

# Cambridge Elements

Elements in Geochemical Tracers in Earth System Science

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## THE URANIUM ISOTOPE PALEOREDOX PROXY

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## The Uranium Isotope Paleoredox Proxy

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**Abstract:** Uranium isotopes ( $^{238}\text{U}/^{235}\text{U}$ ) have emerged as a proxy for reconstructing the redox conditions of the Earth's oceans and atmosphere based upon the large isotopic fractionation between reduced U(IV) and oxidized U(VI). Variations in  $^{238}\text{U}/^{235}\text{U}$ , particularly when recorded in carbonate sediments, can track global trends in marine oxygenation and deoxygenation. It is unique among proxies because reduction occurs primarily at the sediment–water interface, and this sensitivity makes U isotopes especially relevant for the habitability of benthic animals. This Element covers the background, methods, and case studies of this promising tool for understanding Earth's environmental transitions, as rapid development continues to refine the accuracy of interpretations of  $^{238}\text{U}/^{235}\text{U}$  records.

**Keywords:** uranium isotopes, marine anoxia, paleoredox, carbonates

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