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Matrix-independent B isotope analysis by UV femtosecond LA-MC-ICP-MS with application to the cold-water coral *Desmophyllum dianthus*

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Boron isotopes are a powerful tool for pH reconstruction in marine carbonates and as a tracer for fluid-mineral interaction in geochemistry. Micro-analytical approaches based on laser ablation multi-collector inductively coupled plasma mass spectrometry (LA-MC-ICP-MS) often suffer from effects induced by the sample matrix. In this study, we investigate matrix-independent analyses of B isotopic ratios (expressed as $\delta^{11}B$) and apply this technique to the cold-water coral *Desmophyllum dianthus* from a field experiment in the Chilean Comau Fjord. We employ a UV femtosecond laser ablation system coupled to a MC-ICP-MS (Nu Plasma II, Nu Instruments) equipped with electron multipliers for *in situ* measurements of B isotopic ratios at the micron-scale. We obtained accurate B isotopic ratios with a reproducibility of ± 0.9‰ (2 SD) for various reference materials including silicate glasses (GOR132-G, StHs6/80-G, ATHO-G, and NIST SRM 612), clay (IAEA-B-8) and carbonate (JCp-1) using the silicate glass NIST SRM 610 as calibration standard, which shows that neither laser-induced nor ICP-related matrix effects are detectable. The application to cold-water coral (*D. dianthus*) samples taken from the fjord mouth (ambient seawater pH_T = 7.86) and the fjord head (ambient seawater pH_T = 7.59), respectively, reveals average $\delta^{11}B$ values ranging between 23.01‰ and 25.83‰ for skeleton increments grown during austral spring with minor intra-skeleton variability. Inferred internal pH values of calcifying fluids disclose an up-regulation of 0.7 to 1.1 pH units relative to ambient seawater pH_T and show that *D. dianthus* can cope with acidified conditions in a fjord environment. This approach opens a wide field of application in geochemistry, including pH reconstruction in biogenic carbonates and deciphering processes related to fluid-mineral interaction.