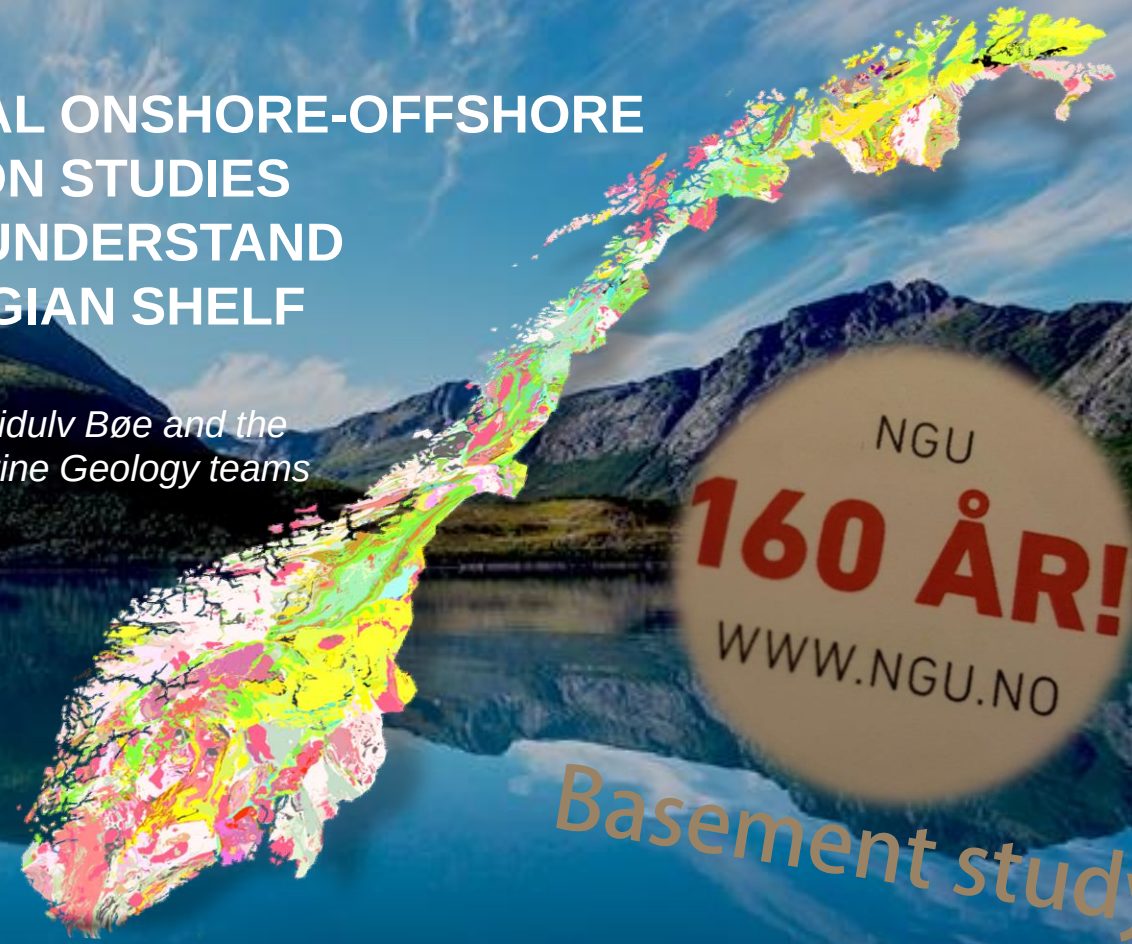
NORGES GEOLOGISKE UNDERSØKELSE

- NGU -

GEOPHYSICAL ONSHORE-OFFSHORE CORRELATION STUDIES TO BETTER UNDERSTAND THE NORWEGIAN SHELF

Marco Brönner & Reidulv Bøe and the Geophysics and Marine Geology teams



Geological Survey of Norway
Geoscience organisation

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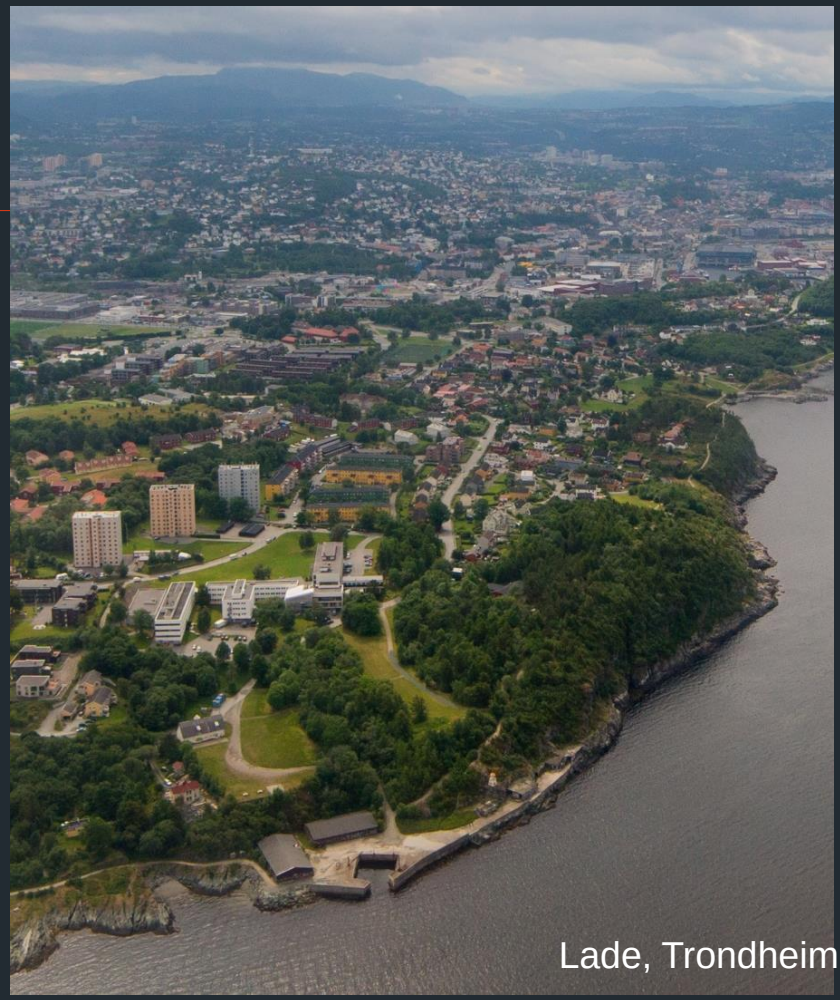
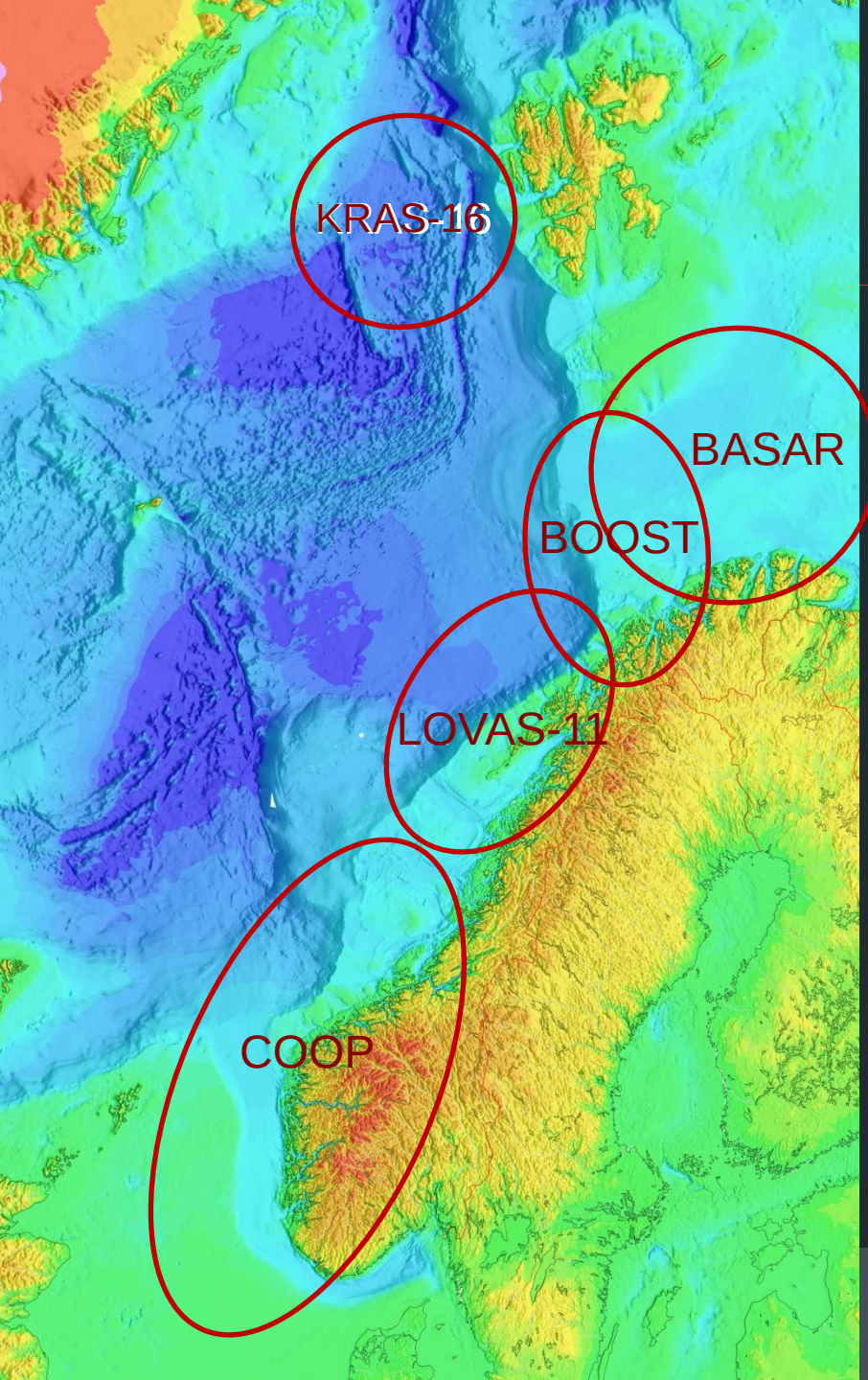

Lade, Trondheim

~ 200 employees



Major Onshore-offshore projects at NGU

KRAS-16 Knipovich Ridge Aeromagnetic Survey EPOS-N

BASAR Barents Sea Aeromagnetic Remapping (2006-2015)

BOOST Barents Onshore-Offshore Structure and Tectonic Modelling

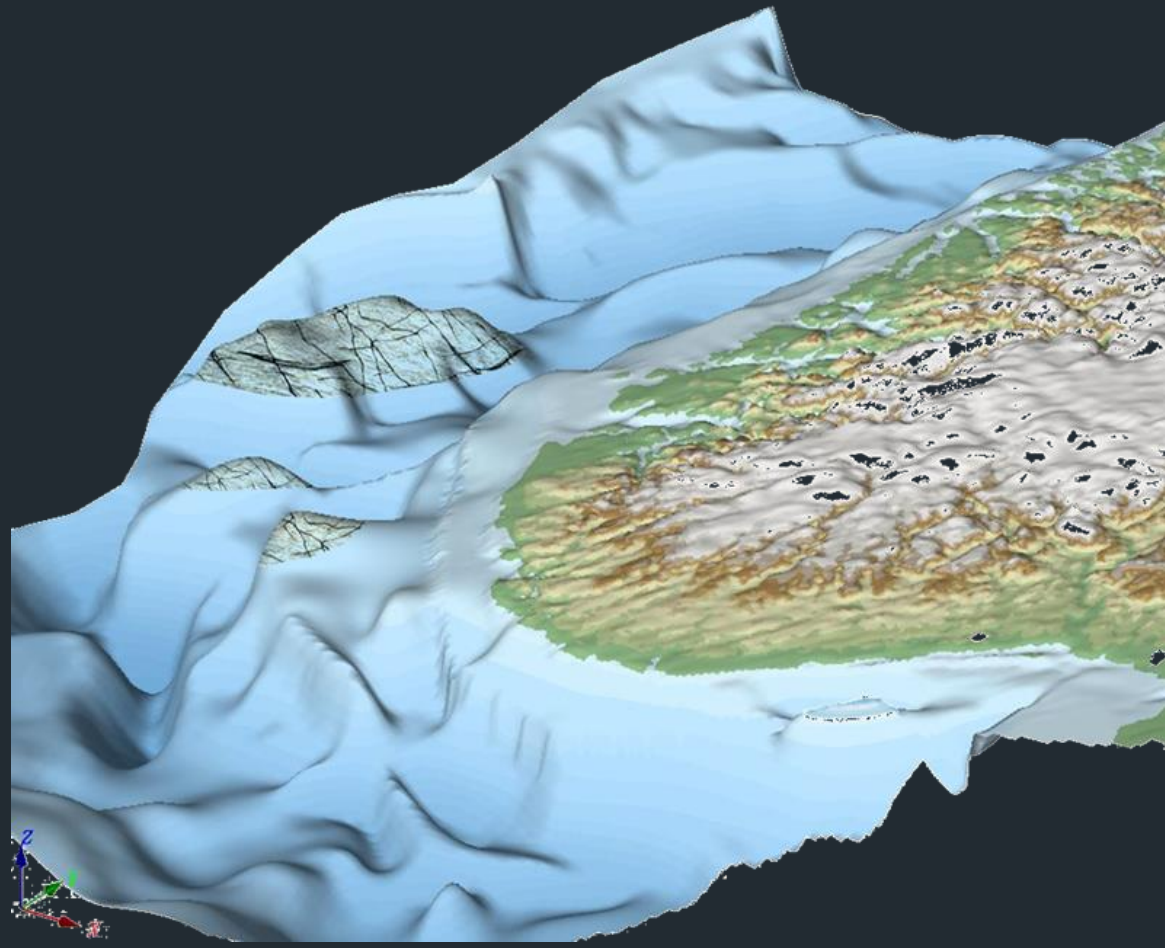
LOVAS-11 / NeoNor2 Lofoten-Vesterålen and Vøring margin

