Uni Research

Centre for Integrated Petroleum Research (CIPR) Geoscience

OWNERS

Universitas Bergensis
85%

BERGENS FORSKNINGS STIFTELSE
15%

COMPANY

uni Research   www.uni.no

DEPARTMENTS

| CIPR | Climate | Computing | Environment | Health | Rokkan |

SECTIONS

| Geoscience | IOR and EOR | Reservoir simulation | Microbiology - SCAL |
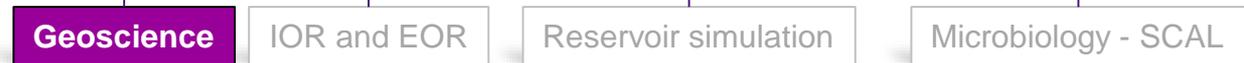
Walter Wheeler   Anita Torabi   Jan Tveranger   Simon Buckley   Eivind Bastesen   Tobias Kurz   Nicole Richter

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Key Competencies

-Reservoir characterization
-Fault and fracture characterization and geomechanics
-Depositional systems/sedimentology
-Seismic interpretation and attribute analysis
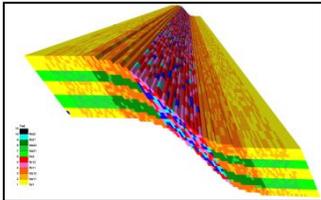
-Geo-modelling
-Complex reservoirs
-Method development
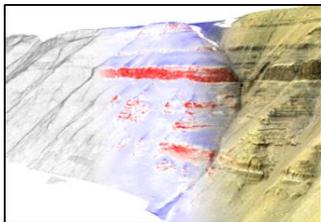
-Virtual outcrop geology
-Acquisition and processing
-Database development
-Software development
-Hyperpectral imaging

Focus

- Petroleum E&P, but also activities in CO_2 sequestration and green energy

CO_2 STORAGE

Scientific leader of the SUCCESS-FME research in the Bergen Region

ATHENA CCUS Centre: Advancing integrated research to enable CCUS in Norway
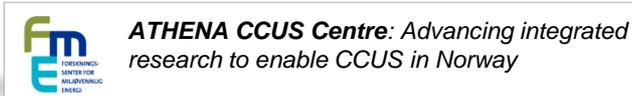
Host. Application submitted to NRC

GEOTHERMAL ENERGY

GeoS Geothermal Energy Solutions

Partner. Application submitted to NRC

CGER — Norwegian Center for Geothermal Energy Research

Partner.

EERA — European Energy Research Alliance

Associate

OFFSHORE WIND

norcowe — Norwegian Centre for Offshore Wind Energy

Partner.

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Strengths

- Cross-disciplinary research environment

- Emphasis on applied research

- Outcrop analogues

- Staff with academic and industrial background

- Extensive network of collaborating institutes, Universities and individual researchers

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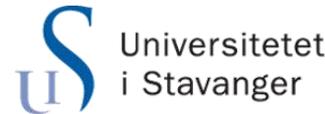
Research partners

Petroleum related research

Examples of ongoing projects

- SAFARI 3
- Fault geometric and seismic attributes
- Seismic expression of fault and fracture zones
- CO_2 seal bypass (COPASS)

Topical research

- Hyperspectral imaging
  - Infrared imaging of cores and outcrops
- Paleokarst reservoirs
  - Forecasting paleokarst architecture, seismic characteristics and fluid flow
- Virtual outcrop modeling
  - Lidar, photogrammetry, UAVs for 3D modelling
  - LIME software for interpretation and field data integration
  - Virtual field trips, synthetic seismic, mobile devices
- Fault facies
- Geothermal reservoirs

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SAFARI

A database of stratigraphic architectures for reservoir modelling

Simon Buckley, Nicole Naumann (*Uni Research CIPR*) & **John Howell** (*Univ. of Aberdeen*)

Public Outcrop Repository

Welcome http://safaridb.com

SAFARI standard

Architectural Elements = fundamental geometric entity (120+ AEs)

Geometric Data Search
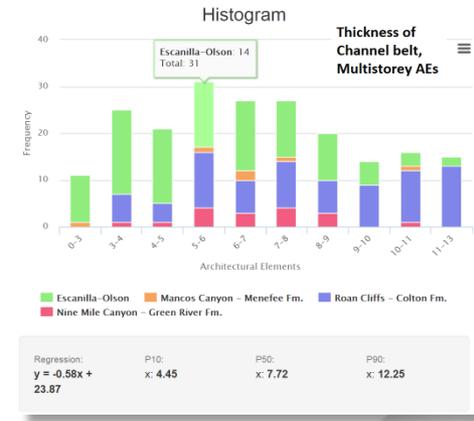
Knowledge Base
(interlinking everything)

Depositional Wiki

Wiki pages for depositional elements.

