

## **Geochemical Survey Database of Hungary – Concept, Development and Application**

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### **Introduction**

Developing a geochemical baseline database through systematic sampling and chemical analysis is a key area of applied geochemistry. It is essential to define the geochemical baseline for the near-surface geological media in order to assess the current state of the environment and to provide information on mineral resources. For this purpose, in the last three decades, many low-to-high sampling density geochemical surveys were conducted at the one-time Geological Survey of Hungary (currently known as the Mining and Geological Survey of Hungary). Until recently, the large amount of geochemical data, produced by these surveys, was dispersed throughout published literature and maps, but has not been collected and collectively interpreted. Our mission was to develop a geochemical database and to implement revision and interpretation of these archive data. The database currently contains data of more than 30 surveys, including the National Survey, the regional surveys of mountains, many large-scale local programmes, and data from three pan-European projects, *i.e.*, FOREGS Geochemical Atlas of Europe (Salminen *et al.*, 2005; De Vos, Tarvainen *et al.*, 2006), EGG - European Groundwater Geochemistry (Reimann and Birke, 2010), and GEMAS - Geochemical mapping of agricultural and grazing land soil (Reimann *et al.*, 2014a, b).

### **Brief history of geochemical surveys in Hungary**

Geochemical surveys in Hungary for a long time aimed to assist mineral exploration. At the beginning of the 1990s, however, the potential environmental application of geochemical mapping was recognised. The main objective of the first country-scale National Survey in the one-time Geological Institute of Hungary was to define the geochemical baseline values for the most important potentially toxic and essential elements. The programme was based on floodplain sediment, and for this approximately 200 sampling sites had been designated (Ódor *et al.*, 1997). The National Survey was the base for the first version of the Geochemical Atlas of Hungary. This survey was soon expanded to the regional-scale survey of the mountainous areas; in this survey, approximately 4 km<sup>2</sup>-large catchment basins were designated in the mountainous regions of the country and at the outlet point of each basin one stream sediment sample was collected. The second version of the Geochemical Atlas of Hungary was the result of the integration of the National Survey and the regional surveys. These two important programmes were followed by many smaller (local, linear, gap-filler) mapping programmes, most of which were conducted for a specific purpose. The Survey also participated in several important EU-scale and EuroGeoSurveys projects, *e.g.*, FOREGS, EGG and GEMAS (Salminen *et al.*, 2005; De Vos, Tarvainen *et al.*, 2006; Reimann and Birke, 2010; Reimann *et al.*, 2014a, b).

### **Concept and development of the Geochemical Survey Database of Hungary**

The initial idea behind the Geochemical Atlas of Hungary was that it can be regularly expanded by new surveys. However, by 2015 it became evident, that there was not a single, transparent database available from which a new atlas can be compiled. Moreover, old files and GIS maps did not meet compliance with modern requirements. Thus, we decided to revise all geochemical programmes to clarify objects and methodology.

The work mostly included the processing of huge number of digital and paper databases and maps, as well as publications and project reports. Work was pulled back by the fact that much information was missing and since data were originated from multiple places, there was a lot of contradiction in connection with sample numbering, coordinates, *etc.* Moreover, both in the National Survey and in the survey of the mountainous regions, there have been a large number of composite samples, the material of which had been collected from different locations.

Altogether, data of 34 surveys have been gathered, resulting in *ca.* 2500 samples, 1000 subsamples and 3000 rows of analytical data. The sample index map of the database was published online on the website of the Mining and Geological Survey of Hungary in 2017 (Fig. 1).

### **Discussion**

The harmonisation and collective interpretation of data shows that the original intention of integrating these surveys into one atlas cannot be accomplished. Differences have been shown between scale, sampled media, analytics and analysed parameters. Application of data for environmental and mineral exploration purposes is possible and has been achieved at regional and local scale in mountains, whereas no reliable data is available from the hilly lands and lowlands at a sufficient scale. Based on our findings, it is concluded that a reliable country-scale geochemical atlas for multiple application is to be accomplished only through the implementation of a new national survey.

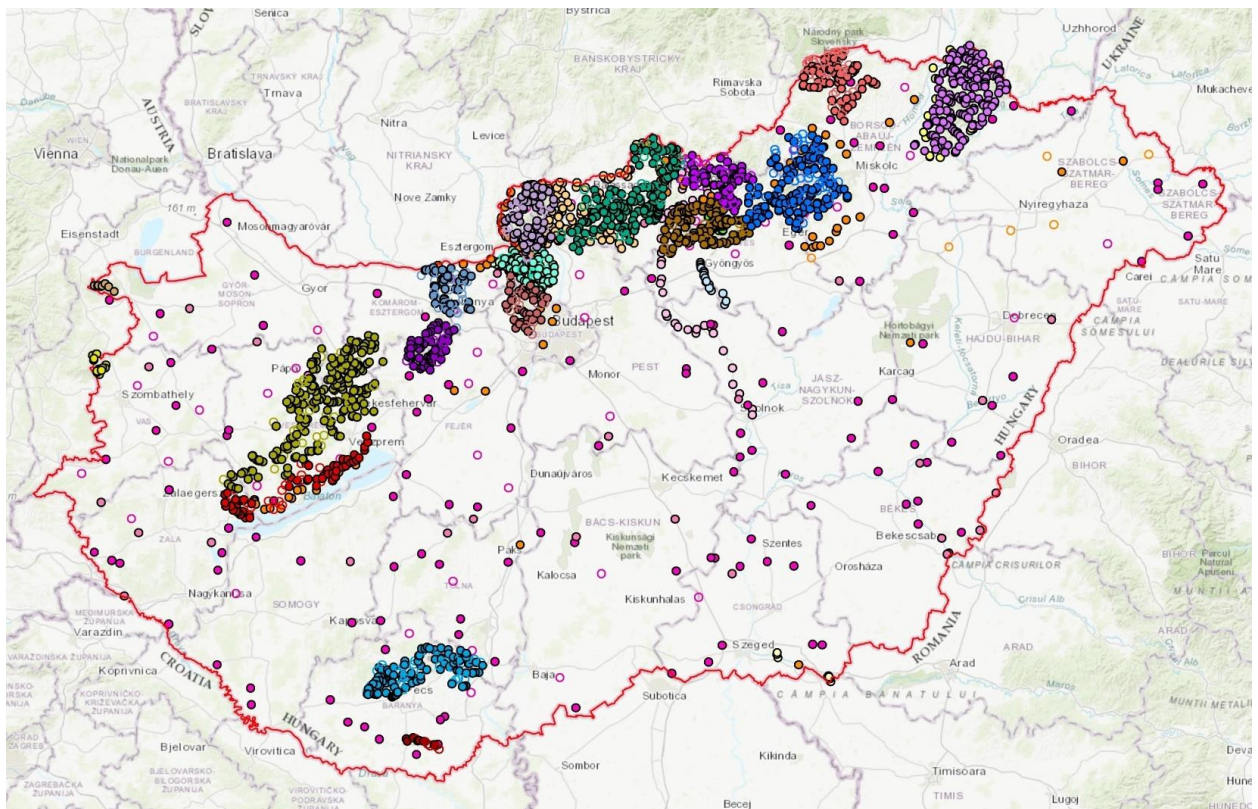


Figure 1. Geochemical Survey Database of Hungary – Sample index map

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