Geophysical Research Abstracts
Vol. 16, EGU2014-11250, 2014
EGU General Assembly 2014

GEMAS: Geochemical distribution of precious metals in European soil

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Precious metal (Ag, Au, Pd, Pt) concentrations are reported for the <2 mm fraction of soil samples from agricultural (Ap horizon, 0–20 cm; N=2218) and grazing land (Gr, 0–10 cm; N=2127), covering 33 European countries and 5.6 million km^2 at a sample density of 1 site/2500 km^2 in two different extractions, i.e., aqua regia and mobile metal ion (MMI®) and determined by inductively coupled plasma emission mass spectrometer. Minimum, median and maximum concentrations of Ag, Au, Pd and Pt in both extractions are given in the following table:

Element	*Sample type*	*Extraction*	*Minimum mg/kg*	*Median mg/kg*	*Maximum mg/kg*
Ag	Ap	MMI®	< 0.001	0.014	1.34
Ag	Ap	AR	< 0.002	0.038	2.95
Ag	Gr	AR	< 0.002	0.040	3.91
Au	Ap	MMI®	< 0.0001	0.0003	0.024
Au	Ap	AR	< 0.0002	0.00093	0.083
Au	Gr	AR	< 0.0002	0.001	0.23
Pd	Ap	MMI®	< 0.001	< 0.001	0.002
Pd	Ap	AR	< 0.001	< 0.001	0.148
Pd	Gr	AR	< 0.001	< 0.001	0.0328
Pt	Ap	MMI®	< 0.001	< 0.001	< 0.001
Pt	Ap	AR	< 0.001	< 0.001	0.027
Pt	Gr	AR	< 0.001	< 0.001	0.038

Geochemical maps of Ag and Au for both land use types (Ap and Gr) in aqua regia extraction show overall similar spatial distribution patterns; the dominant feature is the southern limit of the last glaciation, indicated by a sharp break between northern and southern European Ag and Au concentrations. This break, although more subtle, is still discernible on the MMI® extraction Au and Ag maps. Most of the Ag and Au anomalies are geogenic (e.g., associated with known mineralised districts), but there are some interesting anomalous patterns that indicate an anthropogenic footprint (e.g., London, Paris, Madrid). Although most of the Pd and Pt aqua regia results are below detection limit, there are a number of interesting continental-, regional- and local-scale patterns. Some of the Pd and Pt aqua regia anomalies are associated with mafic and ultramafic rocks (e.g., Norway, Hellas), but this is not always the case, i.e., related to karst and bauxite/laterite mineralisation (e.g., Croatia, Bosnia and Herzegovina, Hellas). While the extensive Pd and Pt anomalies in Italy cannot be explained by the occurrence of alkaline volcanic rocks alone, and it appears that they may be due to ashes of historic volcanic eruptions of Vesuvius, Campi Flegrei and Mount Vulture. Finally, the GEMAS data set defines the geochemical background variation of Ag, Au, Pd and Pt in aqua regia and MMI® extraction for European agricultural and grazing land soil at the 2008 timeline.