Sedimentary features of a modern environment with dolomite formation

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Dolomite is widely found on the geological record. However, the role of environmental variables associated with its formation at low temperature remains uncertain. Lagoa Vermelha, a hypersaline lagoon located on the Southeastern coast of Brazil, contains modern dolomite formation associated with microbial mats and stromatolites. The lagoon area is influenced by the ocean upwelling, affecting the annual hydrological and biogeochemical cycles.

A sediment core retrieved in the central part of the lagoon allowed identifying four lithostratigraphic units. The first unit (154-104 cm) represents a marine depositional environment composed of a poorly sorted sand within a dark mud matrix with high TOC values (~19%). It contains shell debris and high Fe, Al, Si, Ti and S concentrations. The sandy layer at the base of the unit corresponds to a Holocene transgression dated to ~5.0 cal kyrs BP. Unit II (104-86 cm) is characterised by ~20% TOC and comparatively lower Ca, Fe, Al, Si and Ti contents. Unit III (86-30 cm) starts at ~2.6 cal kyrs BP with a transition from estuarine to lacustrine carbonate facies. This well laminated mud unit holds ~72% carbonate content. TOC varies from 5 to 19% and Ca and Sr substantially increased, while K, Fe and Ti decreased, indicating changes in the sedimentary input. A pure dolomite concretion is found at 76 cm. The most recent Unit IV (28 cm to the top) contains ~56% carbonate covered by a microbial mat layer corresponding to the ongoing depositional process occurring at 1.5 m water depth with seasonal ocean upwelling episodes. Ongoing analyses of the organic matter from both surface waters and sediment, along with radiocarbon and biomarker data will contribute to improve our knowledge on the impact of ocean upwelling on the lagoon biogeochemical cycle and associated dolomite formation.