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A banner at the top of the slide with a collage of four images: a rocky landscape, a volcanic eruption, a mountain valley, and a city skyline. The text 'Gateway to the Earth' is overlaid in white.

Gateway to the Earth

# 'GlaciStore' bid Scientific drilling for CO<sub>2</sub> storage

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# 'GlaciStore'

- CO<sub>2</sub> storage in early Palaeogene and Neogene hydrogeological systems of the North Sea:
- Preparation of a bid for IODP scientific drilling and informing store development
- 'Cutting-edge' science and relevant to IODP 'challenge' to inform CO<sub>2</sub> storage
- Achieved by an international consortium with Norwegian CLIMIT programme
- Pre-proposal in 2014 and full-bid in April 2015



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**CLIMIT**



UiO : **University of Oslo**

UNIVERSITETET I BERGEN



Institute for Energy Technology



**Statoil**

**Lundin**  
Petroleum



# Motivation

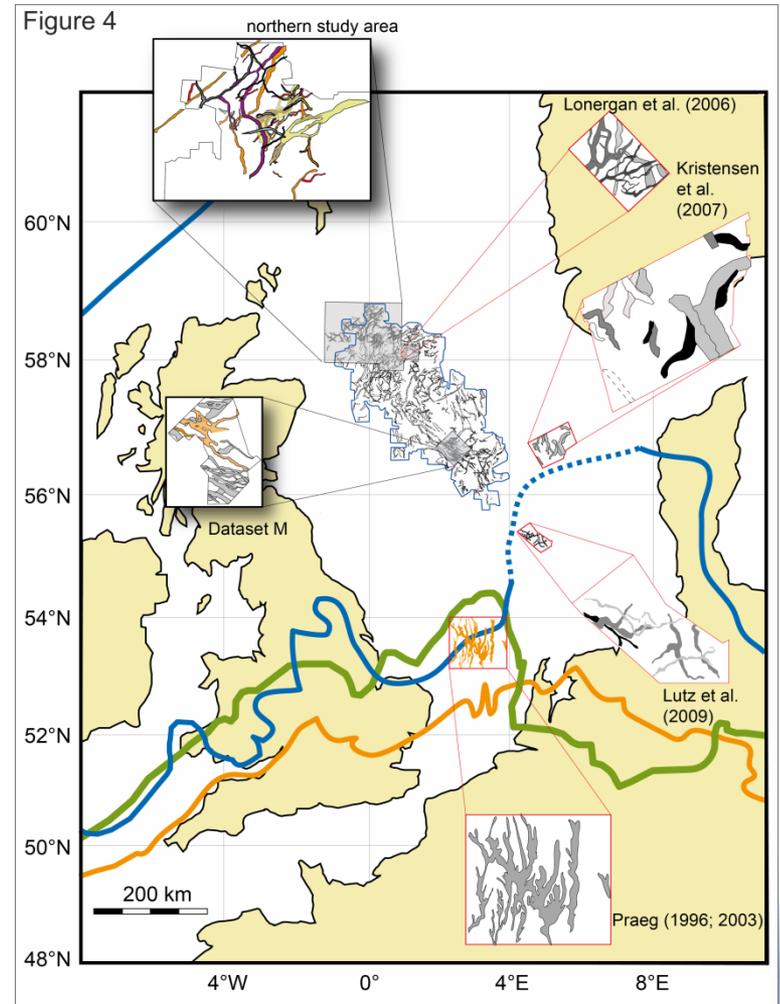
The North Sea has been overridden by ice at least three times

Knowledge gaps:

- How many ice sheet advances and retreats (up to 7)
- Geometry and character of buried glacial features
- Impact of ~1 km-thick ice sheet loading and unloading on:
  - physical properties,
  - stress distribution,
  - fluid flow properties

All North Sea strata will be affected

Very few cores 10 m to 900 m deep



Stewart, M.A. et al. 2013. Quaternary Science Reviews, v. 72, 1–17.

# 'GlaciStore' scientific drilling objectives

- Explore the Earth's climate history in an area where the most complete sequence is preserved;
- Better understand the geometry, dynamics, processes and wider impact of ice sheet development;
- Understand fluid flow within the strata and its evolution during a period of fluctuating pressure conditions in shale-dominated basins and its implications for CO<sub>2</sub> storage;
- Understand secondary containment barriers for North Sea CO<sub>2</sub> storage

# 'GlaciStore': benefits for CO<sub>2</sub> storage

IODP very detailed sampling and scientific analysis will inform:

- Climate modelling impact due to better history of glaciation.
  - North Sea has a global significance due to the unique preservation of the most complete deposits known in the Northern Hemisphere.
- History of stress changes on the storage strata and secondary seal, geometry and character of the shallow overburden strata
  - For improved baseline data and the response of the strata if CO<sub>2</sub> is introduced.
- Acoustic characterisation of the upper layers.
  - Interpreting and re-processing of seismic data, based on actual layer properties rather than approximations
  - Improve models of the underlying store and primary seal rocks.

# Informing CO<sub>2</sub> storage operator needs

## Understand cap rock and overburden

- Stratigraphy
- Sealing
- Leakage scenarios
- Storage integrity
- New core recovery technologies and stress logging
- Site selection and qualification
- Cost reduction
  - Drilling procedures
  - Data acquisition

