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Manfred Birke, Uwe Rauch, Jens Stummeyer, Hans Lorenz, Beate Keilert

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A review of platinum group element (PGE) geochemistry and a study of the changes of PGE contents in the topsoil of Berlin, Germany, between 1992 and 2013

Manfred Birke[a*], Uwe Rauch[b], Jens Stummeyer[a], Hans Lorenz[a], Beate Keilert[b]

[a] Federal Institute for Geosciences and Natural Resources (BGR), Stilleweg 2, D-30655 Hannover, Germany

[b] Federal Institute for Geosciences and Natural Resources (BGR), Berlin Branch, Wilhelmstrasse 25–30, D-13593 Berlin, Germany

[*] Corresponding author.

E-mail address: Manfred.Birke@bgr.de (M. Birke)

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Abstract

The data represent the first available data set on platinum group element (PGE) levels in Berlin topsoil. In 2013, over 100 topsoil samples (0-20 cm) were collected in the inner city of Berlin. The PGEs in topsoil samples were analysed by ICP-MS after a trace-matrix separation. The results were compared to analyses of PGEs in Berlin topsoil collected at the same sample sites in 1992.

The data show an increased accumulation of PGE concentrations in Berlin topsoil during this two-decade interval as a result of gradual increase in the use of vehicles with catalytic converters. A comparison of PGE median concentrations show an increase by a factor of 1.5 for Pt, 3.0 for Pd, 4.3 for Rh, and 3.1 for Au, over the 20-year period. The single element distribution maps of PGEs from 2013 confirm a clear correlation with traffic density. The PGE ratios (Pt/Pd, Pt/Rh, Pd/Rh) were consistent with known catalytic converter compositions, and indicate catalytic exhausts as the main source of these elements. A comparison of the maps of measured raw PGE data with the clr-transformed maps reveals identical distribution patterns (including PGE anomalies). Principal component analysis (PCA) results obtained from the classical statistical approach (standardised) are quite similar to those from PCA carried out using the compositional data analysis (CoDA) approach. Grouping of the PGEs, based on hierarchical cluster analysis, provides a complementary