Active Seepage at Legacy Wells
Findings from the 2025 WELLFATE Survey

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WELLFATE KpN Project

Knowledge building project for the industry

2023 – 2028 | 22,000 knok

20% from Industry Partners

equinor

OKEA

80% from Funding Agency

The Research Council of Norway

Project #344447

Research Partners

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Collaborations

BGR Geological Survey Germany

DTU Technical University of Denmark
Danish Offshore Technology Center

Observers

Norwegian Offshore Directorate

Norwegian Ocean Industry Authority

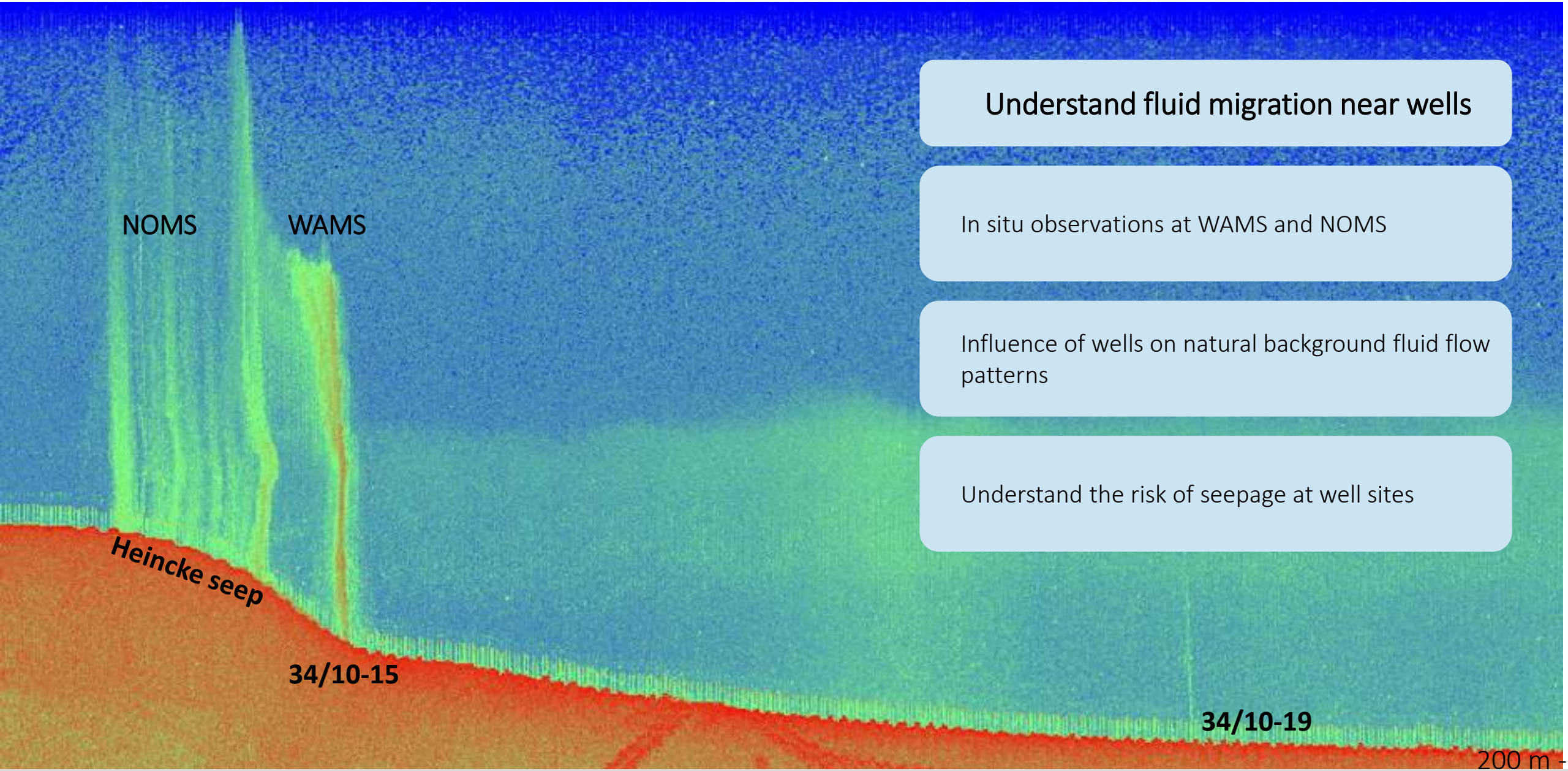
