Geophysical Research Abstracts
Vol. 21, EGU2019-14437, 2019
EGU General Assembly 2019


# Assessment of heavy metal pollution of Vistula River sediments using magnetic methods

Iga Szczepaniak-Wnuk, Beata Górka-Kostrubiec, and Sylwia Dytłow
Institute of Geophysics Polish Academy of Sciences, Warsaw, Poland (igasz@igf.edu.pl)

The aim of the study was to evaluate the level of heavy metal pollution of Vistula River sediments, within high urbanized area. The study was conducted in Warsaw agglomeration, which is the largest emitter of urban pollution in the central part of Poland. Measurements were performed for fine fractions (71 $\mu$m and less than 71 $\mu$m) of sediments taken from the surface layer of river bank. An interdisciplinary approach including magnetic methods (e.g. mass magnetic susceptibility $\chi$, temperature dependence magnetic susceptibility and hysteresis loop parameters), microscopic and chemical analyses was undertaken to assess the level of heavy metal pollution.
The results showed local impact of Warsaw's activity on the level of heavy metals pollution. This was indicated by the maximum values of magnetic susceptibility and the maximum concentrations of heavy metals in the city center. The anthropogenic origin of pollution was confirmed by magnetic mineralogy of finest granulometric fraction (less than 0.071 $\mu$m), dominating by magnetite and large amount of spherical magnetic particles. The dominant sources of sediments pollution were discriminated by analysis the relationship between magnetic parameters dependent on the domain structure of magnetic particles and the concentrations of individual heavy metals. It was found that the source of cadmium, zinc and copper were mainly vehicle emissions and the motion process of vehicles such as abrasion of road surfaces, brake discs, brake pads etc. These chemical components are associated with irregularly-shaped particles. Nickel, aluminum, titanium and chromium were connected with spherical shaped particles originated from high temperature combustion processes. Results suggested that the source of large amount spherical particles in sediments observed in the city center was the storage of ashes from coal power plant, located at the south of Warsaw. This was demonstrated by the similarity in mineralogy and morphology of magnetic particles observed in sediments and street dust collected from the road at the vicinity of the waste disposal site.
The study demonstrated that magnetic method have a useful and practical application for detecting and mapping heavy metal pollution of river systems.