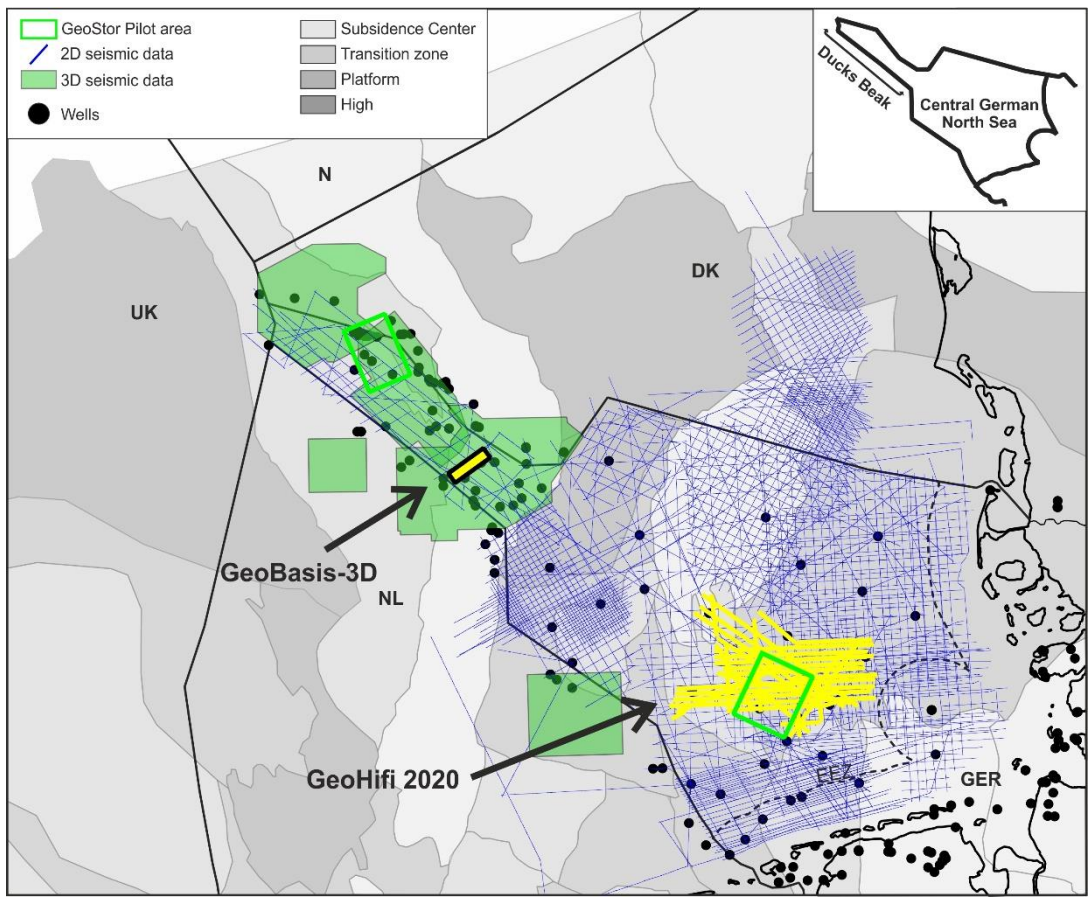


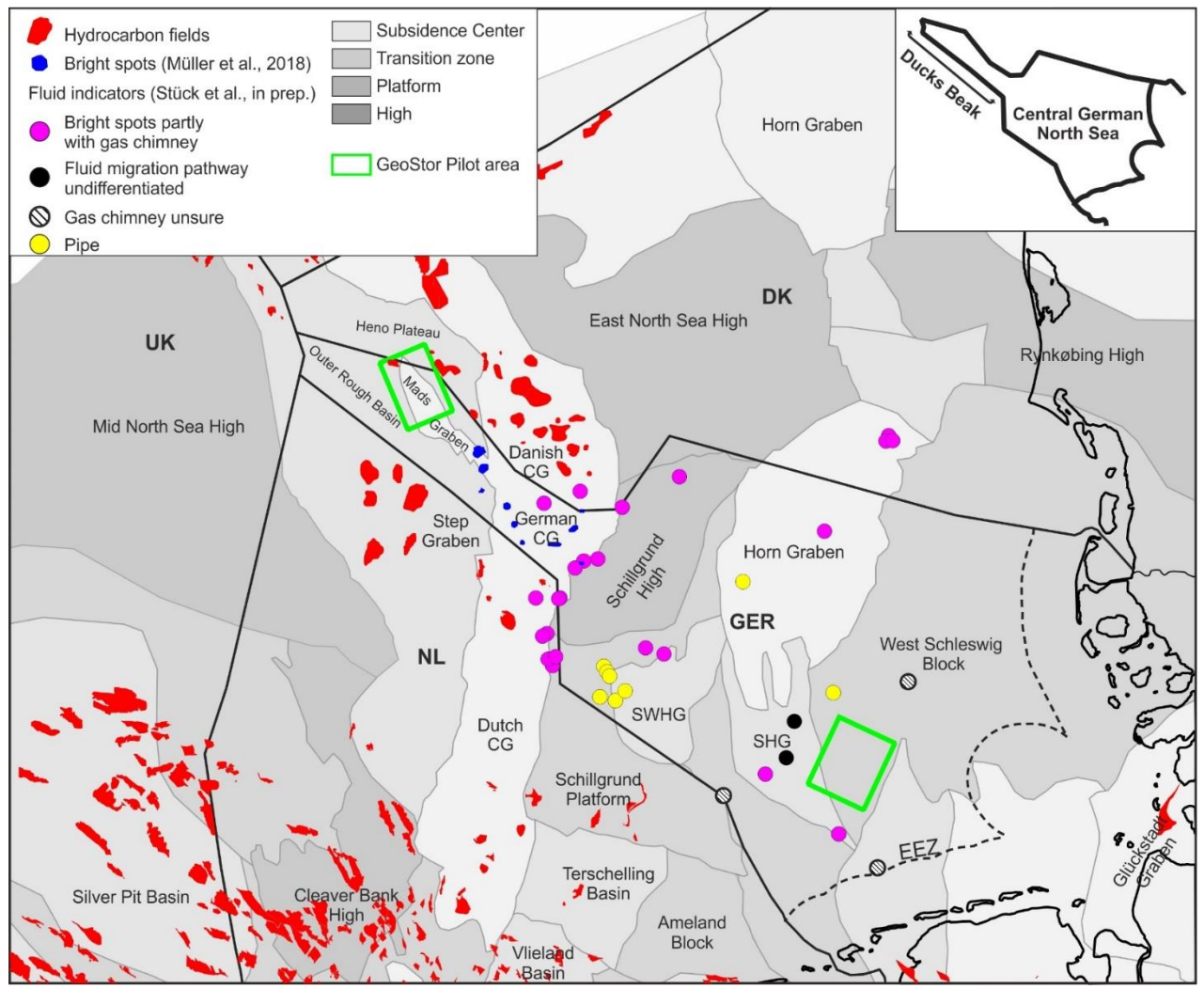
Leakage risks: Fluid indicators in seismic data

