

EGU22-1787

<https://doi.org/10.5194/egusphere-egu22-1787>

EGU General Assembly 2022

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Stress history and reservoir pressure for improved quantification of CO₂ storage containment risks (SHARP Storage)

Tine B. Larsen¹, Elin Skurtveit², Philip Ringrose³, Kees K. Hindriks⁴, Daniela Kühn⁵, Dan Roberts⁶, J. Michael Kendall⁷, Marie Keiding¹, Auke Barnhoorn⁸, Devendra N Singh⁹, and the SHARP Team*

¹Geological Survey of Denmark and Greenland (GEUS), Copenhagen, Denmark, tbl@geus.dk

²Stiftelsen Norges Geotekniske Institut (NGI), Oslo, Norway

³Equinor Energy AS, Stavanger, Norway

⁴Shell Global Solutions International B.V., Amsterdam, Netherlands

⁵NORSAR, Kjeller, Norway

⁶Rockfield Software, Swansea, United Kingdom

⁷University of Oxford, Dept. of Earth Sciences, Oxford, United Kingdom

⁸Delft University of Technology, Delft, Netherlands

⁹Indian Institute of Technology Bombay, Dept. of Civil Engineering, Powai, Mumbai, India

*A full list of authors appears at the end of the abstract

The SHARP project was launched in late 2021 as a collaboration between 16 research institutions and commercial companies in Norway, UK, the Netherlands, Denmark, and India under the ACT3 Programme. The project is interdisciplinary with a strong focus on understanding and reducing the uncertainties related to subsurface CO₂ storage containment risk focusing on the geomechanical aspects of CO₂ storage.

The geomechanical response to CO₂ injection is one of the key uncertainties in assessing proposed storage sites. The main aim of the SHARP project is to mature the technology for quantification of subsurface deformation by the development and integration of models for subsurface stress, rock mechanical failure and seismicity. Key activities for the project include: developing basin-scale geomechanical models that incorporate tectonic and deglaciation effects and use newly developed constitutive models of rock/sediment deformation (WP1); improving knowledge of the present-day stress field in the North Sea from integrated earthquake catalogues and developing a database of earthquake focal mechanisms (WP2); quantifying rock strain and identifying failure attributes suitable for monitoring and risk assessment using experimental data (WP3); developing more intelligent methods for in situ monitoring of rock strain and failure as part of the overall monitoring programmes (WP4); quantifying containment risks using geomechanical models and observations from the field and laboratory (WP5); and communicating technology development on containment risk to industry and regulators (WP6).

The SHARP project is expected to accelerate the maturation of six sites from the North Sea region and India. The case study sites range from very mature projects such as the Northern Lights CO₂ storage project in the Horda area (N) to emerging storage prospects such as the Endurance site

(UK) and the Hanstholm structure (DK). Furthermore, application of the methods to well-characterised offshore depleted oil and gas fields as Nini (DK) and Aramis (NL) will accelerate their transformation into viable and safe CO₂ storage sites. India has high focus on emission reduction including development of CCUS and an onshore case study for CO₂ injection will be matured using lessons learned from the European projects in order to kick-start CO₂ injection and storage projects in India.

Involvement of international CO₂ storage operators in the consortium ensures that the SHARP project has a high impact on CCS development in Europe and India, as well as globally. New technologies for quantification of subsurface deformation and strategies for monitoring deformation and fluid flow will provide cost-efficient tools for CO₂ subsurface risk management. The results of the project will be communicated to storage site operators and regulators to increase confidence in storage safety and seismicity risk assessment.

SHARP Team: GEUS: Nina Skaarup, John R. Hopper, Trine Dahl-Jensen, Peter Voss, Henrik Vosgerau, Lars Hjelm NGI: Lars Grande, Jung Chan Choi, Maarten Vanneste, Farrokh Nadim, Luke Griffiths, Brian Carlton Equinor: Zoya Zarifi, Nicholas Thompson, Long Wu Rockfield: John Cain, Adam Bere, Martin Dutko U. of Oxford: Tom Kettleby TU Delft: Kees Weemstra, Hadi Hajibeygi NTNU: Rao Martand Singh BGS: John Williams, Emrys Philips, Rob Cuss, Jonathan Pearce, Andy Riddick BP: Tony Espie, Rodney Johnston, Steve Dee, Robin Eve Risktec: Steve Pearson, Sheryl Hurst, Michael Kupoluyi, Bertjan Haitisma INEOS: Søren Reinhold Poulsen, Johan Byskov Svendsen Wintershall Dea: Andreas Szabados, Sabine Schatzmann, Oleksandr Burachok, Tillmann Roth Alcatel: Jan Kristoffer Brenne, Hilde Nakstad NGL: Kjell Hauge, Helen Mehammer NORSAR: Volker Oye, Bettina Goertz-Allmann, Ivan Van Bever