



Subsurface coring for CCS applications

Shallow subsurface coring with a robotic seafloor drill to aid the understanding of leakage pathways from carbon storage reservoirs.

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 654462



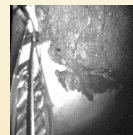
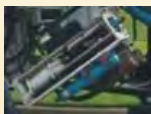
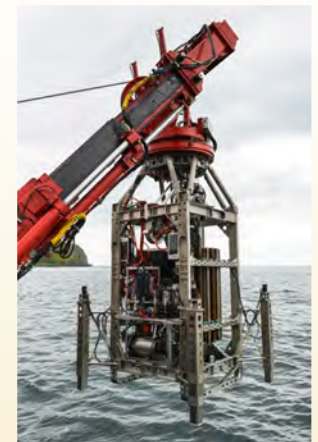
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Summary

- What can the BGS remote seafloor drill (RD2) do for the CO2 storage community?
 - Our current capability
 - Coring the Scanner Pockmark for STEMM-CCS
 - Future possibilities?

50 years of history



1970's

1980's

1990's

2000's

2010's



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RD2 - Key Specifications & Capability

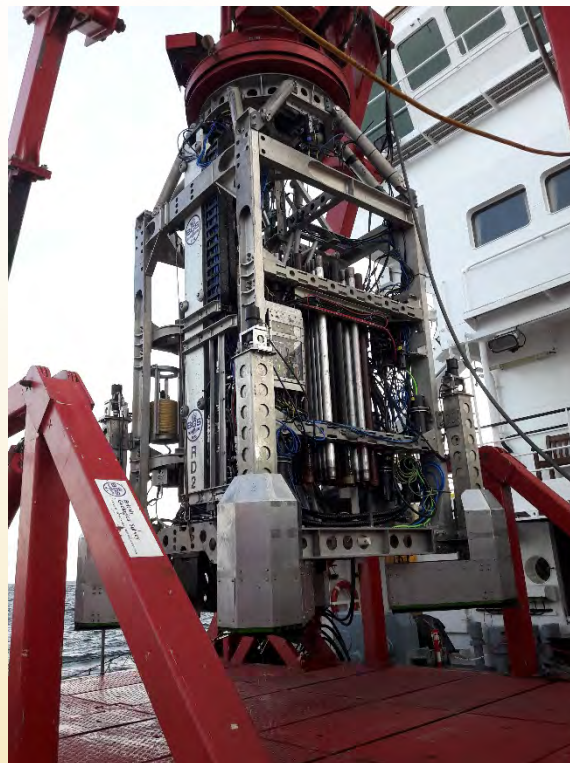


Coring / Drilling Specifications

- **Up to 50 m penetration**
- Rotary coring
- Core size 61.1mm
- 1.72m individual core length
- Borehole diameter ~98mm
- Suite of logging tools & scientific sensors

Proven capability

- **Deepest core 41 m**
- **Longest core 32 m**
- Lithologies cored: marine sediments to igneous rocks
- Core recovery up to 104%
- >300m total cored length



Operational Specifications

- **4000 m operating depth** (proven to 3550 m)
- Up to 18° of slope on seabed (proven on 9° slope)
- Capable of landing on soft sediments to hard seabed
- Launch & recovery in up to 5.5m wave height
- Containerised for mobilising on research & supply vessels



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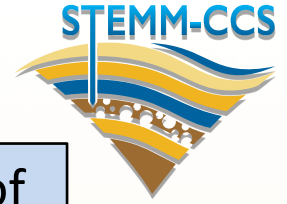
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The research question



Could a sub-surface chimney structure act as a potential point of release from CO₂ storage reservoirs?

