Stochastic inversion of Pneumatic Tomography Survey in Hanford Site

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Abstract

The distribution of permeability is the main factor that controls airflow and gas-phase transport in unsaturated conditions. To characterize the behavior of flow and transport, a scheme procedure is a typical approach that has been widely used to laboratories and fields. This approach is based on accurate, and more importantly, a satisfactory tool to interpret those measurements from experiments. This study applies a pneumatic inverse model that is capable to investigate the distributions of permeability with high resolution in heterogeneous unsaturated formations at the Hanford site. Based on the concept of the sequential successive linear estimator (SSLE), the developed model accounts for compressibility and density of air and estimates the geologic parameters using air pressure measurements from a pneumatic tomography survey. Results of the horizontal two-dimensional model show that the proposed model can reconstruct the properties fields such as permeability. With a relatively small number of available point measurements, the proposed model can accurately capture the patterns and the magnitudes of estimated permeability. In a comparison with the kriging interpolation method, the proposed model presents an improvement in the fluctuation of permeability through the number of injection tests.