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

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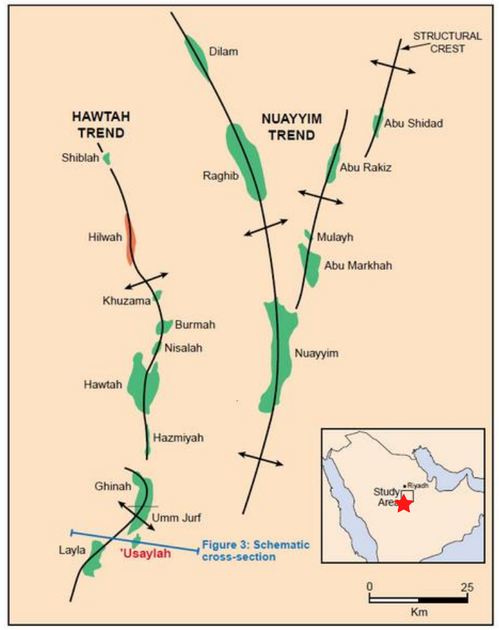
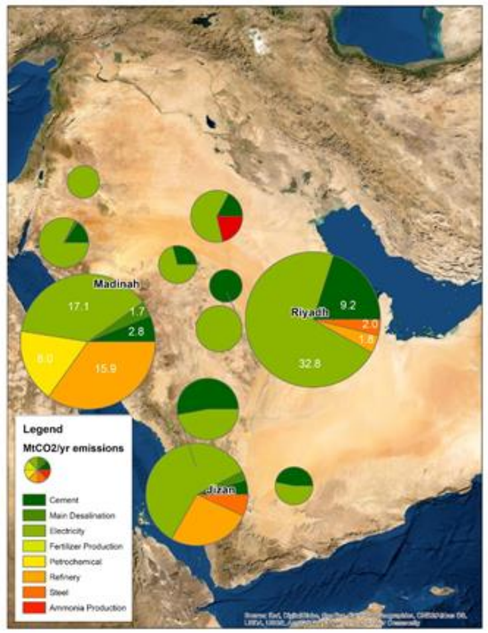
Context & Objective



Evans, 1997



ANPERC, 2020

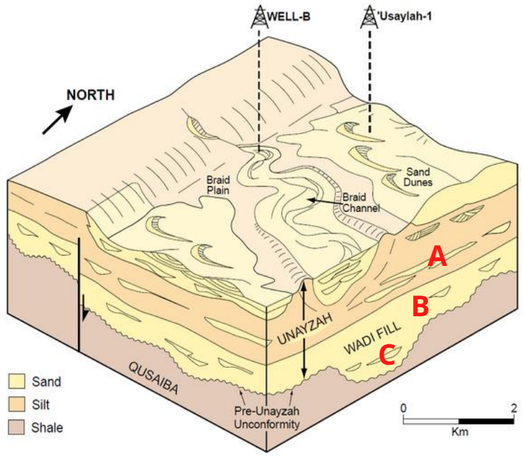
3D High-resolution Model of the Unayzah Formation as a Carbon Storage Reservoir

Reservoir architecture and heterogeneity
Reservoir properties
Key uncertainties and risks involved

