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Hydrogeological modeling of a fissured and karstic thermal system adjacent to a salt diapir (Dax - Saint-Paul-Lès-Dax - France)

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In the South of Aquitaine Basin (France), several thermal springs occur with a flow discharge of 350 $m^3.h^{-1}$ of a water at 62˚C and evacuate locally an important geothermal flux. The thermal layer is an upper Cretaceous porous and fractured dolomite straightened up in a subvertical position along the flank of a Triassic salt diapir. The present study is the first detailed quantitative approach, initially by a 2D vertical model. Then, we have constructed a 3D model of the thermal complex of Dax - Saint-Paul-Lès-Dax, main thermal cities in France with more than 70,000 curists a year.

The objective of the 2D conceptual model is to make a heuristic project to validate - or invalidate - the operating mode of the local thermal system. The 3D multilayer model should be able to be used as management tool of the thermal water resource : resolution of the conflicts of use (interferences between wells, optimization of draughts), simulation of the influence of new wells and simulation of the relation with the alluvial aquifer.

For modeling this hydrogeological singularity, we used the last available field data : the recent drilling data (heads, temperatures, facies), the interpretation of pumping tests according to a convenient double porosity model for the fissured dolomite and the results of recent petrophysic analyses (intrinsic permeabilities, hydraulic conductivities).

The low value of intrinsic permeabilities of the dolomite can not explain the important discharge of the thermal springs. It was necessay to explain this facts to take into ac-

count firstly the fracturing which affected the thermal reservoir during the movements related to halokinesis, and in a second time, the improvement of the reservoir properties by dolomitization and karstification during the geological times, specially on the flanks of the diapir.

Using the finite element code FEFLOW, the option “fractured elements”, allows to combine porous matrix structure with interconnected discrete feature elements in both 2D and 3D models. This is accurate to represent hydraulic properties of a double porosity reservoir. This approach is justified by the results obtained in a good agreement with the collected field data. So the transient regime seems to be quite precise to reconstitute influence of the draughts of the whole thermal wells in Dax area.