

Geochemical background and threshold for chemical elements in Slovenian soil and comparison with European soil (GEMAS project)

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Geological survey of Slovenia collected 817 topsoil (0-10 cm) samples using grid of 5 x 5 km. The <2 mm fraction of these samples was analysed for 47 elements by ICP-MS and ICP-AES, following modified aqua regia ($\text{HNO}_3/\text{HCl}/\text{H}_2\text{O}$) digestion of 15 g samples.

Results are used here to establish the geochemical background variation and threshold values, derived statistically from the data set, in order to identify unusually high element concentrations for these elements in the soil samples. Geochemical threshold values were determined following different methods of determination for (1) whole of Slovenia and (2) for 8 spatial units determined based on geological structure, lithology, relief, climate and vegetation. Medians and geochemical thresholds for whole of Slovenia were compared with GEMAS agricultural soil data for southern Europe as large differences in the spatial distribution of many elements are observed between northern and southern Europe. It was thus necessary to compare Slovenian geochemical threshold values with southern Europe. Potentially toxic elements (PTEs), namely As, Cd, Co, Cr, Cu, Hg, Mn, Mo, Ni, Pb, Sb, and Zn, are of particular interest. Medians of these PHE elements are all higher in Slovenia than in southern Europe. Medians of Pb and Mo are 1.5 times higher and medians of Hg and Cd are more than 2 times higher in Slovenia. Geochemical thresholds for As, Cr, Cu, Ni, Sb and Zn are of similar values in both Slovenia and southern Europe, up to 1.5 times higher in Slovenia for elements Co, Mo and Pb and more than 2.5 times higher in Slovenia for Cd and Hg. These values were then compared to existing Slovenian soil guideline values of these elements.