

A Stochastic Model for Interpreting the Partitioning Tracer Recovery from Residual Trapping Experiment at Heletz, Israel, Pilot Injection Site

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Residual trapping is one of the key trapping mechanisms for geological storage of CO₂. While relatively abundant experimental data exists on laboratory cores, only very few experiments have attempted to address this parameter in the field. As part of the experimental program at Heletz, Israel, pilot CO₂ injection site (Niemi et al. 2012, 2016), two small-scale push-pull CO₂ injection experiments were carried out to determine residual trapping in-situ (Niemi et al. 2012). In the second one of these experiments, carried out in 2017, the main method for characterizing the residual trapping was injection of partitioning tracer Krypton before and after creating the residually trapped zone. This paper presents one of the model interpretations of the tracer experiment, by assuming a stochastically heterogeneous interpretation of the properties of the storage reservoir. Based on field data on layer properties, heterogeneous models are generated using geostatistical library GSLIB (Finsterle and Kowalsky 2007) and multiple realization Monte Carlo simulations of the experiment test sequence are carried out using the simulator iTOUGH with the equation of state modules EOS7C/ECO₂N (Pruess 2005; Oldenburg et al. 2004). Effect of heterogeneity characteristics on simulated tracer recovery is analyzed and compared to that from the field data. The results provide us a better understanding on how heterogeneity effects can influence partitioning tracer behavior and its partitioning into trapped CO₂.

Keywords: Geological CO₂ storage, residual trapping, partitioning tracers, heterogeneity, Monte Carlo simulation

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