The Second International Conference on Saltwater Intrusion and Coastal Aquifers — Monitoring, Modeling, and Management. Mérida, Yucatán, México, March 30 - April 2, 2003

MODELLING LATERAL SALTWATER INTRUSION MECHANISMS IN FRACTURED ROCKS USING SPATIAL CORRELATION ANALYSIS: A CASE-STUDY IN THE MURGIA AQUIFER (SOUTHERN ITALY)

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ABSTRACT

Classical investigation techniques such as aquifer pumping tests or tracer tests [Tharailkill, 1988; McConnel, 1993] have been recognised world wide as being essential tools for characterising any type of aquifer. However, because of the limited investigation scale of these techniques, they do not always provide sufficient information on the different types and temporal variation of groundwater flow [Larocque, 1997]. Time series analysis is especially used in karst environments [Padilla et al., 1994] because it uses data that are easily available and relatively inexpensive to collect.

In order to improve a basic understanding of lateral seawater intrusion processes in fractured aquifers, in a typical study-area of the Murgia coastal aquifer (Southern Italy), ten wells have been drilled, tested and finally equipped with multiparametric probes able to record daily piezometric level (m) and electric conductivity (mS/cm) variations. The position of the study-wells has been chosen according to the general hydrostructural features of the study-area, already described in a previous paper [Maggiore et al., 2001].

A preliminary study has been performed using space-time correlation analysis. This analysis allowed for the modelling of the spatial correlation laws using an exponential correlation model ($R = e^{-kx}$). Thus, by performing a regionalized reconstruction of k coefficients of the modelled laws, a direct link between the aquifer hydraulic proprieties and this indicator has been found.

We can finally observe that a good agreement exists between spatial distribution of the k coefficients and the electric conductivity map and the evidence of such agreement confirms the important role played by the lateral seawater intrusion mechanisms in fractured karst coastal aquifers [Tulipano, 1999].

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