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Ruthenium isotopic evidence for a missing late accretion component in the mantle source of Pilbara craton

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Early Archean komatiites from the Pilbara craton (Australia) exhibit lower highly siderophile element (HSE) concentrations than observed for younger komatiite formations [1]. The significant HSE depletion in 3.5-3.2 Ga-old komatiites from Pilbara suggests that these lavas derive from a mantle source that had not yet fully equilibrated with late accreted material [1]. This interpretation seems to be corroborated by the presence of ^{182}W excesses reported for some mafic rocks from Pilbara [2]. However, the ^{182}W excesses do not provide unequivocal evidence for incomplete mixing of late accreted material because they may also reflect early mantle differentiation processes [3]. In this regard, mass-independent Ru isotope variations represent a more powerful and indicative tool to identify primordial mantle heterogeneities arising from incomplete mixing of the ambient mantle with late accreted material [4]. Here we determined the Ru isotope compositions of komatiites from Pilbara and report new $^{187}Os/^{188}Os$ and HSE contration data for the same rocks.

Komatiites from the Ruth Well, Louden/Bookingara and Coonterunah formations show a relative excess in ^{100}Ru of 23 parts per million compared with the modern mantle composition. The magnitude of the ^{100}Ru excess in these rocks is the same as observed for ultramafic rocks from SW Greenland [4]. The ^{100}Ru excess represents a mass-indepenedent anomaly of nucleosynthetitc origin and provides unambiguous evidence that the Pilbara komatiites derive from a mantle source that did not have the full equivalent of late accreted material compared to the modern mantle. Futhermore, the ^{100}Ru excess also indicates that the mantle source of these rocks contains a fraction of Ru that was not completely stripped from the mantle during the latest stages of core formation. Otherwise no Ru isotope anomaly could be observed.

[1] Maier *et al.* (2009) Nature **460**, 620-623. [2] Archer *et al.* (2019) EPSL **528**, 115841. [3] Tusch *et al.* (2020) this meeting. [4] Fischer-Gödde *et al.* (2020) Nature, in press.