Lithostrat Wiki

Wiki pages for groups, formations, and members.

Browse for an analogue

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SAFARI Phase 3 is sponsored by the Norwegian Research Council and

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Anita Torabi

Fault geometric and seismic attributes

- Improve existing methds for fault identification and characterization in seismic volumes.

- Provide new techniques for enhanced imaging of fault geometries

- Fault seismic attribute volumes are used to extract fault geometric attributes (Length, displacement, height) and develop new statistical models for fault scaling relations (Focus area: Barents Sea),
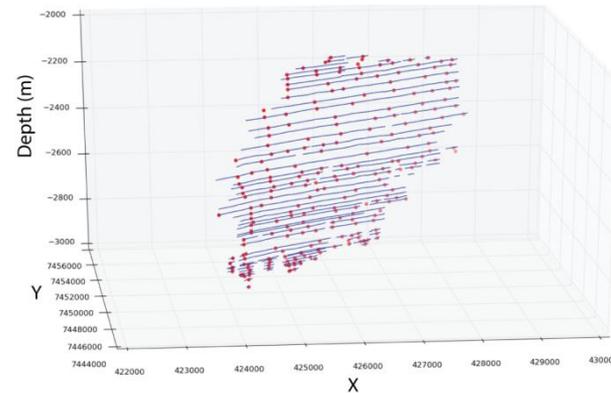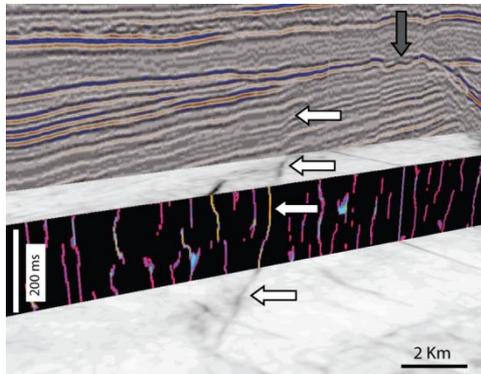
- Investigate the feasibility of creating new seismic attributes to capture fault geometry.
- Develop new algorithms for improving imaging of discontinuities in seismic data.
- Scaling of faults for the purpose of modelling and prediction of fault seal integrity.

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of Sciences

PURE

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OF OSLO

CO$_2$ seal bypass (COPASS)

- Reservoir modelling and simulation of exhumed paleoreservoirs, Utah

- Integration of structural and stratigraphic field observations, spatial patterns of diagenesis and geomechanical properties

- Provide a fundamental, conceptual understanding of CO$_2$ plumbing systems, covering aspects such as
  - temporal impact of CO$_2$ plumes on flow
  - Capability of models to reproduce observations
  - Impact of selected parameters on reservoir quality, integrity and responses

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NGI

WESTERN STATE COLORADO UNIVERSITY
Learning, Elevated.

UTAH STATE

SCHOOL OF MINES 1874 COLORADO

UNIVERSITÀ DEGLI STUDI DI PARMA

Jan Tveranger
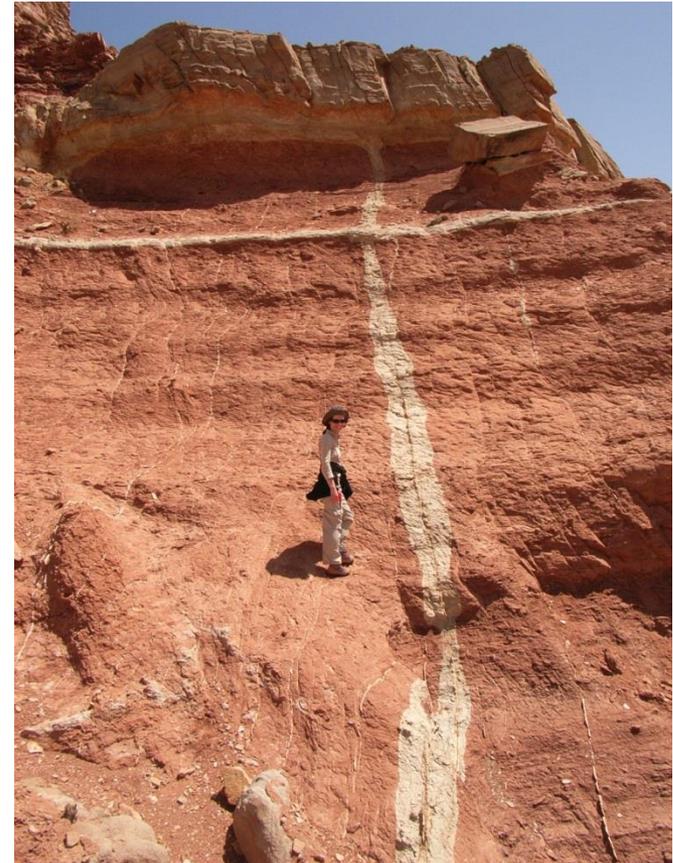
Seismic expression of faults and fracture zones