Database



Database creation and seismic processing of recently acquired 2D and 3D data completed!

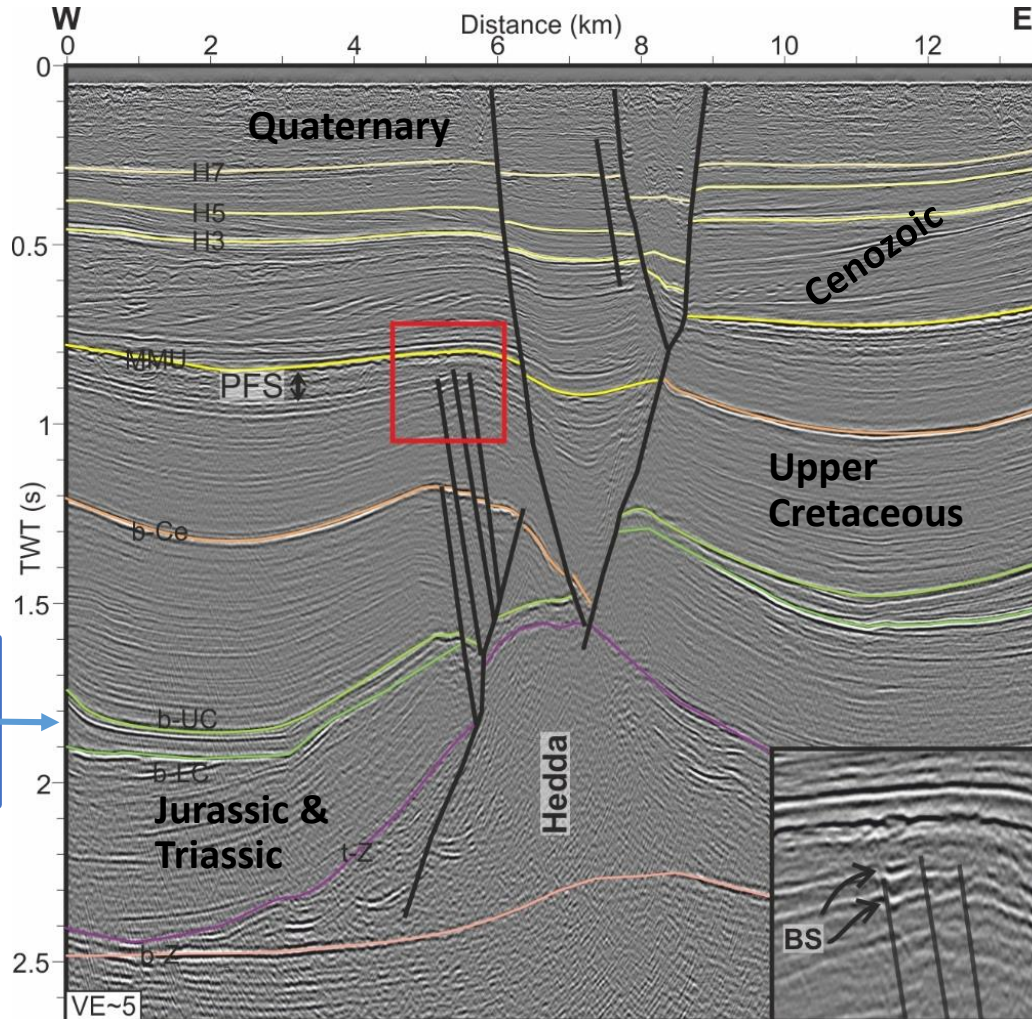
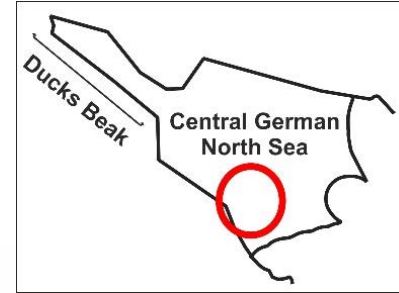
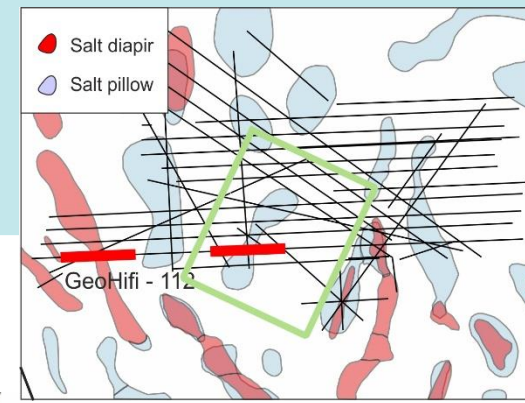
Fluid indicators



