

## Early Cryogenian Cr isotope stratigraphy, Otavi Group, Namibia

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Due to its redox-sensitivity, the chromium (Cr) isotope system is a promising tool for paleo-environmental reconstructions. Variations in Cr isotopes (denoted as  $\delta^{53/52}\text{Cr}$  or simply  $\delta^{53}\text{Cr}$ ) are particularly powerful in recording fine-scale redox fluctuations in marine environments, and can complement other (isotope) proxies for paleocean reconstructions. Carbonates are ubiquitous throughout Earth's rock record and have the potential to record the marine  $\delta^{53}\text{Cr}$  signal e.g.<sup>1,2</sup>. Here, we seek to investigate climatic changes associated with the aftermath of an early Cryogenian glacial event, one of the Snowball Earth-type periods characteristic for the Neoproterozoic Era. We present elemental and isotopic signatures of cap dolostones pertaining to the Berg Aukas Fm (Otavi Group, N Namibia) that were deposited in marine settings following the Chuos Fm ( $746 \pm 2 \text{ Ma}$ <sup>3</sup>). More specifically, in order to decipher past environmental changes, we couple major, trace and rare earth elemental patterns of these cap dolostones with variations in stable carbon ( $\delta^{13}\text{C}$ ) and oxygen ( $\delta^{18}\text{O}$ ) isotopes complemented by the novel Cr isotope paleoredox proxy. Prominently, the Chuos  $\delta^{53}\text{Cr}$  signal ( $\sim -0.1\%$ ) is within the range of bulk silicate Earth, where a pronounced hydrothermal influence is also indicated by positive Eu anomalies ( $>1.1$ ) and elevated Fe concentrations. This is followed by a fluctuating, but generally positively fractionated  $\delta^{53}\text{Cr}$  signature ( $\sim +0.1\%$ ) indicative of a sufficiently oxygenated atmosphere/hydrosphere, as well as typical marine  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  values ( $\sim +4.4\%$  and  $\sim -2.6\%$ , respectively), all of which prevail throughout the studied cap dolostone sequence. Furthermore, negative Ce anomalies ( $<0.95$ ) are common. The observed cap dolostone  $\delta^{53}\text{Cr}$  values indicate sufficiently high oxygen levels to oxidize and mobilize Cr during weathering processes on land and to stabilize this  $\delta^{53}\text{Cr}$  signature in the marine environment of the early Cryogenian.

<sup>1</sup> Guilleadeau *et al.* (2016) *GPL* **2**, 178-187; <sup>2</sup> Holmden *et al.* (2016) *GCA* **186**, 277-295; <sup>3</sup> Hoffman *et al.* (1996) *Comm. Geol. Surv. Namibia* **11**, 47-52.