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New insights on cratonic mantle history from single grain Re-Os on sulphide and platinum-group minerals: A case study in Letlhakane (Botswana), Thaba Putsoa and Liqhobong (Lesotho) mantle xenoliths.

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Cratonic terranes overlie the oldest known subcontinental lithospheric mantle; hence ascending mantle melts can entrain peridotite xenoliths that record the earliest melting history of this region. However mantle xenoliths have complex petrological histories that may subsequently overprint the original melt depletion event. Therefore whole-rock Re-Os age analysis may provide only a minimum estimate for the age of the lithospheric mantle, and likely reflects the presence of multiple generations of base metal sulphides (BMS) or platinum group minerals (PGM), which differ in age as well as mineralogy and habit. While metasomatic sulphides and/or PGM are likely to yield "artificially young" Re-Os ages, refractory PGM such as Os-Ir-Ru alloys and refractory sulphides (e.g. Laurite) should preserve older ages as a result of their high Os concentrations and resilience to overprinting and isotopic resetting; they therefore constitute a perfect target to unravel and constrain craton agglomeration history and mantle depletion events.

The Kalahari craton in Southern Africa has been extensively studied and is host to a variety of cratonic xenoliths of various ages and differing stages of metasomatism. Among these, mantle xenoliths from Letlhakane (Magondi Belt, Botswana), Thaba Putsoa and Liqhobong (South Eastern Terrane, Kaapvaal Craton, Lesotho) kimberlite suites show variable Re-Os T_{RD} ages coupled with highly siderophile element fractionations. The Pt-Pd depleted peridotites, typically resulting from high degrees of partial melting, show a high Os/Ir ratio ($>$1.3) associated with high osmium concentrations ($>$3.5ppb) and yield Archean Re-Os T_{RD} ages (3.3-2.5 Ga). They are generally BMS-free but their suprachondritic Os/Ir ratio and high Os concentrations may be symptomatic of the presence of refractory alloys or laurite [1]. Whereas the Pt-Pd-rich peridotites yield Archean to Proterozoic T_{RD} ages (2.7-1.4 Ga) and are characterised by chondritic Os/Ir ratios ($<$1.1), these samples typically contain BMS and PGM sometimes associated with metasomatic phlogopite.

We will present a coupled study of detailed mineralogical investigations and single grain Re-Os analyses on Os-bearing sulphides and PGM in residual and metasomatised peridotites from Letlhakane, Thaba Putsoa and Liqhobong. The combined whole-rock and single grain Re-Os investigations will provide a new perspective on the recording and timing of Archean depletion events by revealing chronometric information that is so far unexplored. This will ultimately improve our understanding of the partial melting/metasomatic history of cratonic mantle samples and allow us to refine craton agglomeration models.

[1] Luguet et al. (2007) *Geochimica et Cosmochimica Acta* **71,** 3082-3097