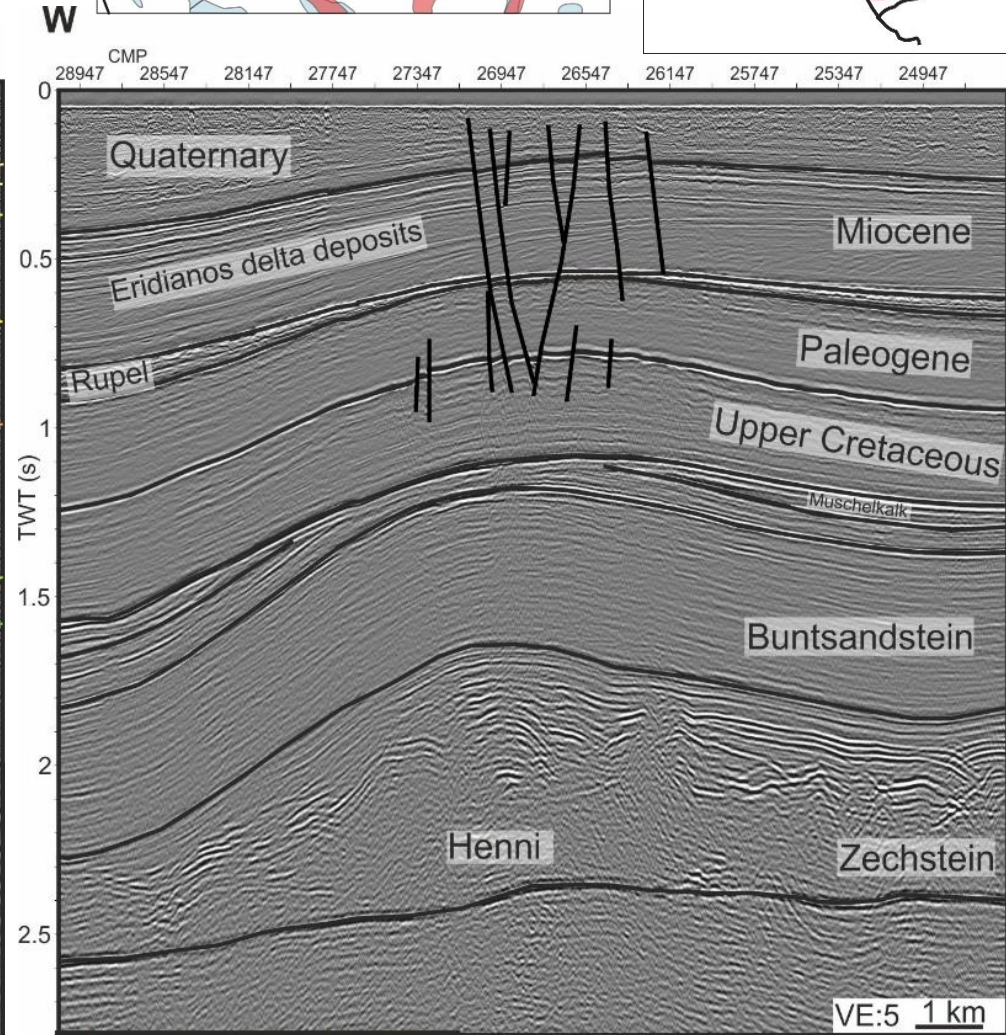
Ahlrichs et al., in preparation

Leakage risks: Fluid indicators in seismic data

GeoHifi - 112

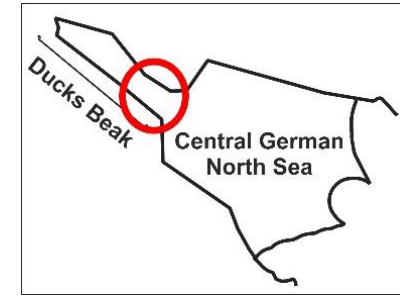


