Assuring integrity of CO_2 storage sites through ground surface monitoring (SENSE)

Project Overview

ACT meeting at UiB, 10 Feb 2020, Bergen, Norway

Project Coordinator: Bahman.Bohloli@ngi.no

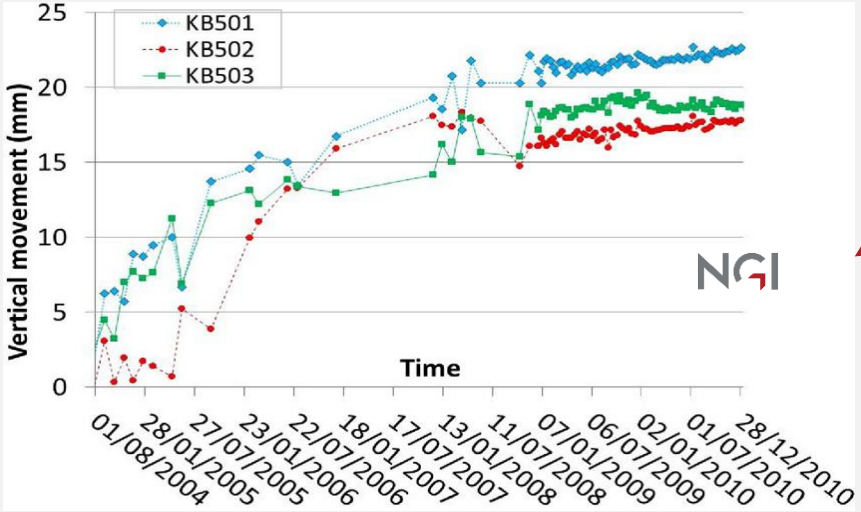
Principal Investigator: Joonsang.Park@ngi.no

Outline

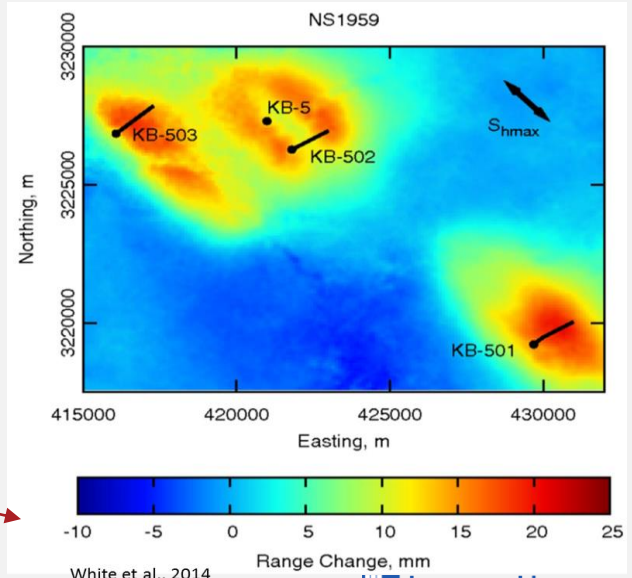
- Introduction and objective
- Project structure and WPs
- Project innovations
- Status for SENSE

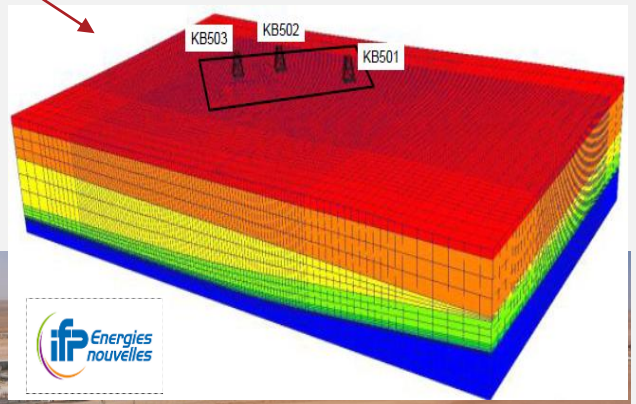
Introduction

- In Salah: an important site to understand subsurface flow-mechanics



Three SENSE Partners performed independent studies for In Salah (2010-2017).

