TEMPERATURE LOGS APPLICATION TO EVALUATE GROUNDWATER – SURFACE WATER INTERACTION IN AN AREA OF SABATO BASIN, IN SOUTHERN ITALY

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In recent years, temperature is being more and more used as natural tracer in hydrogeological field investigations in order to characterize groundwater flow systems and interaction between surface water bodies and groundwater (Anderson, 2005; Vandenbohede & Lebbe, 2010).
Down-hole temperature measurements are useful tools for groundwater investigations to provide information about groundwater flowpaths and residence times in small sites with complex hydrogeological settings. In deeper wells, the temperature anomalies resulting from groundwater circulation in surrounding formation or within the well itself can be significant (Michalski, 1989).
The overall objective of this study is to investigate and characterize groundwater and surface water mixing using temperature-depth (T-z) profiles in Campania region, Southern Italy.
The study area is located in Pianodardine (AV), on the left side of the Sabato River and is characterized by the presence of local groundwater mixing with stream water.
This area is mostly made of alluvial and pyroclastic deposits while the base of the stratigraphic series is made of clays and loose pyroclastic rocks of the Altavilla Unit (Di Nocera & Matano, 2011).
Down-hole temperature logging in 9 monitoring wells, referred to two monitoring campaigns in April and October 2016, have been compared to evaluate seasonal effects on water mixing processes.
Groundwater and surface water temperatures were recorded in the study area by means of a SEBA KLL-Q multi-parameter probe (Seba Hydrometrie). The temperature sensor has a measurement rage of –5° to 50°C with a 0.01 °C resolution and a ± 0.1°C accuracy.
Down-hole temperature measurements were made at 1 m step of increment from the ground surface. The results from these surveys have been coupled with the lithological and geological descriptions obtained from reports coming from drill holes within the study area.
The results of the comparison of the down-hole temperature logging obtained in April and October 2016 suggest that stream water interacts with the groundwater local flow in some parts of the area under study, due to the specific geological structure and is responsible of temperature anomalies. As a matter of fact the analysis of temperature logs let us distinguish where the mixing processes between stream water and groundwater are sensitive, and stream water feeds the shallow aquifer from where these processes are not present.
The temperature logging offers a non-expensive tool, able to acquire, rapidly, reliable data and to support hydrogeological studies in small sites or in high heterogeneity conditions.

References

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