CO_2 Field Lab

September 2011

Objectives

- Determine the sensitivty of monitoring systems to detect shallow CO_2 migration and surface leakage
- Upscale these results to assess monitoring systems and requirements that will ensure safe CO_2 storage
- Test and calibrate migration models in well controlled conditions
- Test new monitoring methods towards the development of improved technology
- Provide guidelines to regulators, operators and technology providers for monitoring systems
- Gain acceptance from the public by showing the performance of monitoring systems

Background

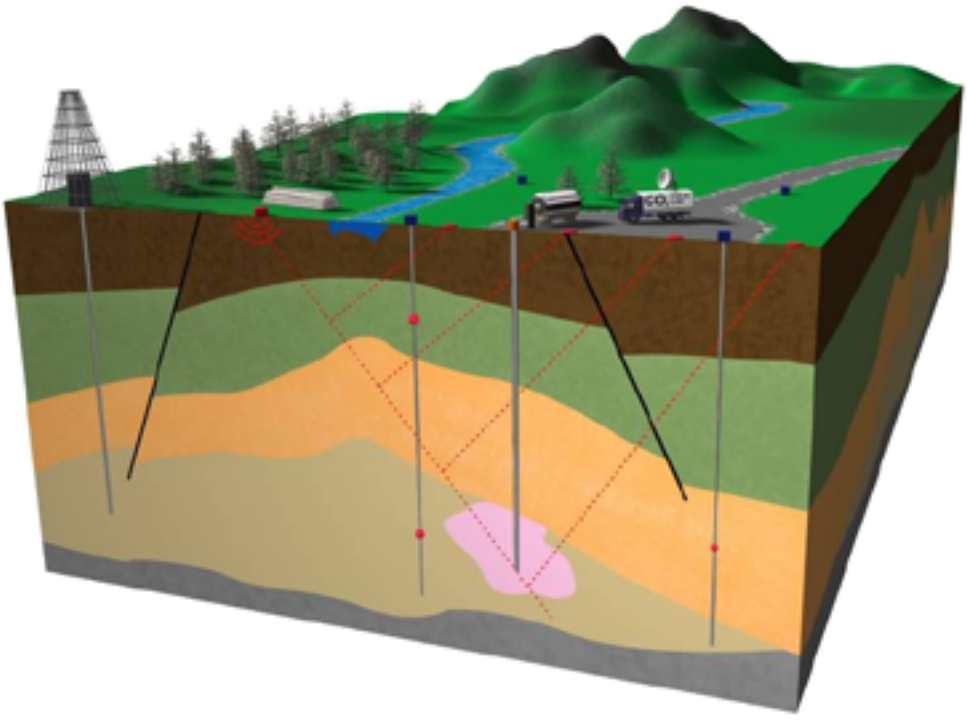
Geological storage of CO_2 is viewed as one of the acceptable options to minimize greenhouse gas emission into the atmosphere, thus to mitigate climate change. Technical feasibility of geological storage of CO_2 is currently being demonstrated. One of the barriers to commercial deployment of Carbon Capture and Storage (CCS) is the lack of protocols for Monitoring, Verifying and Accounting (MVA) the CO_2 stored in the reservoir. Another potential barrier that should not be overlooked is the public acceptance of CO_2 storage. Demonstrating the capability to detect leakage, so that remediation can be effected, will contribute to gain public acceptance.

State of the art

Protocols to perform detection of CO_2 outside the storage complex and the quantification of CO_2 leaking at the surface are not yet mature. The absence of MVA does not stem from the need for new technologies but rather from the lack of relevant field tests. The required spatial and temporal resolution of present available techniques for detecting CO_2 leakage is not well understood. CO_2 Field Lab provides a unique opportunity to demonstrate the sensitivity of each technique, and to propose a methodology for designing an MVA plan and protocol.

Methodology

Although a well-chosen and well-designed storage site is not expected to leak, the issue of leakage has to be addressed. Therefore, this project comprises two controlled releases of CO_2 in the shallow and very shallow subsurface in a Norwegian field setting. The CO_2 displacement in the subsurface and at the surface will be monitored with an exhaustive set of techniques deployed by the different partners.



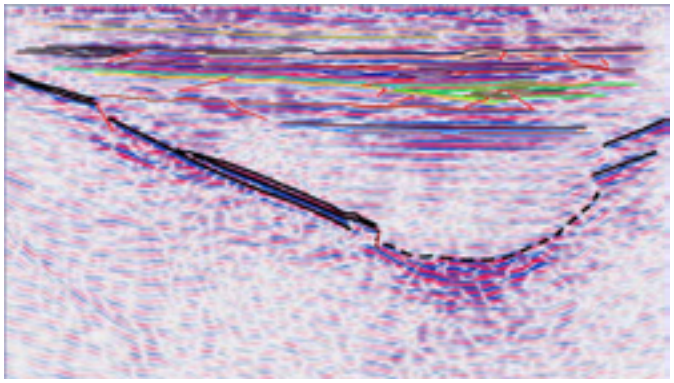
Phase 1 *(Completed in January 2011)*

- Site characterisation (2009 - 2010)
  - Geological surveys using ERT, GPR and 2D seismics have been performed at the site
  - A 330-m deep appraisal well has been successfully drilled and logged
  - Hydrodynamic appraisals at several depths
  - Updating geological and flow models using acquired data
- The site was found suitable for controlled injection experiments in Phase 2

Overview of the field laboratory site

Phase 2 *(Started in May 2011)*

- CO_2 injection & monitoring (2011 - 2013)
  - Drilling of injection and monitoring wells
  - Shallow CO_2 injection: 10-30 m (September 2011)
  - Deep CO_2 injection: 100-300 m, 200 tonnes (2012 - 2013)
  - Monitoring techniques include seismic, electromagnetic, gravimetric, downhole, chemical, geochemical, ecological and atmospheric methods
  - Investigate detectability and sensitivity
  - Ensure safe operations and clean site abandonmnent
  - Development of a monitoring protocol and certificate



Migrated image from the performed 2D seismic survey

Eurogia+

- The project has received the internationally recognised EUROGIA+ label (June 2009), that is granted to projects demonstrating technical innovation and showing strong market and exploitation commitment
- This label is a proof of quality to access national funding by individual participating countries' programs

CLIMIT *(Norwegian CCS research funding programme)*

"The Field Lab project addresses several important issues that the Norwegian authorities has given priority to within the mandate of the CLIMIT program"

- Active participation in, and funding of the feasibility pre-project
- Funded 52% of the total project budget in Phase 1

DGCIS *(French ministry funding)*

- General Directorate for Competitiveness, Industry and Services
- Funded 10% of the total budget in Phase 1

Project partners

Norway:

SINTEF

NGI

WesternGeco

United Kingdom:

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

France:

Schlumberger Carbon Services

Géosciences Montpellier

brgm
Geoscience for a sustainable Earth

Move Forward with Confidence

imageau

Contact

Project manager: Maria Barrio
Cellphone: +47 995 34 665
e-mail: maria.barrio@sintef.no

Local contact: Marion Børresen
Phone: +47 22 02 31 10
e-mail: marion.borresen@ngi.no

dgcis
direction générale de la compétitivité de l'industrie et des services

CLIMIT

eurogia
The EUREKA Cluster for Low-Carbon Energy Technologies