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Assessment of the chromium isotope system using global marine sediments

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To reconstruct changes in past biogeochemical conditions, paleoproxies such as the chromium (Cr) isotope system ($\delta^{53}Cr$) can be used. The Cr isotope system can record changes in redox conditions, as well as in biological productivity. Sediments deposited during the Pleistocene glacial/interglacial cycles provide useful archives to explore the sensitivity of the Cr isotope system to various forcing mechanisms. They are typically better preserved (less diagenetic alteration) and better characterised compared with sediments or sedimentary rocks recording biogeochemical changes over longer timescales (during, e.g., ocean anoxic events, great oxidation event).

We investigate potential drivers of change in sedimentary Cr from the North Atlantic to the North Pacific using core-top sediments and sediments deposited during the Last Glacial Maximum (LGM). The selected sediment cores were deposited in open ocean environments, and thus, may preserve information on regional to global changes in the climate system without potentially obfuscating local signals (e.g., river input).

The results show that authigenic Cr concentrations are typically elevated in sediments deposited during the LGM compared with core-top sediments, regardless of the lithology. However, as these changes can be subtle and authigenic Cr concentrations are typically low (< 3 µg/g), Cr concentrations alone provide only limited information. Preliminary data from core-top sediments show that small changes in Cr concentrations can be accompanied by substantial changes in $\delta^{53}Cr$ values (e.g., < 0.5 µg/g change in Cr with a > 0.5 ‰ change in $\delta^{53}Cr$). This observation provides support for the utility of the Cr isotope system to record biogeochemical changes in the sedimentary record.