COOP Crustal Onshore-Offshore Project

BASE Understanding weathered and fractured basement

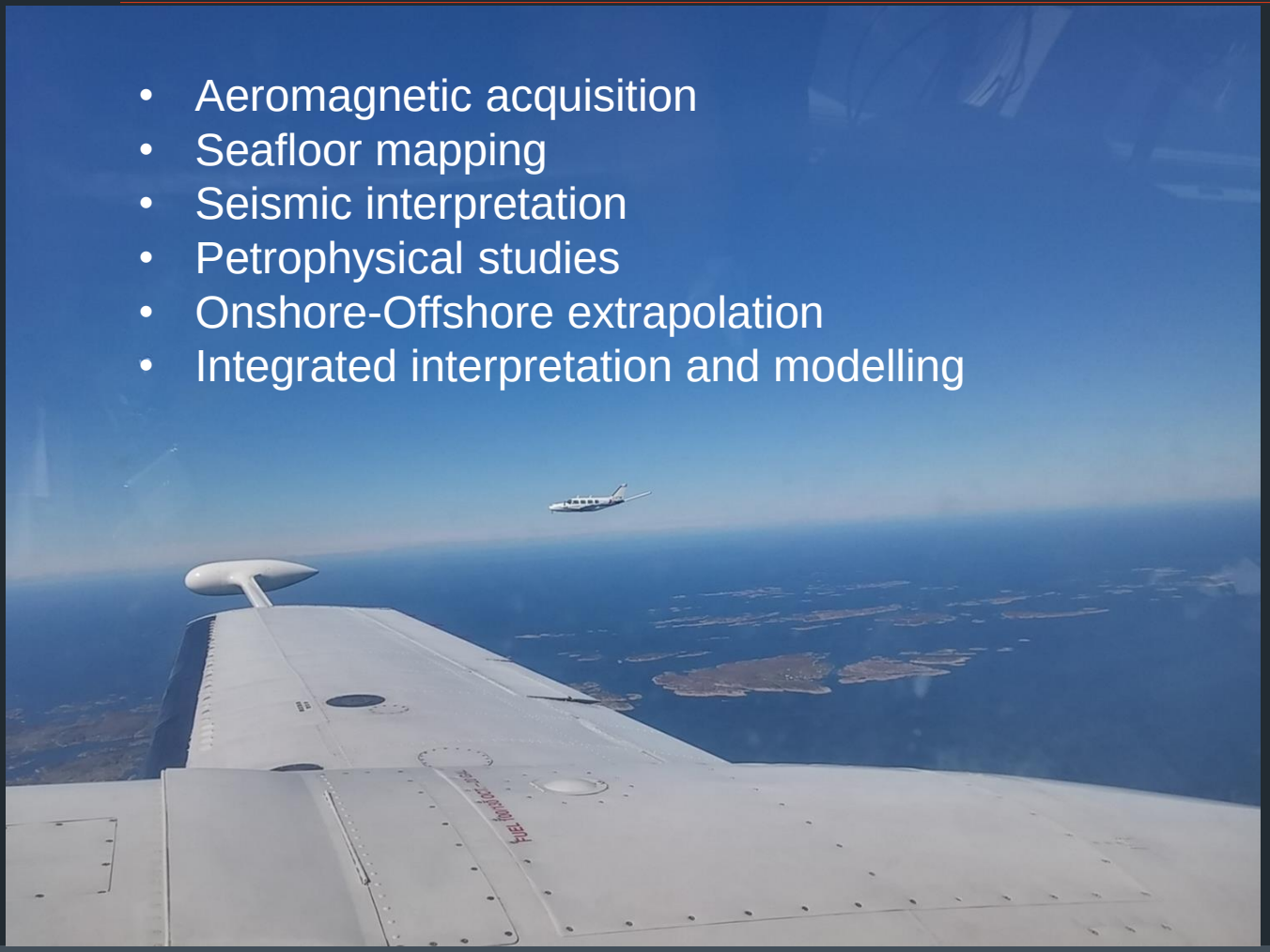
Research objectives

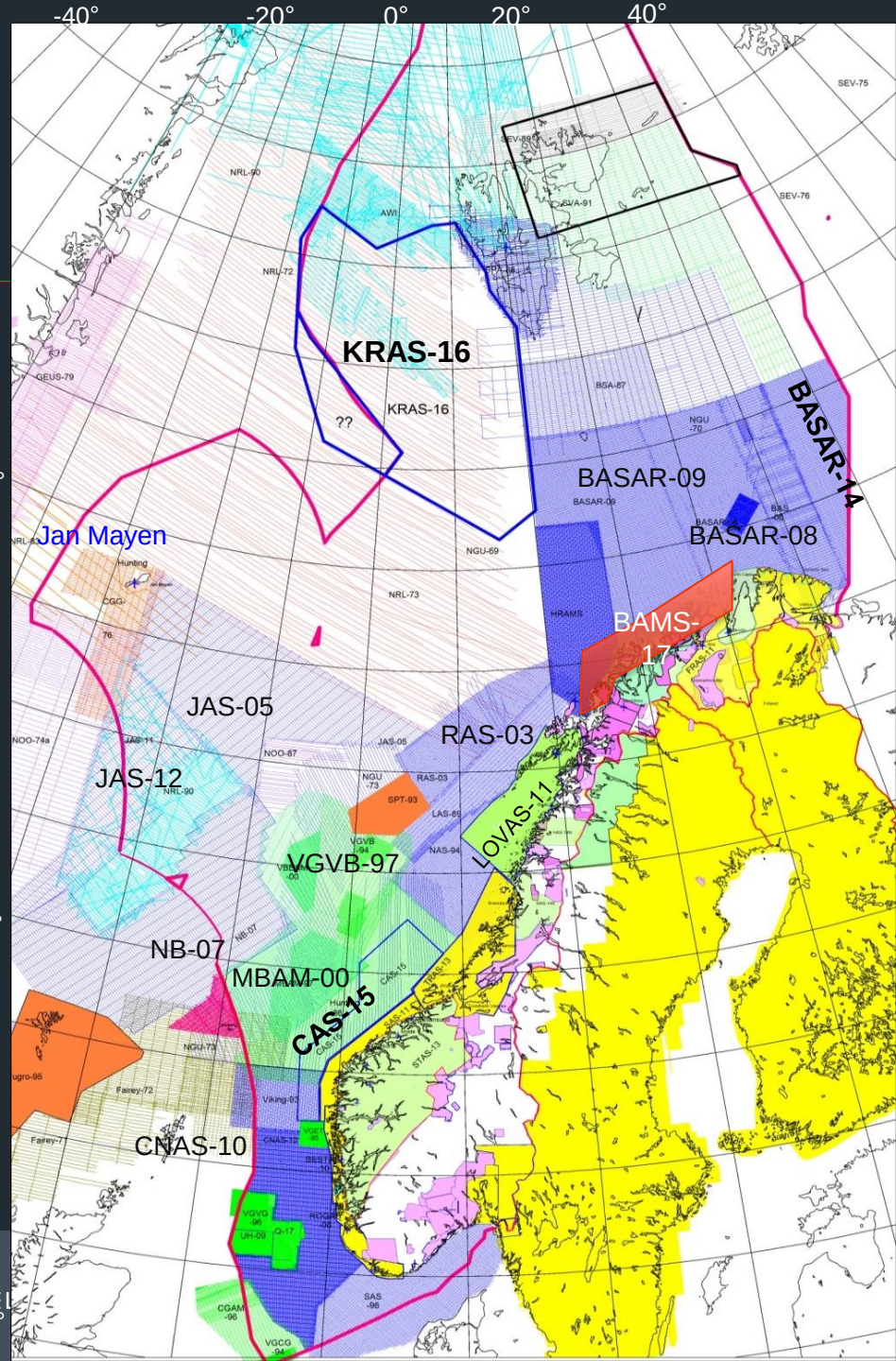
- Depth-to-basement
- Basement characterization
- Crustal thickness and Lithosphere study
- Tectonic development of the margin
- Lithospheric temperature and heat-flow

