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Use of GIS hydrogeological database for integrated water management.

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Data availability is essential to develop approaches that allow integrated water management for monitoring freshwater resource changes. Such data, however, are sparse, seldom organised and updated. This often prevents the application of integrated water management methodologies. In Italy, the D.Lgs.n.152/06 regulation, acknowledgment of 2000/60/CE Directive, forces Regional Authorities to characterise the main hydrodynamical and hydrodispersive aspects of aquifers in order to develop conceptual models of the hydrogeological systems and their interaction with surface hydrology features, human activities, etc.

In this context it is necessary to have the disposal of tools that allow storaging and processing of the overall data related to the groundwater resource. Nevertheless, existing data management tools are designed to deal separately with the elements constituting the hydrological cycle, i.e. surface hydrology only, subsurface hydrology only, etc. Consequently, it is not possible to perform straightforward operations involving all different factors that take part in the water cycle. Hence, a tool is needed that allows the implementation of data pertaining to the various components of the hydrological systems.

In order to achieve this goal, a digital geographic database, by means of ESRI® geodatabase (ESRI, 2005), was developed to collect, store, update and display data from alluvial, fissured and karst groundwater systems, and to show their relationship with the other elements of the water cycle. This data management tool permits the implementation of surface hydrology, hydrogeological, hydrogeochemical, karstic and anthropic features involved in water resource management available from different sources (national and local authorities, consultants, etc.). Its dynamic structure allows

updating and checking of data in real time, automating data storage, management procedures as well as time-series analysis and the production of detailed hydrogeological maps.

This GIS is being tested on Apuan Alps karst and fissured aquifer and some alluvial groundwater systems in Tuscany (Italy). Further developments of the geodatabase will allow data processing by means of groundwater and solute transport modeling and vulnerability-assessment techniques. Once these functions will be implemented, data could be processed to manage groundwater abstraction points and water quality monitoring networks, to evaluate groundwater resource availability due to human activities and climate changes, and the protection of aquifers from pollution.

References

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