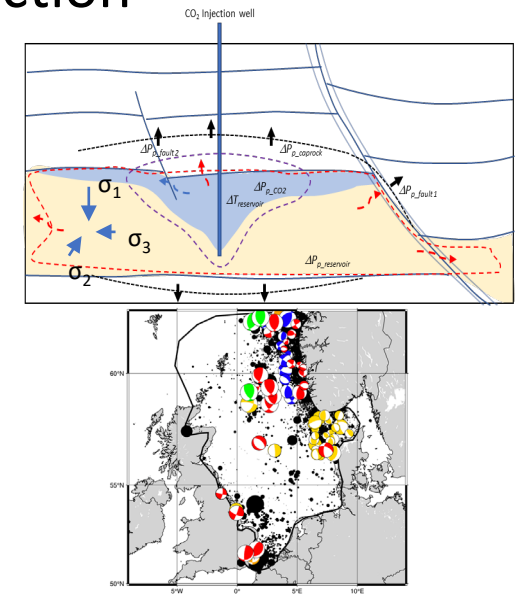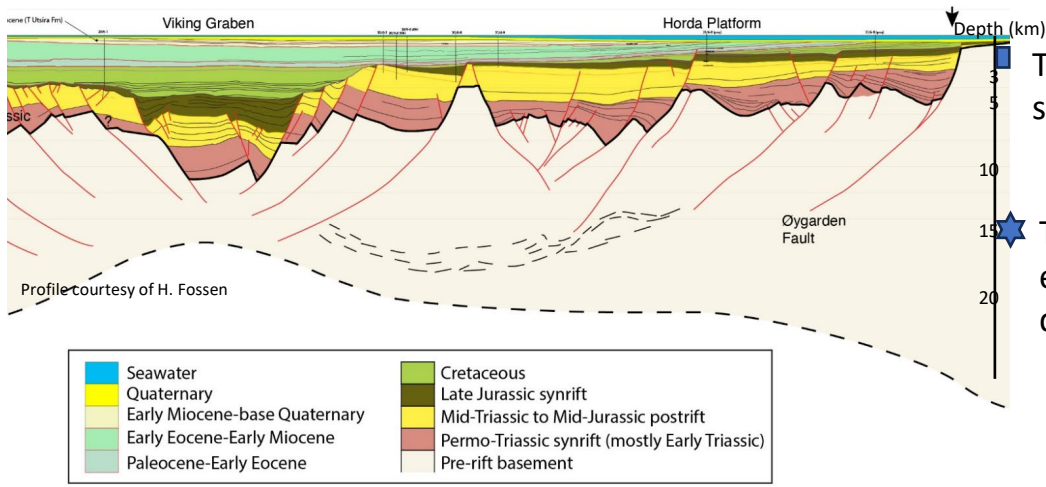# SHARP Storage

Stress history and reservoir pressure for improved quantification of CO_2 storage containment risks

ACT Knowledge Sharing Workshop
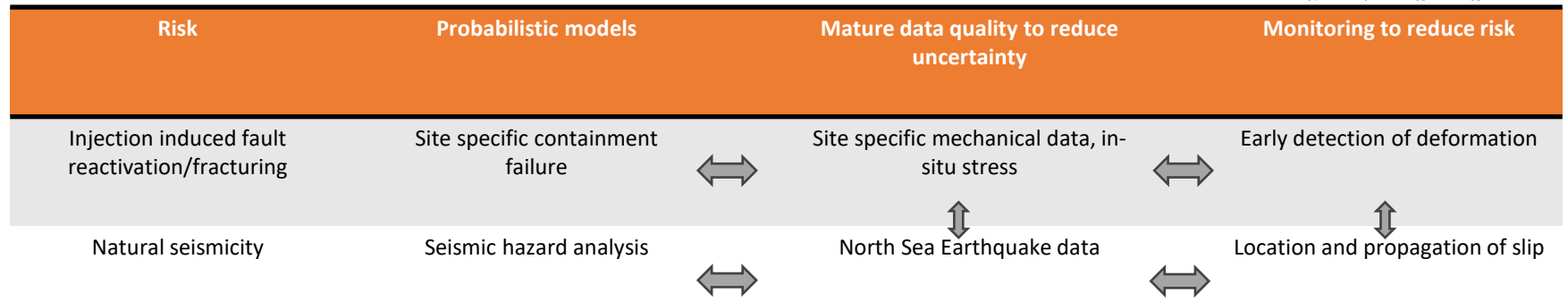Paris, October 4-5, 2023

