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Re–Th–U nuclear geochronometry: Th/U $\approx$ 4.3 within the Earth's core is consistent with global MORB Th/U ratios

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^{187}Re -^{187}Os nuclear geochronometry is a new age dating method combining principles of geochronology with nuclear astrophysics. It has been successfully applied to PGE hosting magmatic ore deposits like the Late Archean Stillwater Complex (SC), Montana, USA [1]. The pronounced isotopic dichotomy of the SC has been interpreted as being due to the interaction of two magmatic components with extremely different ^{187}Os/^{188}Os$_i$ but Re/Os $\approx$ 1. A Mercury-like planetary contraction with Fermi-pressure controlled core collapse at about 3.48 Ga producing heavy nuclides has been suggested [2] to explain the ultra-subchondritic ^{187}Os/^{188}Os$_i$ of the SC, consistent with the observed increase in PGE abundances within komatiites [3] and in magnetic field strength between 3.6 Ga and 3 Ga [4]. It contradicts a partial melting event of primitive mantle or a chondritic late veneer PGE addition [3] to the Earth. Besides, rocks and plagioclase from the SC show uniform Th/U $\approx$ 4 [5], consistent with Th/U = 4.1 $\pm$ 0.3 as derived from 12 Barberton komatiites [6]. For the Earth's core, a high Th/U $>$ 4.3 has recently been proposed [7]. This seems to contradict global and average MORB Th/U [8]. However, assuming that the r-process nuclides were produced in the same nucleosynthetic event(s), mixing of the two reservoirs could explain the decreasing Th/U ratios observed in oceanic basalts since 3.5 Ga [7, 8]. To test this hypothesis, two nucleogeochronometric ^{232}Th/^{238}U evolution lines are plotted versus time, starting with an r-process production ratio ^{232}Th/^{238}U $\approx$ 0.96 [9] at 13.781 Ga and 3.48 Ga, respectively. It turns out that the model explains successfully global MORB ^{232}Th/^{238}U between 1.45 and 4.3 [8] by mixing of the two ^{232}Th/^{238}U components. Hence, it can be shown for the first time that a high Th/U $\approx$ 4.3 in the core is consistent with global and average MORB Th/U ratios.

[1] Roller (2015) *Geophys. Res. Abstr.* **17**, EGU2015-17. [2] Roller (2015), T13A-2982, AGU Fall Meeting. [3] Maier *et al.* (2009) *Nature* **460**, 621-623. [4] Tarduno *et al.* (2015), *Science* **349**, 521-524. [5] Wooden *et al.* (1991), *Contrib. Mineral. Petrol.* **107**, 80-93. [6] Brévart *et al.* (1986), *EPSL* **77**, 293-303. [7] Wohlers *et al.* (2015), *Nature* **520**, 337-340. [8] Arevalo *et al.* (2010), *Chem. Geol.* **271**, 70-85. [9] Roller (2015), 78th Ann. Meeting Met. Soc., Abstr. #5041.