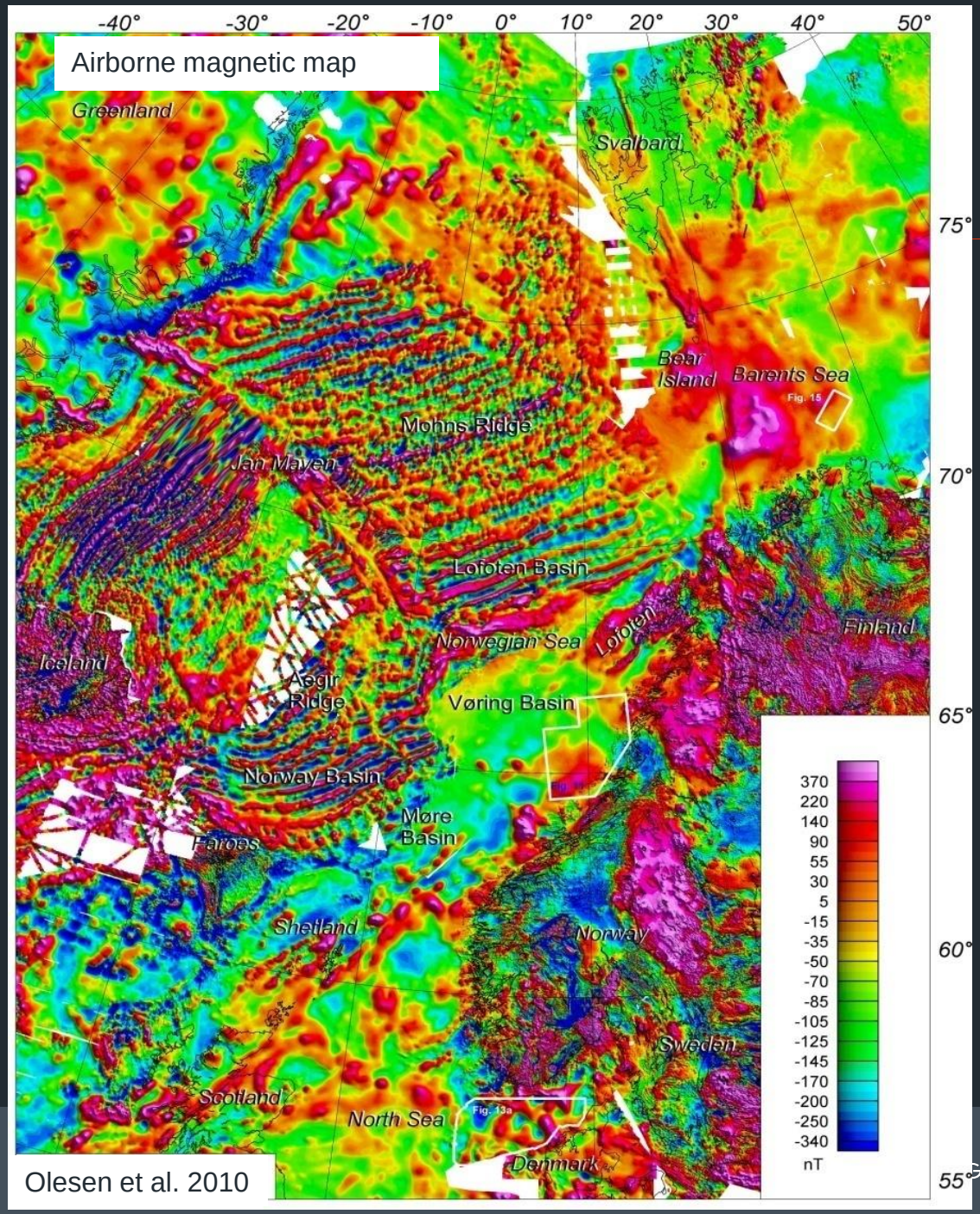


Approach

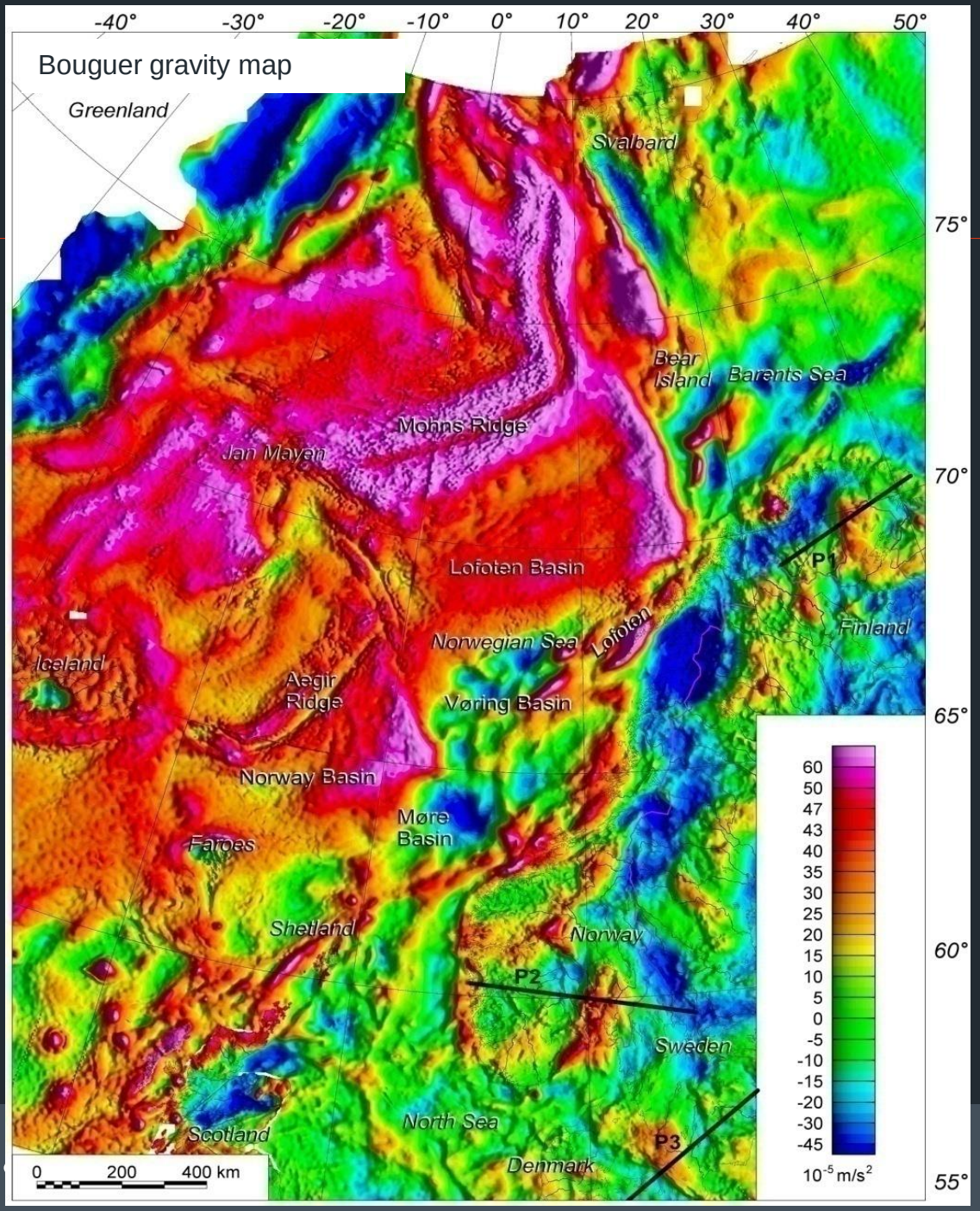
- Aeromagnetic acquisition
- Seafloor mapping
- Seismic interpretation
- Petrophysical studies
- Onshore-Offshore extrapolation
- Integrated interpretation and modelling



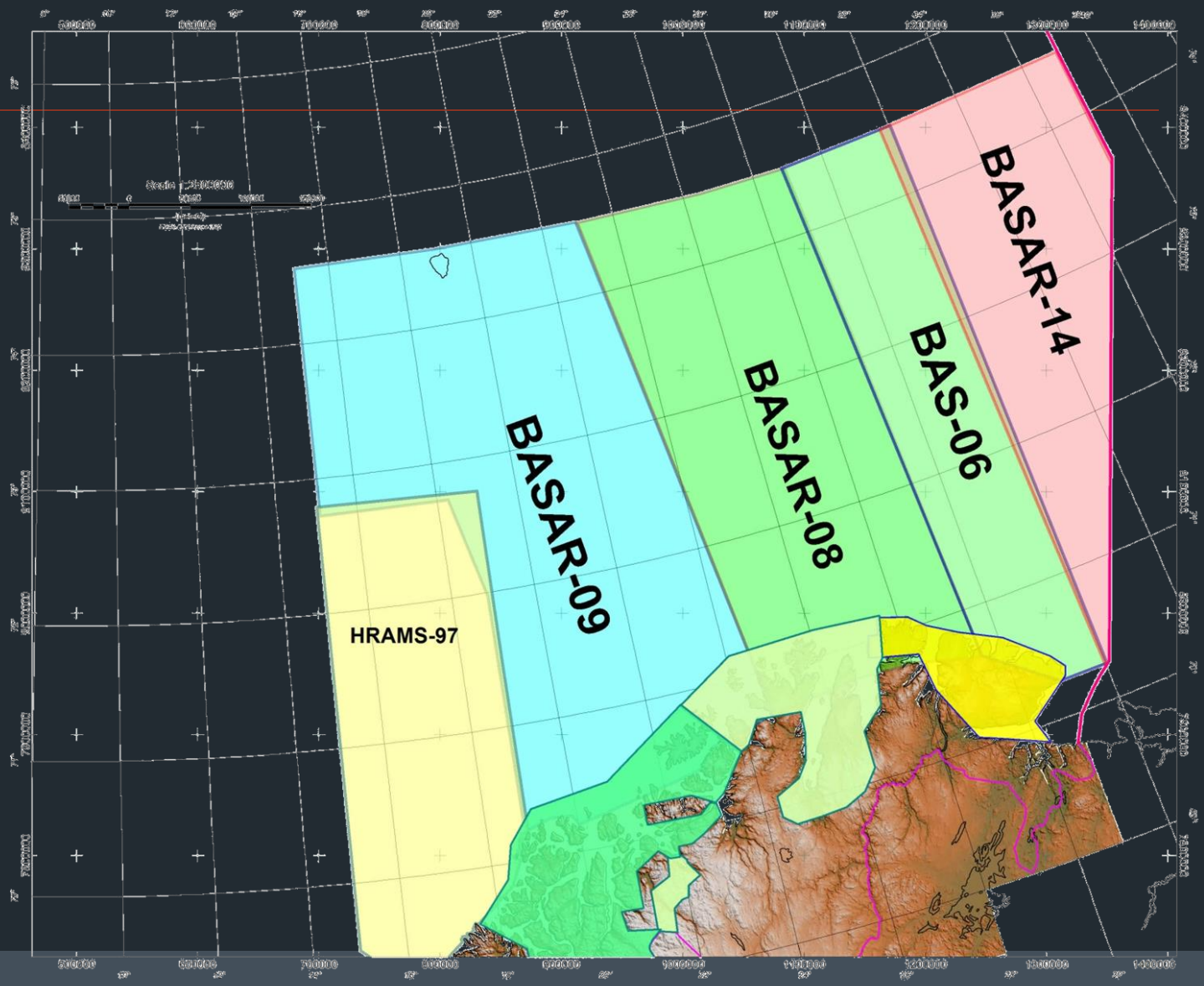




Olesen et al. 2010

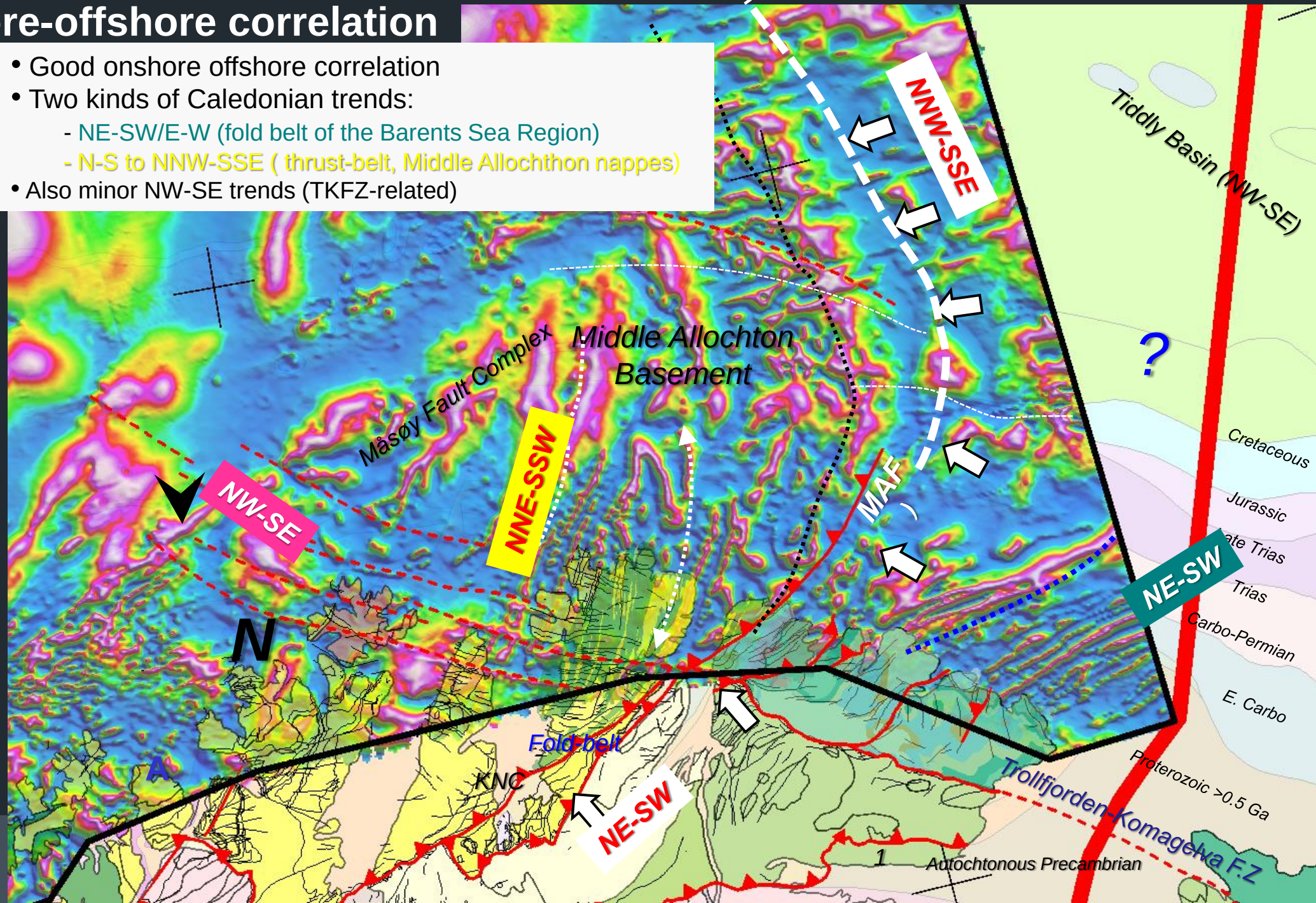


BASAR- Barents Sea aeromagnetic data



BASAR: Onshore-offshore correlation

- Good onshore offshore correlation
- Two kinds of Caledonian trends:
  - NE-SW/E-W (fold belt of the Barents Sea Region)
  - N-S to NNW-SSE (thrust-belt, Middle Allochthon nappes)
- Also minor NW-SE trends (TKFZ-related)