Lower Cretaceous barrier formation

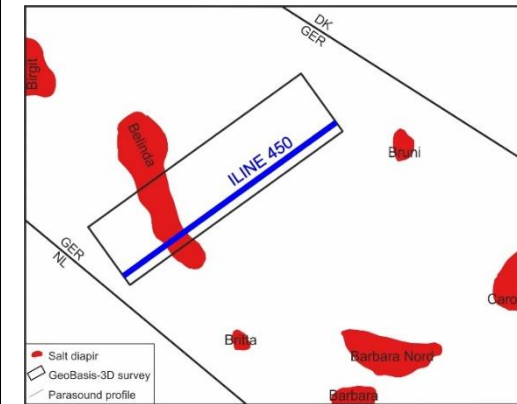
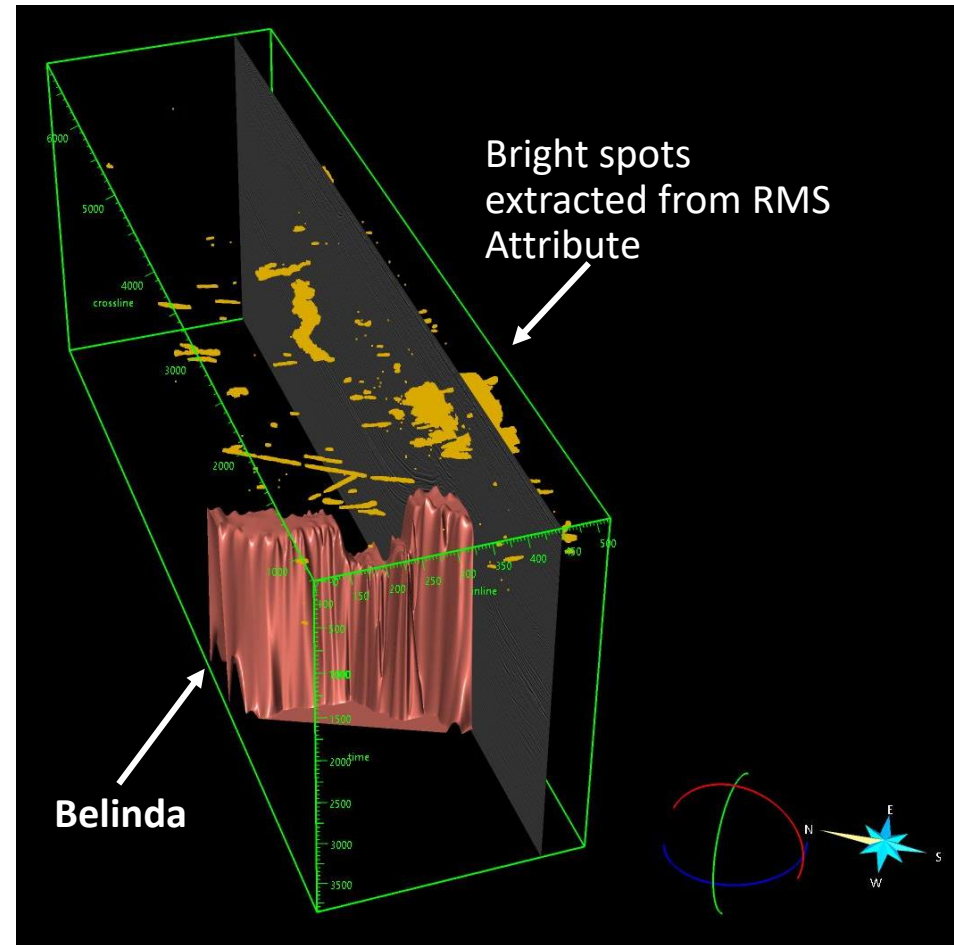
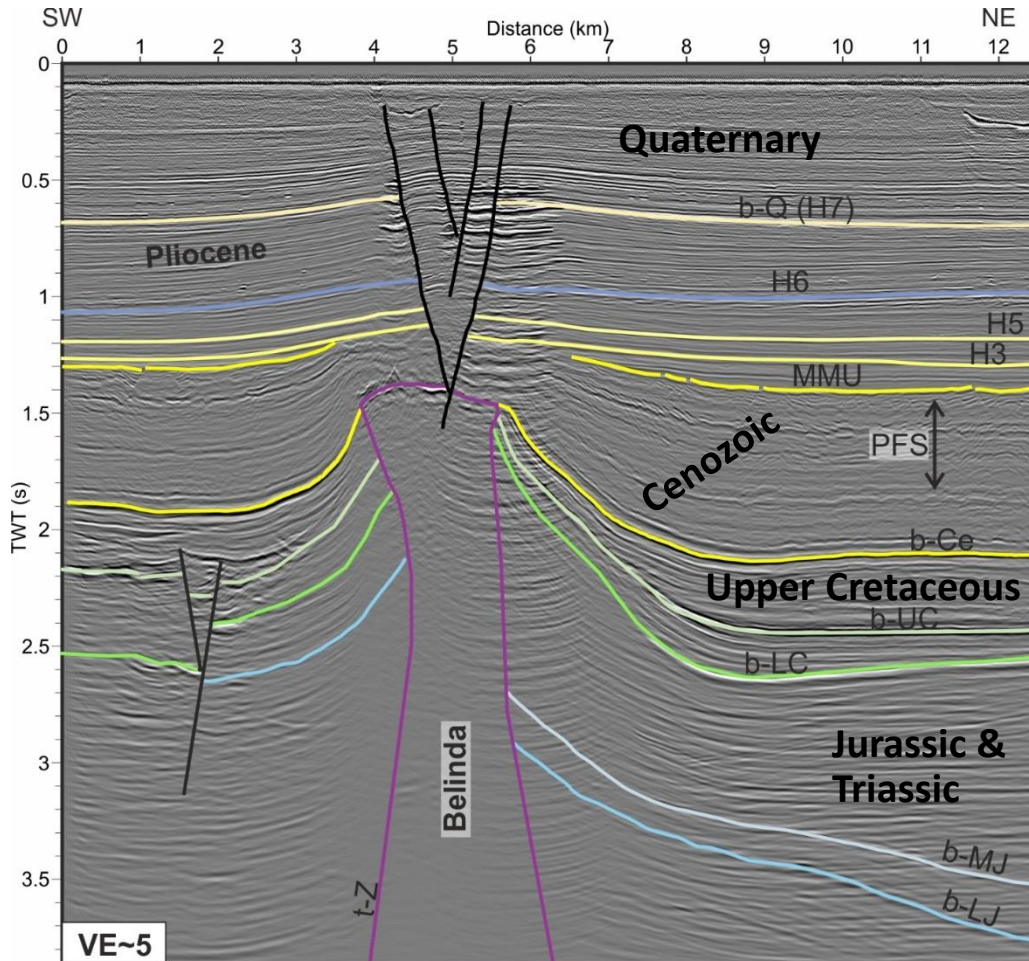


