CENTRE FOR ENVIRONMENT-FRIENDLY ENERGY RESEARCH

successful news

SUbsurface CO2 storage- Critical Elements and Superior Strategy

Newsletter from the SUCCESS centre – September 2015 – no. 19

SUCCESS Fall Seminar in Stavanger

This year's fall seminar will be held October 21st–22nd at the Norwegian Petroleum Directorate in Stavanger, back to back with a meeting in the national CO_2 Forum. This year we will have special focus on the Snøhvit field.

The seminar will have open sessions from lunch Wednesday October 21st until lunch the next day.

The program the first day includes a core workshop with a display of actual Snøhvit cores by NPD. This is followed by a morning session October 22nd on Snøhvit field pilot results from the SUCCESS Centre.

There is no conference fee, but participants are expected to cover travel expenses and accommodation. The session after lunch on the 22nd will be for SUCCESS partners only.

Please find a regularly updated program at *http://fme-success.no/index.cfm?id=426137*, and sign up for the seminar, deadline October 1st!

Preliminary program

Wednesday 21st

13:00 Registration and welcome

13:30 Keynote speaker session, including presentation of available core material (see above link for an updated list of talks)

15:30 Snøhvit Core Workshop, with an introductory talk and display of cores from Tubåen and Stø Formations

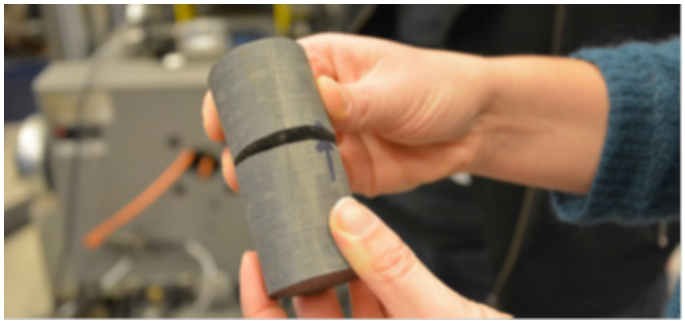


Photo: NGI

Thursday 22nd

09:00 Snøhvit field pilot workshop

- Roland Kaufmann: CO_2 storage together with gas production: Factors determining migration pathways in Snøhvit
- Per Pettersson: Estimating leakage risk in a Norwegian Shelf CO_2 storage site using probability based methods
- Sarah Gasda: Gravity-driven convective mixing of CO_2 in oil
- Elin Skurtveit: Numerical/analytical fault modeling of Tubåen
- Rohaldin Miri: Physical and chemical processes leading to injectivity issues – INJECT project

11:30 Status overview of SUCCESS

- Per Aagaard: WP1 Reservoir – activities and focus
- Sarah Gasda: WP2 Containment – activities and focus
- Joonsang Park: WP3 Monitoring – activities and focus

13:00 Presentations (for SUCCESS partners only)

- NPD: Presentation of NPD digital CO_2 storage atlas,
- Anja Sundal: Geological reservoir selection criteria for long-term CO_2 storage
- NGI: CO_2 rock physics development combined with Sleipner field data
- Magnus Wangen: Summary KPN INJECT
- UiB: Monitoring of varying marine environment: detection method and survey strategies

Marte Gutierrez – new SAC member

Dag Nummedal from Colorado School of Mines (Mines) has participated in the SAC committee several years. He currently notified SUCCESS of his withdrawal, due to overcommitment.

FME SUCCESS has signed a Memorandum of understanding (MoU) with Mines and wishes to further develop this collaboration. Hence, Dr. Marte Gutierrez from Mines has accepted to replace Nummedal in the SUCCESS Scientific Advisory Committee (SAC).

Dr. Gutierrez's main research interests are in geomechanics and energy and environmental sustainability. Recently, he has been actively involved in research on CO_2 geological sequestration with projects funded by the US Department of Energy. He currently holds a joint appointment as Professor II at the Department of Geosciences, University of Oslo.