Objectives

- assess the permeability of a chimney
- collect geochemical and geophysical data to assess the connectivity of the chimney with the subsurface
- assess the pathways and degree of fluids flow through the chimney structure
- ground-truth the geophysical data and to collect data for permeability modelling

Part of STEMM-CCS Workpackage 3:

“Characterising the potential CO₂ leakage pathways through the overburden”



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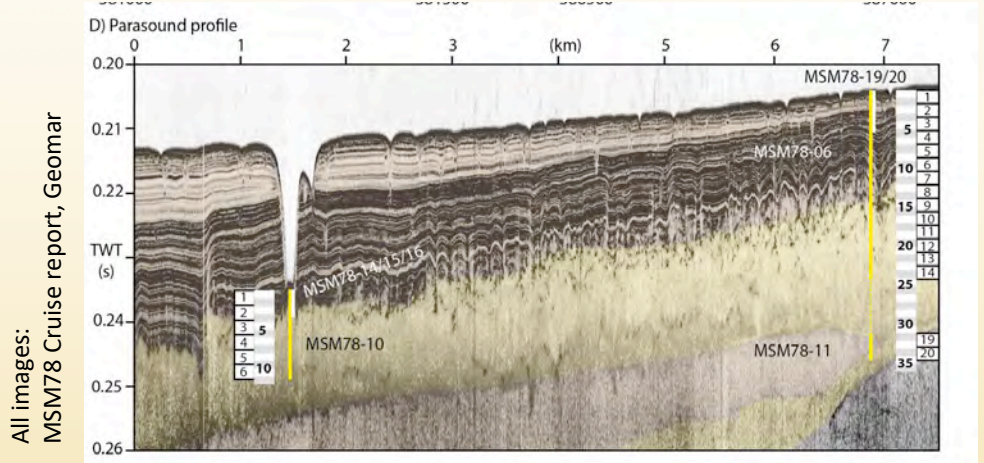
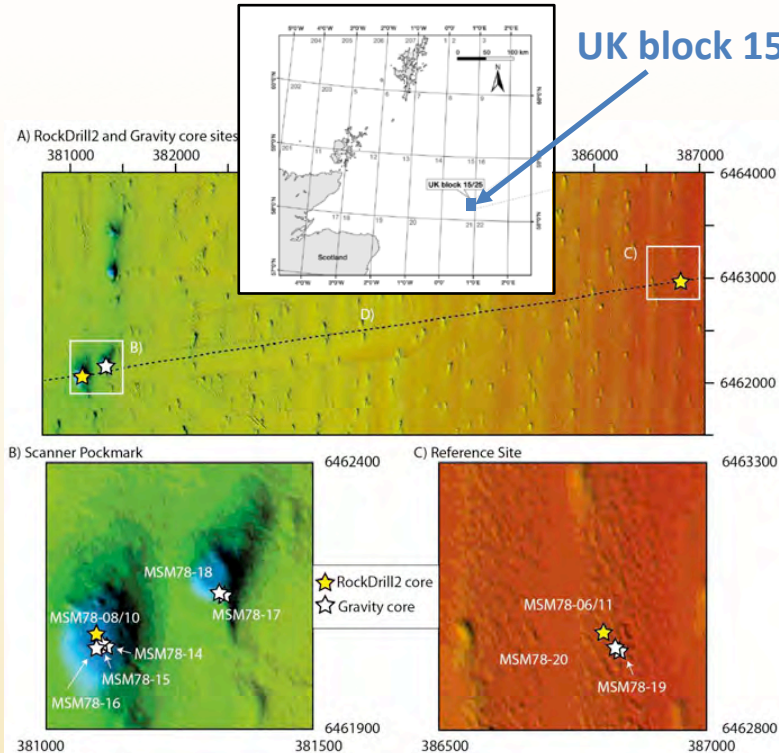


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The target: the Scanner Pockmark

UK block 15/25

- Active pockmark in UK block 15/25 (Witch ground basin)
- Roughly oval shape 900 m long, 450 m wide and 22 m deep
- Constant seepage of methane
- Carbonates on the seafloor