- Seismic forward modelling of fault zone models based on empirical data

- Investigate link between fault zone properties and seismic response
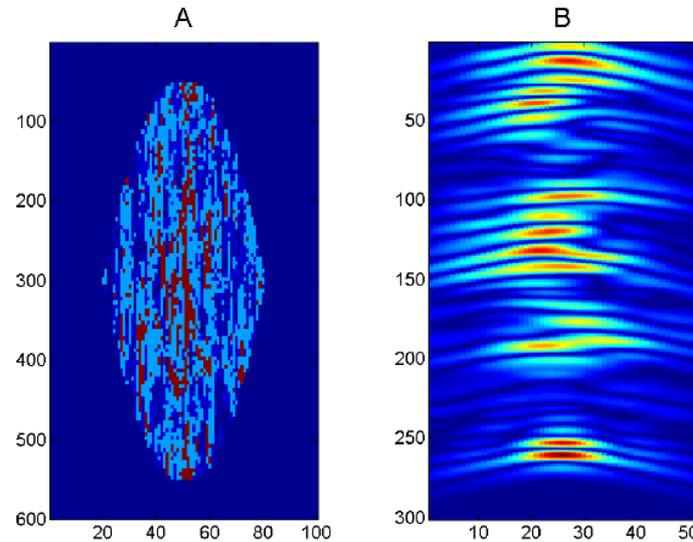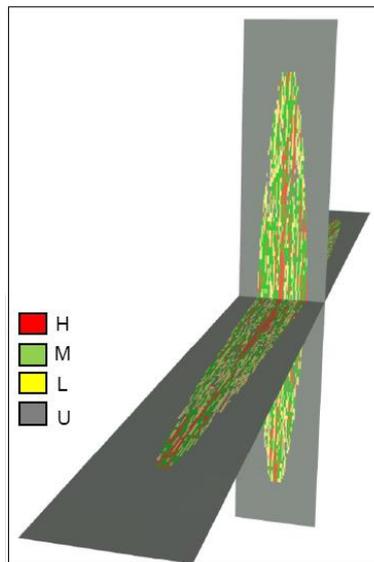
A: original model, B: Seismic image.

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Topical research

Tobias Kurz

Hyperspectral Imaging - cores

- Infrared imaging of cores
- Map and ID core material, clay content and carbonate phases
- Automatic mapping, recognition and quantification at mm resolution

Infrared

Portable rig

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Visible light

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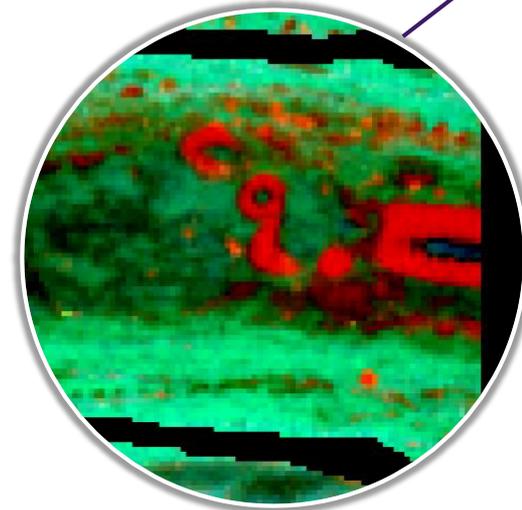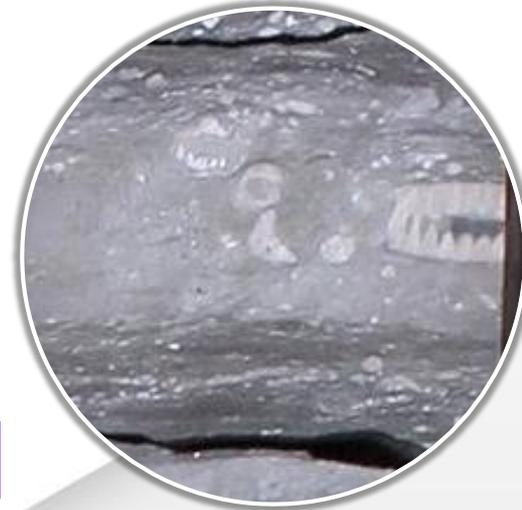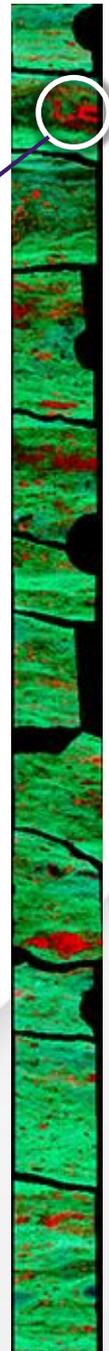
3 bands visualised in RGB,
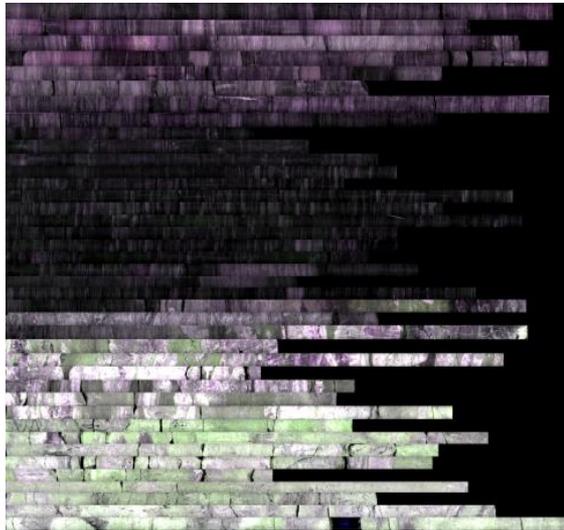
Variability map

