Quantifying Uncertainty through 3D Geological Modeling for Carbon Capture Storage in the Unayzah Formation in Saudi Arabia

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Context & Objective

3D High-resolution Model of the Unayzah Formation as a Carbon Storage Reservoir

- Reservoir architecture and heterogeneity
- Reservoir properties
- Key uncertainties and risks involved

Accurate site selection
Proper characterization

Safe, efficient, and reliable storage

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ANPERC, 2020

Evans, 1997

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Geological Model

Reservoir = Unayzah Formation
A Member
B Member
C Member

Uncertainty Analysis

Parameters:
• Facies proportion in trend maps
• Channels and facies elements orientation
• Porosity and permeability

Reservoir = Unayzah Formation

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Dynamic Model: Quick CO2 Storage Estimation

Parameters: Bulk volume, porosity, permeability, net thickness, efficiency factor.
Dynamic Model: Uncertainty Assessment

Workflow

Parameters → DOE - LHS → Realizations → Proxy Model → Monte Carlo Simulation

Sobol Analysis

Tornado Chart

Proxy Model

Monte Carlo Simulation

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Thank You

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