Please ensure that your abstract fits into one column on one page and complies with the *Instructions to Authors* available from the Abstract Submission web page.

The redox state of mantle eclogites

SMART, K.A.[1], TAPPE, S.[2], SIMONETTI, A.[3], SIMONETTI, S.S.[3], WOODLAND, A.B.,[4], HARRIS, C.[5]

[1]University of the Witwatersrand, Johannesburg, South Africa; katie.smart2@wits.ac.za
[2]University of Johannesburg, Auckland Park, South Africa
[3]University of Notre Dame, IN, USA
[4]Goethe-Universitat, Frankfurt am Main, Germany
[5]University of Cape Town, Rondebosch, South Africa

Mantle-derived eclogite xenoliths are key for studying the evolution of the cratonic lithosphere, because geochemical evidence suggests that they typically represent fragments of Archean and Proterozoic oceanic lithosphere [1]. Recently, it has been suggested that eclogite xenoliths can serve as redox sensors of the Precambrian upper mantle using V/Sc as a redox proxy [2]. However, metasomatism can change the original oxidation state of the cratonic mantle [3], thereby limiting its use for monitoring mantle redox evolution.

Circa 1.8–2.2 Ga eclogite xenoliths erupted with Jurassic kimberlites of the northern Slave craton have geochemical features that indicate oceanic crust protoliths [4, 5]. Such Paleoproterozoic ages are common for Slave craton mantle eclogites [6], linking eclogite formation with 1.9 Ga subduction-collision events at the western craton margin. The eclogites studied here have highly variable $Fe^{3+}/\Sigma Fe$ (0.019 – 0.076 ±0.01), with $\log fO_2$ (ΔFMQ-4 to +2 ±0.5) that are both relatively oxidized and reduced compared to Slave mantle peridotite xenoliths [3]. Also, eclogite fO_2 positively correlates with some indicies of metasomatism, such as elevated TiO_2 in garnet. In addition to considering the time gap between eclogite formation and kimberlite eruption, the highly variable fO_2–depth systematics of the eclogites studied here illustrate the drawbacks of using averaged eclogite fO_2 to define the redox evolution of the upper mantle. Despite this, the ca. 2 Ga northern Slave craton eclogites have an average depth-corrected $\log fO_2$ of ΔFMQ-0.5±1.3 (1σ) that overlaps with modern MORB, and complies with the upper mantle redox evolution trend predicted using V/Sc ratios of mantle-derived melts [2]. However, given the debate around the secuarity of mantle redox [7], further research into the suitability of mantle eclogites as redox sensors is warranted.

[1] Aulbach & Jacob (2016) Lithos **262**, 586-605.
[2] Aulbach & Stagno (2016) Geology **44**, 751-754
[3] Yaxley *et al*. (2017) Sci Reports **7**, 30.
[4] Smart *et al*. (2014) J Petrol **55**, 549-583.
[5] Smart *et al*. (in press) Chem Geol.
[6] Schmidberger *et al*. (2007) Earth Planet Sci Letts **254**, 55-68.
[7] Gaillard *et al*. (2015) Chem Geol **418**, 217-233.