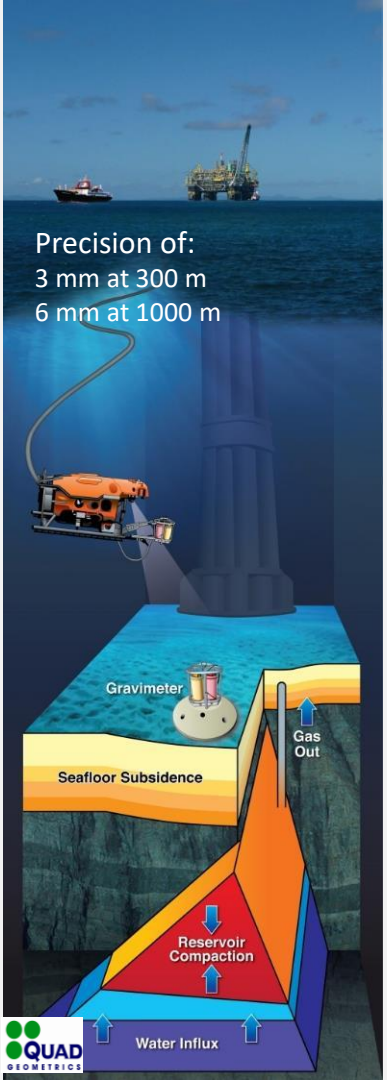


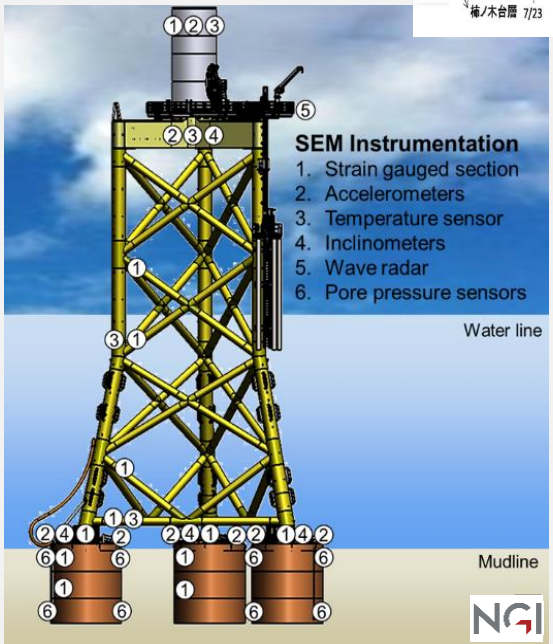


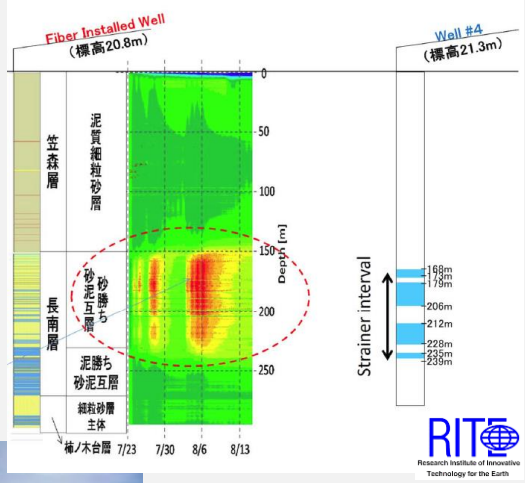
Experience and facilities

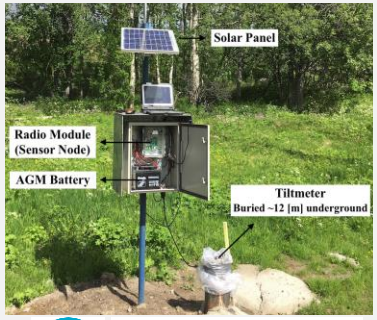
- Gravity survey @ subsea
- Pore pressure & tiltmeter landers
- Seafloor and platform instrumentation

