The hydrochemical geogenic background of groundwater bodies in Austria

G. Hobiger[1], E. Haslinger[2], P. Klein[2] & H. Pirkl[3]

1 Geological Survey of Austria, Dept. of Hydrogeology, Neulinggasse 38, A-1030 Vienna, gerhard.hobiger@geologie.ac.at
2 Geological Survey of Austria, Dept. of Geochemistry, Neulinggasse 38, A-1030 Vienna, edith.haslinger@geologie.ac.at, peter.klein@geologie.ac.at
3 Geoöko, Technisches Büro für Geologie, Gentzgasse 17/1/6, A-1180 Wien, herbert.pirkl@chello.at

Summary

The Water Framework Directive of the EU (2000/60/EG) as well as the future "Groundwater Directive" comprise the determination of national background levels. These background levels are necessary to exclude anthropogenic input into the groundwater. The aim of this study is to determine geogenically induced background values with the help of available hydrochemical, geochemical and other data. This study shall serve as basis for the estimation of anthropogenic influences when assessing the quality of groundwater bodies. Generally it can be said, that this study is the first study of this kind in Austria.
In this study the hydrochemical background for several parameters was determined from existing hydrochemical data as well as from geochemical analyses of stream sediments. These analyses include all surficial groundwater bodies of Austria. All hydrochemical and geochemical analyses from research and monitoring programmes of Austria and its federal states were combined in a database. Furthermore, the corresponding descriptions of the data were included into a web-based meta database. For the purpose of visualization and regionalization of the data from the analyses, an interface between the database and GIS was developed.
The background values were determined with the help of a stepwise interpretation of geostatistical, hydrogeological and hydrochemical parameters. The resulting values were illustrated in maps.

As basis for the determination of the background values the following hydrochemical and geochemical data were used:
1. Data from the implementation of the Water Quality Monitoring Ordinance
2. Data from hydrochemical analyses from the federal states
3. Data from research projects of research institutions
4. Data from the geochemical atlas of Austria (stream sediments)

All in all, 2.559,864 hydrochemical analyses of 27,625 measuring points in the groundwater bodies as well as about 3 million geochemical analyses of about 60.000 measuring points were included in this study.
Apart from these data, additional sources like the map of the groundwater bodies, land registers of mining areas and waste dumps, Corin-maps of land use, geological maps etc. were used. All data were then combined in a GIS-database.
Prior to the interpretation, all datasets were checked for obvious typing errors or incorrect analyses. Thereafter, all data were analysed with statistical methods. Subsequently, the data were checked on the basis of hydrochemical, hydrogeological and geological considerations. Measurements which showed anthropogenic influence were singled out and excluded from further processing. The resulting data correspond to the natural background values in the groundwater. A thorough examination of the data showed, that the background values within one groundwater body can be different due to geological or hydrogeological conditions on a local scale. Therefore it is necessary to distinguish between “global” and “local” background values. The global background is valid for the entire groundwater body, whereas local backgrounds are confined to local conditions. Higher values are referred to as “Hot Spots”. One example for a Hot Spot is the higher chloride values in areas, where “Haselgebirge” (breccia-like rock type constituted of salt, gypsum and clay) occurs, such as in Hall/Tyrol. Such Hot Spots were also taken into consideration and visualized in the GIS.