A 6000 year record of iridium and osmium accumulation at a remote peat bog in NW Spain

SEBASTIEN RAUCH[1]

[1]Water Environment Technology, Department of Architecture and Civil Engineering, Chalmers University of Technology, 412 96 Gothenburg, Sweden. Email: sebastien.rauch@chalmers.se

Platinum group elements (PGE, i.e. Pt, Pd, Rh, Ru, Os, Ir) are among the least abundant elements in the Earth's upper continental crust [1]. Extraction and use of these elements are now resulting in the anthropogenic overprint of their natural cycles [2] and elevated PGE concentrations have been reported in both urban and remote environments [3].

Peat cores collected at Penido Vello (PVO), a remote ombrotrophic peat bog [4,5], were used to reconstruct the depositional history of Ir and Os in NW Spain. Pre-anthropogenic accumulation rates are estimated to be 0.06 ng Ir m^{-2} yr^{-1} and 0.10 ng Os m^{-2} yr^{-1}. First observations of elevated Ir and Os accumulation correspond to the Copper and Bronze Ages and to the Roman period. Further increases in Ir and Os accumulation are observed following the industrial revolution. Accumulation rates reach 15 ng Ir m^{-2} yr^{-1} and 30 ng Os m^{-2} yr^{-1} in the most recent sample (ca. 2001 AD).

The timing of accumulation increases and osmium isotopic composition ($^{187}Os/^{188}Os$) indicate that a combination of sources contribute to Ir and Os accumulation at PVO. Until the 20th century, $^{187}Os/^{188}Os$ is defined by a 2-component mixing attributed to crustal erosion and metal production activities. Cu mining from sulfide deposits in the southern part of the Iberian Peninsula is the main anthropogenic source of Os and possibly Ir during the Roman period. In the 20th century, $^{187}Os/^{188}Os$ is defined by a 3-component mixing and recent anthropogenic sources include metal production activities, automobile exhaust catalysts and fossil fuel cobustion.

Although automobile exhaust catalysts are typically considered to be the main anthropogenic source of PGE, the PVO record implies that a combination of sources contribute to the biogeochemical cycle of Ir and Os, as well as other elements in this element group.

[1] Jahn & Peucker-Ehrenbrink (2001) *Geochem Geophys Geosyst* **2**. [2] Sen & Peucker-Ehrenbrink (2012) Environ Sci Technol **46**, 8601ff. [3] Rauch & Morrison (2008) *Elements* **4**, 259ff. [4] Kylander et al. (2005) *Earth Planet. Sci. Lett.* **240**, 467ff. [5] Rauch et al. (2010) *Environ Sci Technol* **44**, 881ff.