- Downhole fiber optic
- Downhole tiltmeter

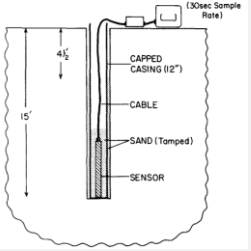




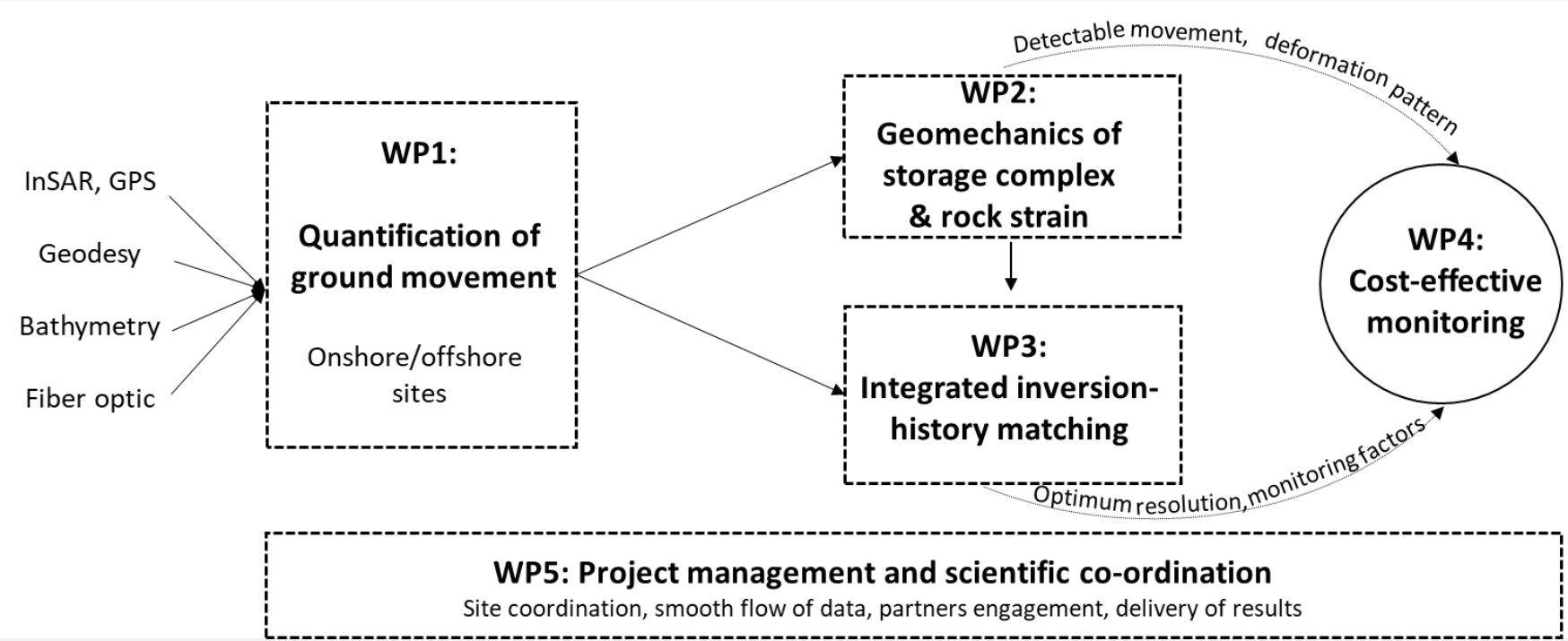




Courtesy CSIRO



SENSE project structure

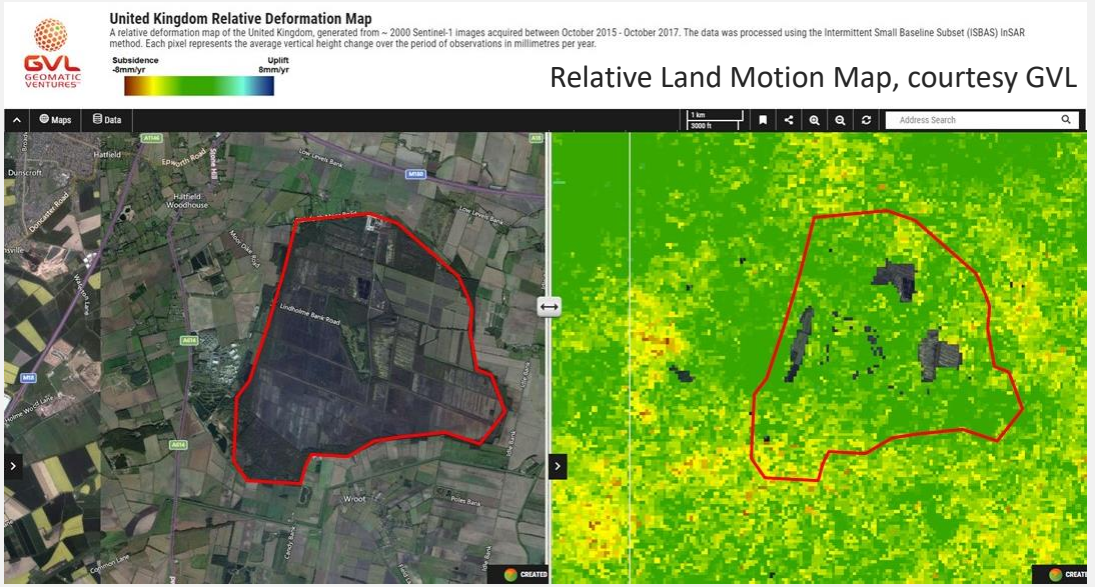


WP1: Four proposed field sites (Lead: Geomar)

#1: Hatfield Moors, onshore UK
#2: Hontomin, Spain (→In Salah)
#3: Offshore Germany
#4: Gulf of Mexico, USA