Classification
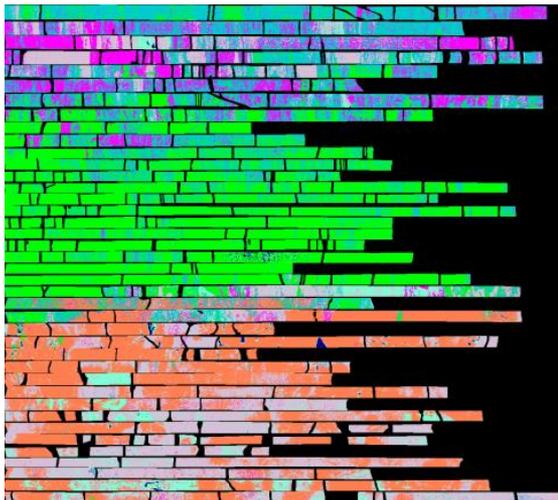
End-members

illite, montmorillonite, pyrite sandstone

nontronite, chlorite sandstone

illite, montmorillonite, pyrite sandstone

pyrite rich sandstone

zeolithe sandstone

carbonatic sandstone

clorite, nontronite sandstone

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Tobias Kurz
Simon Buckley
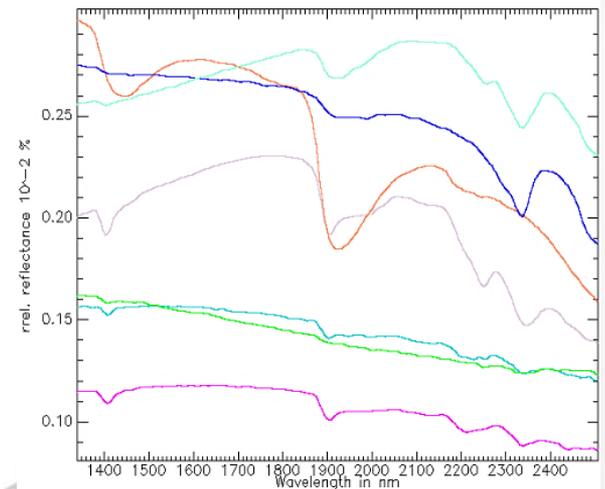
Hyperspectral Imaging - Outcrops