Accurate site selection
Proper characterization

Safe, efficient, and reliable storage

Geological Model



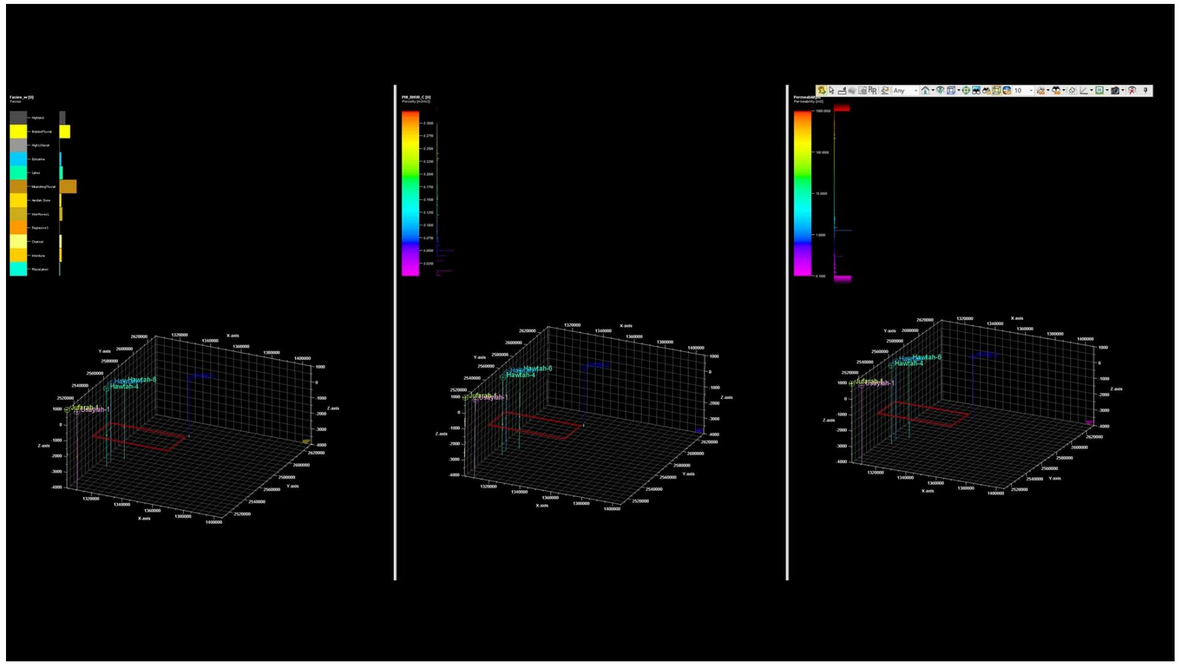
Evans, 1997

Reservoir = Unayzah Formation

A Member

B Member

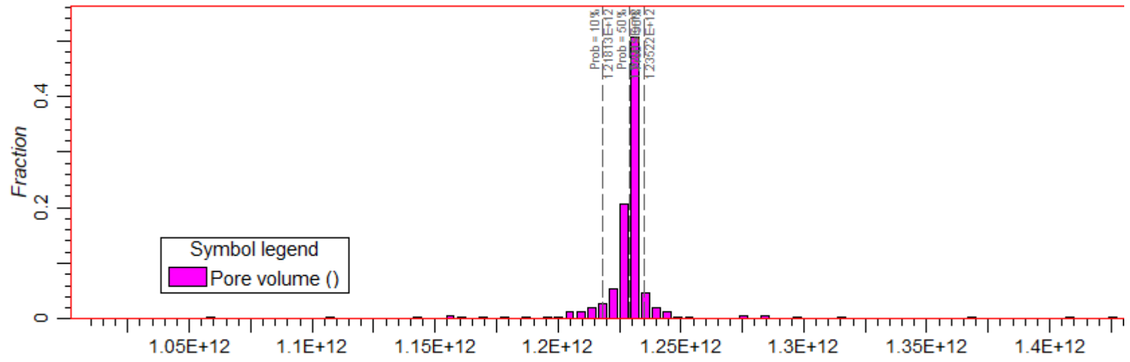
C Member



Uncertainty Analysis

Parameters:

- Facies proportion in trend maps
- Channels and facies elements orientation
- Porosity and permeability

