
Classical approach to achieve calibration of the Hydraulic Conductivity of a Computer Model of an aquifer is based on the principle of the minimization, using minimum squares method, of the following objective function:

$$F_{obj} = \sum_{i=1}^{N} (h_{j}^{obs} - h_{j}^{calc})^2$$

Where $h^{obs}$ are the observed (measured) hydraulic heads and $h^{calc}$ are the calculated heads of the $j_{th}$ cell.

We propose a new Method, based on the hydraulic gradients, based on following the iterative correction of the Hydraulic Conductivity:

$$K_{j}^{i+1} = K_{j}^{i} \left| \frac{\nabla h_{j}^{calc}}{\nabla h_{j}^{obs}} \right|$$

Where $\nabla h_{j}^{calc}$ is the calculated hydraulic gradient (in a cell $j$ considering iteration $i$)

And $\nabla h_{j}^{obs}$ is the observed hydraulic gradient (in a cell $j$ considering iteration $i$)

$K_{j}^{i}$ is the Hydraulic Conductivity of a cell $j$ considering iteration $i$

$K_{j}^{i+1}$ is the Hydraulic Conductivity of a cell $j$ (considering iteration $i+1$)

The methodology proposed is based creating two models of the aquifer: One is elaborated considering that the cells where the hydraulic head is known (measured) are considered cells of fixed heads (fixed cells model) and in another model the hydraulic heads of these cells are allowed to vary (non-fixed cells model) like in the following example.

Then the iterative process described previously is initiated.