Nearly 2,000 exploration wells P&A

Ca. 2250 wells in operation on NCS

EU methane regulations

nrk.no – 13.09.2020 | 14.09.2020

Aims of WELLFATE



Understand fluid migration near wells

In situ observations at WAMS and NOMS

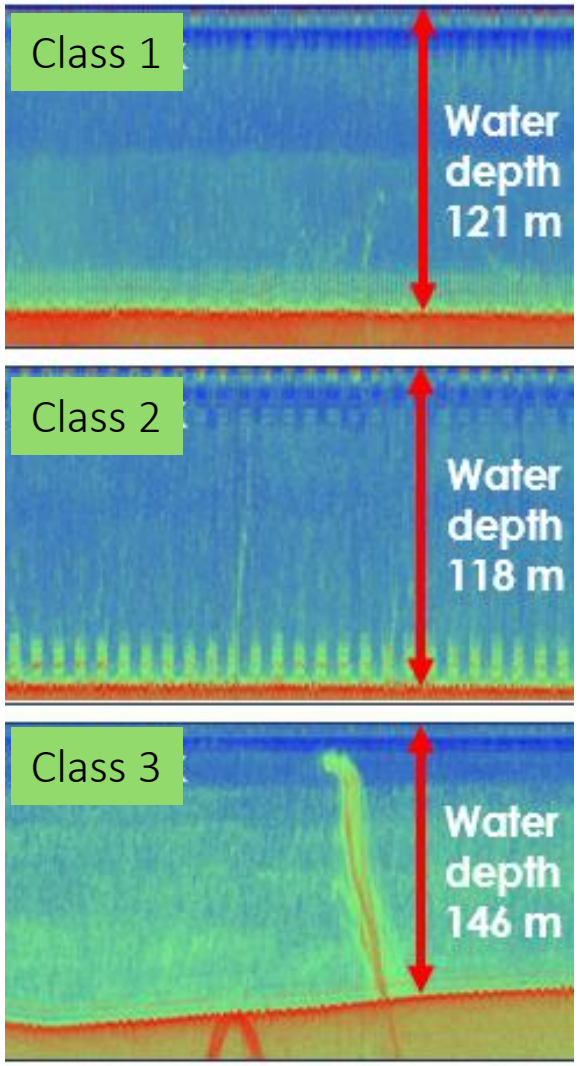
Influence of wells on natural background fluid flow patterns

Understand the risk of seepage at well sites

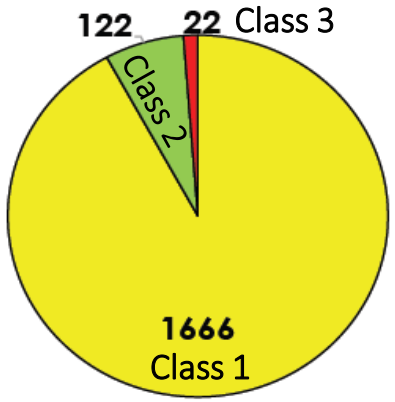
NOMS: Naturally occurring methane seep | WAMS: Well-associated methane seep | Image courtesy of NPD (Mattingsdal and Jensen, 2023)

WELLFATE 2024 | Tampen

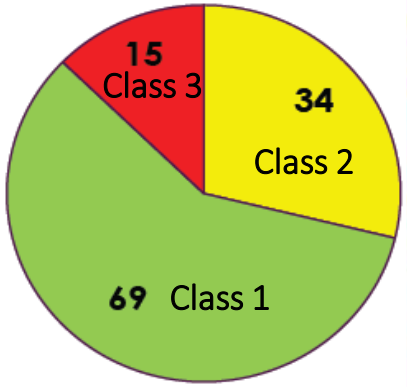
Preben Thomsen, MSc (UiO)



