Pt-Re-Os dating of the Pt-alloys from the Kondyor zoned mafic-ultramafic complex (Far East Russia)

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The Kondyor massif is an Ural-Alaskan-type zoned mafic-ultramafic complex having intruded the Archean basement of the SE Siberian craton and is famous for its world-class placer deposits of Pt-alloys. The ages of the Pt mineralization and host rocks are however poorly constrained limiting our understanding of the conditions of formation of this extremely Pt-rich mineralisation. Dating of the mafic-ultramafic rocks range from Paleoproterozoic (2477±18 Ma, U-Pb on dunitic zircons) to Jurassic-Cretaceous (e.g. 149-137 Ma, K-Ar on phlogopite from dunites), while the Pt-Fe and Os-Ir-Ru alloys yield respectively Cretaceous (129±5-112±7 Ma, ^{190}Pt-^{4}He) and Neoproterozoic (658-602 Ma, Re-Os) ages.

Here, we performed using LA-MC-ICPMS the ^{187}Re-^{187}Os and ^{190}Pt-^{186}Os isotopic dating of 12 Kondyor "magmatic" Pt-alloys, which contain nm-scale Os-Ru exsolution lamellaes as revealed by the FIB-TEM. These alloys define a ^{186}Os-^{190}Pt isochron yielding an age of 249.8±12 Ma, while the least radiogenic ^{187}Os/^{188}Os ratio suggests a PUM-like mantle individualised at the latest in the NeoArchean as source of the Pt mineralisation. Our findings thus suggest that the Pt source could be the Siberian cratonic mantle root and that the mineralisation of the Kondyor massif is coeval to that of the other Ni-Cu-PGE deposits associated with the Siberian craton (i.e., Noril'sk-Talnahk), all being closely related to the early Triassic Siberian mantle super-plume.

Finally, the discrepancy between the alloys ages obtained here and those previously published may reflect a methological bias (LA-MC-ICPMS vs. bulk grains) and/or the least robust nature of the Pt-He and Re-Os isotopic systems when compared to the Pt-Os system.