



Trace elements natural concentrations in the sedimentary aquifers of central Italy

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In order to understand the trace metals pollution trends and the anthropogenic impacts on the aquifer systems it is essential to have a knowledge of their natural baseline. In this work we define the natural concentrations of several trace and ultra-trace species dissolved in groundwater of the sedimentary aquifers of central Italy. In order to achieve this objective the concentrations of major, trace and ultra-trace elements were determined in 123 groundwater samples collected, during 2004-2006, from the carbonate-evaporite aquifers and from one alluvial aquifer of the Apennine region in central Italy. Temperature, pH, Eh, conductivity and total alkalinity were determined in the field. Cations and anions were respectively determined by AA-spectrophotometry and ion chromatography, trace and ultra-trace elements by ICP-MS. The concentration of trace elements are showed as cumulative frequency distribution diagrams. Following the GSA methods (Chiodini et al., 1998) each distribution is partitioned into different population according to the Sinclair (1974) procedure and the mean values for each population are estimated by means of the Sichel's t estimator (David, 1977). All the trace elements considered in this study are characterised by a polymodal distribution partly due to the different mineralogical composition of the aquifer formations. The most important factors controlling the trace elements concentration in the studied waters are the trace element contents of the carbonate and evaporite minerals, which are the principal source for the dissolved species, the presence of clay minerals, controlling through adsorption and cation exchange the distribution of some metals, and the Eh-pH conditions. The highest concentration of trace and ultra-trace species are showed by some saline water samples representative of hydrothermal systems, but most of the dataset result below the European standards for drinking water.

References:

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