Carbon Storage in Depleting Groundwater Aquifers: A Solution to Water Stress?

Introduction

- Australia has abundant deep fresh groundwater aquifers onshore (e.g., The Great Artesian Basin). These aquifers are experiencing water level decline due to extraction over ~100 years. Injecting CO2 in depleting groundwater aquifers may:
  - Boost the pressure to lift declining water levels over the broad regions;
  - Displace deep water to shallower regions, making it accessible;
  - Reduce CO2 emissions.

Research Questions

- Enhanced Water Recovery (EWR) may be beneficial, but also raises concerns:
  - RQ 01: Can the pressure build-up increase water levels at great distance? In what time frame? For how long?
  - RQ 02: Does displaced water from greater depth add to shallow water supply? Does mixing water of different compositions lead to water degradation at extraction sites?
  - RQ 03: How much water loses quality when decreasing pH (proxy for chemical changes) as a result of CO2 reacting with water?

Methodology

Integrated modelling (geological modelling, multiphase multicomponent flow modelling and geochemical modelling) to establish the pressure footprint, the pH footprint and the impact of carbon storage on freshwater aquifer resource availability and degradation.

Acknowledgements

This research is supported by The University of Queensland Surat Deep Aquifer Project (UQ-SDAAP), which is funded by the Australian Government, Coal 21 (ACALET) and The University of Queensland. Schlumberger and CMG Ltd have provided modelling software. A research scholarship is provided by Energi Simulation and The University of Queensland.

References