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30 JAHRE ANGEWANDTE GEOCHEMIE IN ÖSTERREICH

Experimental Geochemical Map of Croatia and Slovenia

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The experimental geochemical map of Croatia and Slovenia is produced as a result of succesfull international cooperation in the field of environmental geochemistry. Regarding the fact that strategy and methodology in producing the national geochemical maps have so far much in common it was decided to produce the joint geochemical map that would explain the regional geochemical trends in a more comprehensive way.
The joint investigation was grounded on 2,346 analyses of soils sampled at 2,329 locations in the 5 × 5 km grid on the territory of Croatia with finer sampling pattern applied to the areas of the national parks. On the Slovenian territory 819 analyses were made from the basic 5 × 5 km sampling grid, or 25 × 25 km, and 2,349 analyses from 1,983 locations from the finer grid, particularly in the urban areas, and areas of former mining and smelting industry.
The methodology of sampling, sample preparation and analysis was in both cases in accordance with IGCP and FOREGS recommendations. The research work included 5,514 analyses from 5,134 sampling locations. For the purpose of evaluating the associations between chemical elements the cluster and R-type factor analysis were used. The correlation coefficient (r) was selected as a measure of association between elements. Normality of variable distributions was tested both by statistical tests and visual inspection of histograms. A set of 26 elements was selected for further treatment: Al, Ca, Fe, K, Mg, Na, P, As, Ba, Cd, Cr, Cu, La, Mn, Nb, Ni, Pb, Sc, Sn, Sr, Th, V, Y, Zn, Zr and Hg. Other elements were omitted from further consideration because
1) number of analyses was insufficient for successful handling,
2) most of the results were under the detection limit, and
3) some elements failed to establish logical associations (low communalities) in factor analysis.
The factor analysis reduced the initial number of 26 chemical In order to interpret the geochemical maps as correctly as possible we used the method of universal kriging with linear variogram and linear drift. The concentrations of analyzed elements on the sampling site were interpolated in the basic cell 2,5 × 2,5 km. The individual grid data are influenced by the 128 closest values from eight sectors in a regular octagonal pattern.
The main chemical association brings together the high contents of Fe, Ni, Cr, Sc, V, Mn, Al and Cu, distinguishing the areas covered by Paleogene and Cretaceous flysch sediments, and to a lesser degree the areas outcropped by Neogenic postorogenic sedimentary formations as well as by metamorphic rocks of the Pohorje Mt. and its surroundings area. The next geochemical association (Nb, La, Th, As, Y, Zr) is characteristic for brown carbonate soils, or terra rossa on carbonate platforms, as well as for the areas of eastern Slavonia. Geochemical association correlating Ba, K and Na is typical for areas covered by igneous rocks. In the Pannonian part of Croatia the higher concentrations of these elements are related to the sedimentary rocks originated mostly through the weathering of igneous rocks. The combination of Ca, Sr, Mg and P is most poorly differentiated. Generally, these elements are associated either with rendzinas and similar soil types in the mountainous areas or, again, with the carbonate contents in immature alluvial soils in the Sava and Drava river valleys.
Geochemical association of Pb, Zn, Hg and Cd represents a typical heavy metal association originated either as a consequence of natural erosion of ore-bearing rocks or mining activity and smelting industry in the past. Their highest concentrations can be found in Slovenia in the vicinity of mines and metallurgic centers (Idrija, Mežica, Litija, Jesenice and Celje). Mining activity left its traces as well, which is reflected in the higher concentrations of heavy metals in recent sediments of the Sava and Drava rivers. Increased values in the areas of Gorski kotar, Velebit and Dalmatia derive their origin mostly from atmospheric deposition.

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