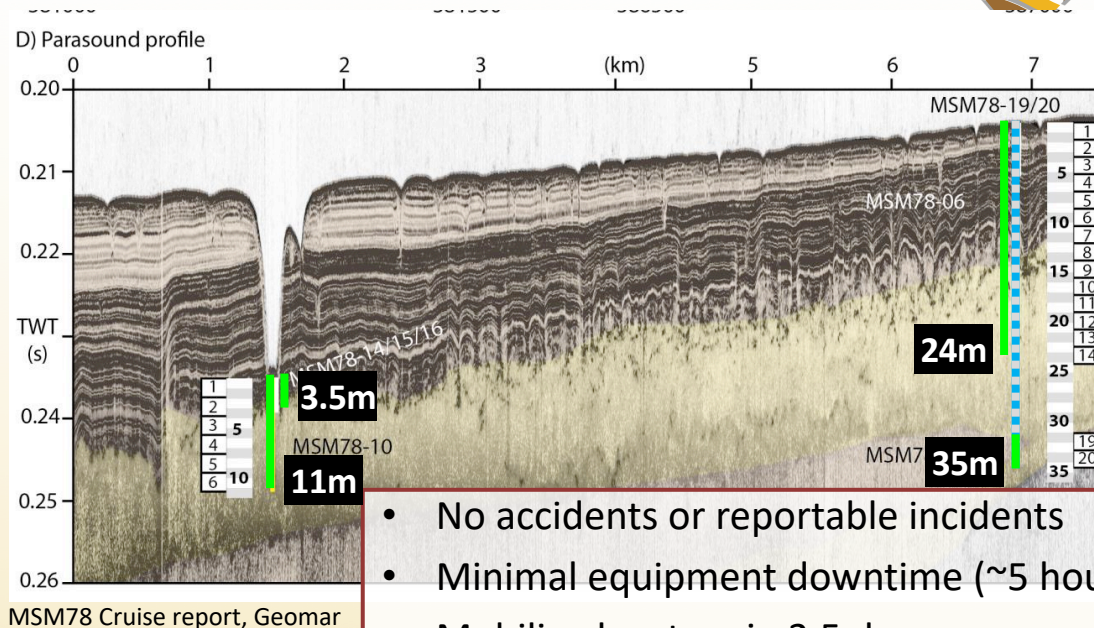


All images:
MSM78 Cruise report, Geomar

What we achieved for STEMM-CCS



74m drilled
43m cored
4 days
4 sites
55% recovery



MSM78 Cruise report, Geomar

- No accidents or reportable incidents
- Minimal equipment downtime (~5 hours)
- Mobilised system in 3.5 days
- Demobilised in 2 days



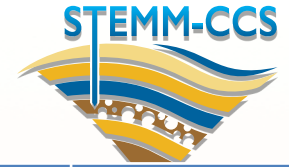
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Coring summary



| Sites | Penetration (mbsf) | Coring runs (m) | Coring Recovery (m) | Average Recovery (%) | Recovery Range (%) |
|---------------|--------------------|-----------------|---------------------|----------------------|--------------------|
| 1 | 24.2 | 24.2 | 14.7 | 61 | 24 – 103 |
| 2 | 3.5 | 3.5 | 1.7 | 42 | 19 – 66 |
| 3 | 11.1 | 11.1 | 6.0 | 54 | 3 – 90 |
| 4 | 35.4 | 3.4 | 1.0 | 30 | 13 – 31 |
| Totals | 74.8 | 42.8 | 23.5 | 55 | 3 - 103 |



Examples of recovered core material (split cores)

