

A combined sedimentological and biomarker record across the Neoproterozoic Bitter Springs Excursion

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Isotopic records from carbonate carbon of the Neoproterozoic (1000 – 542 Ma) display extremely large negative excursions, with $\delta^{13}\text{C}$ values shifting from 5‰ to 8‰ down to -4‰, -6‰, or even -12‰. The origin of such large amplitude variations is still enigmatic because they do not occur in any other geological period, except in diagenetically altered carbonate platforms [1].

In this work we focus on the Bitter Springs Excursion (BSE), which is the oldest (~800 Ma) and the least extreme in the Neoproterozoic, with $\delta^{13}\text{C}$ values shifting from 6‰ to -4‰. In respect to the other large excursions this is the only one not preceding nor followed by a large glacial event, and it is the only case in which the negative excursion is recorded both in carbonate and in organic $\delta^{13}\text{C}$ [2].

We present sedimentological and geochemical data from a new core drilled through the Bitter Springs Formation of the Amadeus Basin in Central Australia. The lower part of this unit consists of a thick succession of carbonate and evaporitic facies (Loves Creek member), whereas the upper part is dominated by red silty marlstones alternating with gray, more carbonatic facies (Jonny's Creek member). Bulk carbonate $\delta^{13}\text{C}$ is between -4‰ and -2‰ within the Loves Creek member, corresponding to the upper part of the BSE. The base of the Jonny's Creek member coincides with the end of the excursion, with $\delta^{13}\text{C}$ increasing up to 6‰. However, the $\delta^{13}\text{C}$ pattern is continuous indicating that there is no significant hiatus at the boundary between the two members.

We also present the first detailed record of indigenous [3, 4] biomarkers from within and above the BSE. Shifts in facies as well as in biomarker assemblages suggest significant ecological changes at the end of the BSE within the Amadeus Basin.

[1] Swart & Kennedy (2012) *Geology*, **40**, 87-90. [2] Swanson-Hysell *et al.* (2010) *Science*, **328**, 608-611. [3] Brocks *et al.* (2008) *Geochimica and Cosmochimica Acta*, **72**, 871-888. [4] Pawlowska *et al.* (2013) *Geology*, **41**, 103-106

Enrichment of Pb, Se, As, U and Cs in commercial cosmetic clays

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Three samples, representing different commercial types of cosmetic clays (white, green and red) were analyzed for 29 trace elements (Ag, As, Ba, Be, Cd, Ce, Co, Cr, Cs, Cu, Ga, Hf, Hg, La, Mo, Ni, Pb, Rb, Sb, Sc, Se, Sr, Th, Tl, U, V, Y, Zn and Zr).

According to EC regulation [1] the presence of As, Be, Cd, Cr, Hg, Ni, P, Pb, Sb, Se, Te, Tl, Zr and their compounds is prohibited in cosmetics. However, for 16 trace elements (As, Ba, Ce, Cr, Cs, Cu, La, Ni, Pb, Rb, Sr, Th, V, Y, Zn and Zr), concentrations ranging from 10 ppm to 410 ppm have been detected in the studied clays.

Compared to the average concentration of elements in shales (average shale) [2] (Fig. 1), white clay (WC) is enriched in Pb (11.0 times), Cs (2.0 times) and U (2.0 times), green clay (GC) is enriched in As (3.3 times) and U (2.1 times), while the red clay (RC) is enriched in Se (9 times).

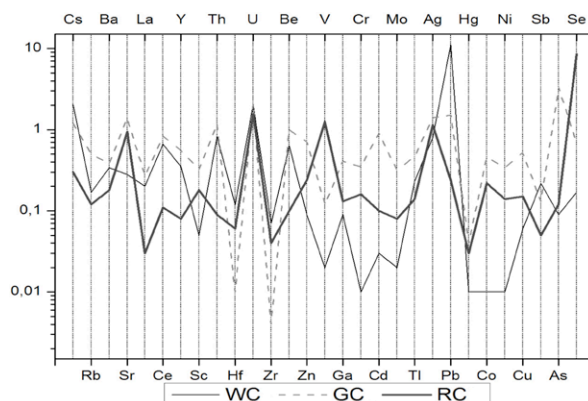


Figure 1: Average shale-normalized trace element spider diagram patterns of the studied samples; elements sorted according to their electronegativity values.

[1] E.C. Regulation 1223 (2009) *Official Journal of the European Union*, L342 (22.12.2009), 59-209. [2] Mason & Moore (1982) *Principles of Geochemistry*. Wiley, New York, 344p.