Geochemical fingerprinting of PGM placers and linking with Large Igneous Provinces

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Placer deposits of platinum group minerals (PGM) have varied origin [1, 2]. The most productive are associated with (subduction-related) Alaskan-Ural type intrusions and others are associated with ophiolites. Some are linked to stratiform mafic-ultramafic complexes that can be associated with Large Igneous Provinces (LIPs) [3]. Here we explore compositional criteria to explore links between placer PGM and magmatic events (both LIP and non-LIP) in the same region. Compositional fingerprinting can include the bulk PGE composition as well as the distribution of trace elements in Fe-Pt alloys that are sensitive indicators of geochemical specialization of the host magmatic rocks and physicochemical conditions of their formation—these criteria allow prediction of sources for these PGM placer [4].

We consider the PGE placer record of the Siberian Platform [2, 4]. In the Aldan shield (southern Siberian craton) PGM consist of high-Ir isoferroplatinum, associated with Mesozoic Alaska-Ural type intrusions (e.g. Konder and Inagli). In the northern Siberian platform several types are linked to the Siberian Trap LIP: placer Ir-Os (the Guli dunite massif), placer high-Pd Pt-Fe alloys (Norilsk intrusions), and, in the Anabar basin, complex gold - platinum - diamond placer deposits, with ferroan platinum with high contents of Rh, Ru, Ir and Pd, and a ^{190}Pt-^{4}He age of 259 ± 9 Ma [5]. In NW Anabar shield and Aldan shield gold placers often contain sperrylite - PGM [2], which are characteristic of ancient large layered intrusions, and therefore should be linkable to known LIP events (possibly Proterorozoic). The compositional comparison between placer PGM, PGE reefs in stratiform intrusions and background PGE levels in non-mineralized mafic LIP units (basalts and dolerites) is indirect but potentially diagnostic.

[1] Weiser (2002) *CIM* **54**, 721-756. [2] Okrugin (1998) *Int. Geol. Rev.* **8**, 677–687. [3] Ernst (2014) *Cambridge*. 653. [4] Okrugin (2014) *12th IPS*. 192-193. [5] Yakubovich *et al.* (2015) *13th SGA Meeting*. 663-664.