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Effect of lithium on seven phytoplanktonic species and their δ^7Li

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In the context of energy transition, lithium (Li) is a trace element that is becoming increasingly important due to its use in electric vehicle batteries and in renewable energy storage systems. However, Li is not recycled and little is known about its potential effects on marine coastal organisms, especially on phytoplanktonic species, which are at the basis of most trophic networks. In this study, we investigate the effects of Li contamination on different phytoplankton species, many of which live in littoral zones, and use Li isotopes to model biological processes at play.

We cultured 7 phytoplankton species: *Chlorella sp., Dunaliella tertiolecta, Thalassiosira pseudonana, Isochrysis sp., Tetraselmis sp., Nannochloropsis granulata,* and *Skeletonema costatum* for 7-8 days with a Li concentration of 1.5 µg/ml. We compared different methods of cell extraction (centrifugation, filtration), and explored the effect of a rinsing step to remove exchangeable Li, as previously developed for Zn [1]. We also cultured *Isochrysis sp.* at different Li concentrations, from 0.18 µg/ml to 180 µg/ml, for 14 days. We measured phytoplankton growth rates, Li concentrations by TQ ICP-MS, and Li isotopes by MC-ICP-MS.

Our results show that most of the Li is concentrated in the cytoplasm, and that cell breakdown causes a massive Li loss. Furthermore, collecting Li from cells by centrifugation appears more efficient than by filtration techniques. We also found a significant difference in the phytoplankton Li content between the rinsed and the unrinsed aliquots. Li isotopes suggest that this effect may be due to a leak during the rinsing step. Overall, the phytoplankton growth rates remain unaffected by Li within the explored range. Phytoplanktonic species have generally higher Li concentrations than the control cultures, and are associated with small isotopic variations.

To conclude, our study provides the first insights into the effects of Li enrichment on marine phytoplankton growth and their isotopic composition, and a detailed methodological investigation unravels the potential of Li isotopes to track mixing and biological effects.

[1] Köbberich, M. and Vance. (2019) Chemical Geology **523**,