Geophysical Research Abstracts
Vol. 19, EGU2017-19475, 2017
EGU General Assembly 2017

Reducing transition probability model parameter uncertainty using a smoke tracer test

Catherine Moore and David Scott
GNS Science, Te P¯ Ao, Lower Hutt 5040, New Zealand

Where small scale structures in heterogeneous alluvial gravel aquifers impact groundwater responses, stochastic or probabilistic approaches are typically adopted. Stochastic approaches are needed because there is almost always insufficient data to characterize small scale structures uniquely. Groundwater models are then run multiple times using equally likely aquifer property realisations and outputs of these model runs are collated to provide model output probability density functions.

Markov chain based geostatistical methods are used to generate stochastic realisations by characterising the juxtapostional tendencies of stratigraphic units. However estimation of the transition probability model parameters often results in non-unique solutions with a wide range of equally plausible models: therefore the stochastic model itself cannot be characterised uniquely. The range of equally plausible models are seldom explored, instead a single stochastic description of the hydrostratigraphy is usually selected as the basis for generation of multiple stochastic realisations.
By using the dominant flow directions from a smoke tracer test, we evaluated the plausibility of the candidate Markov-chain geostatistical parameters and identified the statistical characteristics of the hydrostratigraphy more precisely. This was based on a relationship between the mean length of the facies units in the X and Y dimensions and the number of successful model-to-measured matches with the observed dominant flow directions from the smoke tracer test. The most successful transition probability model generated 80% of realisations consistent with the smoke tracer tests. This approach provides a method for determining the stochastic nature of our heterogeneous aquifers that is easily transferable to another site.