



Lithium isotopes as a proxy for weathering intensity during the Late Devonian

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The Late Devonian was an interval of time during which complex vegetation was evolving throughout the terrestrial realm and periodic marine anoxia-associated extinction occurred, locally accompanied by deposition of organic-rich black shales. Such phenomena were possibly forced by geochemical changes in the oceans and atmosphere, probably related to extrusion of the Viluy Traps in Siberia (Yakutsk Large Igneous Province). Given the possible role of volcanically derived carbon dioxide in controlling climate and the global carbon cycle, this study investigates how weathering intensity changed over this interval to illuminate its role in removing CO₂ from the atmosphere, converting it to dissolved carbonate/bicarbonate ions, and potentially transporting them to the oceans. Using lithium isotopes as the preferred proxy, it is possible, through analysis of Devonian carbonate-rich sediments, to determine whether the intensity of weathering was congruent (transport limited: resultant fluids effectively retaining the isotopic signatures of material weathered) or incongruent (chemically limited: formation of new clay minerals during weathering preferentially removing isotopically light lithium, leaving resultant fluids relatively isotopically heavy).

Preliminary lithium-isotope data from Frasnian–Famennian carbonates of Kowala Quarry, Poland, and Steinbruch Schmidt, Germany, will be presented to demonstrate how weathering intensity varied over Late Devonian time, along with recent results on clay mineral assemblage (via XRD) and I/Ca geochemical data.