Geophysical Research Abstracts
Vol. 16, EGU2014-2868, 2014
EGU General Assembly 2014

Towards inverse modelling by conditional simulation

Sebastian Hörning (1) and András Bardóssy (2)

(1) Institute of Hydraulic Engineering, University of Stuttgart, Stuttgart, Germany (sebastian.hoerning@iws.uni-stuttgart.de),
(2) Institute of Hydraulic Engineering, University of Stuttgart, Stuttgart, Germany (andras.bardossy@iws.uni-stuttgart.de)

Inverse modelling is an important technique in hydrological studies. It is related to aquifer characterization and with that also to the process of collecting information on the model parameters from measurement values.
An inverse modelling approach based on a new conditional simulation technique in a MC framework is introduced. It consists of two main steps. The first is to generate n hydraulic conductivity fields conditional to the available conductivity measurements. This can be achieved by a linear combination of unconditional fields. Here the task is to find the weights of the linear equation system fulfilling certain constraints, under which the covariance structure is preserved. The problem of finding suitable weights is not solved directly. First the problem is thought as an optimization problem with relaxed constraints that can be solved using quadratic programming. Second the solution fulfilling the proper constraints can be found applying a simple algorithm and interval halfing. It is important to mention that if one can find different weights fulfilling the conditions a whole domain is defined, i.e. an infinite set of fields is generated which fulfill the conditions.
In a second step the hydraulic head conditions are taken into account. Here the task is to find a linear combination with positive weights of the previously conditioned realizations that minimizes the deviation of the hydraulic head conditions. Due to the positive weights one will not get out of the previously defined solution domain. Hence all hydraulic conductivity conditions are fulfilled and the deviation of the hydraulic heads is minimized.
The applicability of this technique will be shown with an synthetical example.