



British
Geological Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL

Gateway to the Earth

Fault Seals Controls on CO₂ storage

Phase 1 project update

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THE UNIVERSITY of EDINBURGH
School of GeoSciences



1. Captain Sandstone

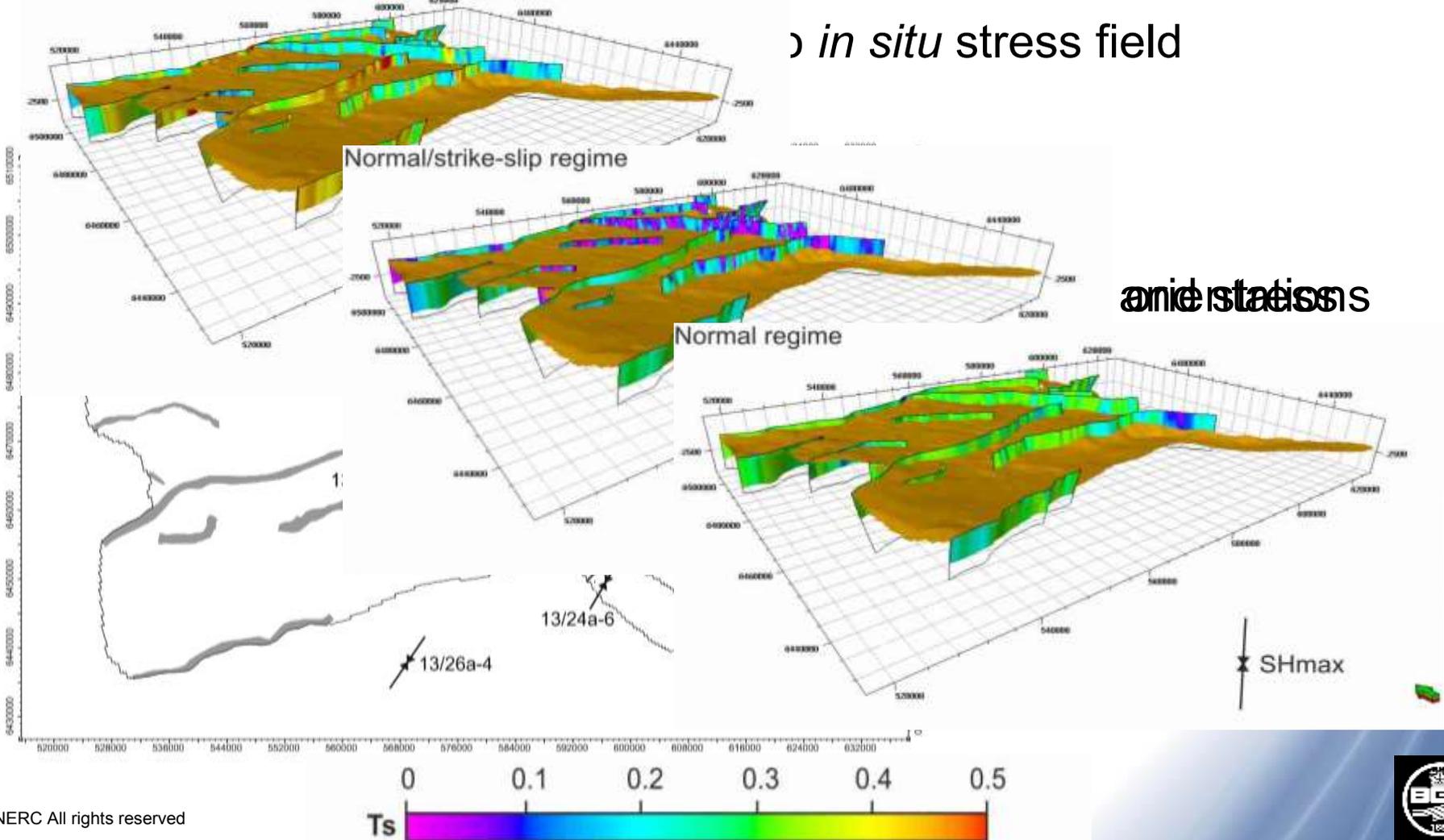
Strike-slip regime

in situ stress field

Normal/strike-slip regime

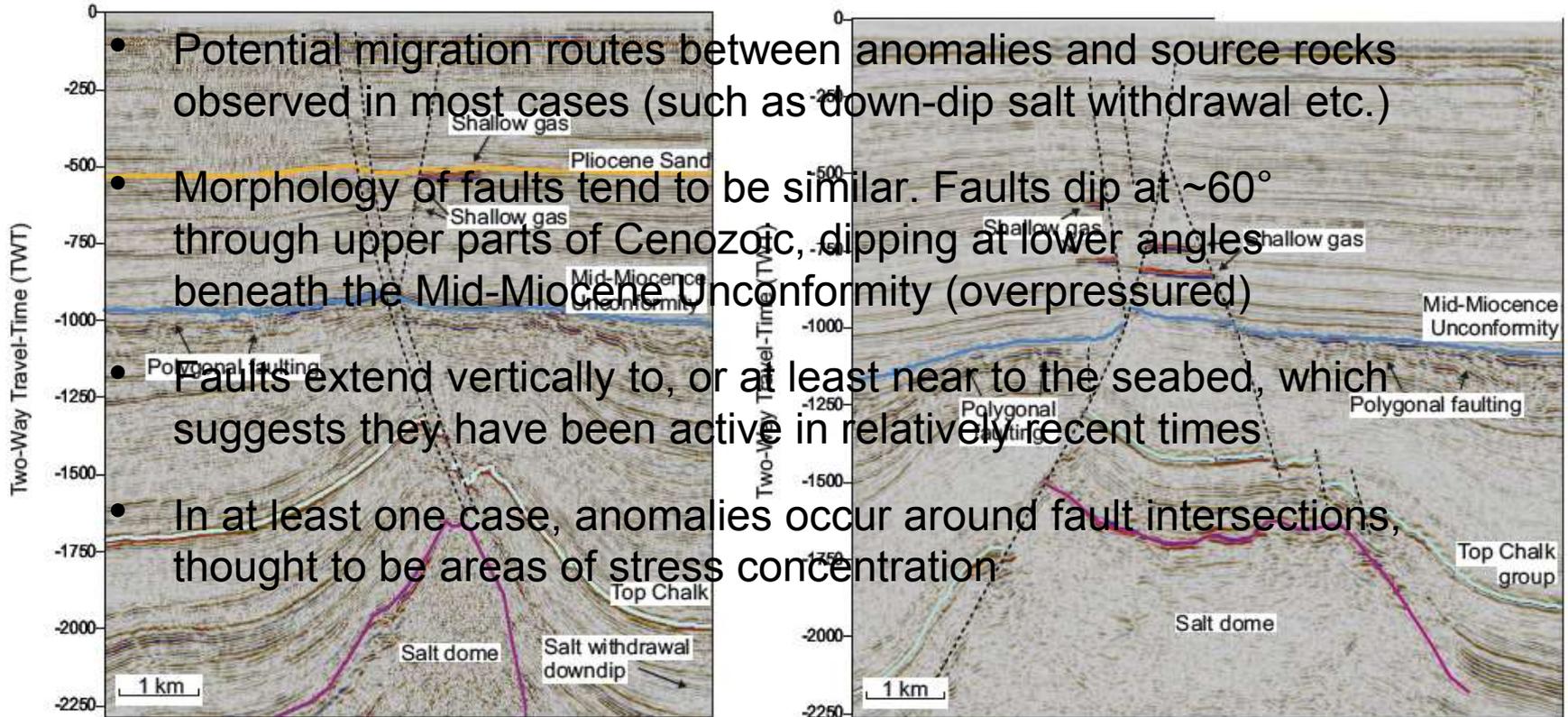
Principal stresses

Normal regime



2. Netherlands shallow gas

- Examples of seismic cross-sections showing seismic anomalies
- Shallow gas anomalies (often stacked) are coincident with faulting above salt domes as mapped for this project
- Shallow gas within the Cenozoic succession offshore the



- Potential migration routes between anomalies and source rocks observed in most cases (such as down-dip salt withdrawal etc.)
- Morphology of faults tend to be similar. Faults dip at $\sim 60^\circ$ through upper parts of Cenozoic, dipping at lower angles beneath the Mid-Miocene Unconformity (overpressured)
- Faults extend vertically to, or at least near to the seabed, which suggests they have been active in relatively recent times
- In at least one case, anomalies occur around fault intersections, thought to be areas of stress concentration

3. Fizzy/Oak gas fields

- Fizzy field structure is under-filled relative to closure
- Field-bounding fault is sealing to CO₂, but potential reservoir-reservoir juxtaposition may have limited the fill
- Naturally occurring gas fields in UK with high CO₂ contents
- Fault is stable geomechanically (little risk of reactivation)
- Fields are fault-bounded demonstrating that these faults form effective barriers to CO₂
- Published literature data (IFT, wettability, contact angle) used to calibrate the observed column against expected height
- Fault seal analysis suggests that in some cases sealing may further of gas fill (50% CO₂) would result in cross-fault leakage
 - • Applicable to faulted aquifer cases?

