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FEATURED PROJECT

Storage Geochemistry

Carbon Management Canada

Tracing fate of injected CO_2

Bernhard Mayer, Lead PI

It's of paramount importance to be able to track injected CO_2 in a storage formation and detect and remediate any potential leaks into overlying rock formations, shallow aquifers or the atmosphere.

But with current tools, it's often difficult to trace the movement and the reactions of CO_2 after it has been injected underground. This project aims to fill that knowledge gap by conducting comprehensive geochemical baseline and monitoring studies that will clarify suitable monitoring strategies elucidating the fate of injected CO_2.

Researchers use hydrogeological and geochemical techniques to trace the movement and the fate of injected CO_2 in storage reservoirs, including assessments of solubility, ionic and mineral trapping potentials for injected CO_2 in order to identify and quantify transport and trapping mechanisms, and potential leakage pathways.

Developing comprehensive monitoring strategies, including a combination of geophysical and geochemical approaches, is essential for secure carbon storage. It's also likely that monitoring the fate of CO_2 in the injection reservoir may become an essential component for public and regulatory acceptance of CO_2 storage projects in mature oilfields and saline aquifers.

Research Grant

$630,300 over 3 years; Awarded 2010

Research Team

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Benefits to Canada and beyond

Geophysical, geochemical, and modeling approaches are used at CCS projects world-wide and the combination of these approaches has the potential to realize the most accurate verification of CO_2 storage in the subsurface. Using both down-hole and well head sampling, this project will yield superior monitoring protocols that enable a more accurate and precise tracing of injected CO_2.

Researchers will develop recommendations on how to apply these monitoring approaches to large scale CO_2 injection programs as well as evaluate how accurately injected CO_2 can be accounted for within the storage reservoir and outside, should leakage of CO_2 occur.

The results of this project will be a lynchpin for securing public acceptance of CCS in Canada and elsewhere.

Industrial Applications

The developed techniques are of significant interest to industry for tracing the movement and the fate of CO_2 injected for enhanced oil recovery (e.g. Weyburn-Midale CO_2 monitoring and storage project) or for storing CO_2 in saline aquifers (e.g. Shell QUEST project, PTRC-Aquistore). They are also vital for assessing claims of CO_2 leaks.

Industrial Project Partners

Shell Canada Limited
Cenovus Energy
Penn West Exploration
Petroleum Technology Resource Centre - Aquistore

Project Description

Goal

Researchers will develop accurate and highly efficient approaches to monitor the fate of injected CO_2 in the subsurface, therefore facilitating secure CO_2 storage.

Activities

Short-term objectives include:

- Assess interaction of potential storage sites with regional aquifers, pressure communication, and predict future flow.
- Conduct baseline geochemical assessment for potential sites and assess origin and distribution of fluids and gases, including H2S, in potential injection horizons in the Western Canadian Sedimentary Basin.
- Integrate noble gas tracers with the hydrogeological and geochemical techniques to constrain regional transport mechanisms, fluid-rock-reactions and trapping mechanisms for carbon storage.
- Conduct lab experiments to test model predictions of CO_2 – brine – rock reactions using geochemical and isotopic tracers.

Medium-term objectives:

- Initiate a geochemical monitoring program at selected field pilot sites to assess CO_2 movement and reaction in the target reservoir and develop monitoring strategies for potential leakage of CO_2.
- Use initial monitoring data from pilot projects to compare predicted CO_2 – brine – rock reactions based on laboratory experiments and models with field measurements.

Milestones

- Development of novel monitoring approaches that integrate multiple geochemical tracers to constrain fluid-rock-reactions and trapping mechanisms for injected CO_2.
- Development of advanced monitoring approaches for injected CO_2 at both enhanced oil recovery (EOR) and saline aquifer sites.

Research associate Michael Nightingale obtains fluid samples at an observation well at a CO_2 injection enhanced oil recovery (EOR) pilot site in Alberta.

For additional information

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About Carbon Management Canada

Carbon Management Canada (CMC) is a national and international network of researchers dedicated to research, development and performance validation of technologies related to the reduction of industrial greenhouse gas emissions. Working with over 160 senior investigators at universities across Canada and abroad, CMC has committed over $22 M to a portfolio of 44 research projects. CMC draws from world-wide pool of experts to find and develop real-world carbon solutions.

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