Eni Norge

AkerBP

Statoil

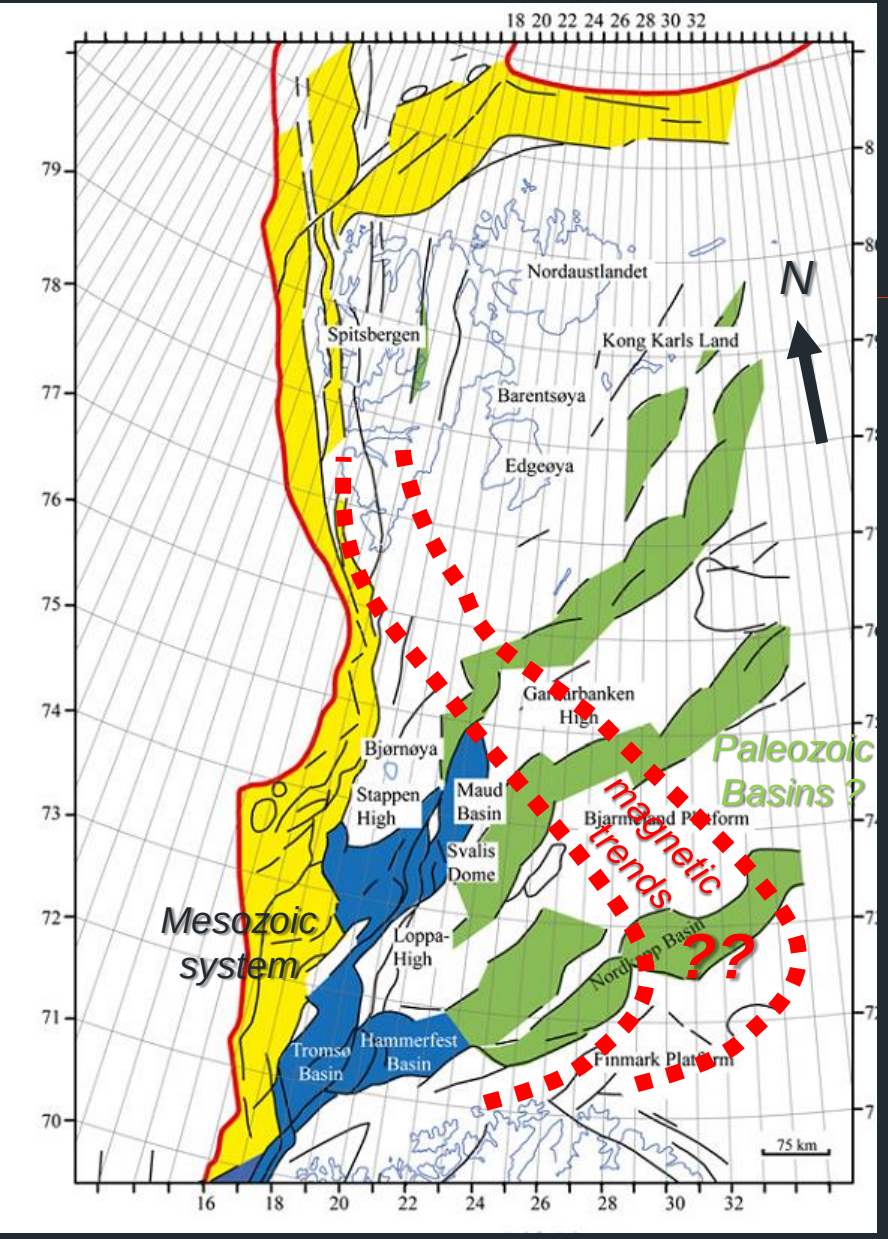
NORWEGIAN PETROLEUM DIRECTORATE

Gernigon et al. 2014

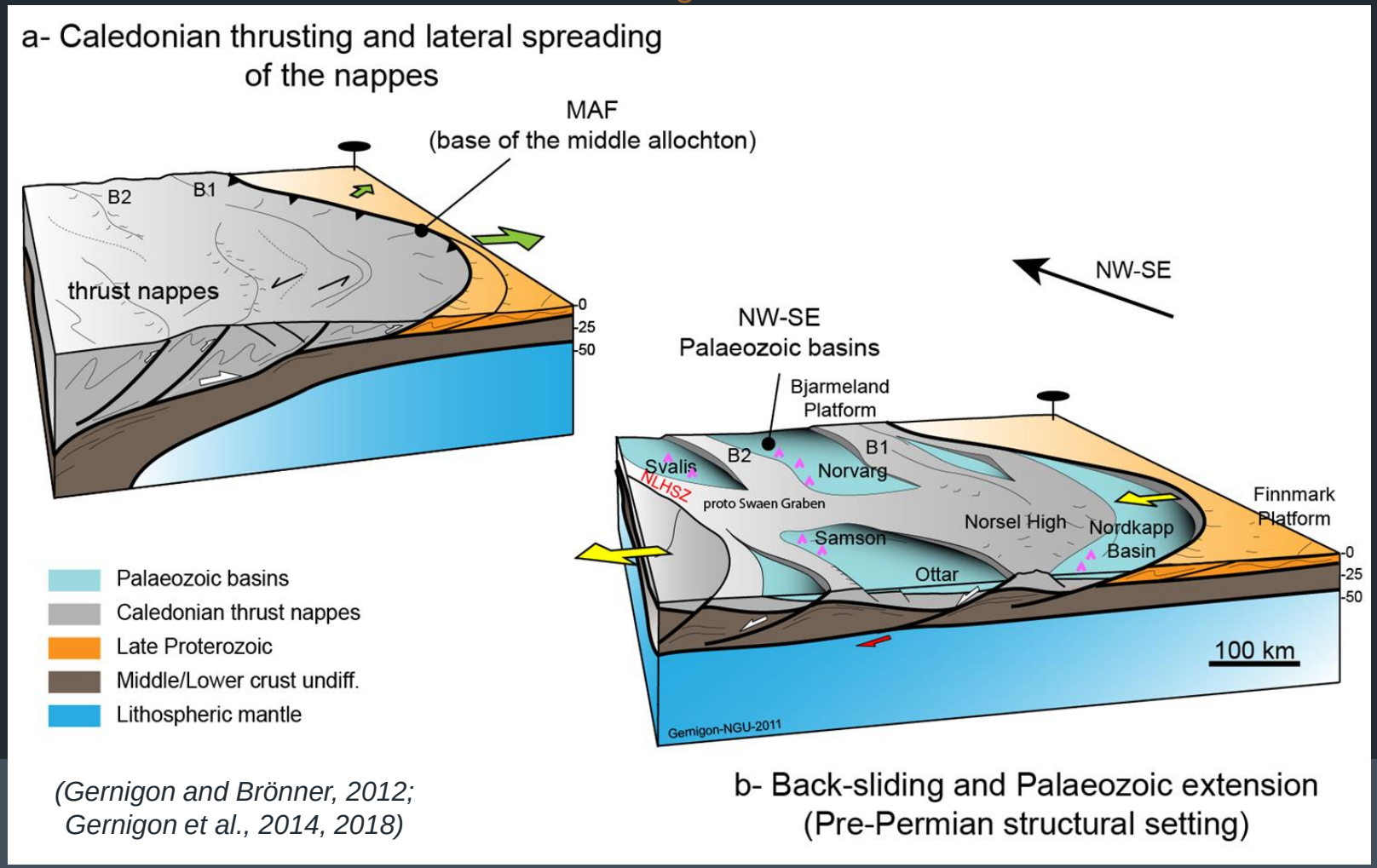
BASAR: Onshore-offshore correlation

- *Do we possibly have two distinct Palaeozoic rift systems in the SW Barents Sea?*

✓ *A Late Devonian?-Early Carboniferous event?*
✓ *A distinct and late Carboniferous rifting event ?*



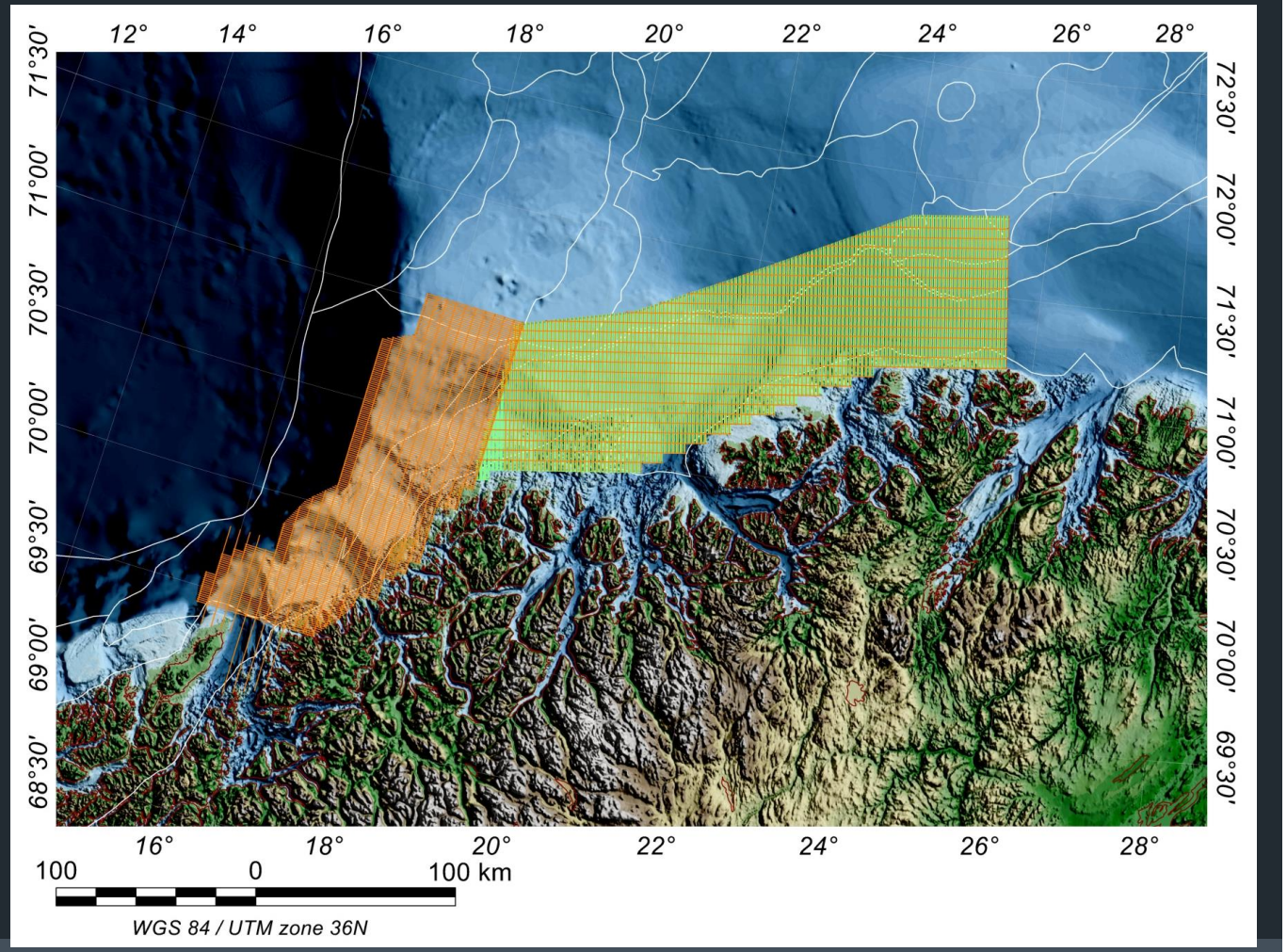
(*) Dengo and Røssland, 1992;
Gudlaugsson et al., 1998
Breivik et al., 1999; Faleide et al., 2006
Glørstad-Clark et al. (2010); Tsikalas et al., 2012

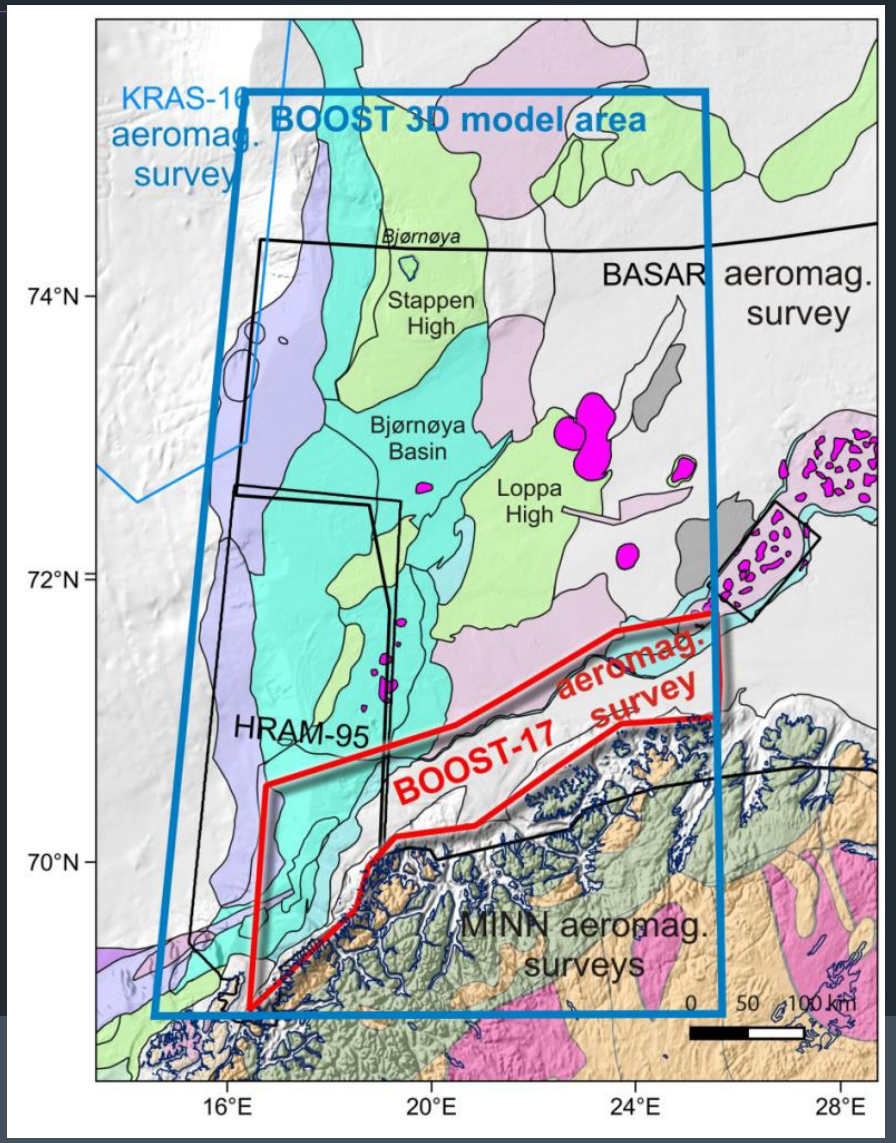


(Gernigon and Brönner, 2012; Gernigon et al., 2014, 2018)