We wish to thank Dag Nummedal for is efforts and input to the SUCCESS Centre and welcome Marte Gutierrez as new member in the Scientific Advisory Committee.

Photo: Marit Hommedal

SUCCESS Collaboration project

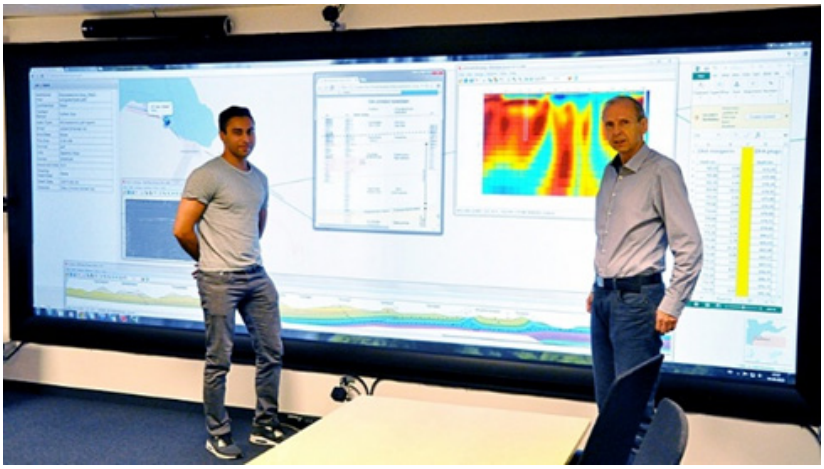
KPN VIRCOLA finalized

Geological storage of CO_2 requires a good understanding of the reservoirs, injection and flow of CO_2, and of what happens to the CO_2 in the long term. Development of such knowledge requires interdisciplinary research. In the VIRCOLA roject (Virtual Laboratory CO_2), researchers at Christian Michelsen Research (CMR), University Centre in Svalbard (UNIS) and Institute for Energy Technology (IFE) have developed a visualization platform that can promote such interdisciplinary research.

CMR wishes to develop internet solutions further with improved user interface and search functions in free text reports and publications. Moreover, implementing three-dimensional visualization functionality in the solution is planned. This will enable easy 3D exploration of seismic data or well data.

The researchers envisage that such a solution in the long term can go a step further: In addition to being a tool for identifying partnership opportunities, it can also support work processes in which researchers are working together to explore 3D data over networks. You can read more about this in the **Climit newsletter**.

At the picture below we see CMR researchers Daniel Patel and Tor Langeland in front of the big screen at the collaboration room at CMR; the screen showing visualizations developed in the VIRCOLA project. *(Photo: CMR)*



New SUCCESS doctor: Hilde Kristine Hvidevold

How to detect CO_2 leakage on the seafloor?

Hilde Kristine Hvidevold SUCCESSfully defended her PhD thesis *Quantifying uncertainties when monitoring marine environments in connection with geological storage of CO_2* on June 26th at University of Bergen.

One of several proposed measures to reduce anthropogenic CO_2 emissions is to store the CO_2 in deep geological formations far beneath the seabed. Such storing will increase the potential of leakage of CO_2 into the sea. Although the probability of leakage is very small, one can never be one hundred percent sure. Therefore it is important to have in place effective methods to discover a leak at the seafloor, so that mitigation measures can be taken.

To detect leaks, it is important to understand how CO_2 behave in the ocean, and we can do this by using a model that describe how CO_2 leaks from the seafloor and how CO_2 dissolves in the ocean. This model consists of two equations having unknown values, and these values need to be identified by experiments. The work of Hvidevold's thesis determines the uncertainty in these model values for a given experiment, showing how uncertainties affect the answer that the model provides. In addition, she has investigated how to design a new experiment in order to minimize uncertainties.

