Clumped isotope systematics in lacustrine and fluvial carbonates: A tool for paleohydrology, paleoclimate, paleoenvironment, and paleoaltimetry

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Lakes and rivers provide important archives of terrestrial climate change. Our capacity to understand Earth's environmental history is highly dependent on the accuracy of reconstructions of past climates. Unfortunately, while multiple methods for constraining marine temperature exist, quantitative terrestrial proxies are scarcer – tree rings, speleothems, and leaf margin analyses have all been used with varying degrees of accuracy. Clumped isotope thermometry has the potential to be a useful instrument for determining terrestrial climates: multiple studies have shown the fraction of 13C—18O bonds in carbonates is inversely related to the temperature at which the rocks formed. We have been measuring the abundance of $^{13}C^{18}O^{16}O$ in the CO_2 produced by the dissolution of carbonate minerals in phosphoric acid in modern lake samples and comparing results to independently known estimates of lake water temperature. Sample types we have investigated include endogenic carbonates, freshwater gastropods, bivalves, microbialites, and ooids.