(Troll field-subsidence analysis)

Site #1: Hatfield Moors, UK

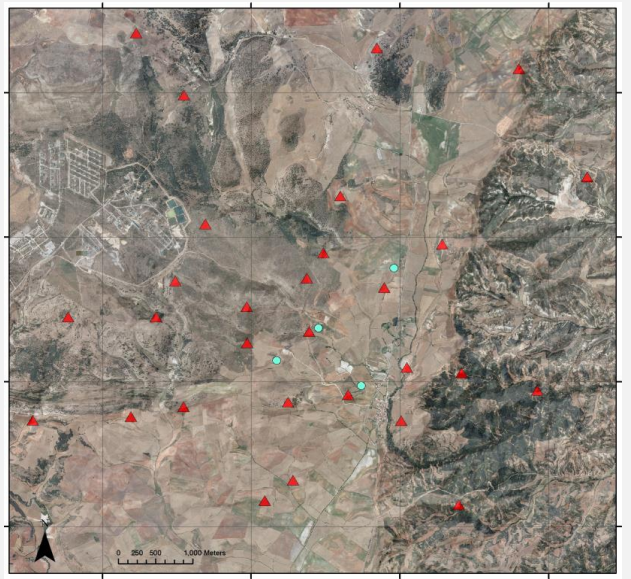
- Hatfield Moors gas storage site sandstone reservoir
- Depth of storage ~450m
- Natural gas storage reservoir
- Plan to use the site to advance geomechanical modelling



Relative Land Motion Map, courtesy GVL

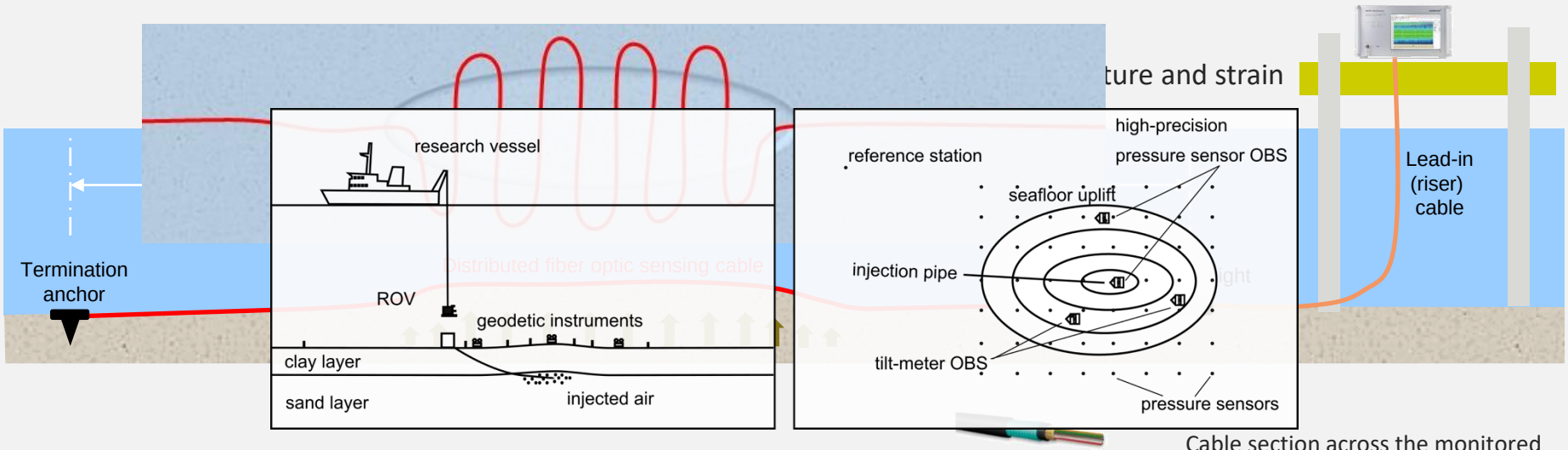
Site #2: Hontomín Spain (or alternatively In Salah)