VE:5 1 km

Leakage risks: Fluid indicators in seismic data

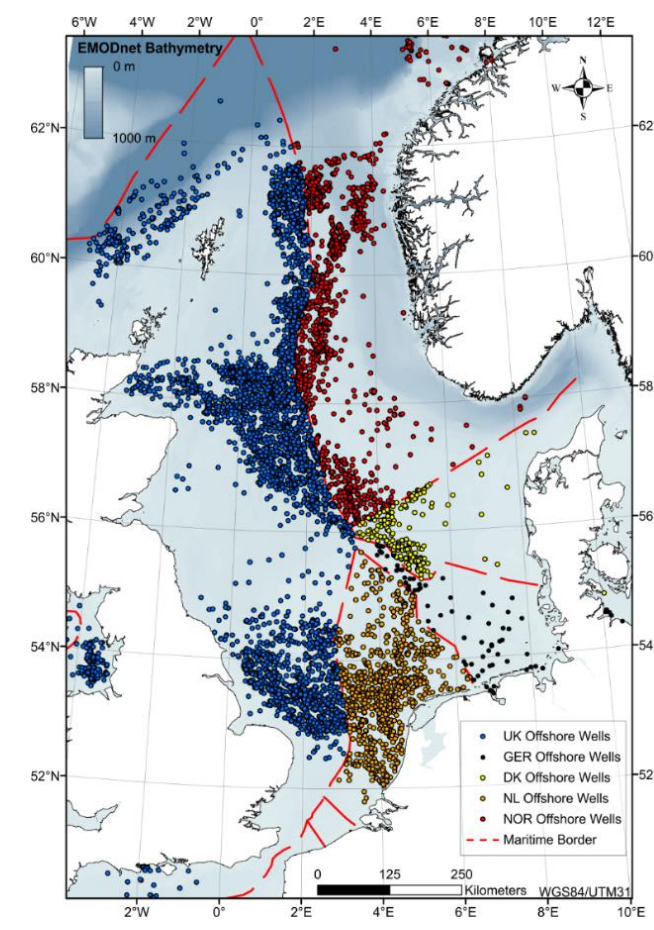
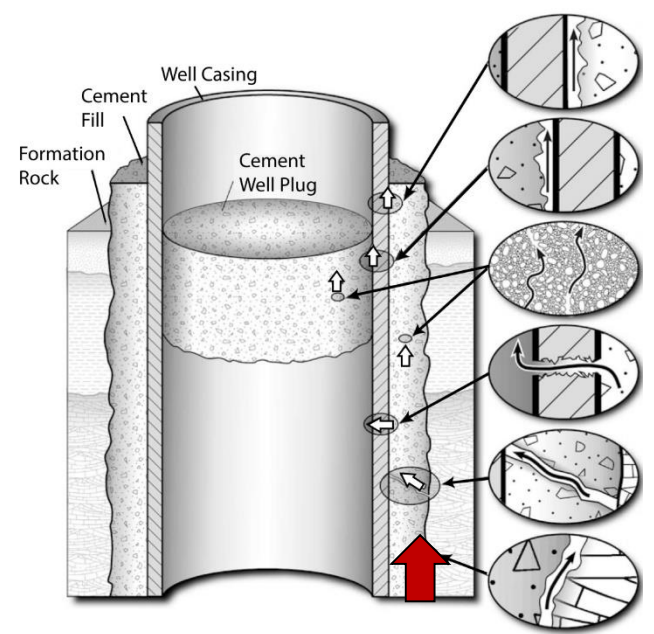
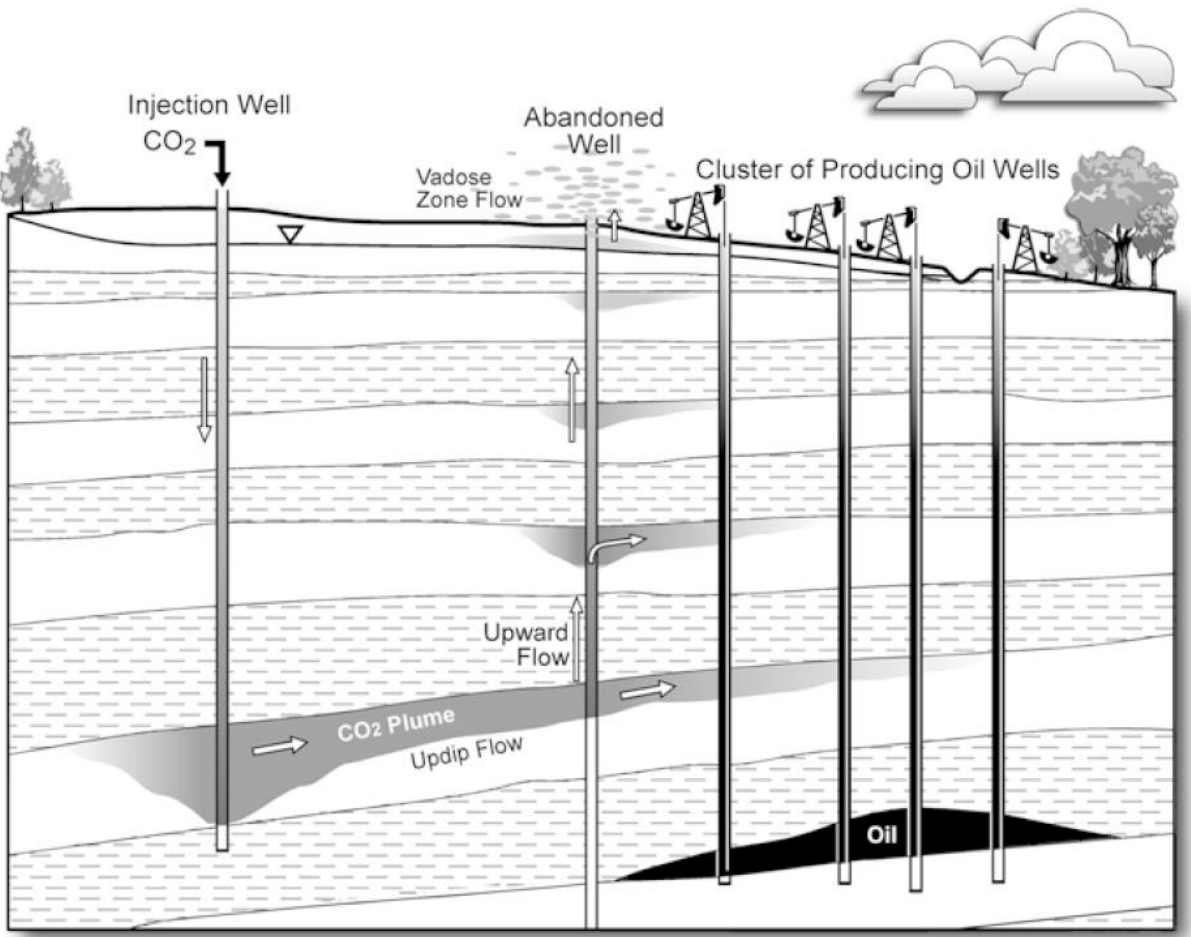


