

HOVER WP3 D3.5b: Development of European exposure maps of selected elements (and indicators) based on GIS interpolation of measurements

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Introduction

In Task 3.4, analysis of the spatial pattern of dissolved trace elements in groundwater has been considered because may reveal that it is related to certain geological features controlling their occurrence.

The distribution of As and F- concentrations in groundwater has been spatially analysed using two specific indices: the HydroGeoToxicity (HGT) and the Basal Reference Concentration (BRC).

HGT assesses the [As] and [F-] with respect to the drinking-water guideline value established by the World Health Organisation (10 µg/L and 1.5 mg/L, respectively). $HGT \geq 1$ signifies that a potential health risk must be considered. Samples with $HGT_{As} \geq 1$ ($HGT_{As} \geq 0.5$ for Denmark) constitute 4% of the As observation network, and 7% of the F-database shows $HGT_{F} \geq 1$.

The BRC index represents the value that selects the highest outliers susceptible to form a geogenic pattern for As and F-. The BRC threshold corresponds to the 98th percentile of the cumulative frequency curve. The most significant anomalies are represented by the 2% of the samples exceeding this threshold (985 samples for the As network and 1049 samples for the F- network), and their distribution draws a natural pattern that can be spatially justified by geological factors.

HGT is an individual index calculated for each water sample on respect to a fixed concentration (limits for drinkable water), independently of the set of samples considered in a study area. In contrast, the BRC is an index for a set of samples, which establishes a threshold above which values are considered maximum anomalies.

HGT and BRC indices provide a study methodology that highlights the importance of studying distribution of hydrochemical data in the framework of the natural geological environment (geo-hydrochemistry), especially when addressing issues involving trace elements, and particularly potentially toxic geogenic trace elements (PTGTEs).

The results of BRC can be weighted in terms of health when the correspondence between BRC and HGT indices is applied. From this reading, the results can help to identify areas with groundwater naturally enriched in As and F-, depending on the geological setting. The BRCAs (15 g/L) and BRCF (2.3 mg/L) correspond to a HGT_{As} and HGT_{F} of 1.5.

An important percentage of samples with the highest and most significant As anomalies are identified in porous aquifers and their distribution may be related to structural faults, as an extension of nearby relief faults that can facilitate the circulation of mineralized fluids. Fluoride seems linked especially to EAMs outcrops (or as fissured basement), mainly consisting of FHR rocks, showing the influence of lithology on the pan-European distribution pattern of F- concentration in groundwaters.

Layers

Within this service, map layers are available for the following contents:

- HydroGeoToxicity (HGT) indicator for Arsenic and Fluorine, distribution at Pan-European scale.
- Basal Reference Concentration (BRC) indicator for Arsenic and Fluorine, distribution at Pan-European scale.

Links:

HOVER WP3 deliverable D3.4 “Compilation of indicators, analyses of possible use at pan-European scale and test application in countries of contrasted main litho/geology”: <https://smex-ctp.trendmicro.com:443/wis/clicktime/v1/query?url=https%3a%2f%2frepository.europe%2dgeology.eu%2fegdidocs%2fhover%2fhover%2b34%2bindicators%2bv2.pdf&umid=62ebfc3f-c542-43db-bccb-1de61c9ddb95&auth=8c62fcefcb4b33ec629a7997e06b00615986a604-17bbaa059f9af39ebff5d9ae5d19ccb1e0f1e27e>