Widespread marine dolomite precipitation reveals an anoxic, high Mg/Ca Neoproterozoic ocean?

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The secular variation of marine carbonate mineralogy recorded the ocean oxygenation, seawater chemistry and co-evolution of life and environments through Earth's history. Abundant marine dolomite deposits (notably dolomite cements) were reported in Neoproterozoic platform successions in USA, Australia and Namibia. Studies on these dolomite cements have suggested an anoxic and high Mg/Ca Neoproterozoic ocean, which chemistry is profoundly different from that of the Phanerozoic seawater (Hood and Wallace, 2018). A novel type of marine dolomite cement, which dominates the Dengying Formation (late Ediacaran) in the Yangtze block, provides a further opportunity to test this hypothesis.

The petrological, mineralogical and geochemical analysis of these dolomite cements were studied to constrain the late Neoproterozoic seawater chemistry. These marine cements have well-preserved textural and optical characters similar to previously reported Neoproterozoic dolomites, indicating a primary or early post-depositional origin. Fabric-specific in-situ REE analysis on dolomites cements indicate an organic-rich and relatively anoxic seawater condition which may facilitate the precipitation of these cements within a platform setting. Further Mg isotopic analysis combined with petrographic evidence demonstrate that terminal Ediacaran seawater Mg/Ca ratio may be not as high as older successions in other cratons.

Hood and Wallace (2018) Global and Planetary Change, 160, 28-45