A PROPOSAL FOR GROUNDWATER SAMPLING GUIDELINES: APPLICATION TO A CASE STUDY IN SOUTHERN LATIUM

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Chemical monitoring of groundwater is required, in order to protect the environment, by legislation, in different sectors and at variable spatial scales, from groundwater body status assessment, to the control of the impact of anthropic activities at the site scale. Whatever the aim of the monitoring activity, sampling procedures as well as the laboratory activities, must strictly follow standardized and common procedures. Well-defined and common sampling procedures can reduce the error linked to wrong methods and, most important, the differences between the analytical results for samples collected by different operators.
These aspects are particularly relevant in the anoxic environments, where wrong sampling procedures may modify redox conditions and eventually the analytical results.
The current lack, in Italy, of a national guideline for groundwater sampling, has led in the past to significant differences in the analytical results derived by samples collected by different operators in several sites including the presented case study, raising uncertainties on the qualitative status of the groundwater body and the effective impact of the anthropic activities therein.
In order to fill this gap, the Water Research Institute was asked to produce a "best practice" document for groundwater sampling, based on international literature, and suitable in the Italian legislative framework. The proposed procedure include aspects such as:

- 1) the implementation of the conceptual model;
- 2) best sampling techniques;
- 3) appropriate treatment and preservation of samples and quality control (e.g. field and transportation blanks, blind samples, etc).

In this communication, we describe the application of the proposed procedure to a case study in southern Latium, where a phreatic aquifer of local interest is threatened by an industrial area including a waste-to-energy plant. Thick quaternary alluvial and pyroclastic deposits, outcropping above the Meso-Cenozoic limestones dislocated by normal faults, host the phreatic aquifer, which was sampled in more than 30 private wells in the study area following the mentioned sampling procedures. The collected samples were analyzed for anions, major cations and trace elements determination through ionic chromatography, ICP-OES and ICP-MS.
Despite the specific results and the possible exceedances of normative thresholds, our aim was to obtain a snapshot which is deemed representative of the chemical status of the groundwater both within and outside the site, with particular attention to redox sensitive elements like As, Fe, Mn and Al. As a result, when the proposed guidelines apply most of the exceedances observed by previous monitoring activities do not occur, hence they were ascribed to incorrect extraction and unfiltered samples.

Finally, it is important that all the operators involved in the same site, including site managers, control agencies as well as researchers, share the same procedures in order to have comparable results. This would avoid legal disputes about the obtained results, and the subsequent decision linked to them could be implemented in a more participated manner.