Terestrial Lidar Scaning integrated with
Ground-Based Hyperspectral Imaging
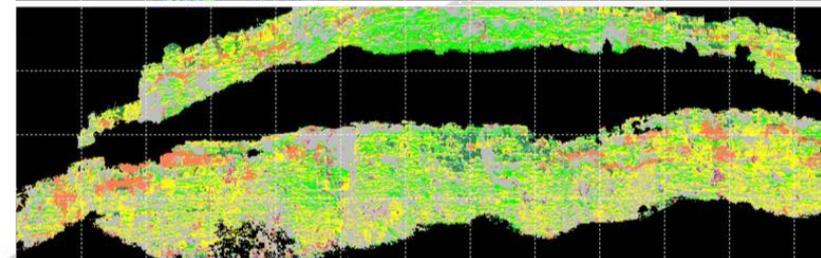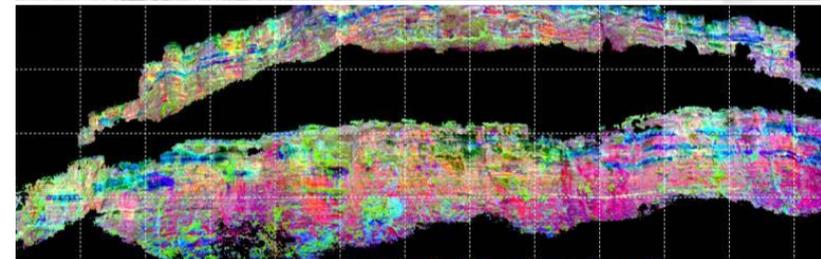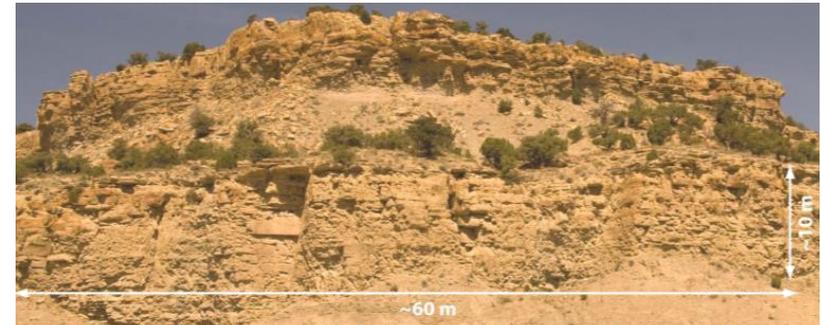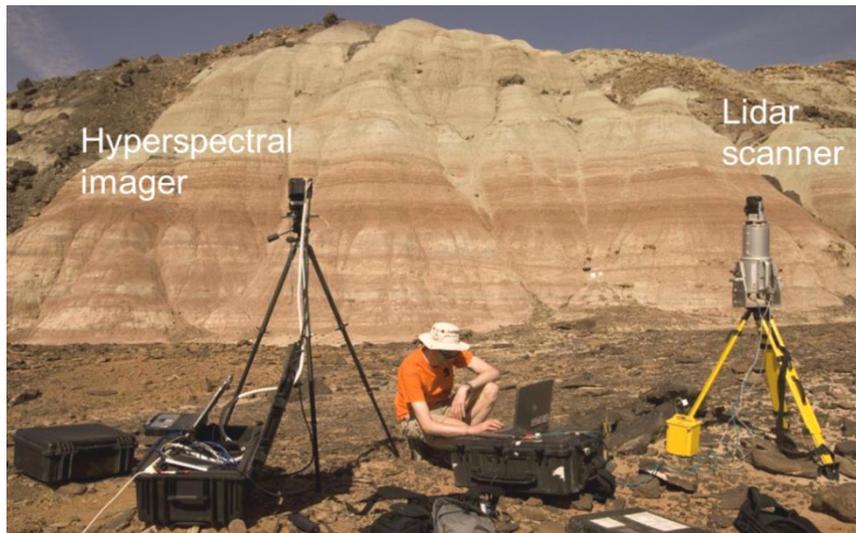
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- sandstone, 366.8 m²
- siltstone, 273.3 m²
- carbonate nodule, 117.9 m²
- gypsum, 5.5 m²
- desert varnish, 53.0 m²
- not classified, 627.5 m²
- masked pixels

