Variability in seawater concentrations of lithium

ZVI STEINER[1], ERIC P. ACHTERBERG[1], WILLIAM M. LANDING[2], MADELEINE S. BOHLIN[3], SATYA PRAKASH[4], P. N. VINAYCHANDRAN[5], MERVYN GREAVES[6] AND ALEXANDRA (SASHA) TURCHYN[6]

[1]GEOMAR Helmholtz Centre for Ocean Research Kiel
[2]Florida State University
[3]Uppsala University
[4]Indian National Centre for Ocean Information Services
[5]Indian Institute of Sciences
[6]University of Cambridge
Presenting Author: zsteiner@geomar.de

Lithium has little biological activity and can readily replace iron, aluminium and magnesium in aluminosilicate minerals, making lithium an excellent proxy for the inorganic silicate cycle. Data from the North Pacific, tropical Indian, South Atlantic and Southern Oceans reveal that there is a 2-3% variability in dissolved lithium concentrations in the open waters of the global ocean. The data suggest that the oceanic lithium cycle operates as two distinct pools. Most seawater lithium is highly stable and has very long residence time in the ocean. A second pool of lithium is extremely dynamic and behaves similarly to aluminium in the ocean. Lithium in the dynamic pool is supplied to the ocean by aerosols and quickly reacts with aluminium and manganese derived from these aerosols. The initial mechanism of reaction is adsorption to freshly formed manganese oxides and aluminium hydroxides. Removal of lithium from the deep waters of the North Pacific is correlated with removal of aluminium, likely for the formation of authigenic clays.