



## **Subsurface flow simulation with model coupling**

**E. Rozos** and D. Koutsoyiannis

N.T. University of Athens (rozos@itia.ntua.gr)

The powerful modern computer systems have enabled use of mathematical tools, such as optimisation procedures, that are computationally demanding. Nevertheless, even the fast modern systems have the need for elegant modeling to avoid extreme computation times during model calibration. The subsurface hydrology models are well known to be very time consuming and for that reason the modeler faces the dilemma to select between dense (good spatial representation) and sparse discretisation (low calculation time). The MODFLOW is considered as a standard ground water model and it is based on the finite differences method. The rectangular grid that is imposed by this method encumbers significantly the compromise between speed and representation. The 3dkflow ground water flow model is based on the integrated finite differences method and discretises the flow domain using large non rectangular cells. The model is very fast and for that reason can be coupled easily with a global optimisation algorithm but it has the disadvantage that it needs as prior information the shape of the equipotential lines. The coupling of these two models has been proved to be very advantageous both in calibration and in application stages. The MODFLOW is used with a dense grid and a rough estimation of aquifer hydraulic parameters to simulate water flow and obtain the equipotentials. Hereupon the 3dkflow is used in conjunction with shuffled complex evolution algorithm to obtain reliable parameter estimates. These estimates may be subsequently used either with MODFLOW (solute transport, local impacts due to pumping, etc.) or 3dkflow (stochastic forecast, water management decision programs, etc.) depending on the application type.