Introduction: An alluvial quaternary aquifer system, assumed as a high heterogeneous porous media, has probably conceived as a numerical modeling hell, according to most of hydrogeologists. We will show how we tried to manage the whole subsurface physics

Computational Methods: we built a 2D section: a) Darcy’s law (multilayer and heterogeneous saturated aquifer), b) Richards’ equation (portion of unsaturated aquifer and), c) ALE (aleatory Lagranian-Eulerian) methods to show piezometric surface deformation, d) Inlet from surface (recharg according to hydrogeology terms), e) solute transport (flux of mass) and inlet from a surface water (2m incised creek with a generic solute

Results: After this "academic" exercise, we applied this modeling work plan in a very critical pollution site, in order to define a capture zone of nine wells with double screens pumping simultaneously. We exactly used the same configuration of 2D model in a 3D domain

Conclusions: Though the domain was increased by 2000% (from a decametric simulation to a kilometric study area) we appreciated how COMSOL multiphysics® runs very well parallelized in our workstation and found very fastly the convergence although faced with a high areal complexity.

Currently, we are developing a very large scale 3D high detailed aquifer model ready to be imported as an interpolation function and to define hydrogeological heterogeneities. We are testing COMSOL Multiphysics® for a very large domain with interesting response. For our test we do not notice a limit (except calculation time) to areal dimension.