

Naturally occurring arsenic in groundwaters

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The arsenic groundwater pollution is a worldwide problem affecting many countries in alluvial plains (e.g., USA, Vietnam, Hungary, Spain, Bangladesh and India), and it is object of many studies (Nordstrom, 2002). Arsenic is not widespread in the Earth's continental crust. It is commonly concentrated in sulfide-bearing mineral deposits associated with Pyrite (FeS₂), Arsenopyrite (FeAsS), Realgar (As₄S₄), Orpiment (As₂S₃) or Fe-Mn oxy-hydroxides (e.g. goethite, ferrihydrite and hematite). Furthermore, many groundwaters can exceed the Contamination Threshold Value (CTV) of 10 µg/l suggested by the Groundwater Directive (GWD, 2006/118/EC). The arsenic pollution concerns the middle-low Veneto plain, where arsenic is one of the most problematic contaminants. In particular, some zones of the Veneto region, from Verona province to Venice province, show arsenic contents exceeding the CTV, corresponding to CSC (10 µg/l) in the Italian legislation (D.Lgs. 152/06). Many studies, regarding the Drainage Basin to the Venice Lagoon (DBVL), Verona plain and Padua middle plain were carried out. These studies provide information about the relationships between arsenic and other parameters such as aquifer depth, organic matter occurrence, redox condition of the reservoir, aquifer sediments and relations with other dissolved substances. The cited relationships are known but not completely understood because they are very complex and daisy-chained each other. As pointed out by many studies (Carraro et al., 2015, Molinari et al., 2013), As often is adsorbed into both the Fe-Mn oxides or hydroxides and the organic matter. The dissolution of these minerals in acid-reduced environment causes arsenic desorption processes. Moreover, the organic matter is a source of arsenic contamination in addition to its role on redox potential. Currently, a large number of arsenic data are available from university or environmental agencies. All of these aim to understand the release of arsenic and its spatial spread on the Veneto region to improve environmental management. Thus, the aims of this PhD project are: i) the assessment of the subsoil structures in the study areas by geostatistical methods ii) the study on the geochemical relationships influencing arsenic mobility (sorption processes) into groundwater iii) the implementation of a reactive transport numerical model of the arsenic concentration in groundwater. Finally taking into account the previous results, the Natural Background Level (NBL) concept, suggested by European BRIDGE project, could be improved.

The research will be carried out with the collaboration of the following experts:

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