- Hontomín TDP CO_2 injection pilot project
- Testing of integration on InSAR with other onshore monitoring techniques
- Improving data processing techniques, time- and cost -wise



Site #3: Offshore Germany

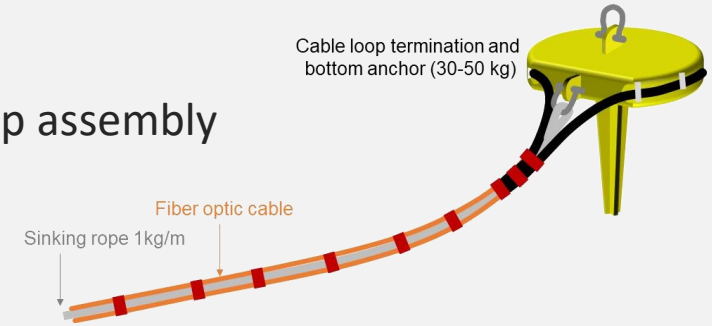
- SENSE Fiber optic deformation cable tests

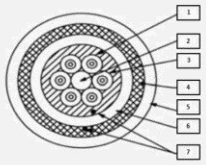


Cable section across the monitored section must lay fixed to the seabed

- Weighted by lead rope
- Buried ?
- Trenched ?
- Scour ?
- Onshore tests ?

