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First stable strontium isotopes ($\delta^{88/86}$Sr) from cold-water corals – new proxy for intermediate water temperatures

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Zooxanthellate scleractinian shallow-water corals are known as archives for seasonal variations of climate variability, such as sea-surface temperature, sea-surface salinity or productivity. The use of azooxanthellate cold-water corals as potential archives for intermediate water mass properties and climate variability was recently tested (e.g., Smith et al. 2000, Lutringer et al. 2005, Montagna et al. 2005, Cohen et al. 2006). However, the correlation of well-known proxies (δ^{18}O, δ^{13}C, Sr/Ca, Mg/Ca, U/Ca) with distinct environmental parameters is complicated due to the complex microstructure and microarchitecture of the aragonite skeleton and vital effects observed for coral species.

Over the past years non-traditional stable isotopes, like the divalent cations Ca^{2+} and Mg^{2+}, have been developed in the field of low-temperature geochemistry (e.g., Nägler et al. 2000, Gussone et al. 2003, Hippler et al. 2003). Fietzke and Eisenhauer (2006) followed this approach, developed a method to determine the fractionation of stable strontium isotopes of carbonate and showed a temperature dependent strontium isotope fractionation during calcium carbonate precipitation.

In this study, live samples of the cold-water coral *Lophelia pertusa* were collected along the European continental margin (Norwegian fjords and shelves, Skagerrak, Rockall Bank, Porcupine Seabight, and Ionian Sea of the Eastern Mediterranean) between 100 and 1000 m covering a temperature range from 6 to 14˚C. The stable stron-

tium isotope ratios $\delta^{88/86}$Sr incorporated in their skeletons show a clear relation to the ambient seawater temperature. The temperature sensitivity is 0.026 ($\pm$0.002) ‰/°C – a similar sensitivity comparable to a tropical shallow-water coral from Galapagos (0.033 ($\pm$0.005) ‰/°C) indicating a similar fractionation process of strontium for both, zooxanthellate and azooxanthellate corals.

The stable strontium isotope ratio $\delta^{88/86}$Sr of biogenic carbonates may serve as a new paleo-temperature proxy and thus introduce new perspectives in paleoceanography, such as changes in intermediate and deep-sea temperature and ocean circulation.

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