Contribution ID: **726** Type: **Poster**

Fast large-scale joint inversion for deep aquifer characterization using pressure and heat tracer measurements

Tuesday, 15 May 2018 18:00 (15 minutes)

Characterization of geologic heterogeneity is crucial for reliable and cost-effective subsurface management operations, especially in problems that involve complex physics such as deep aquifer storage of carbon dioxide. With recent advances in computational power and sensor technology, large-scale aquifer characterization using various types of measurements has been a promising approach to achieve high-resolution subsurface images. However, large-scale inversion requires high, often prohibitive, computational costs associated with a number of large-scale coupled numerical simulation runs and large dense matrix multiplications. As a result, traditional inversion techniques have limited utility for problems that require fine discretization of large domains and a large number of measurements to capture small-scale heterogeneity, like CO2 monitoring in the subsurface.

In this work, we apply the Principal Component Geostatistical Approach (PCGA), an efficient inversion method, for large-scale aquifer characterization. The domain considered is a synthetic three dimensional deep saline aquifer intended for CO2 storage with 24,000 unknown permeability grid-blocks. Transient pressure and heat tracer measurements from multiple dipole pumping tests are simulated with the TOUGH2 simulator and are used to estimate the heterogeneous permeability field and the corresponding uncertainty. For this scenario, we investigate the worth of combining heat and pumping tracer data for characterization. We demonstrate that with the PCGA, the inversion can be performed at a reasonable computational cost, while also resolving the main features of the permeability field. This presents opportunities for using inverse modeling to improve monitoring design and data collection strategies in field applications.

References

Acceptance of Terms and Conditions

Click here to agree

Primary author: LEE, Jonghyun (University of Hawaii at Manoa)

Co-authors: Prof. KOKKINAKI, Amalia (University of San Francisco); Prof. KITANIDIS, Peter (Stanford University)

Presenter: LEE, Jonghyun (University of Hawaii at Manoa)

Session Classification: Poster 2

Track Classification: MS 1.28: Coupled chemo-mechanical processes in fractured and nano-porous media