THE USE OF TEMPERATURE MONITORING TO DEFINE THE GROUNDWATER FLOW PATHS

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435 - THE USE OF TEMPERATURE MONITORING TO DEFINE THE GROUNDWATER FLOW PATHS

Alice Gisolo
Department of Earth Sciences, University of Torino, Torino, Italy

Diego Barbero
Department of Earth Sciences, University of Torino, Torino, Italy

Arianna Bucci
Department of Earth Sciences, University of Torino, Torino, Italy

Maria Gabriella Forno
Department of Earth Sciences, University of Torino, Torino, Italy

Manuela Lasagna
Department of Earth Sciences, University of Torino, Torino, Italy

Domenico Antonio De Luca
Department of Earth Sciences, University of Torino, Torino, Italy

Aquifers can be divided into two different parts, according to the water temperature profile: a surficial zone and a geothermal zone. In the surficial zone, temperature profile is influenced by seasonal heating and cooling of air and soil. In the geothermal zone, the thermal log is approximately linear, because temperature follows the geothermal gradient.

More specifically, the groundwater temperature profile in the surficial zone can be modified by the seepage of cooler water, in recharge areas, or by the upward flow of warmer water in discharge areas. As a consequence, the study of temperature profiles of aquifers can support the identification of groundwater flow paths and, in particular, the identification of recharge and discharge areas. In recharge areas the temperature profile is: (a) concave upward, because the seepage of cooler water cause an anomalous low gradient; (b) elongated in depth, because the downward flow of cooler water deepens the beginning of the geothermal zone. Instead, the temperature profile in discharge areas is: (a) convex upward, because the upward flow of warmer water causes an anomalous high gradient; (b) compressed, because the effect of seasonal cooling and heating of air and soil disappears at shallower depth. In the transitional areas, the temperature profiles are linear because they follow the geothermal gradient without any influence by groundwater downward/upward flow.

The study of temperature profiles of groundwater was applied in Piedmont Plain (NW Italy) in order to identify the recharge and discharge areas of aquifers and, consequently, to define the groundwater flow paths. Thermal logs, carried out in piezometers drawing the whole aquifer, were compared with the morphology suggested in theory. The comparison allowed to identify the location of discharge and transitional areas, studying the bending of temperature profiles, and of recharge areas, studying the elongation of profiles, because the absence of quite deep piezometers made impossible to study their concavity. It was recognized that the depth where seasonal effects disappear are deeper in recharge areas (around 20 m below the ground level) than in discharge ones (around 7 m below the ground level).