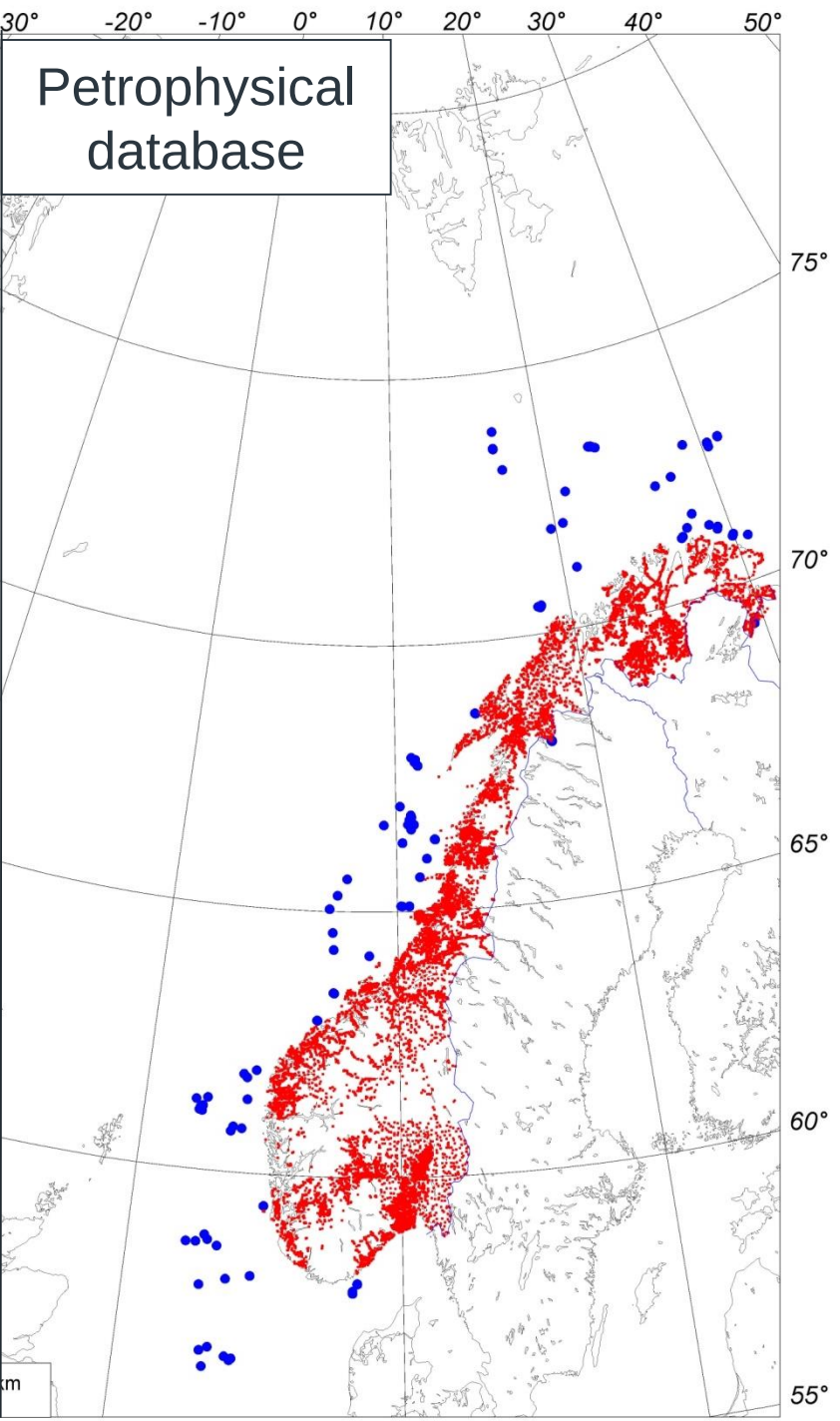
BOOST - Barents Onshore-Offshore Structural and Tectonic Modelling

Project is ongoing and open for late participants

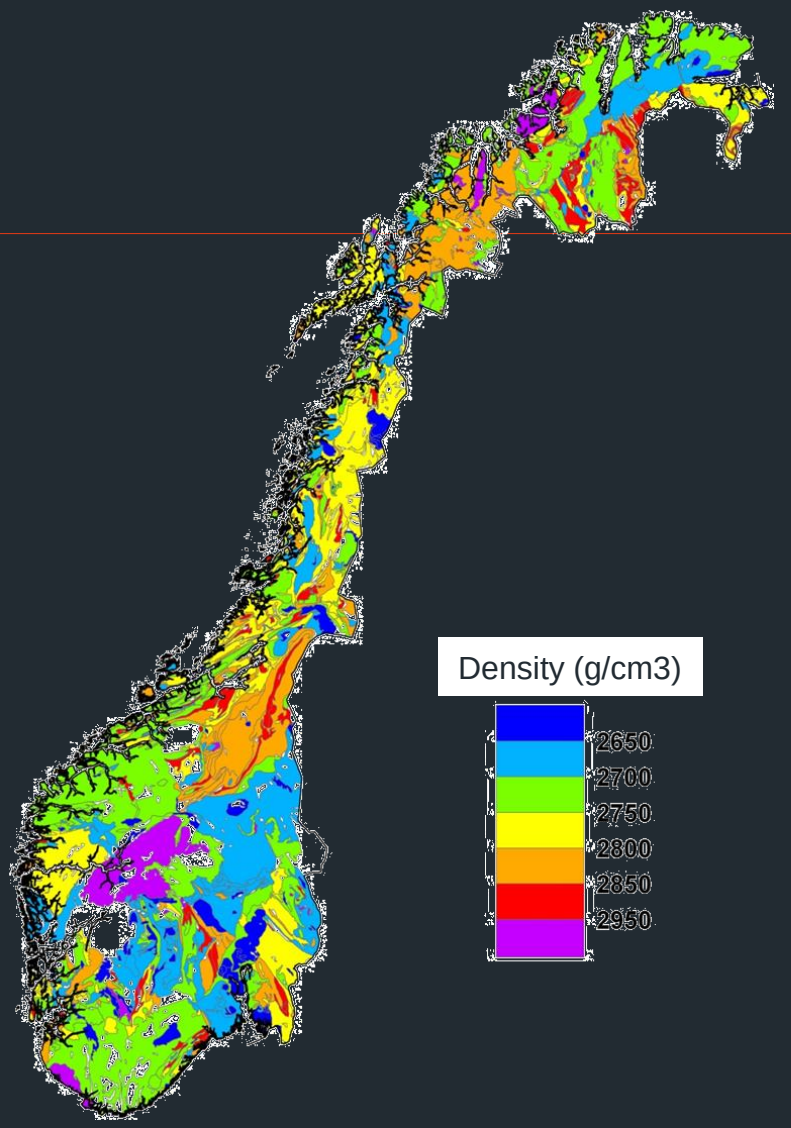




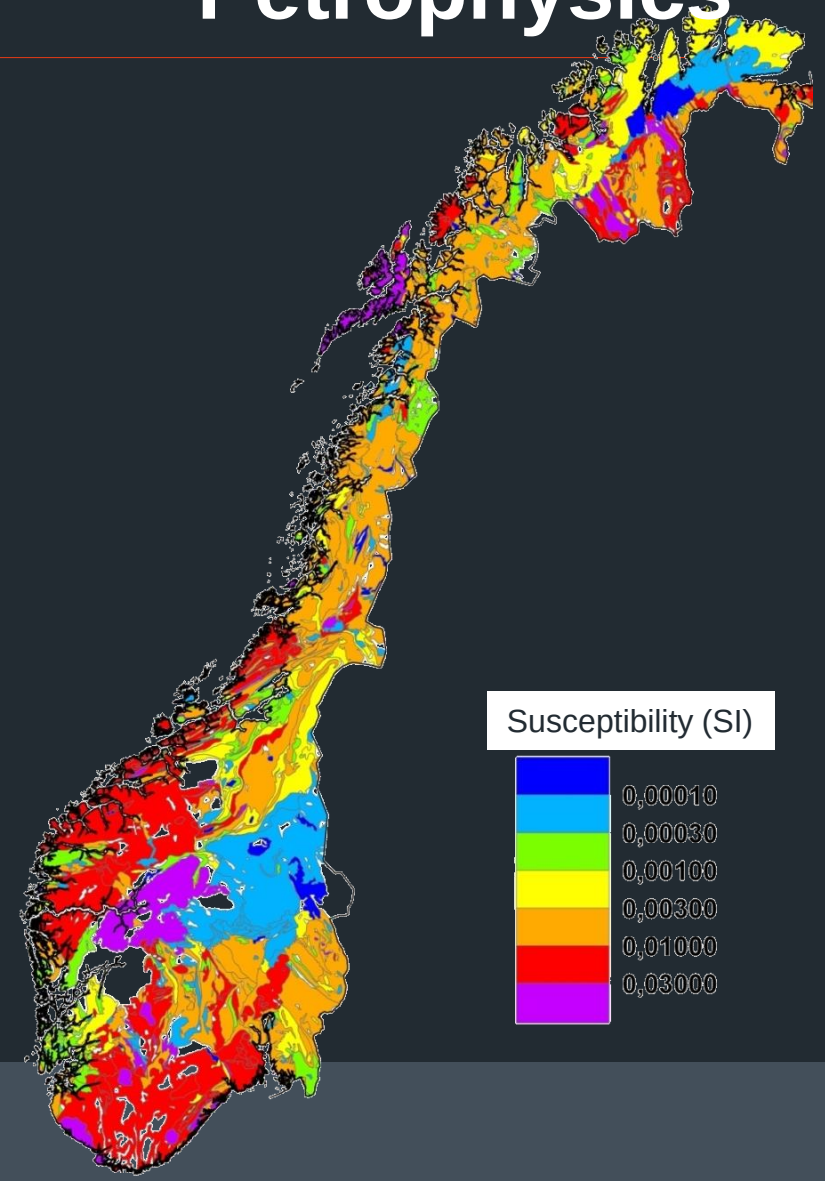
Petrophysical database



Petrophysics



Density (g/cm3)



Susceptibility (SI)

NORGES GEOLOGISKE UNDERSØKELSE
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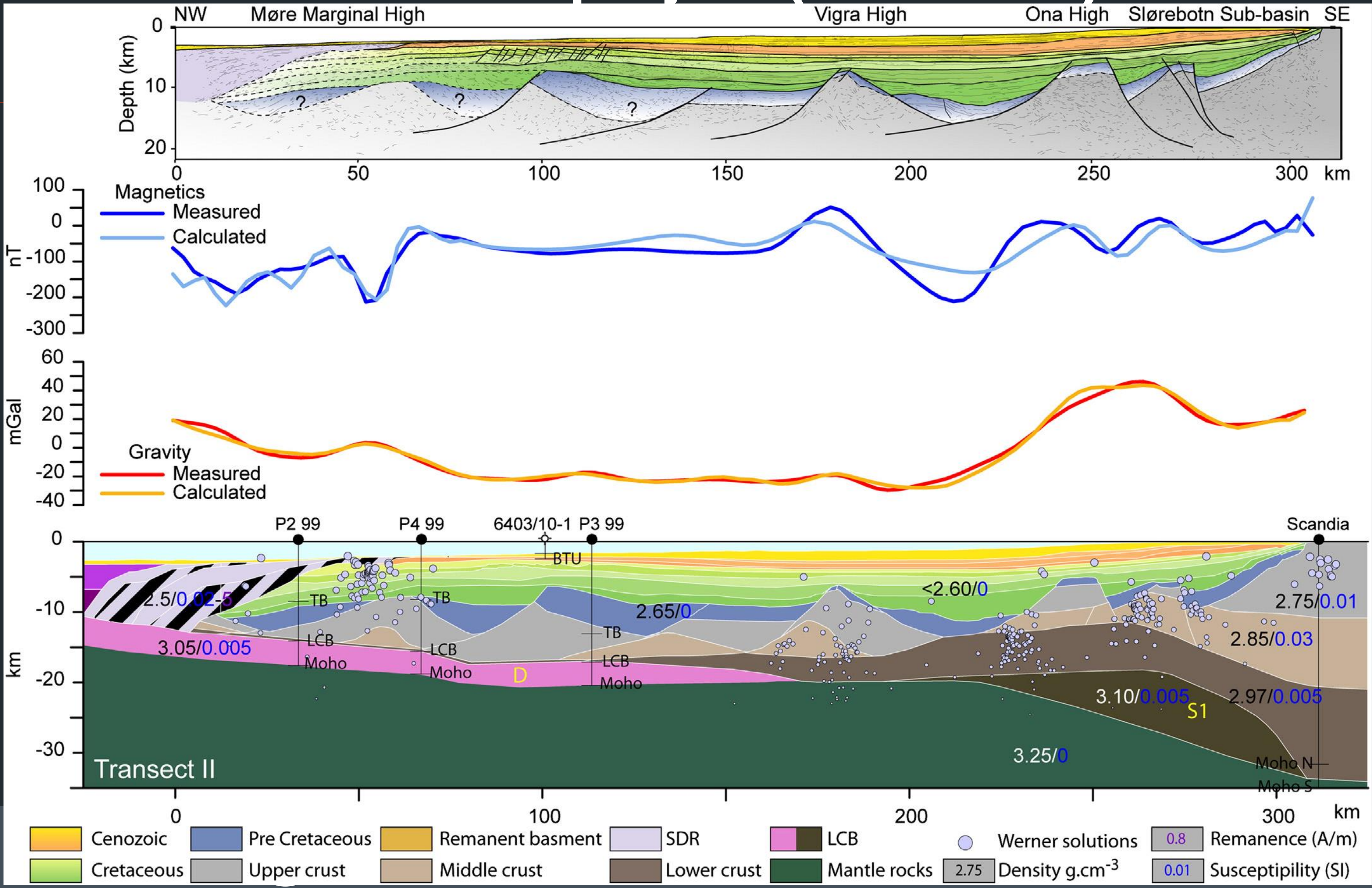
Crustal Onshore-Offshore project (COOP I-III)

