DREAM 2.0: ERT Placement and Beyond

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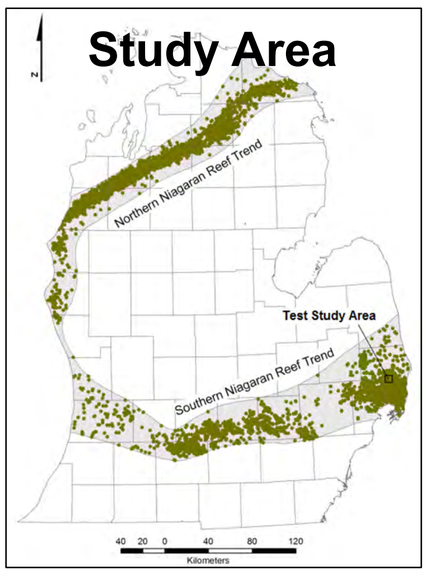
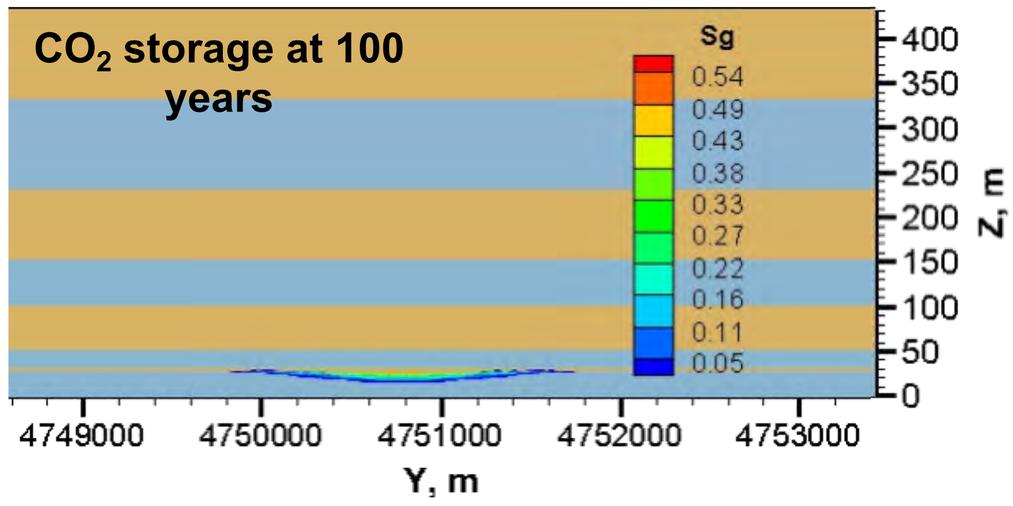
Introduction

We demonstrate an application of the new **DREAM 2.0 ERT module** to a hypothetical CO_2 storage site. The site was based on a study area in southeast Michigan which is near several large power plants. The site was part of a regional wellbore integrity (WBI) research project that evaluated the measures and costs needed to fix legacy oil and gas wells in Michigan and Ohio (Sminchak et al., 2016).

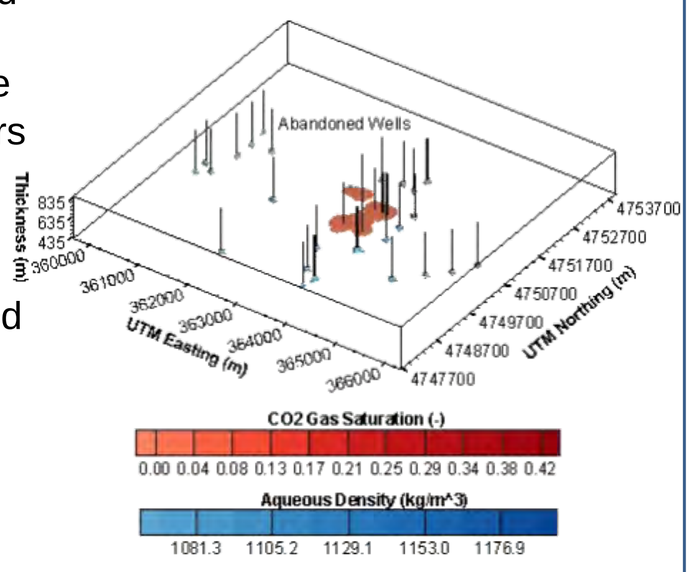




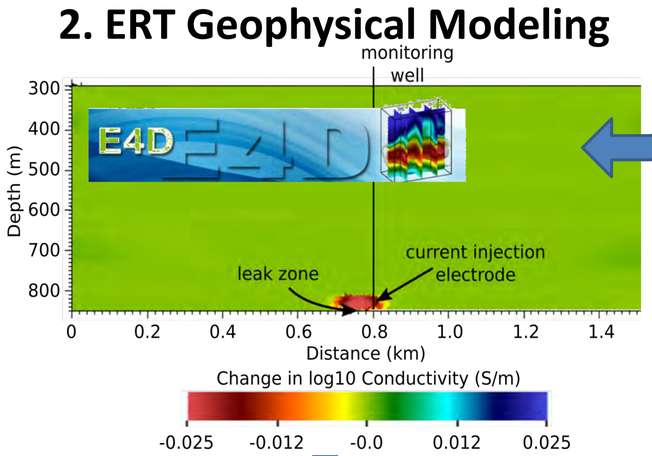
DREAM/E4D Coupling

1. Leak Scenario Simulations

- Hypothetical brine and CO_2 leaks into an overlying aquifer were modeled over 50 years (~500 m bgs)
- NRAP's WLAT tool estimated leak rates through 43 abandoned wellbores
- 11 of 43 exhibited gaseous CO_2 leaks, the rest only showed brine leakage