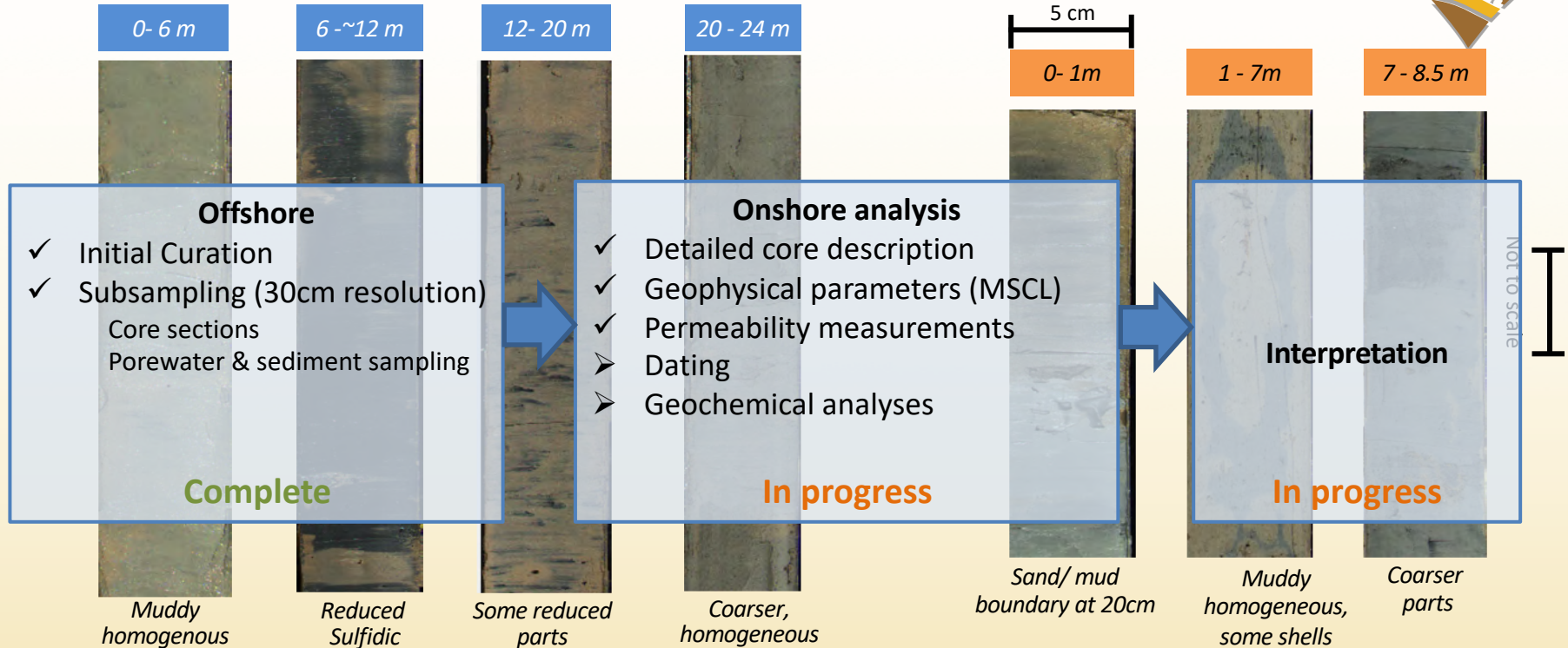


Reference

Core MSM78-06

Pockmark

Core MSM78-10



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RD2 capability for offshore CO₂ storage



- Proven capability in:
 - Characterising storage site overburden
 - Baseline environmental observation of overburden lithology, sedimentology, stability and pore water chemistry
- Future capability for CO₂ storage site monitoring:
 - Instrumentation of shallow subsurface boreholes offering increased signal to noise & improved sensor coupling

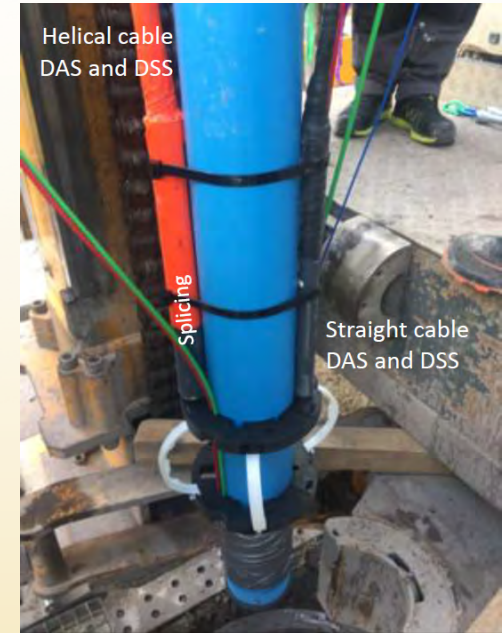


Image: Svelvik Field Lab



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Conclusions

- RD2 capability and the cores obtained are a vital part of STEMM-CCS work to characterise the overburden, including ground-truthing the geophysical data.
- Seafloor drills could play a valuable role in other aspects of the CCS industry, including in the installation of monitoring equipment.



Thank you!