Elin Skurtveit, project coordinator
Norwegian Geotechnical Institute (NGI)

SHARP *Storage*

ACcelerating CCS Technologies

Risk identification, quantification and reduction

Viking Graben

Horda Platform

Depth (km)

Øygarden Fault

Profile courtesy of H. Fossen

Typical CO_2 storage depth

Typical earthquake depth

Seawater	Cretaceous
Quaternary	Late Jurassic synrift
Early Miocene-base Quaternary	Mid-Triassic to Mid-Jurassic postrift
Early Eocene-Early Miocene	Permo-Triassic synrift (mostly Early Triassic)
Paleocene-Early Eocene	Pre-rift basement

CO_2 Injection well

σ_1 σ_2 σ_3

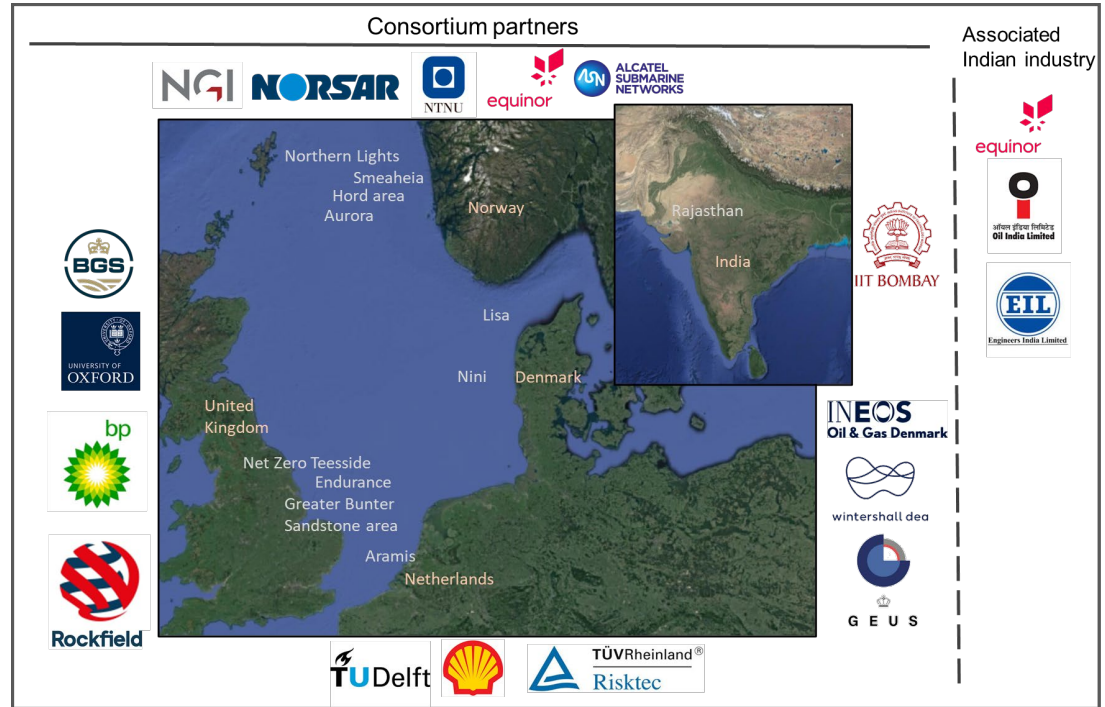ΔP_{p_fault2} $\Delta P_{p\_caprock}$ ΔP_{p_CO2} $\Delta T_{reservoir}$ ΔP_{p_fault1} $\Delta P_{p\_reservoir}$

