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Combined Cadmium-Chromium Analyses of the Cretaceous-Paleogene Belqa Group, Central Jordan

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The Late Cretaceous-Early Paleogene lower Belqa Group outcrops in central Jordan as a sequence of sedimentary rocks deposited in a shallow platform setting along the southern margin of the Neo-Tethys Ocean, which was dominated by an upwelling regime at the time of sedimentation. The Belqa Group contains a notably high level of enrichment in redox and biophile sensitive elements and the nuances of the origins of this enrichment remain of interest for the characterization of the environmental conditions of certain marine depositional environments.

The multi-proxy approach of authigenic cadmium (Cd) and chromium (Cr) stable isotopes is an emerging tool for the reconstruction of primary productivity and redox processes in marine settings [1]. This present study applies the combined Cd-Cr approach to the sedimentary archives of the Belqa Group, and along with previously published geochemical data, aims to constrain the depositional environment and origin of these extremely enriched lithologies [2, 3].

TIMS double spike Cd and Cr analyses were completed on a selection of carbonate and shale samples from the lower Belqa Group. The results present a range of fractionation values, with authigenic $\delta^{53}Cr$ measuring from 0.6‰ to 1.75‰ and $\delta^{114}Cd$ values varying from -3.8‰ to 1.03‰. Corresponding concentrations of these elements range from 0.9 mg/kg to 563 mg/kg for Cd and 88 mg/kg to 1898 mg/kg for Cr.

Results indicate that the depositional environment of the Belqa Group was stratified into an oxic, highly productive surface layer and a euxinic bottom layer, with an organic matter (OM)-shuttle in between. This stratification likely enabled the notably high levels of polymetallic enrichment observed in the Belqa Group sediments. Future research includes a comparison of carbonate versus shale fractionation of Cd, as well as potential high-temperature effects on Cd fractionation.

[1] Frei et al. (2021), *Chemical Geology* 563, 120061; [2] Farouk et al. (2020), *Marine and Petroleum Geology* 120, 104535; [3] Fleurance et al. (2013), *Palaeogeography, Palaeoclimatology, Palaeoecology* 369, p. 201-219.