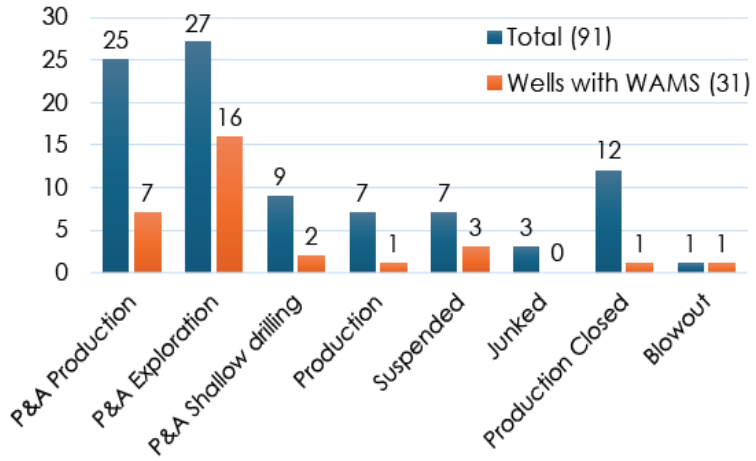
Classes of flares



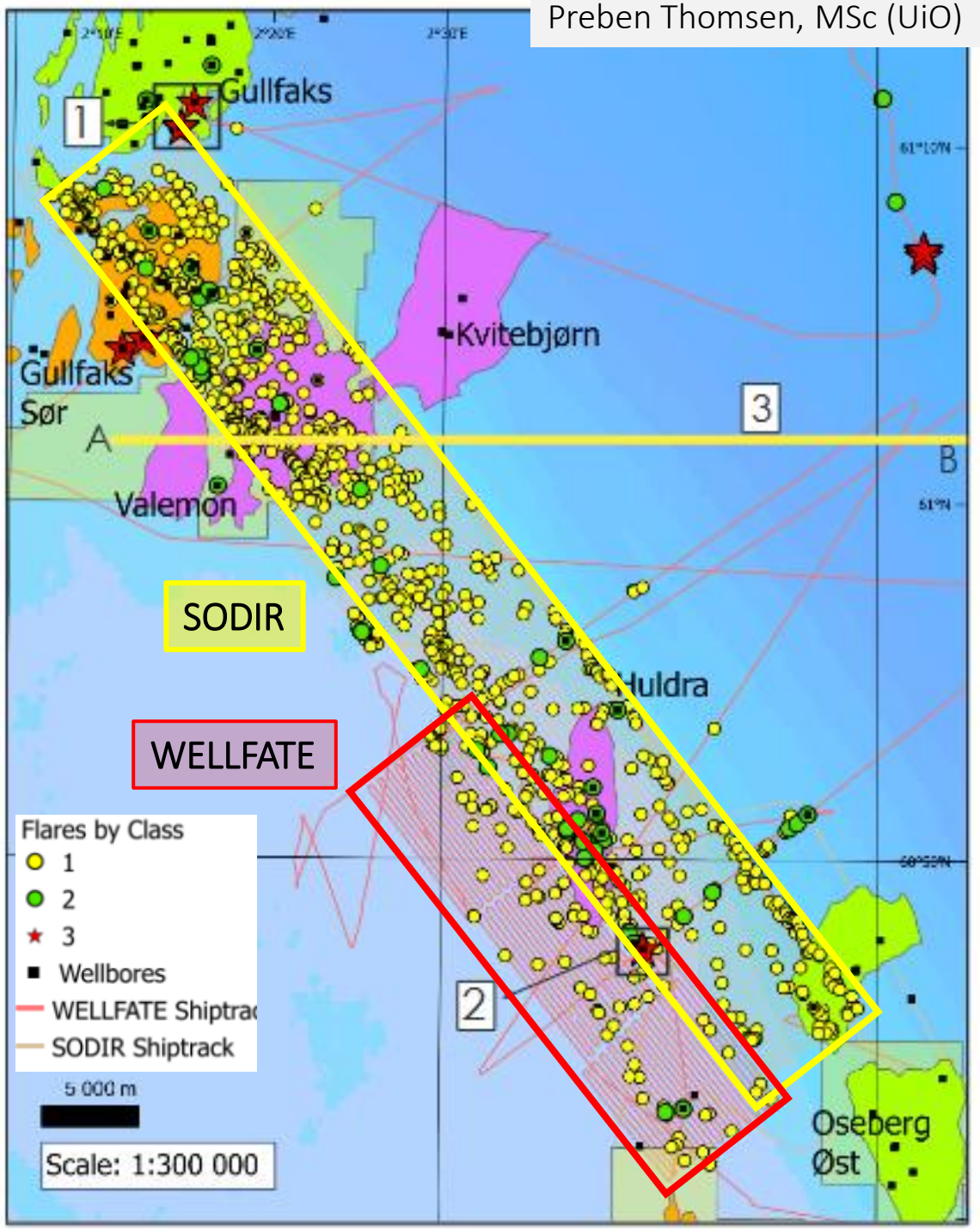
1810 flares



118 WAMS



30% wells with WAMS