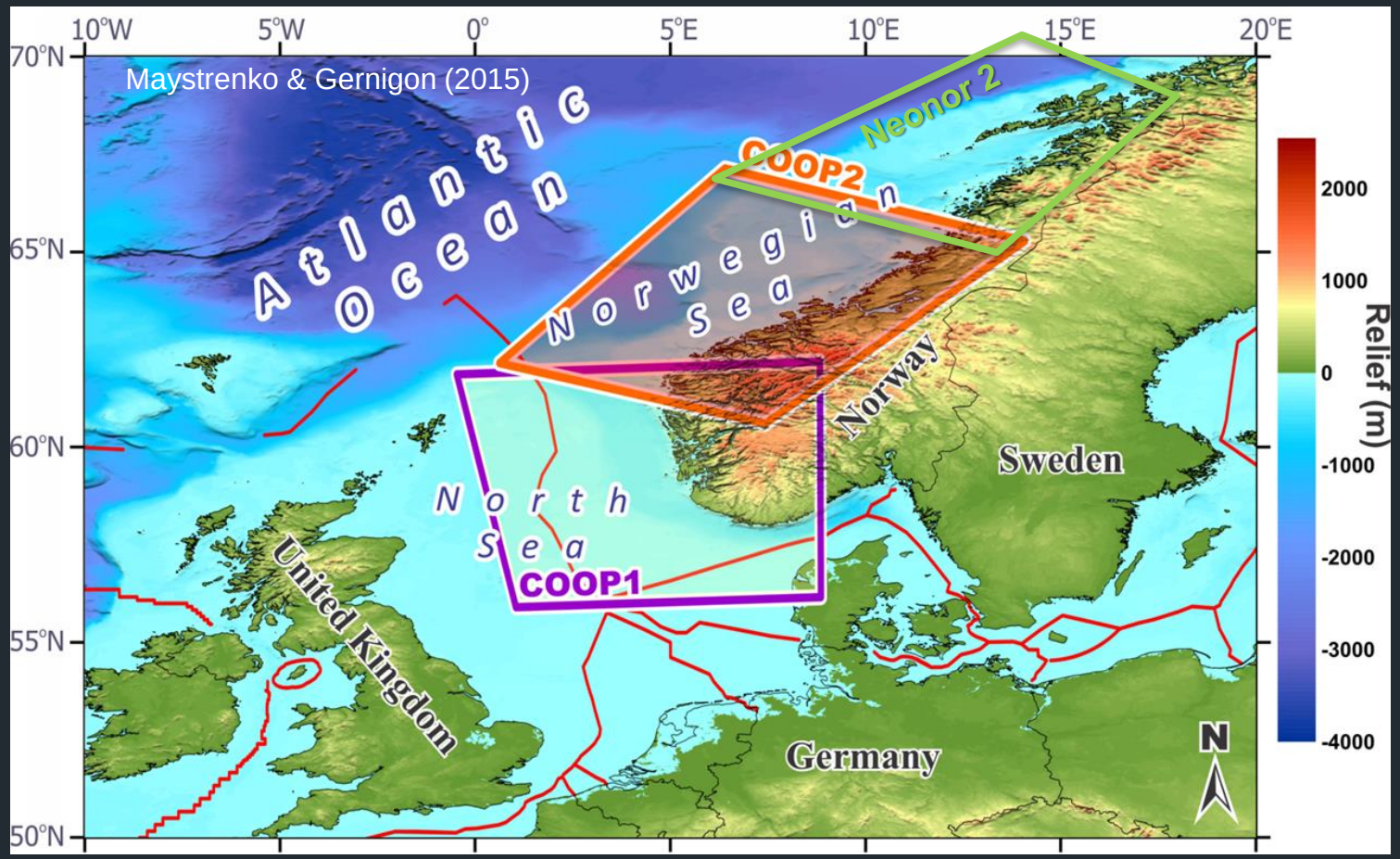
Industry funded project.
Originally 21 companies:

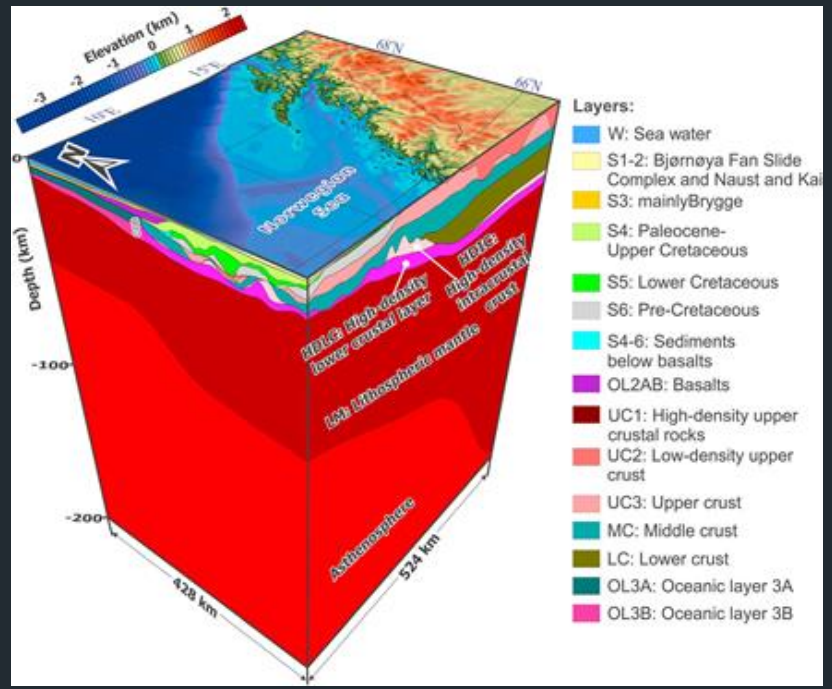
Aker BP,
BayernGas, BKK,
Centrica Energi,
ConocoPhillips,
Dea, DONG,
Engie, Eni, E.ON,
Lundin,
Maersk,
NGU, Noreco, NPD,
Repsol,
Statoil, Suncor,
Total,
VNG,
Wintershall



Nirrengarten et al. 2014

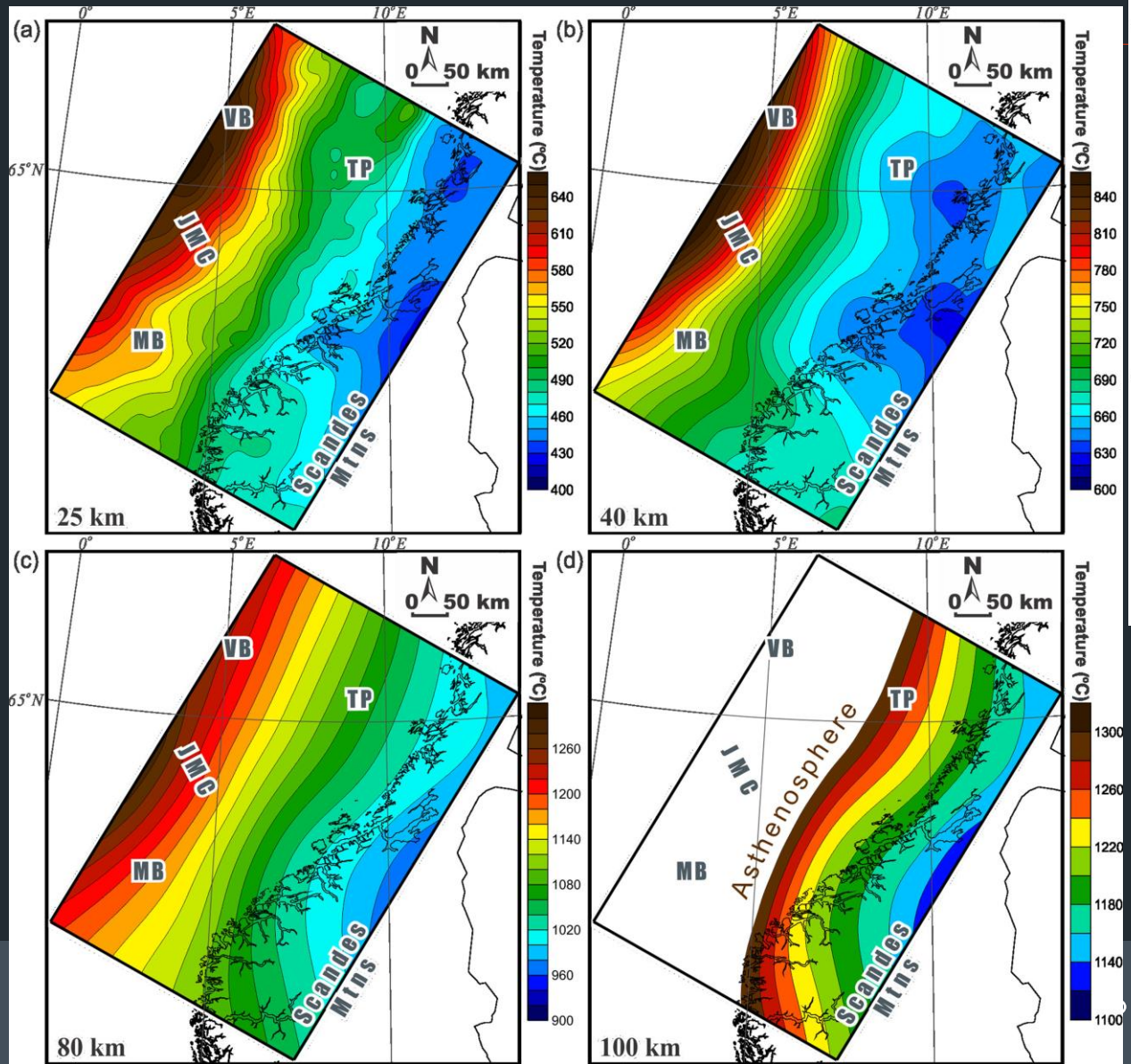
Crustal Onshore-Offshore project (COOP I-III)

