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Evolution of heavy metal concentrations in soils during man-made pollution

A. Saghatelyan, L. Sahakyan

Center for Ecological Noosphere Studies NAS, Yerevan, Armenia (ecocentr@sci.am / Fax: (374-10) 58 02 54 / Phone: (374-10) 569331)

The capital of Armenia – Yerevan – is attributed to cities that are large industrial centers. Natural contents of heavy metals in soil cover are evident in volcanic rocks found in geological structure of the territory: basalt, tuffs and quaternary sediments developed on them. Heavy metals are manifested by a weak intense geochemical series $Zn_{(9.4)} - Cu_{(2.9)} - Co_{(1.8)}$; in brackets excess vs. clark is given. The noted elements are evenly distributed throughout the soil cover and form no anomalies.

Geochemical situation for the city by the late 1980s had resulted from a long-term man-made pressure that finally manifested itself both in increasing concentrations of elements peculiar to the landscape and intense inflow of alien heavy metals Pb, Ag, Ni, Cr, Mo.

A drastic drop in industrial outputs in the 1990s (after the former USSR disintegration) and qualitative and structural transformation of industry impacted geochemical parameters of the city's environment; this phenomenon was recorded as a result of repeated geochemical mapping performed in 2002.

The paper highlights the outcomes of comparative analysis of contents and spatial distribution of heavy metal concentration all across the city's soils by data of analysis of spatially associated soil samples collected in 1989 and 2002. Geochemical survey of the city's territory is made on a scale 1:25000. Totally, 1026 samples were collected and analyzed.

Basic conclusions made as a result of collation of geochemical mapping data for 13 years are as follows:

- The spectrum of heavy metals involved in the city's pollution have not been changed,
- For quantitative series of elements typomorphic to geochemical fields of maximal, medium and minimal pollution level a change of dominating polluting elements is established,
- Despite spatial positioning and variations in peaks of anomalies, mean contents of elements remained practically unchangeable for 2002 vs.1989.
- A comparative analysis of maps of summary index of heavy metal concentrations for soils allowed establishing an inclination to pollution character leveling, this being seen in disappearance of peaks of geochemical anomalies distributed in a mosaic manner throughout the city in 1989. For 2002 a more even distribution of heavy metal concentrations allover the city's territory is conditioned by their re-distribution from most intense spatially located anomalies towards the limits of anomalies of lower orders characterized by a wider area development.
- As a result of the revealed process, the area of anomalies with peak values has decreased from 2.03 sq. km to 0.63 sq. km. Synchronously, for 1989 some 30% of the city's territory was attributed to the category of strong and very strong pollution (by SIC), whereas for 2002 the area of this pollution level covered as much as 65%.