GeoBasis - 3D: ILINE 450



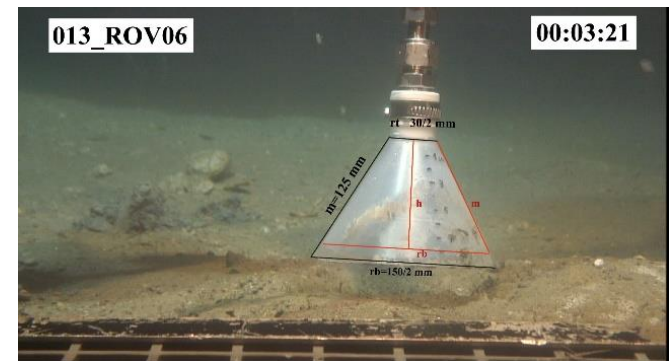
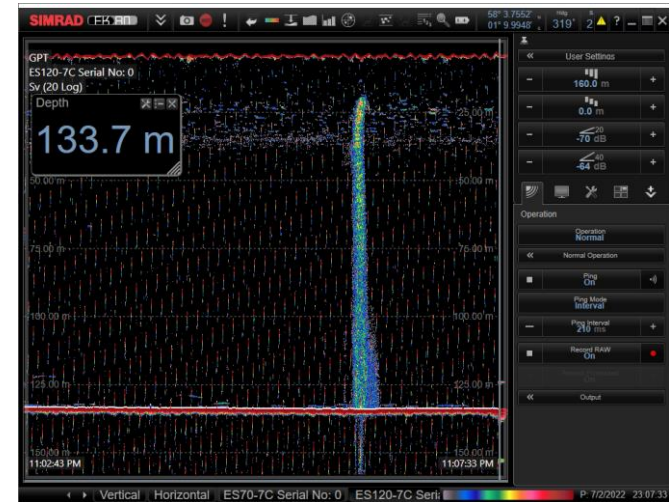
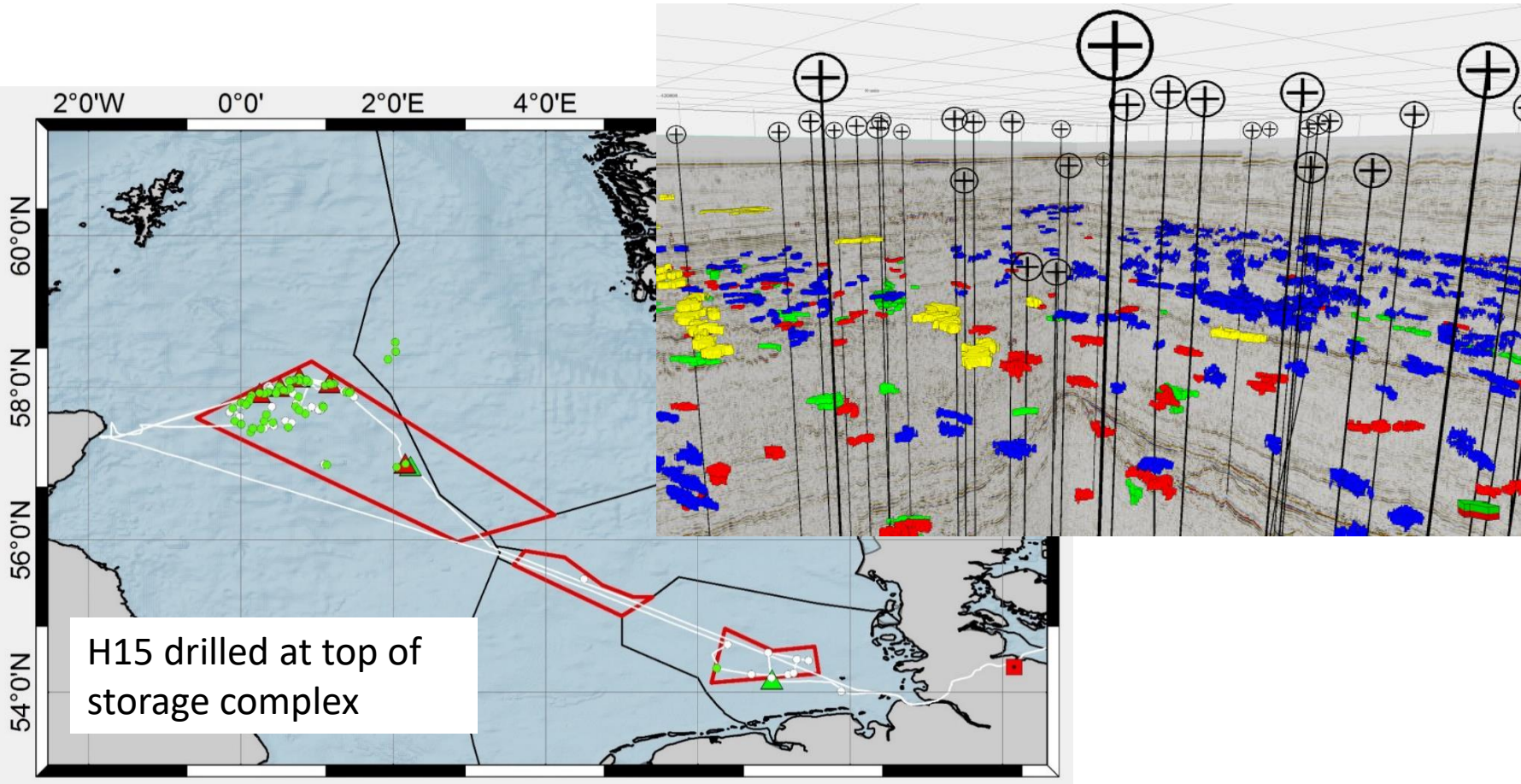
Leakage Risks: along existing boreholes

North Sea hosts **20,507 boreholes** (~17,000 excluding sidetracks)



