Pressure transient tests on geothermal wells in the Dogger aquifer, Paris Basin

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In this work, we propose a new interpretation of pressure transient tests conducted in more than sixty wells targeting the Dogger formation in the Paris basin. The most part of these wells were drilled during the eighties over a very short period of time in an urban area. The transient tests were only recorded during a pressure buildup and show that contrary to what has long been assumed the Dogger aquifer behavior is not homogeneous.

The interpretation of the obtained data was mainly done with Horner's method, independently for each well, and assuming generally that the aquifer is homogeneous. Available data from pressure transient tests are limited because of the precision of the tools used, and because pressure buildup was only recorded during eight to twelve hours. The objective was to determine the average transmissivity and the skin factor in order to obtain the productivity of the wells.

We gather all available data, including those obtained on the thirteen recent wells, and propose a new interpretation in terms of aquifer model. We use the pressure derivative method developed in the nineties for oil reservoirs which allows a better visualization of the model and of the heterogeneity of the aquifer.

Most of the well tests have a derivative pressure curve with a slope equal to zero, that does not change after the well bore effects, confirming that the aquifer is relatively homogenous. However on a dozen of wells, data from pressure transient tests display singular behaviors that can be related to a double porosity or double permeability model for some wells and to a composite model for others. These observations question the validity of a homogeneous model for the Dogger aquifer in the Paris basin and the currently used parameters for the thermal and hydrodynamic predictive model of geothermal exploitation.

Finally, this work increases our understanding of the Dogger aquifer in the Paris basin and will allow the optimization of the ongoing hydraulic tests and the future exploitation of geothermal energy in the area.