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Forecasting paleokarst architecture, seismic characteristics and fluid flow
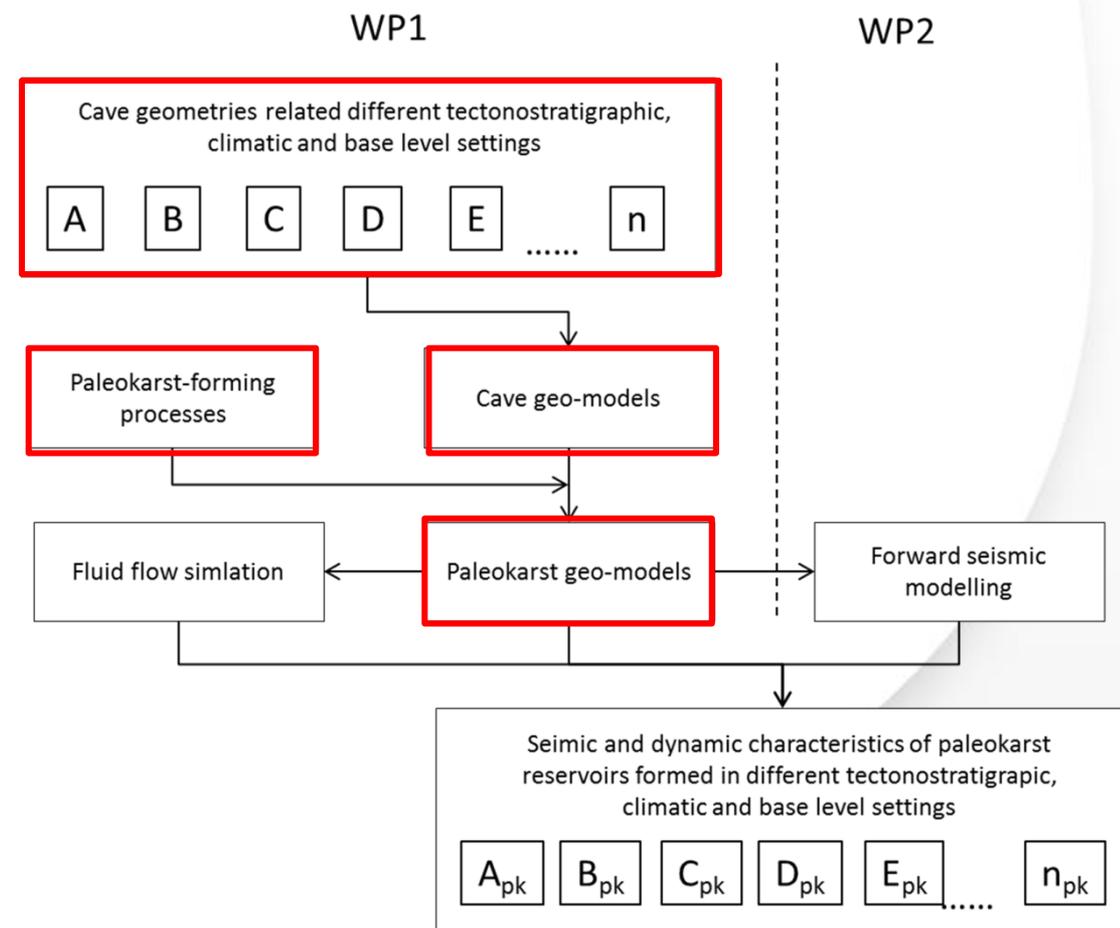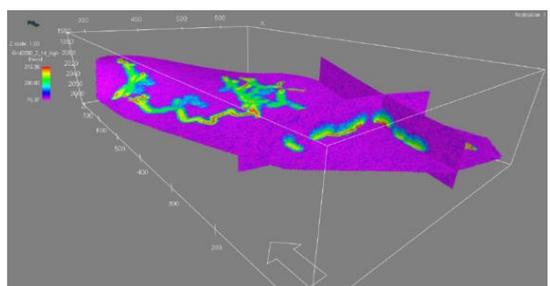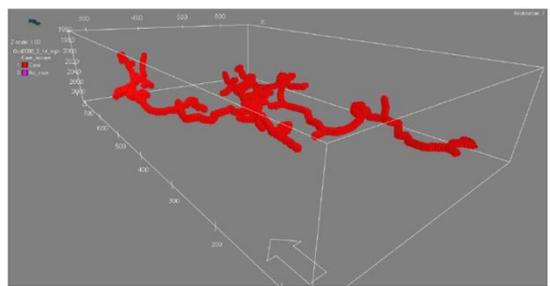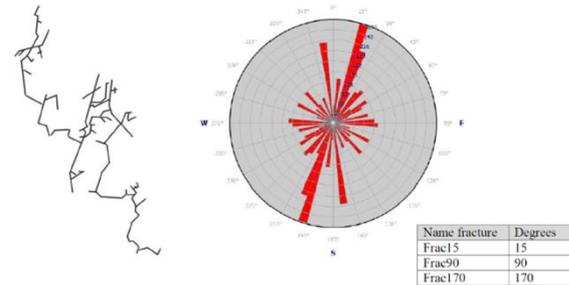
Virtual outcrop modelling

