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Extended Abstracts

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6.1
Hard rocks as specific media — methods and results

title: **Estimate of fractured aquifer thickness using multiple pumping tests analyses**

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A new method consisting in multiple pumping tests to estimate the aquifer thickness is applied on a shallow fractured crystalline aquifer. The methodology developed here requires short duration pumping cycles on an unconfined aquifer with significant seasonal water table fluctuations. The interpretation of 24 pumping tests under variable initial conditions provides information on the change of hydrodynamic parameters T and S according to the initial water table level (Fig. 1).

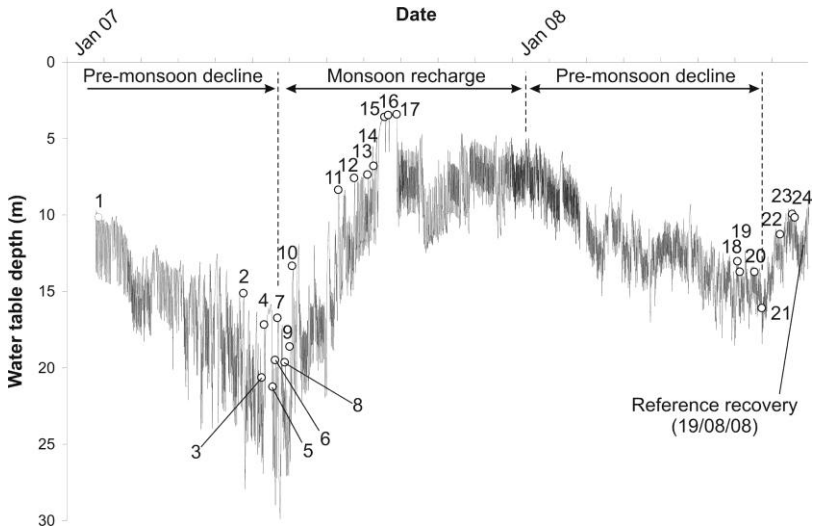

Figure 1. Water table depth fluctuations at observation well during the monitoring period (analyzed pumping cycles are numbered from 1 to 24).

The transmissivity is found to linearly decrease with the initial water level (Fig. 2), thus suggesting a homogeneous distribution of hydraulic conductivity (K = 2.4 × 10^{-6} m/s) with depth. The extrapolation of the relationship between transmissivity and water level (Fig. 2) provides an estimate of the aquifer thickness (35.6 ± 7.2 m) that is in good agreement with the thickness of weathered/fractured rocks estimated from geophysical investigations.

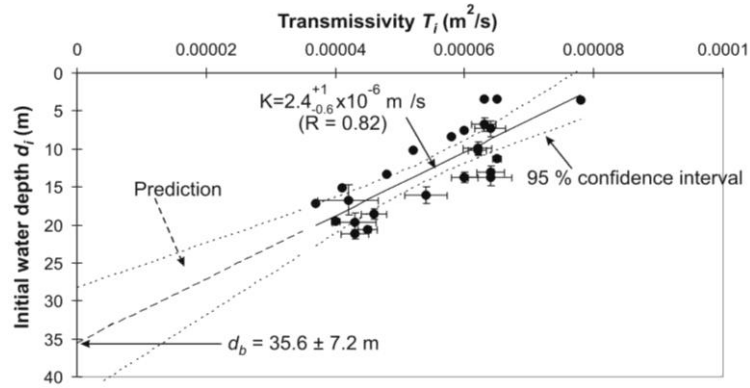

Figure 2. Transmissivity obtained from multiple pumping tests at CMP1 as a function of initial water table depth using unconfined aquifer model.

Our results suggest that the hydraulically active part of the aquifer is located in both the shallow weathered and the underlying densely fractured zones of the crystalline basement. However, no significant relationship is found between aquifer storativity and initial water level. This could be due to the fact that the estimated storage does not correspond to the specific yield but rather to the elastic storage.

This new method contributes to fill a part of the methodological gap between single pumping test and hydraulic tomography in providing information on the variation of the bulk transmissivity according to depth. It can be applied to any unconfined aquifer in the world experiencing large seasonal water table fluctuations and short pumping cycles.

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