compensation depth* (CCD) can be 1-2 kilometres deeper than the *calcite saturation depth*. That aragonite disappears shallower than calcite in marine sediments is coherent with aragonite's greater solubility, but why is the calcite *lysocline*, i.e. the distance between its compensation and saturation depths, much thicker than its aragonite equivalent?

Here, we suggest that at the seafloor, the addition of a soluble CaCO<sub>3</sub> phase (aragonite) results in the preservation of a predeposited stable CaCO<sub>3</sub> phase (calcite), and term this a negative priming action. In soil science, priming action refers to the increase in soil organic matter decomposition rate that follows the addition of fresh organic matter, supposedly resulting from a globally increased microbial activity (Bingeman et al., 1953). Using a new 3D model of CaCO<sub>3</sub> dissolution at the grain scale, we show that a conceptually similar phenomenon could occur at the seafloor, in which the dissolution of an aragonite pteropod at the sediment-water interface buffers the porewaters and causes the preservation of surrounding calcite. Since aragonite-producing organisms are particularly vulnerable to ocean acidification, we expect an increasing calcite to aragonite ratio in the CaCO<sub>3</sub> flux reaching the seafloor as we go further in the Anthropocene. This could, in turn, hinder the proposed aragonite negative priming action, and favour chemical erosion of calcite sediments.

Reference: Bingeman, C.W., Varner, J.E., Martin, W.P., 1953. The Effect of the Addition of Organic Materials on the Decomposition of an Organic Soil. *Soil Science Society of America Journal* 17, 34-38.