- Lidar, photogrammetry, UAVs for 3D modelling
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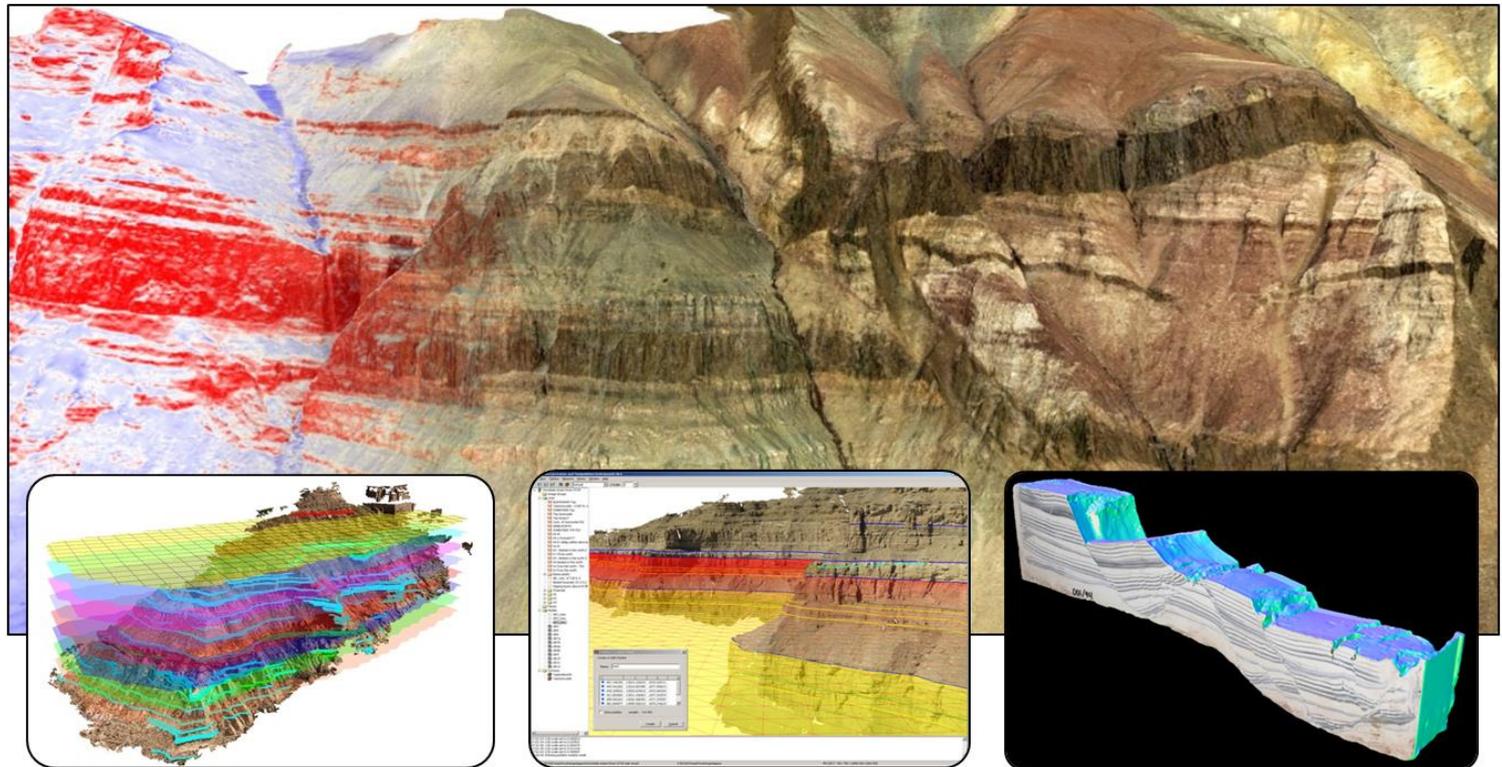
Fault Facies

- Explicit modelling of fault zone architecture and properties

- Adapted for standard reservoir modelling tools

- Full-field implementation and impact on reservoir behaviour recently tested
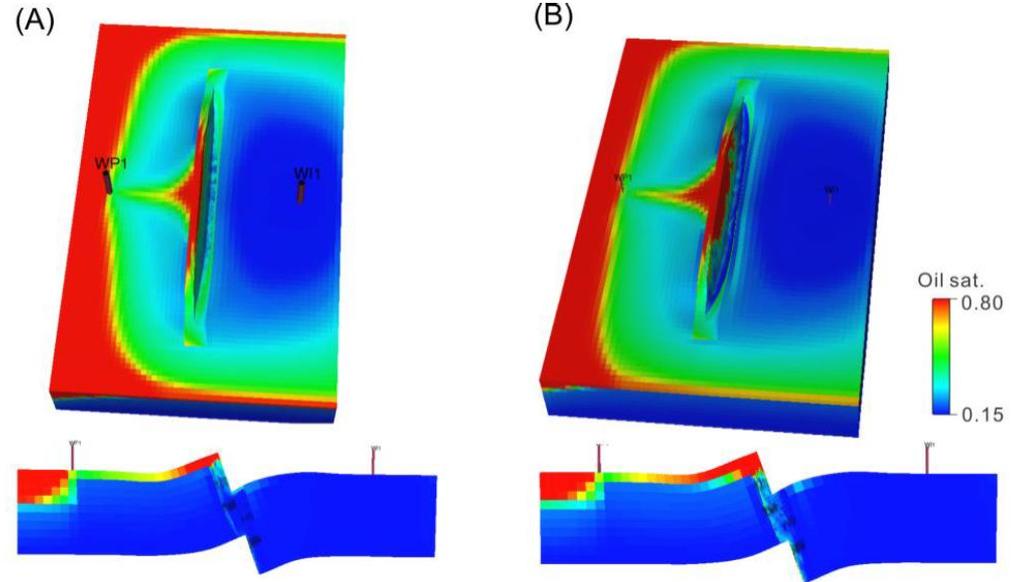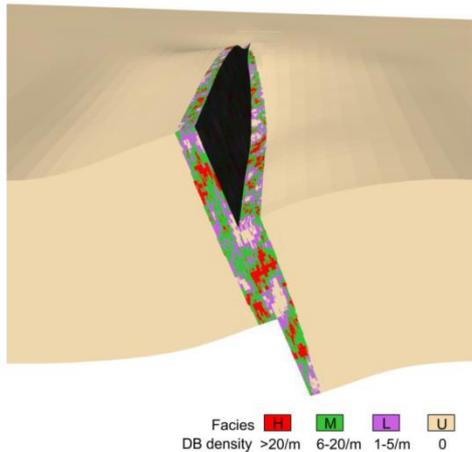
(Qu et al. *in press*)

