flowpath THIRD EDITION
3rd National Meeting on Hydrogeology
Cagliari, 14-16 June 2017

HYDROCOMPLEXITY, AND SPATIAL AND TIME SCALES AS DRIVERS OF MONITORING AND MANAGEMENT APPROACHES FOR A KARST COASTAL AQUIFER (SALENTO, SOUTHERN ITALY)

Alessandro PARISI [1], Maria Dolores FIDELIBUS [1]

[1] DICATECh, Politecnico di Bari, Via Orabona 4-70100 Bari, Italy, alessandro.parisi@poliba.it

The study aims at representing the complexity of the hydrogeological scenario (as to the physical features and the system response) of a karst coastal aquifer (Salento aquifer - Apulia region, Southern Italy). Furthermore, the study intends to point out the issues related to groundwater monitoring and coastal aquifer management, which are consequent to the hydro-complexity, in order to define a suitable approach for the control of groundwater qualitative and qualitative status.

The karst coastal aquifer of Salento is, indeed, a complex aquifer. This complexity, enhanced by the coastal condition, is due to lithology, morpho-tectonic configuration and paleo-geographical history. Both the structural-tectonic characteristics, and the superficial and underground morphological features, defined by karst processes from place to place in a different way, guide the groundwater flow within the Mesozoic mass. As to the system response, groundwater reacts with a certain lag to stressing factors, such as climatic variations and groundwater exploitation. Therefore, if compared to input time, negative effects on groundwater qualitative and quantitative status are appreciable with time delays, which depend essentially on the scale of the flow system.

As matter of fact, the monitoring wells (which belong to the Regional Monitoring Net) intercept groundwater according to the hydraulic conductivity anisotropy, where preferential levels are vertically distributed, even over short distances, because of tectonic dislocations. This spatial condition poses objective limitations to a classical interpretation of groundwater quality status. Monitoring wells, even if specifically designed to saltwater intrusion control (long-screened monitoring wells, which intercept all the groundwater thickness up to salt water), have some limitations in providing a "general" summary about salinization status, inasmuch they identify the response (which varies according to permeability, distance from the sea, impact on groundwater resource) referred only to the areas surrounding the monitoring wells. Moreover, ordinary measures of hydraulic head are also affected by the presence of preferential flow levels (originating vertical flow in the wells) and they are density-dependent.

The study discusses monitoring methods implemented in the Salento area during the last decades and their efficiency in relation to the scenario of hydro-complexity and on the light of the action of the different drivers, which take place over spatial and time scales different from those of monitoring. These drivers cause “concealed” effects of “groundwater drought” and

salinization with time lags compared to the visible stress events.
The study aims at outlining a monitoring and management approach valid for complex coastal aquifers of large dimension.