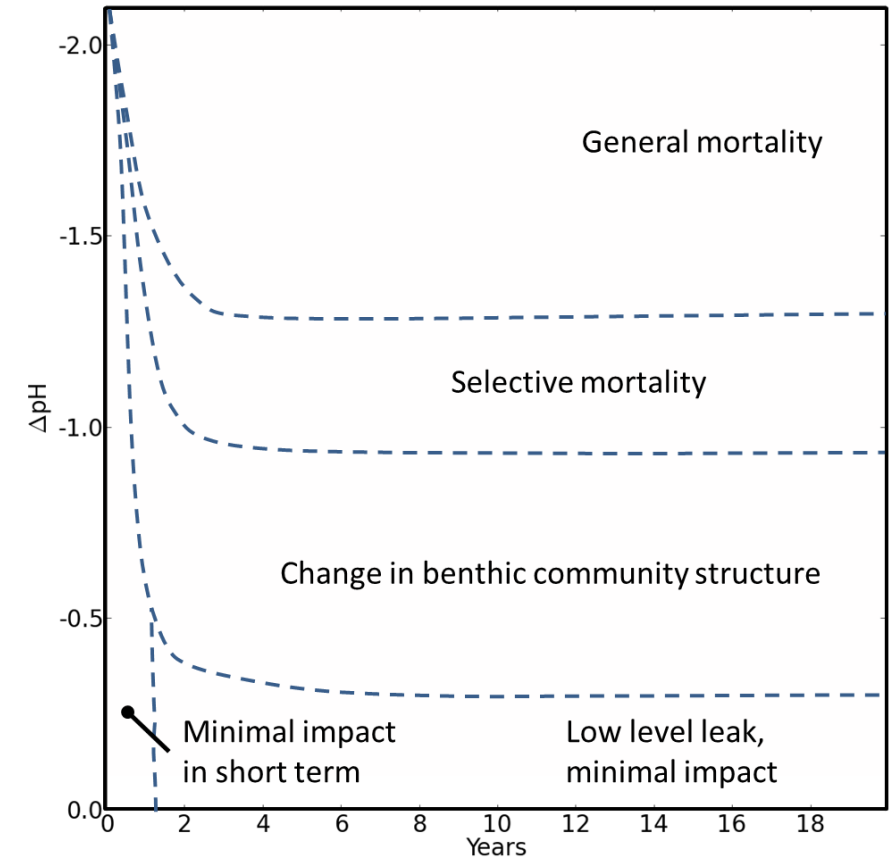
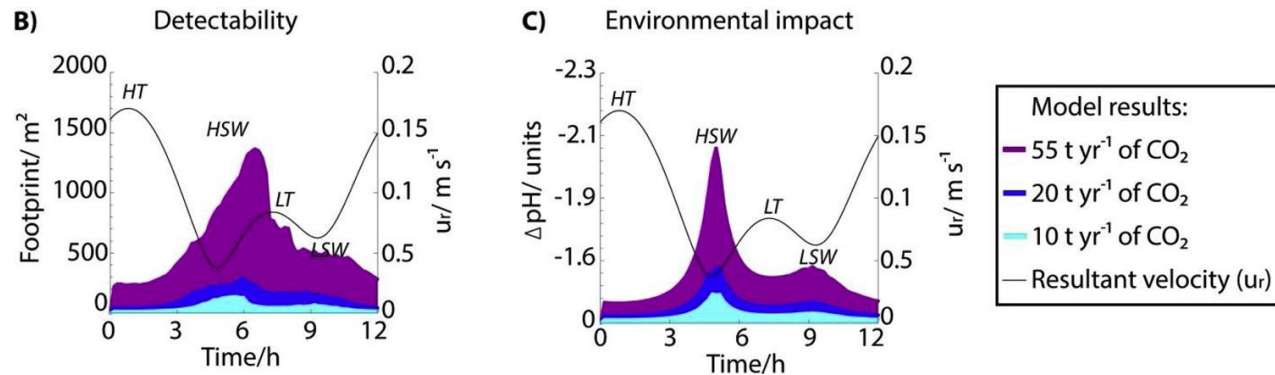
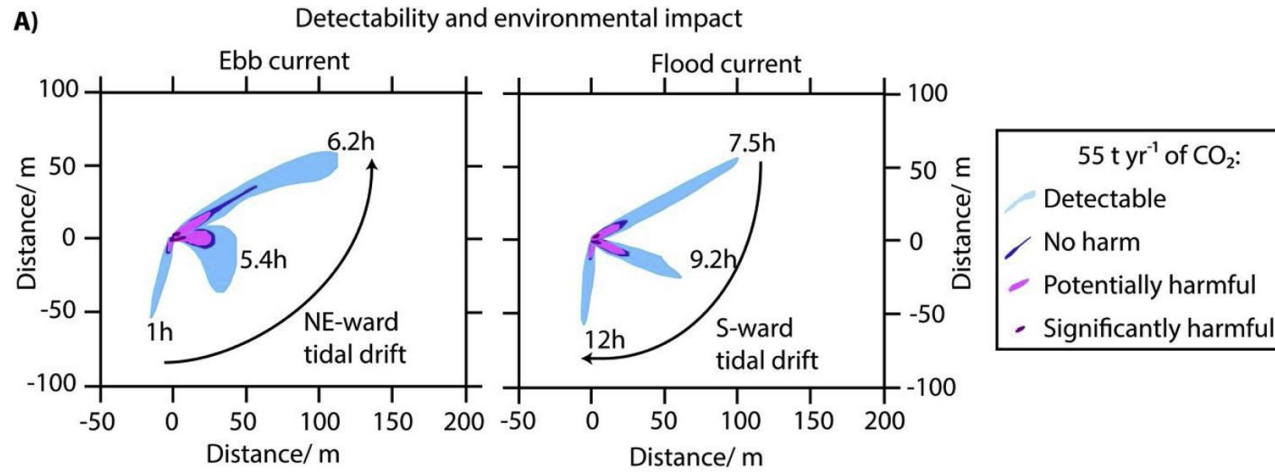
Leakage Risks: along existing boreholes