Workflow development in SHARP

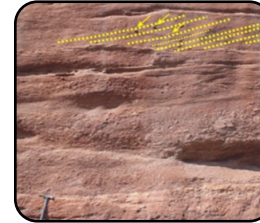| Risk	Probabilistic models	Mature data quality to reduce uncertainty	Monitoring to reduce risk
Injection induced fault reactivation/fracturing	Site specific containment failure	Site specific mechanical data, in-situ stress	Early detection of deformation
Natural seismicity	Seismic hazard analysis	North Sea Earthquake data	Location and propagation of slip

SHARP Storage

SHARP Consortium

- **Norway:** NGI, Equinor, Norsar, NTNU, Alcatel (ASN)

- **UK:** U.Oxford, Rockfield, BGS, BP

- **Denmark:** GEUS, INEOS, WintershallDea

- **Netherlands:** TU Delft, Risktec, Shell

- **India:** IIT Bombay, Equinor, EIL, Oil India, Shell

Case studies for value demonstration

UK: Greater Bunter Sandstone	Norway: Horda area Aurora and Smeaheia	Denmark: Lisa and Nini field	Netherlands: Aramis	India: Rajasthan
Salt tectonics and stress	Mature area for data integration	Seismic hazard and monitoring	Risk assessment of depleted fields	Developing new CCS project

- Different Storage Readiness Level (SRL) - different challenges
- SHARP contributes to maturation of all sites/SRL levels

Expected impact
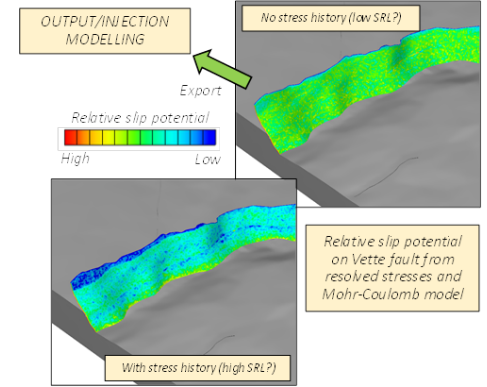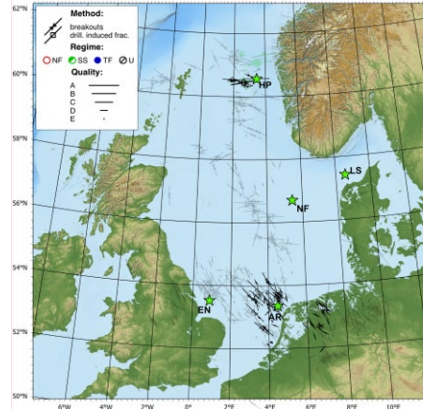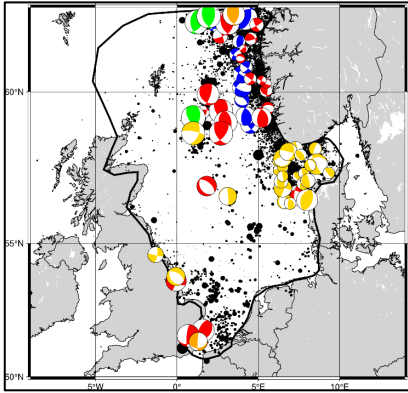
- improve seismic hazard assessment
- enhance knowledge on stress regime for large fault zones

- improve value of geomechanical models
- trendlines and relationships useful for other sites in North Sea

- demonstrate value of new stress data and site specific geomechanical data
- identify failure risk and quantify probabilities

SHARP
Storage

Accelerating CCS Technologies