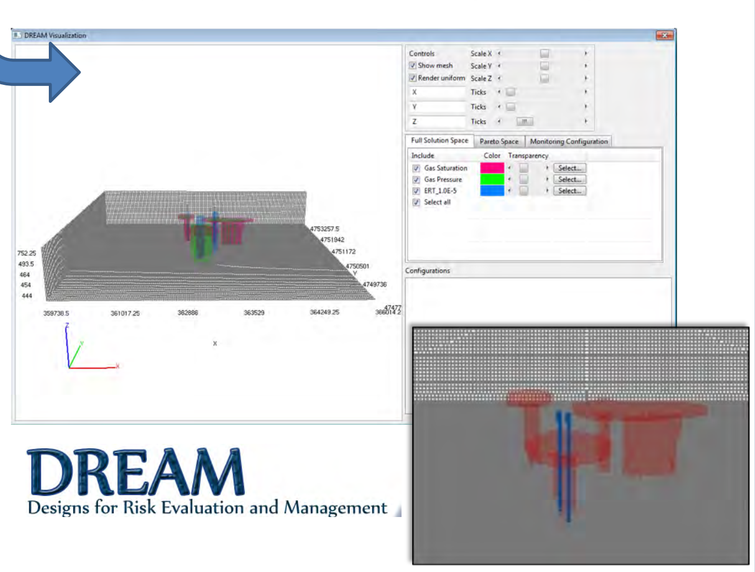
2. ERT Geophysical Modeling



- E4D computed pole solutions for each scenario
- Generated **pole-pole difference surveys** from baseline

3. Optimal Monitoring Design

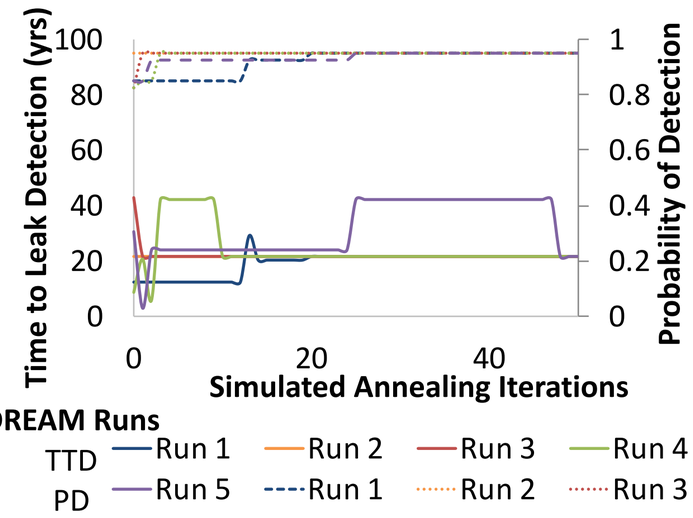
- Time to leak detection was determined for each scenario
- DREAM used a simulated annealing algorithm to optimize well placements for **cross-hole ERT sensors**



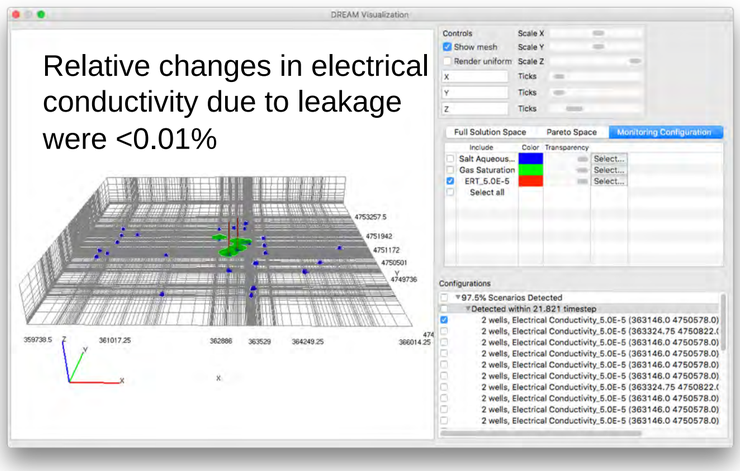
DREAM
Designs for Risk Evaluation and Management

Results

DREAM results show the optimal placement locations for **ERT monitoring schemes** to detect CO_2 leaks with the **highest probability, in the lowest amount of time** across all potential scenarios.



While this data demonstrates the DREAM/ERT sensor placement algorithm, leaked volumes were small relative to realistic ERT detectability.



Conclusions

- The utility of the DREAM/ERT module is shown; however, modeled physical and chemical changes within the monitoring zone were very small and uncertain in space and time.
- Need to ensure models are refined enough to capture small changes and monitoring technologies are sensitive enough to detect them.

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