(Fachri et al. *in press*)

Facies
DB density H >20/m M 6-20/m L 1-5/m U 0

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NR Norsk Regnesentral
NORWEGIAN COMPUTING CENTER

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Eivind Bastesen
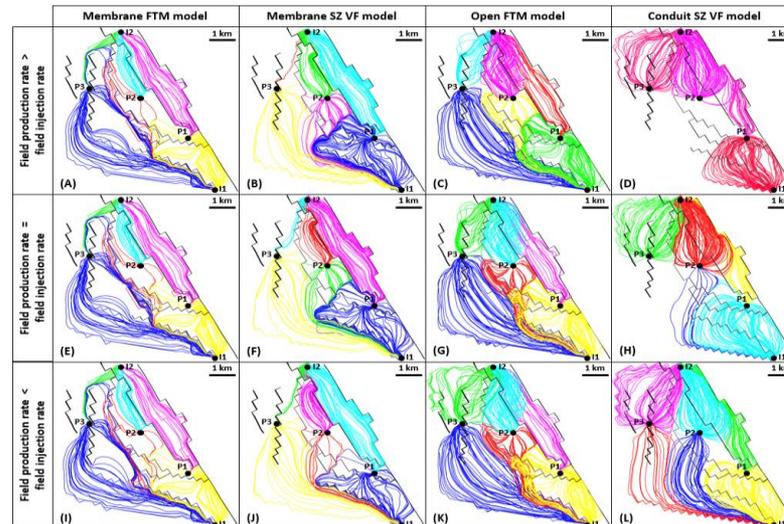
LabFrac

- Planned well park (10-15 wells) in fractured bedrock 100x 100 m at depths down to a few hundred meters

- Eliminate effects of matrix porosity

- Study fluid flow in fractured rock

- Controlled testing of forecasting-ability of of geo and flow simulation models

- Provide empirical data on simulation-cell scale to test and improve up-scaling methods for fractured rock
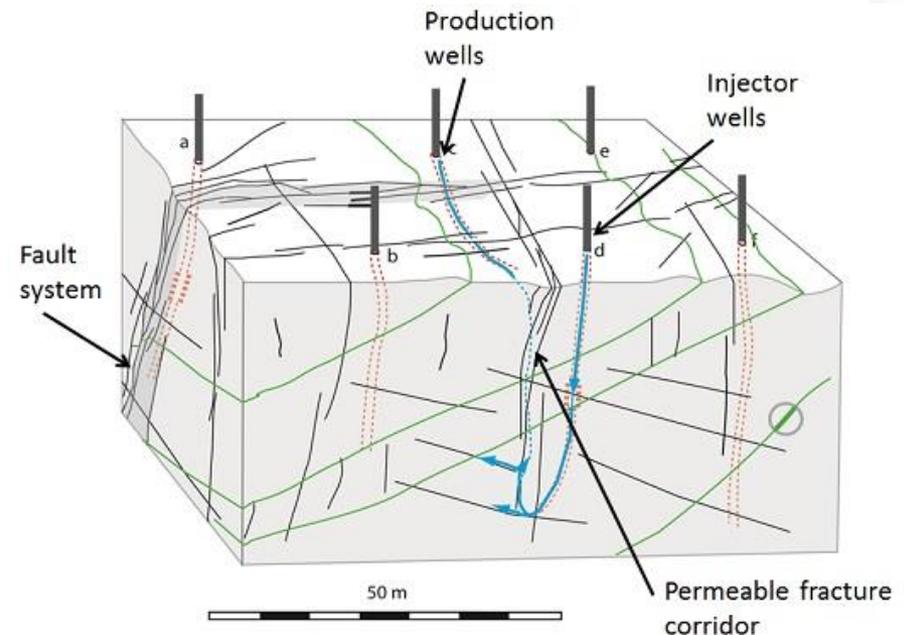
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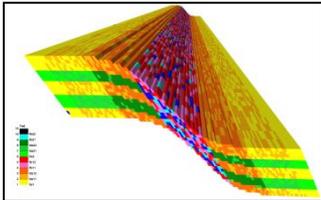
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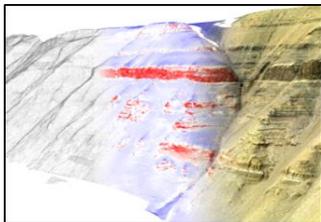
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**Thank you
for
your attention!**

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