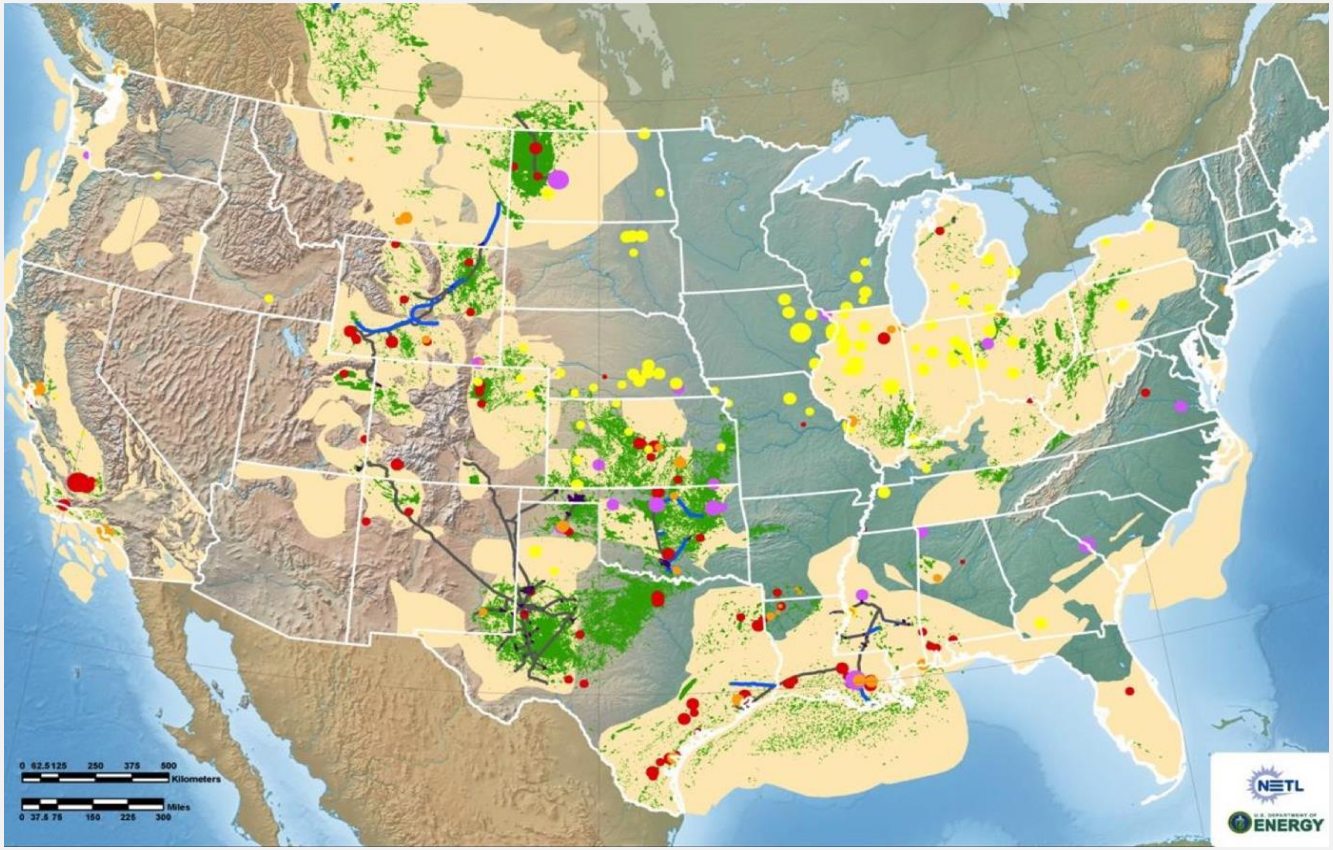
Cable loop assembly





1 Aramid Yarn Strength Member
2 Central Filler / Strength Member
3 Tight Buffer Optical Fiber
4 Corrugated Steel Tape Armor - CST
5 Outer Jacket
6 Inner Cable Jacket
7 Ripcord