The thesis shows how information about potential leakage areas can be combined with simulation data on CO_2 distribution on the seabed, to design a program for monitoring. This can be utilized and aid in deciding how to place sensors or take simple measurements on the seabed, so that the probability of detecting a leak is maximized. Further, the method contributes to reduce costs related to monitoring of CO_2 reservoirs.

Hvidevold has been supervised by Guttorm Alendal, Truls Johannessen and Trond Mannseth at UiB. She currently works as engineer at Sweco.

Collaborating project on its way

COPASS kickoff in Utah

The COPASS project had its formal kickoff in Utah in September. Researchers from the six Norwegian and US institutions joined for a workshop, an excursion and intensive field work in the great outdoors. PhD Valentin Zuchuat had his first days on the project at this event.

The project's goal is to make models that predict how CO_2 moves and, only valid for some cases, if and how CO_2 could escape the reservoir and drift up in the overlying rock succession. The

gained insight will give valuable input to North Sea projects where possible new CO_2 storage sites are evaluated.

New people on the SUCCESS team in Oslo

Welcoming Hossein, Noora and Anja

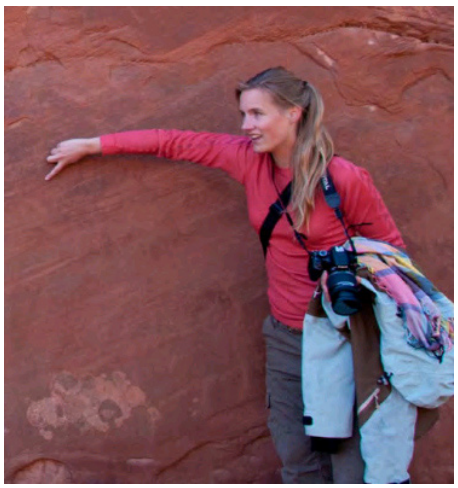
This summer the SUCCESS group at University of Oslo was happy to have three more or less new members on board. Mohammad Nooraiepour and Hossein Fazeli are both PhD students, while Anja Sundal is a postdoc.

Mohammad (or Noora as he is usually called) is a PhD on SUCCESS, financed by University of Oslo. His work is within geomechanics, collaborating with the staff at NGI in studying the Draupne core. He is also in charge of the flow rig that UiO has obtained with infrastructure funds from the Research Council.

Anja is no SUCCESS rookie. She has been in the centre four years already, and defended her PhD this spring. Now we are pleased to have her as a postdoc (UiO financed) until (and in fact beyond) the end of the centre period. She will continue her work concerning parameterization of geological models for simulating long term effects of CO_2 storage. Currently she is developing fluid flow and geochemical models for several North Sea storage candidates in cooperation with Helge Hellevang and Rohaldin Miri. She will also focus more on geological field studies of accessible sandstones that are analogous to subsurface reservoirs, investigating how observed heterogeneities may affect CO_2 storage efficiency.

Hossein is a PhD on our collaborating project PROTECT. He will be working on modeling of CO_2–water–mineral interactions in a fractured seal. He will use mesoscale simulation techniques such as the Lattice-Boltzmann method to study two phase flow of CO_2 and water inside the fracture while considering dissolution/precipitation. He will use better kinetics in order to have more precise simulations of the reactive transport process.

Noora and Hossein and Anja



Finishing INJECT

The INJECT project, which has been a fully integrated part of the SUCCESS centre, is now close to finalizing. Rohaldin Miri at UiO has delivered his PhD thesis and is expected to defend it early December. A final report from the project is on its way. We'll be back with more on this.

SUCCESS (Subsurface CO_2 Storage – Critical Elements and Superior Strategy) is one of several Norwegian centres for environment-friendly energy research, funded by the Norwegian Research Council and industry partners. For more info and contact address: *www.fme-success.no*.

To subscribe to this newsletter, please mail *Charlotte.Krafft@cmr.no*.