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Early diagenesis effect on lithium isotopes in carbonates

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In recent years, lithium (Li) isotopes have become an important proxy for weathering processes. Lithium is predominantly found in silicate rocks, while trace amounts are incorporated into carbonates. Multiple studies have already investigated the Li isotope composition of ancient carbonates of various types with the intention to unravel the Li isotope composition of paleoseawater (δ^7Li_{sw}) and to better understand past carbon-silicon cycles and weathering regimes. However, currently, there is a paucity of studies that focus on the effects of diagenesis on the δ^7Li values recorded by carbonates.

Here we present new Li isotope and geochemical measurements of 260 samples from two shallow (49 and 70 cm) cores from the modern-day Bahamas carbonates, representing different environmental settings. The first core is collected from a shallow mangrove inlet and is composed of Halimeda-rich rudstone to floatstone. The second core is collected from the Great Bahamas Bank flat and is composed of oolidic grainstone. Both cores were sliced into 1 to 2 cm thick segments, whereas each segment was further sieved into six grain fractions; porewater was also extracted from the segments of one of the cores. Interestingly, the data reveal that there is not much variability of the carbonate δ^7Li values with depth, while size fractions in the same core segments differ in their Li isotope composition. Furthermore, both cores express very different δ^7Li pattern between the size fractions, which is directly related to the depositional settings and composition of the cores.