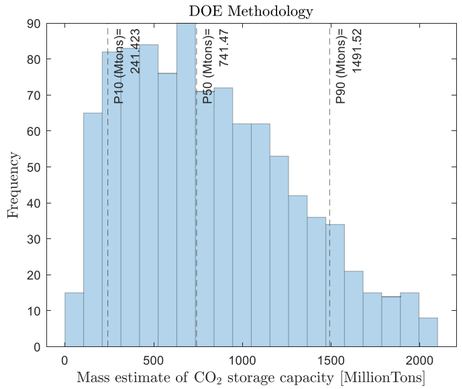


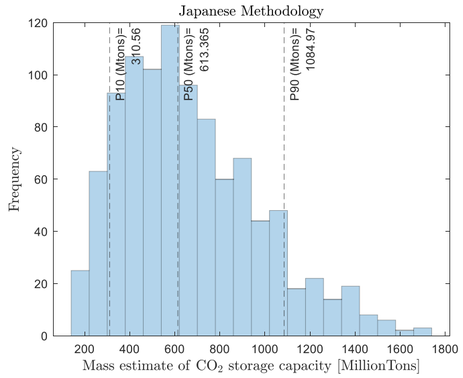
P10
P50 Models
P90

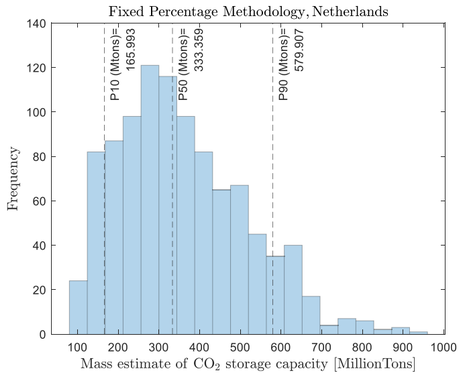
→ **Simulations and Uncertainty Quantification**

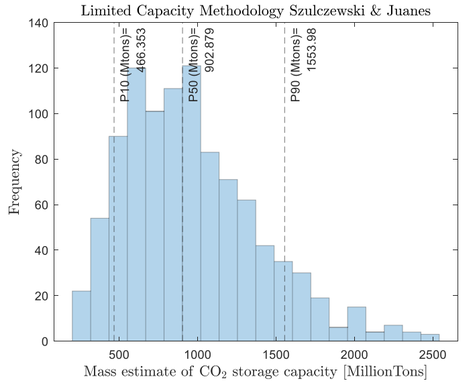
Dynamic Model: Quick CO2 Storage Estimation

