Re-Os study of Paleo-Archean Carbonaceous Siltstones

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We acquired Re-Os isotope data of narrow intervals of carbonaceous siltstone from two cores of the "Barberton Drilling Project" in the Barberton Greenstone Belt, South Africa, using the CrO_3-H_2SO_4 Carius tube digestion technique followed by isotope dilution TIMS [1]. We further determined Ir concentrations (isotope dilution ICP-MS), complemented by trace element, carbon and sulphur contents.

Two BARB5 (Mapepe Fm., Fig Tree Group) intervals (~290 and ~760 m depth) have Re-Os ages of 3432 ± 77 Ma (MSWD = 1.6) and 3264 ± 44 Ma (MSWD = 2.3) with $^{187}Os/^{188}Os_{initial}$ of 0.1010 ± 0.0040 and 0.1055 ± 0.0066, respectively. Remarkably, the two stratigraphic intervals display an inverse age relation, which can be explained in various ways taking into account the selective dissolution method that releases predominantly but not exclusively hydrogenous components. The former age is out of range of literature values for Fig Tree Group deposition (3.223 to 3.26 Ga [2] [3]). Th/U and Zr/Mo show continental composition; in fact, none of the redox-proxies indicates enrichment. Still, Re abundance correlates with organic carbon and not with sulphur content.

Re-Os isotope data for BARB3 (Buck Reef Chert, Kromberg Fm., Onverwacht Group) show considerable scatter (MSWD = 97). Nevertheless, five out of eleven samples define an age of 3318 ± 27 Ma (MSWD = 1.02) with an implausible initial of -0.080 ± 0.013, suggesting post-sedimentation alteration. The calculated age overlaps the younger end of the expected range within uncertainty (3.33 to 3.41 Ga [2]). Two samples of this interval show low Th/U and Zr/Mo indicating light enrichment of redox sensitive elements.

We will discuss the behavior of the Re-Os system in these sediments within the framework of a multi-elemental approach. Used in concert, these data will improve our understanding of Paleo-Archean environmental conditions.

[1] Creaser *et al* (1991) *GCA* **55**, 397-401. [2] Byerly *et al* (1996) *Prec Res* **78**: 125-138. [3] Heubeck *et al* (2013) *Prec. Res.* **231**: 236-262.