Site #4: Gulf of Mexico



saline aquifers

EOR opportunities

ethanol plants

refineries

chemical plants

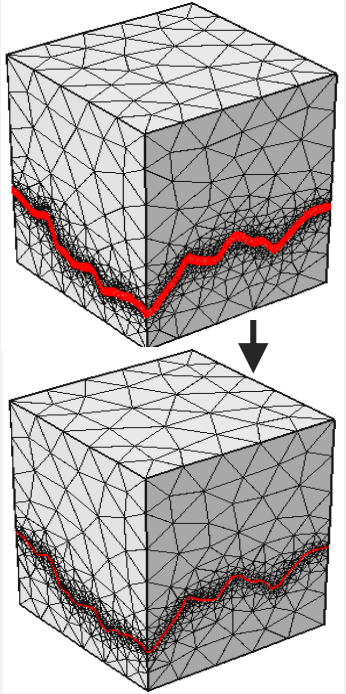
petroleum operations

existing CO_2 pipeline

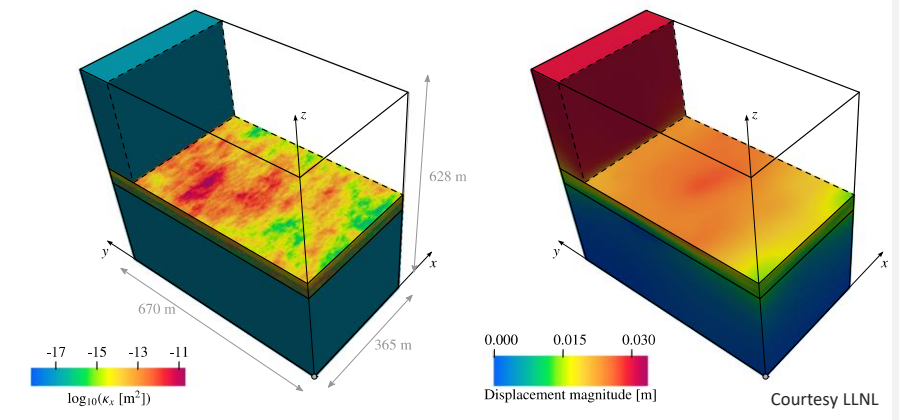
proposed CO_2 pipeline

WP2

Two-way coupled flow-mechanics model, focus on rock strain



WP3 Inversion for permeability and strain to update subsurface behavior



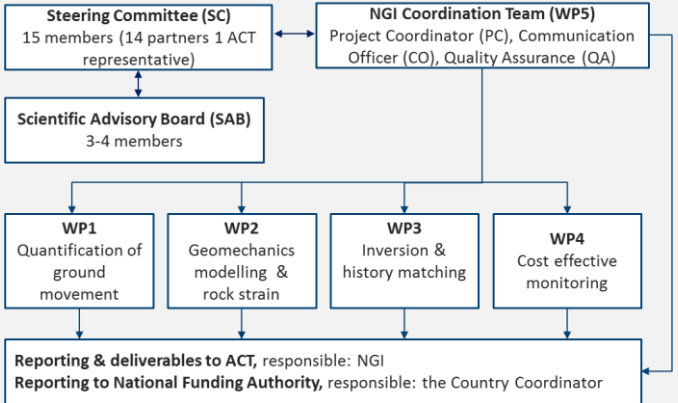
WP4

Integration of results

Optimizing monitoring tools/methods, accuracy & costs

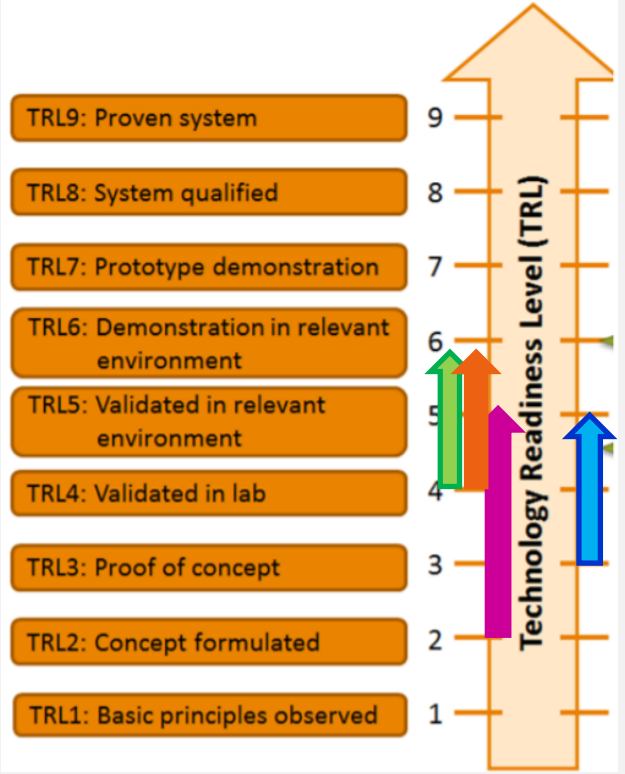
Survey design for UK onshore, North Sea, US offshore, +++

WP5 Coordination



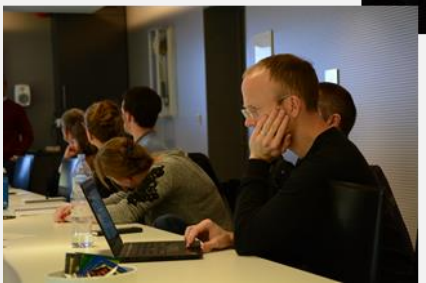
SENSE innovations

- Automated monitoring tool for InSAR data:
  TRL2 to TRL5
- Continuous, accurate monitoring of seafloor using fiber optics and a new ocean bottom lander:
  TRL4 to TRL6
- Innovative interpretation/models coupling ground surface deformation to reservoir hydro-mechanics:
  TRL4 to TRL6
- New algorithms for fast and robust inversion for large scale simulations:
  TRL3 to TRL5



Status for SENSE

- Kick-off meeting held 29-30 Oct in Oslo- 37 attendees
- Work Package meetings held 30 Oct afternoon



Status for WP1 so far in Germany

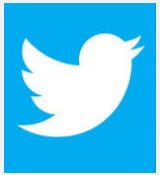
- Cruise AL527 in September 2019
- Site selection
- Coring performed
- Shipment of cores to Oslo
- Lab testing

- New injection (air in sand) applied for Nov 2020
- Fluid migration modelling to determine injection rate

SENSE project

Total budget:	4.5 m€
ACT contribution:	2.7 m€

sense-act.eu



@SenseAct

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NGI

Acknowledgement

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[Courtesy of TRE Altamira]

#påsikkergrunn

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