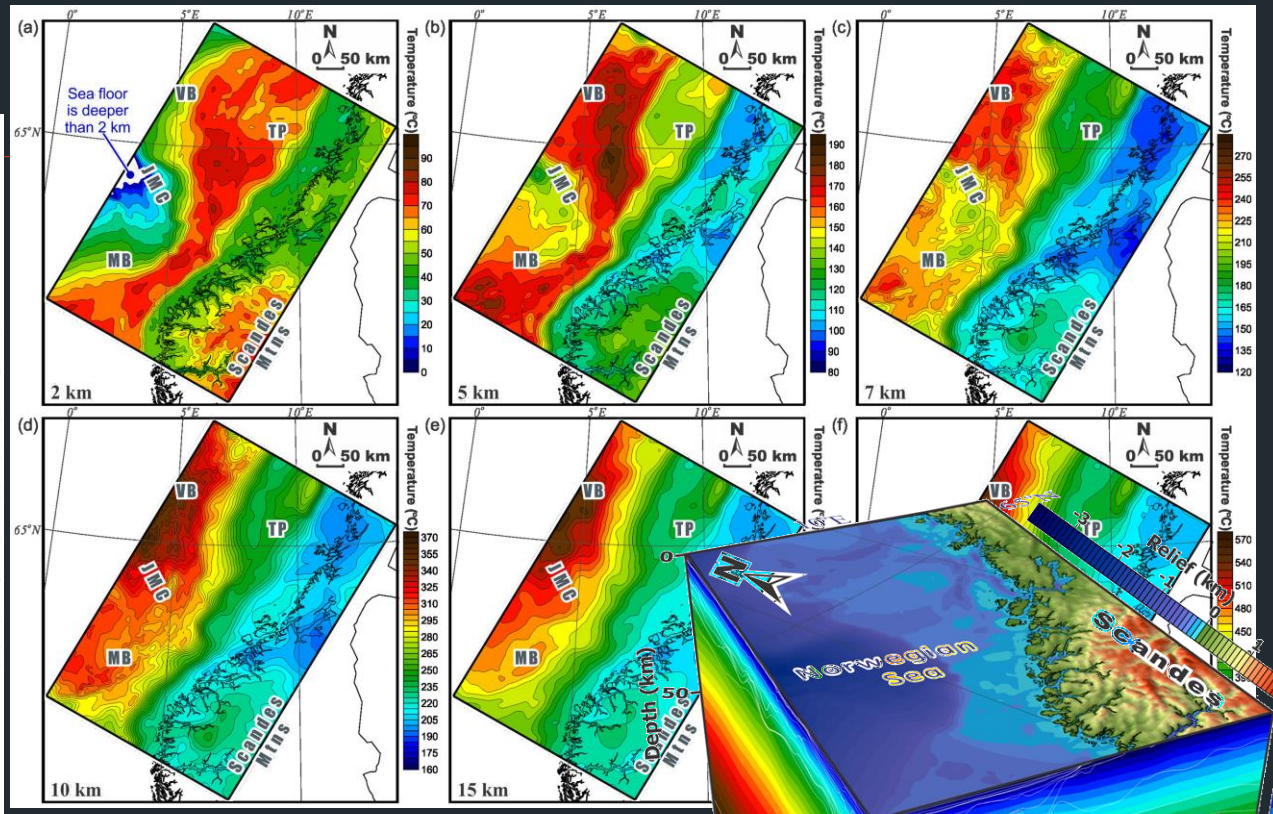


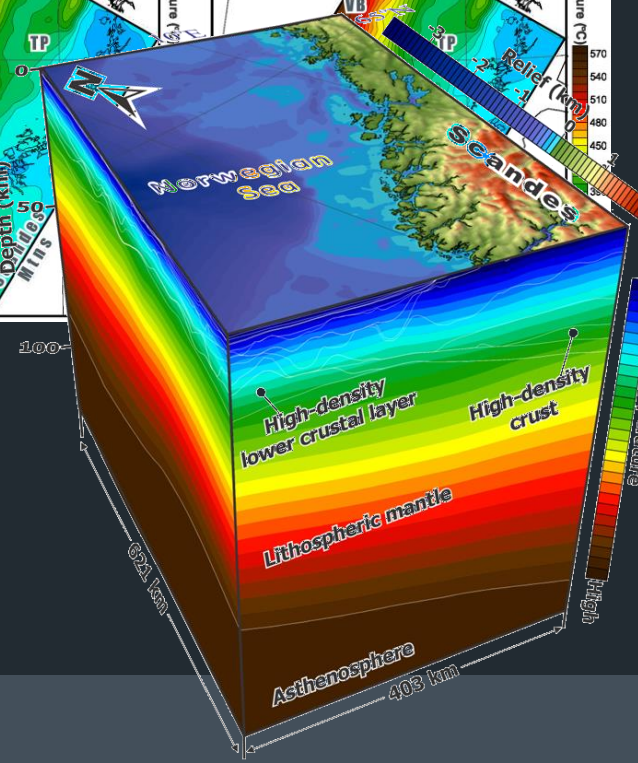


(from Maystrenko et al., 2017)

Crustal Onshore-Offshore project (COOP I-III)
Heat flow modelling



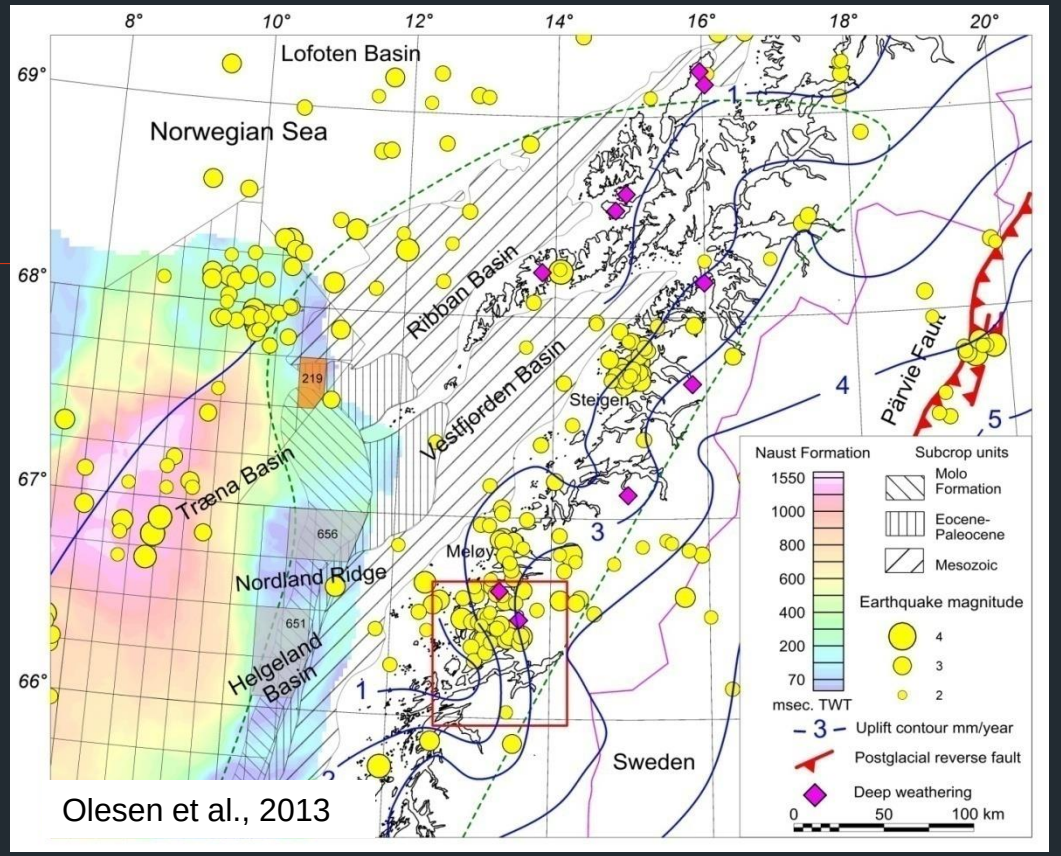




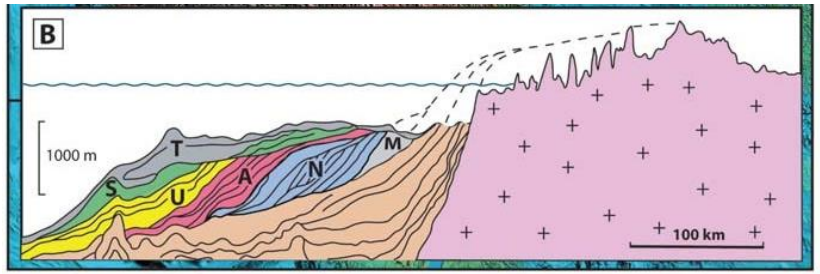
Maystrenko & Gernigon (2015)

NEONOR2
Neotectonics in Nordland

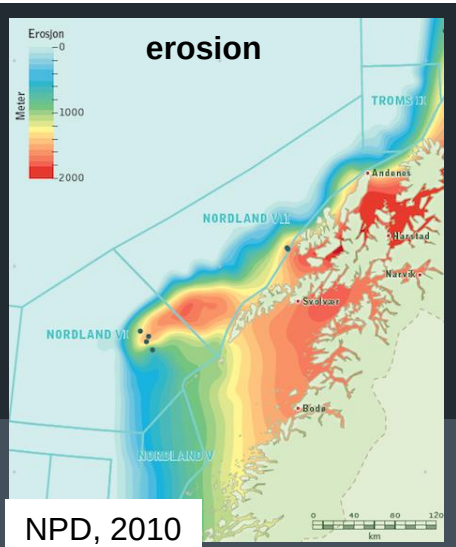
- enhanced vs. low seismicity (coastal areas vs. Vestfjorden Basin)
- irregular uplift pattern
- rapid Pleistocene erosion and sediment deposition (Naust Fm.)
- high near-coastal elevation & narrow continental shelf edge



