The influence of microbial sulfate reduction on the $\delta^{34}S_{CAS}$ composition in modern Mg-rich carbonates

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Dolomite is an important carbonate archive throughout Earth`s history that allows to reconstruct the global marine sulphur cycle through the $\delta^{34}S$ value of carbonate associated sulphate (CAS) and pyrite (py). However, studies of both proxies in environments characterized by modern dolomite precipitation are limited. Here we present $\delta^{34}S$ data for CAS and pyrite from dolomite-rich sediments of two hypersaline lagoons (Lagoa Vermelha and Brejo do Espinho) in Brazil. Results are compared to the sulphur isotopic composition of sulphate of the surface water.

In Lagoa Vermelha $\delta^{34}S_{py}$ values of sedimentary pyrite show a variation from -13 to -5‰. $\delta^{34}S_{CAS}$ values at 28‰ for carbonate sediment are isotopically heavier than the respective surface water with 20.5‰. The carbonates of Brejo do Espinho display increasing $\delta^{34}S_{CAS}$ values from 24‰ at the surface to 43‰ at 0.4m depth. There the $\delta^{34}S_{SO_4^{2-}}$ value of surface water lies at 23‰ and the $\delta^{34}S_{py}$ show an average value of -12‰.

Both, $\delta^{34}S_{CAS}$ and $\delta^{34}S_{py}$ values indicate a strong influence of microbial sulphate reduction during dolomite precipitation, which has implications for the reliably of a primary marine $\delta^{34}S_{CAS}$ proxy signal in ancient dolomites.