3D Model

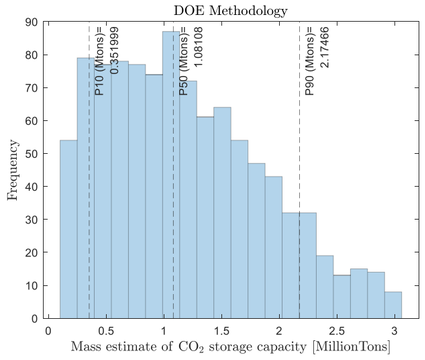


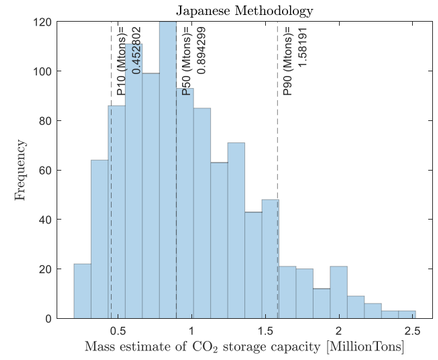


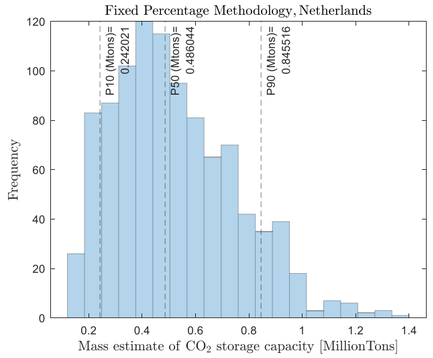


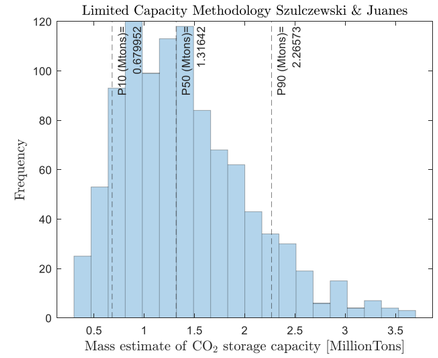


2D Model





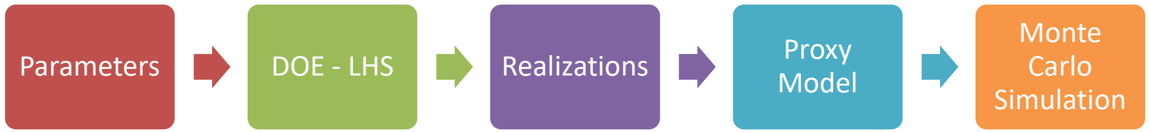




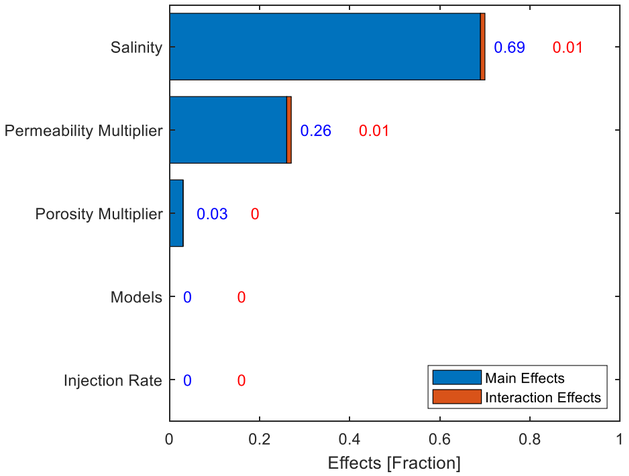
Parameters: Bulk volume, porosity, permeability, net thickness, efficienty factor.

Dynamic Model: Uncertainty Assessment

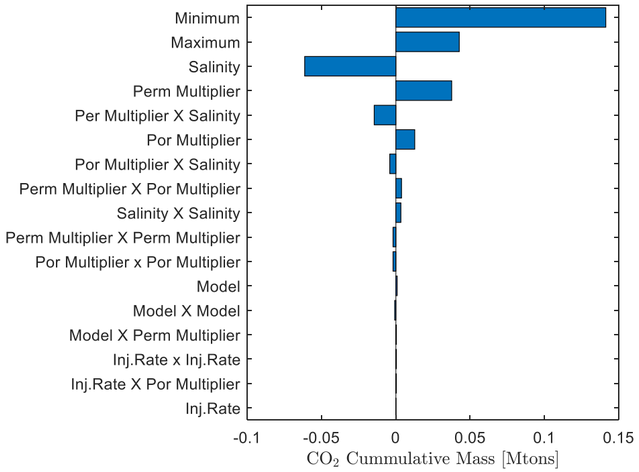
Workflow



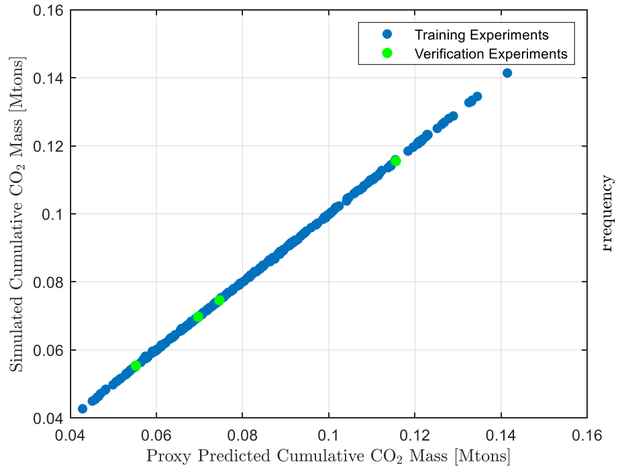
Sobol Analysis



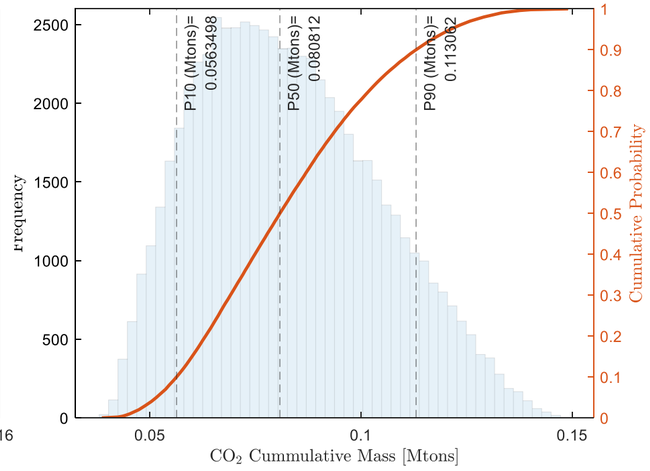
Tornado Chart



Proxy Model



Monte Carlo Simulation



Thank You

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