- 121 boreholes surveyed with hydroacoustics: 59 showed flares
- 7 boreholes sampled: biogenic CH₄ is emitted
- leakage highly likely, if drilled within 1km lateral distance from gas accumulation
- North Sea: 30-50 % of the wells (0.8-5 t/a per well) => 3-30 kt/a (1/3rd into atmosphere)



Leakage Risks: along existing boreholes

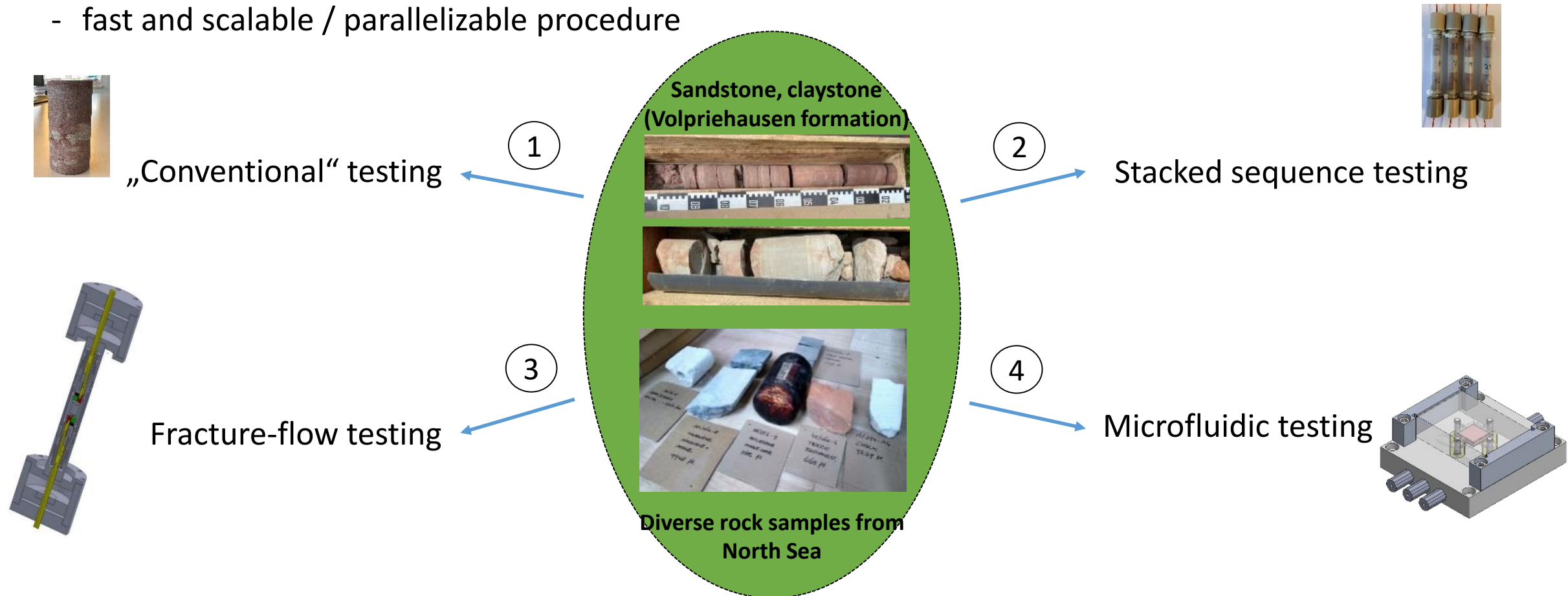
- Footprints at seafloor of North Sea related to CO₂ leakage of 10 / 20 / 55 t/a



Sub-surface reactive transport

Procedure for THCM testing and leakage risk analysis

- standardizable approach for coupled thermo-hydro-chemo-mechanical coupled process testing
- complementary, comparable and sufficiently large data sets (suitable for ML procedures)
- robust with regard to sample availability and quality
- fast and scalable / parallelizable procedure



Sub-surface reactive transport

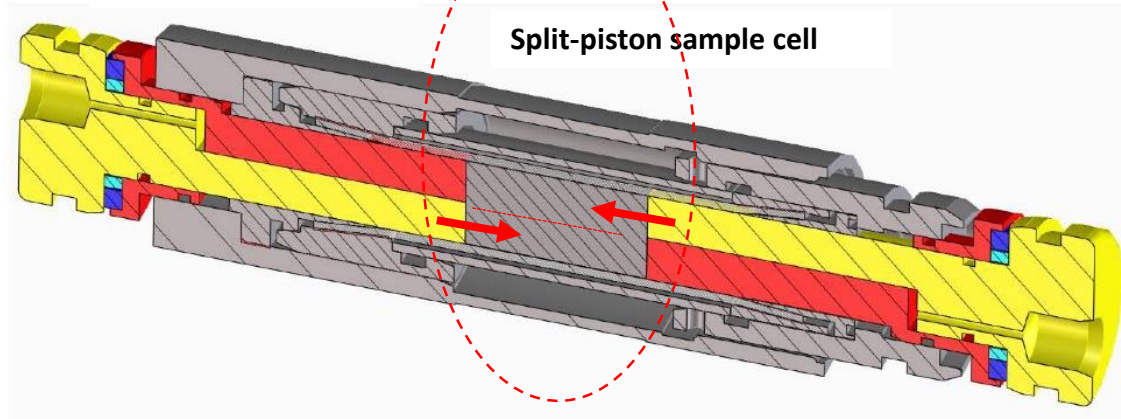
Fracture-flow testing



3 Fracture-flow testing

- THCM testing with in-situ fracture formation
- Interactions between chemical reactivity and fracture dynamics / flow
- Small samples (sample diameter 10 mm, height 20 mm)
-> fast and flexible

Fractured specimen recovered from sample cell



High-pressure cell working concept

