Contrasting osmium isotopes and Zn/Al ratios as magmatism proxies in Cenomanian-Turonian sediments

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During the mid- to late Cretaceous, the Earth was characterised by elevated surface temperatures [1] and high atmospheric CO_2 resulting in reduced latitudinal heat gradients and sluggish oceanic circulation. Several intervals of marine anoxia are recorded by widespread organic-rich shales deposited during this time, with the Cenomanian-Turonian Boundary Event (CTBE; ca. 93.5 Ma) being the most ubiquitous and arguably best studied of these Oceanic Anoxic Events (OAE).

Osmium isotope measurements [2] indicate that large-scale magmatic activity occurred close to the onset of black shale deposition, as indicated by the Os isotope ratios in organic-rich sediments. The calculated initial $^{187}Os/^{188}Os$ ratios – reflecting contemporaneous seawater Os isotopic values – drop abruptly from 0.7-1.2 to unradiogenic values of ~0.14-0.15 at CTBE onset. These low values are most likely linked to magmatic activity as no evidence of bolide impact has been reported near this stage boundary. These results indicate that >97% of the Os in contemporaneous seawater is magmatic in origin, a ca. 30-50 fold increase relative to pre-OAE2 conditions.

In contrast, zinc – which has been attributed to elevated hydrothermal activity during the Cretaceous [3] – shows gradually increasing Al-normalised ratios over several Myrs leading up to the CTBE, with enrichment factors exceeding 130× average shale composition at distant sites [4, 5]. This is agreement with Sr isotopes which, despite long residence times, suggest that hydrothermal activity started well before the onset of OAE2, indicating either a decoupling of the Os and Sr reservoirs in the mantle or that the large Os signal is associated with a specific magmatic event.

[1] Clarke & Jenkyns (1999) *Geology* **27**, 699-702. [2] Turgeon & Creaser (2008) *Nature* **454**, 323-326. [3] Brumsack (2006) *Palaeogeogr. Palaeoclim. Palaeoecol*. **232**, 334-361. [4] Turgeon & Brumsack (2006) *Chem. Geol.* **234**, 321-339. [5] Hetzel *et al.* (in press) *Palaeogeogr. Palaeoclim. Palaeoecol*.

Growth and recycling of the Archean crust: Isotope data on the southwestern margin of Siberian craton

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The interval 2.75-2.65 Ga corresponding to the lagest anomaly in the isotopic age distribution of juvenile continental crust is considerd the major period of continental crust growth [1]. Identified pre-3.1 Ga crustal terranes account for much less than 5% of continental crust [2], and significance of the Paleo-Mezoarchean crust in succesive crustal evolution is controversial. Previous isotope data on the Siberian craton mainly from the Aldan and Anabar shields suggest the existence of the main crustal-forming event in Mezoarchean (3.1-2.9 Ga) [3]. New U-Pb and Sm-Nd isotopic data on Early Precambrian metamorphic and granitoid complexes from the southwestern margin of the Siberian craton (Sharyzhalgay shield) is used to estimate lateral extension of the Paleo- and Mezoarchean crust and to reveal the main stages of crustal growth and recycling. In the Onot and Bulun granite-greenstone domains two periods of crustal growth are identified: 3.3-3.4 and 2.8-2.9 Ga. The TTG complexes were formed in the Paleoarchean as a result of two dicrete magmatic events, at 3.4 and 3.3 Ga, and their metamorphism and migmatization took place at ca. 3.2 Ga. The isotopic signatures of the TTGs suggest the input of pre-3.3 Ga crust in their formation. The Mezoarchean (2.8-2.9 Ga) greenstone sequences include oceanic metabasalts and metasedimentary schists in the Bulun domain and bimodal basalt-rhyolite metavolcanics and metasedimentary schists in the Onot domain. The isotopic composition of greenstone metabasalts indicate their depleted mantle sources. The Mezoarchean crustal growth via greenstone volcanism was accomponied by recycling of the older crust which served as one of the sources of felsic volcanics and detrital material for terrigenous sediments. The isotopic composition of most of the Paleoproterozoic (ca 1.87 Ga) collisional granitoids strongly suggests that they were formed by partial melting of old crust and traced lateral extention of the pre-2.8 Ga crust.

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[1] Condie (1995) *Geophys. Res. Lett* **22**, 2215-2218. [2] Vervoort *et al*. (1996) *Nature* **379**, 624-627. [3] Kovach *et al*. (2000) *Petrology* **8**, 394-408.