Olesen et al., 2013



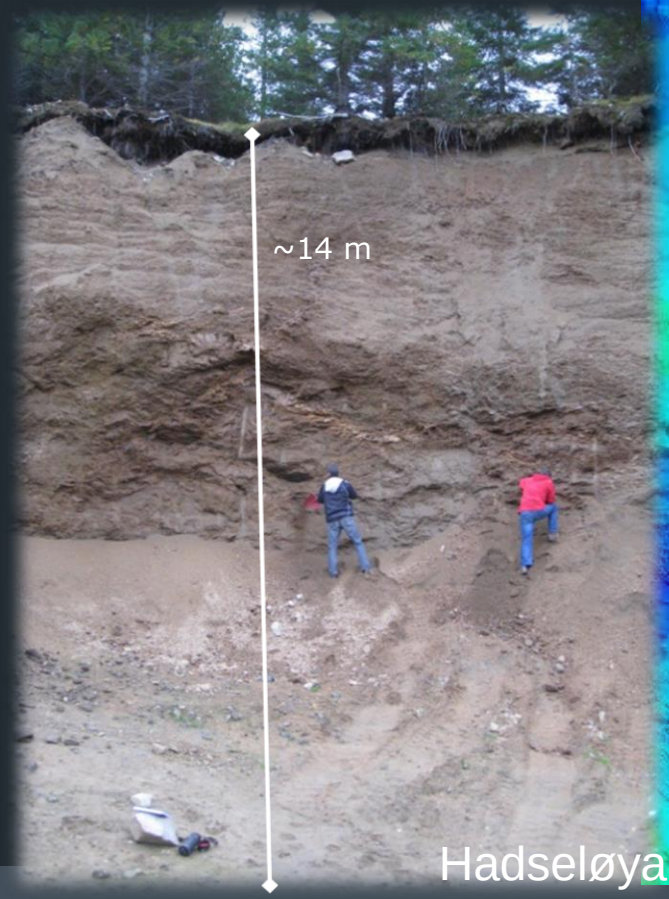
Dowdeswell et al., 2010

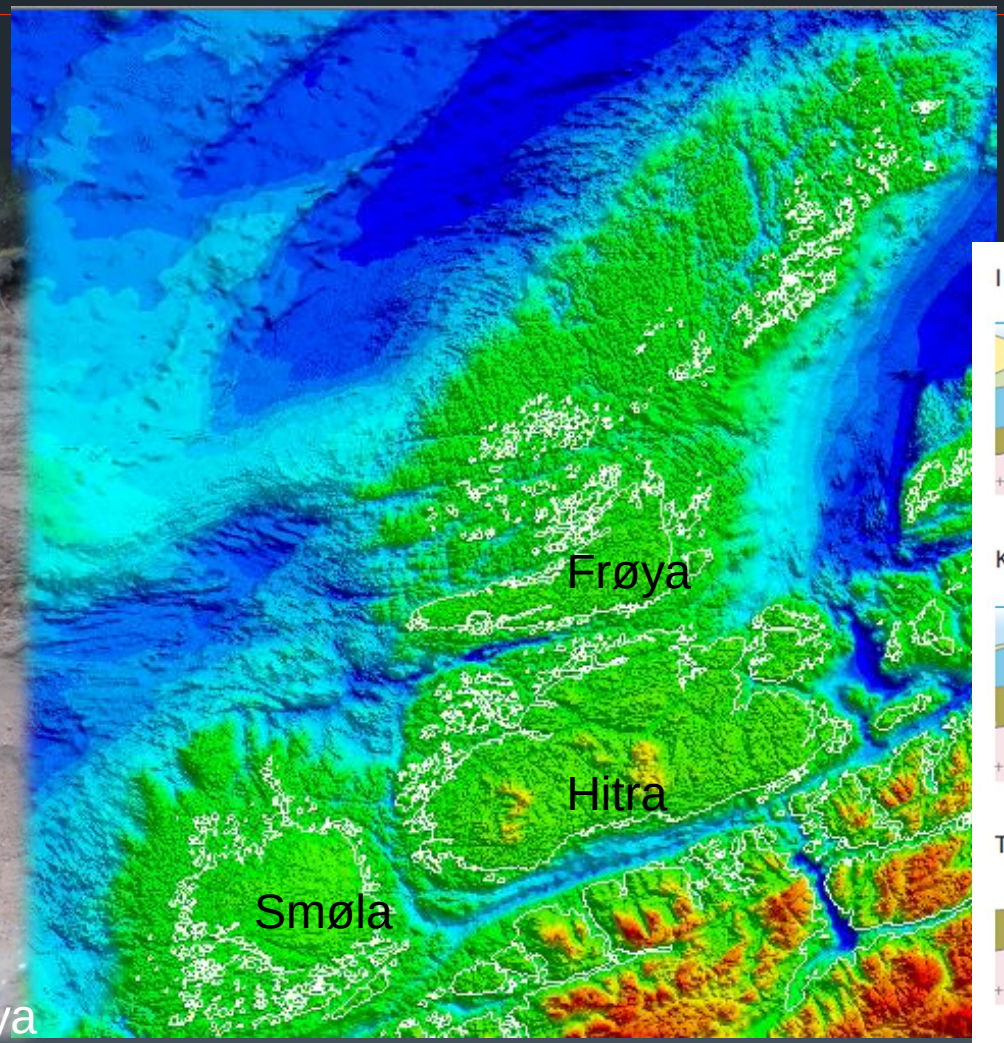


NPD, 2010

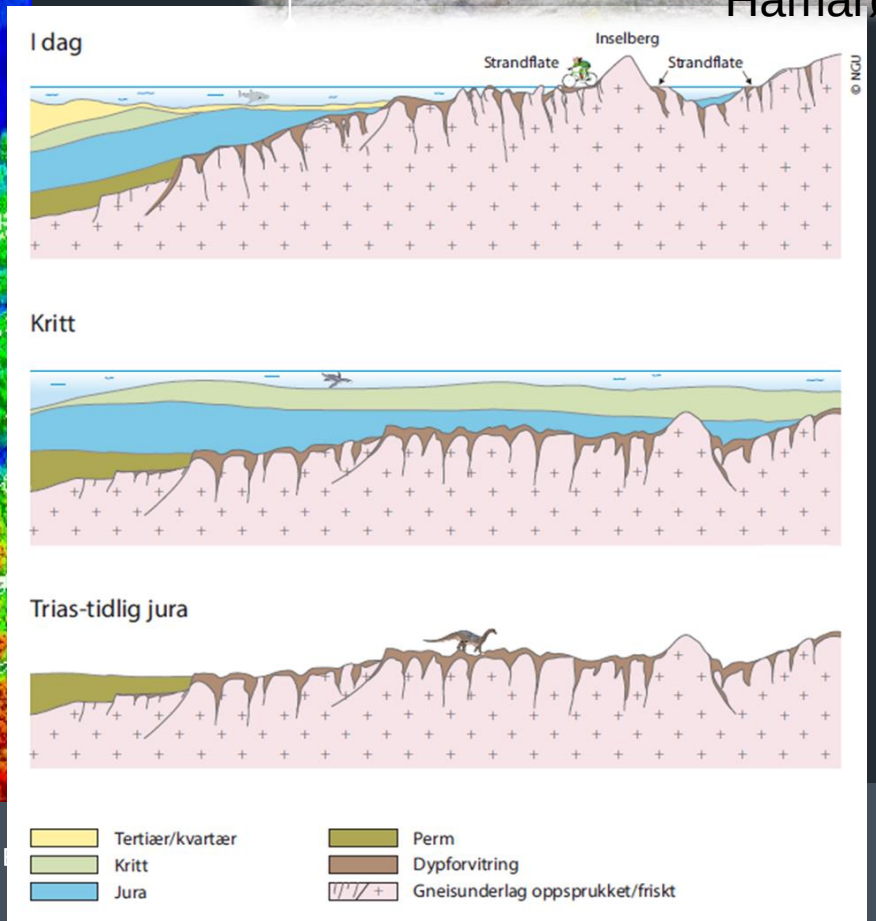
Funding: NFR Petromaks 2

Strandflat

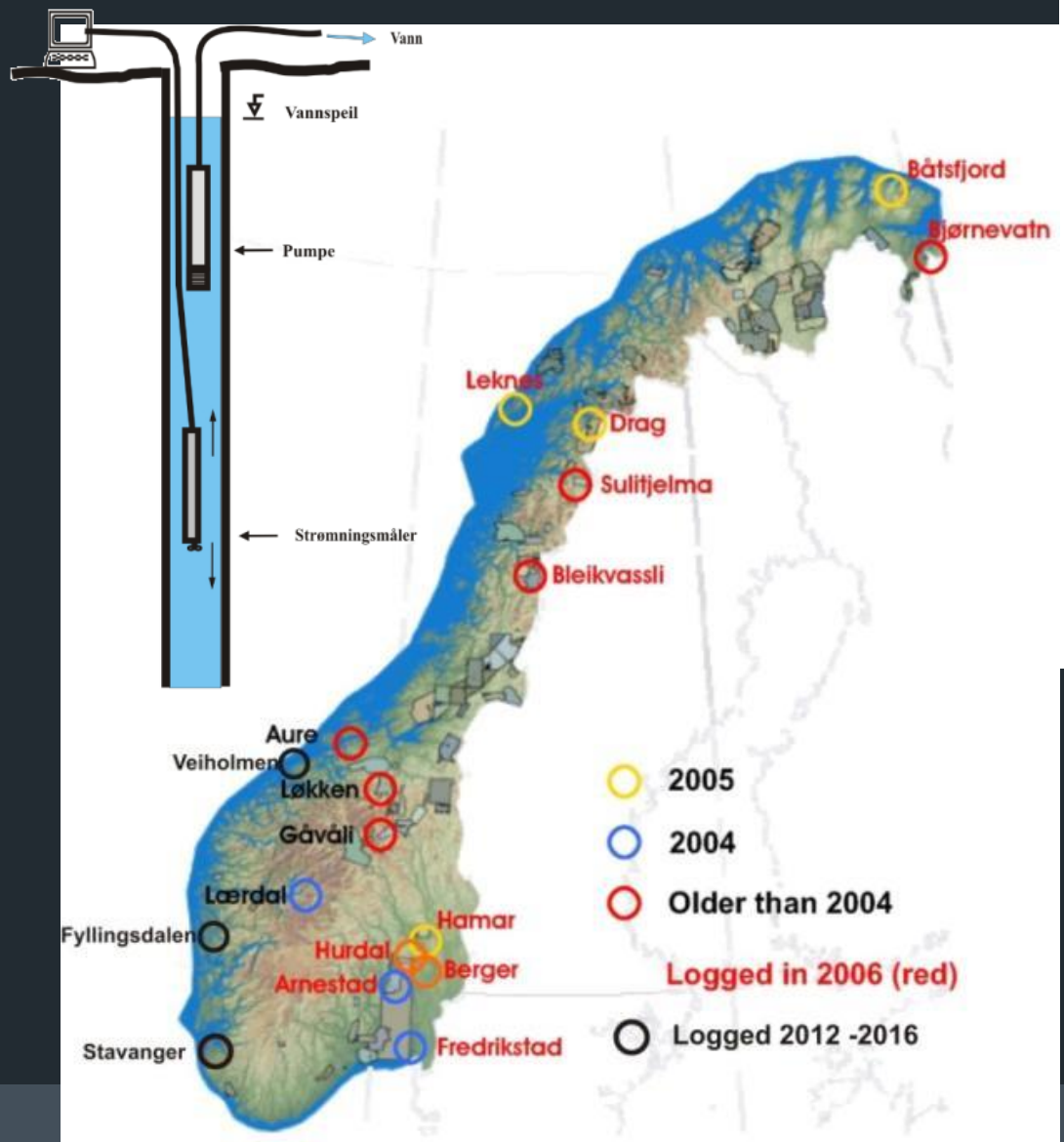

~14 m
Hadseløya


Frøya
Hitra
Smøla

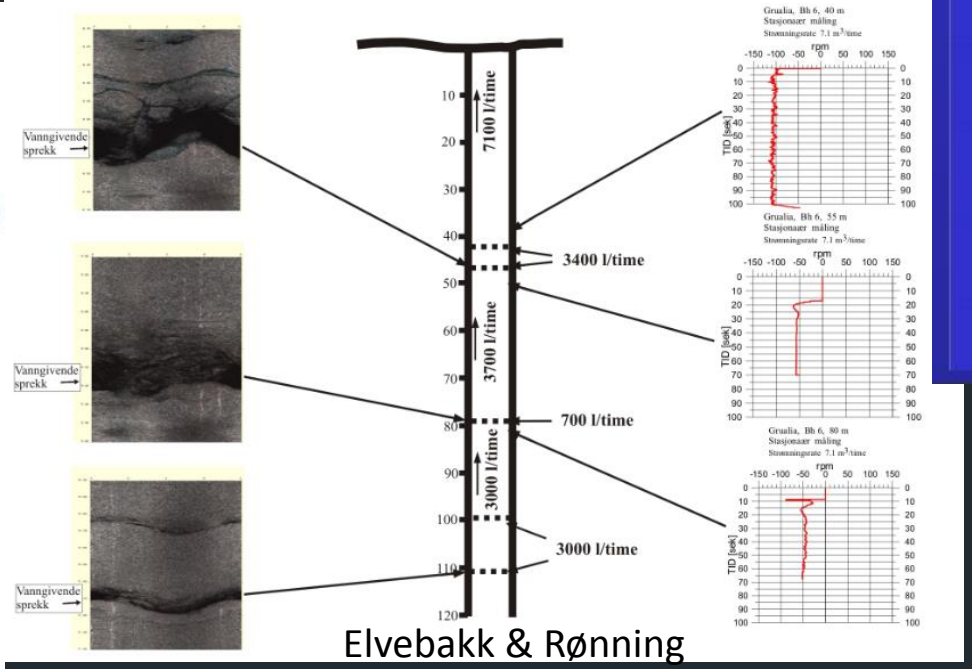

~20 m
Hamarøy


I dag
Inselberg
Strandflate
Strandflate
© NGU
Kritt
Trias-tidlig jura
Tertiær/kvartær
Kritt
Jura
Perm
Dypforvitring
Gneisunderlag oppsprukket/friskt

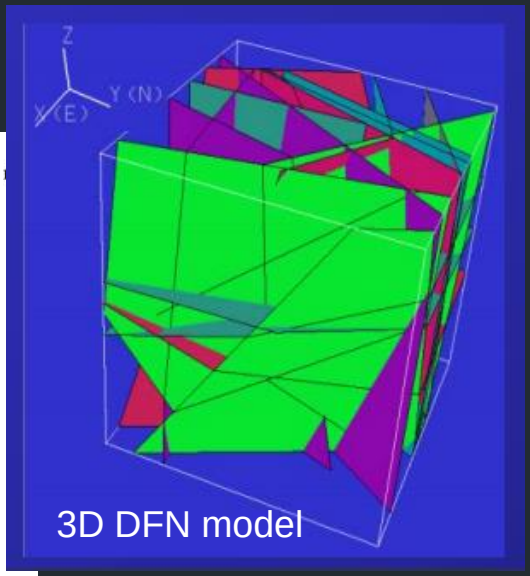
BASE II - Deeply weathered basement (open for further participants)



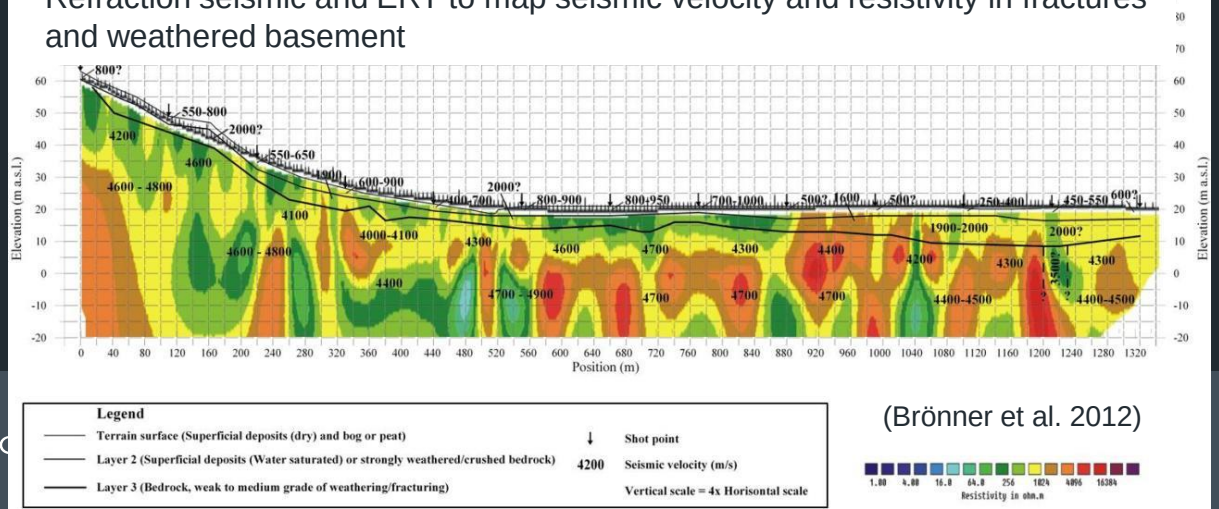
Fluid flow in wells to test fracture porosity and permeability



Elvebakk & Rønning



Refraction seismic and ERT to map seismic velocity and resistivity in fractures and weathered basement



(Brönner et al. 2012)

Thank you for your attention