



Geological, hydrogeological and hydrogeochemical characterization of groundwater bodies in the Tuscany region (Italy)

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This work describes the study for the characterization of meaningful groundwater bodies (CISS, Corpi Idrici Significativi Sotterranei) in Tuscany region (Italy), by way of a multidisciplinary approach, that includes geological and hydrogeological aspects, together with applied hydro-geochemistry.

Due to the high degree of exploitation of such areas, both geological, and hydrogeological, as well as hydrogeochemical data are available, being produced by governmental research agencies and other interested parties.

Said high human pressure resulted in local situations of degradation, such as those related to the ingression of marine and brackish water, the use of nitrogenous fertilizers in agricultural practices, and industrial processes which involve borates.

An additional important aspect that emerged in this framework, is represented by the localization in some wells of this area of the Cr (VI), whose origin is not yet clearly assessed.

In such context, this work is intended to contribute to the assessment of water quality at the catchment scale in the whole territory, as a first step towards a deeper assessment of origin, pathway and understanding of the transport micropollutants.

A multilayer geometric reconstruction has been performed by the stratigraphic interpretation of available data in the Underground and Water Resource Data Base (BDSRI) of the Geological Survey of Tuscany Region, identifying the main aquifer levels, aquitards and acquicludes.

The study of the piezometric surfaces corresponding to different hydrogeological regimes, led to the individuation of the areas characterized by the largest water exploitation, which significantly affect the quality and quantity of the resource.

Hydrogeochemical characterization was carried out using:

- (i) a deterministic approach based on classification plots, Eh-pH diagrams, calculations of speciation-saturation, activity diagrams, etc.
- (ii) a geo-statistical approach, which enabled the geochemical mapping of the most meaningful parameters such as nitrate, boron and chloride concentrations.

Discussion of the geological, hydrogeological and hydrogeochemical information led to the development of a conceptual model of the studied CISS water bodies, that is presented in this work.