Probabilistic Analysis of CO₂ Storage Mechanisms in a CO₂-EOR Field Using Polynomial Chaos Expansion

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Wei Jia, Ph.D.
Post-Doctoral Research Associate,
Carbon Science and Engineering Research (CSER) Group
University of Utah
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Abstract:
Depleted oil fields are already used for storing CO₂ via injection of CO₂ for enhanced oil recovery (CO₂-EOR). Such storage is an outcome of CO₂-EOR, albeit not necessarily by design. A next step would be intentional storage via post-EOR CO₂ injection. Following injection for EOR or post-EOR, CO₂ may be trapped by dissolution in the oil or aqueous phases, or remain in the supercritical CO₂ phase. Forecasting the nature of trapping and the ultimate CO₂ distribution in a reservoir is hindered by uncertainty in reservoir properties. The purpose of this study is to develop and apply reduced order models (ROMs) integrated with Monte Carlo simulations to quantify the three primary types of storage mechanisms in an active CO₂-EOR field, including oil solubility trapping (oil phase), aqueous solubility trapping (aqueous phase), and hydrodynamic trapping (CO₂ in supercritical phase).

Short Biography:
Dr. Jia finished the Ph.D. program in the Department of Civil and Environmental Engineering at the University of Utah in 2016. He received his Master of Science in Environmental Science from Tongji University in 2010, and BS in Environmental Science from the University of Science and Technology of China in 2007. Now he is a postdoc in the Carbon Science and Engineering Research (CSER) Group. Dr. Jia’s research areas include multiphase flow, reservoir modeling and simulation, risk assessment, and uncertainty quantification of CO₂ sequestration by using reduced order models.