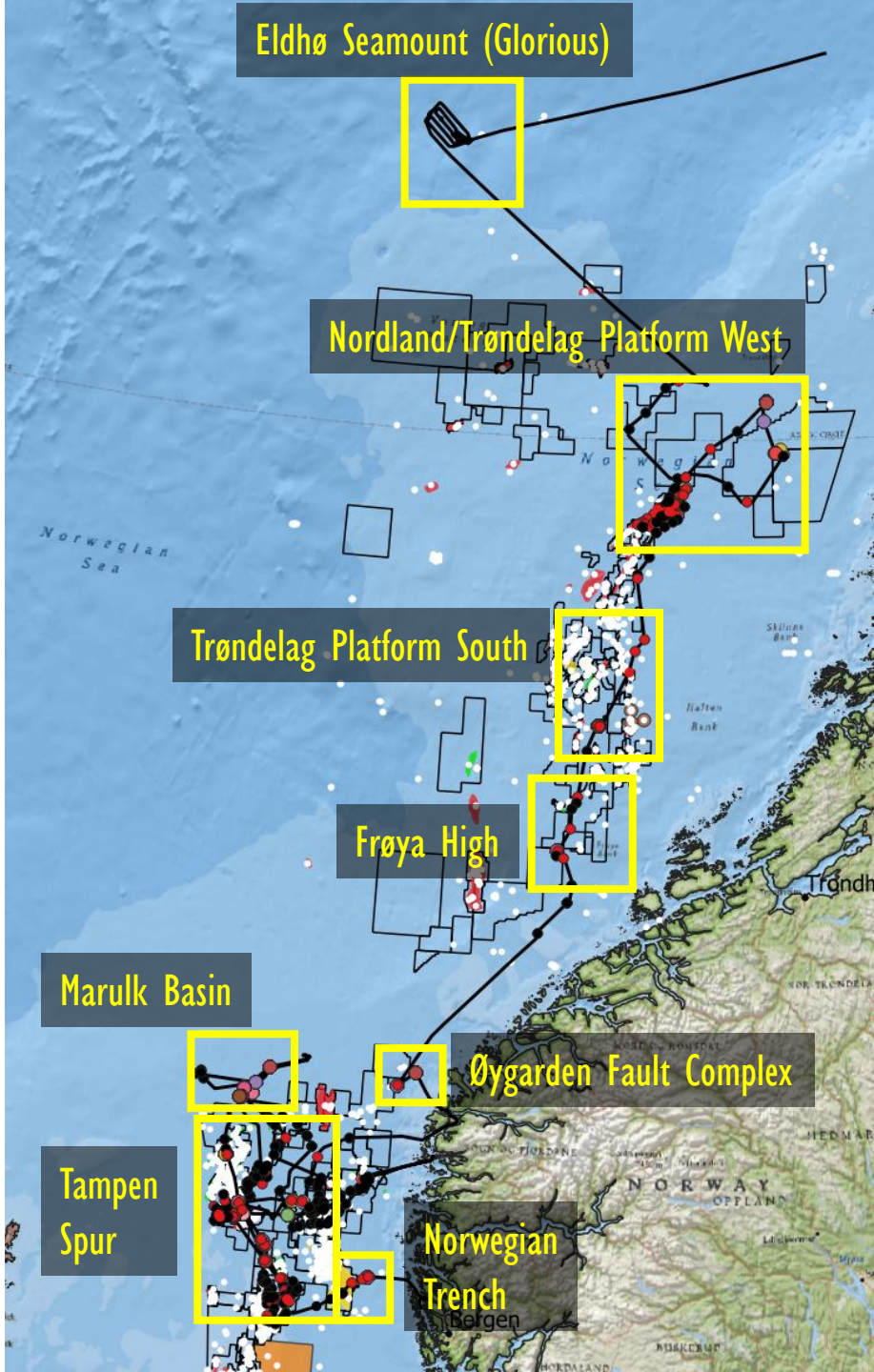
WELLFATE 2025

Mob in Tromsø: 19 June | Demob in Bergen: 9 July

Aurora ROV from RevOcean

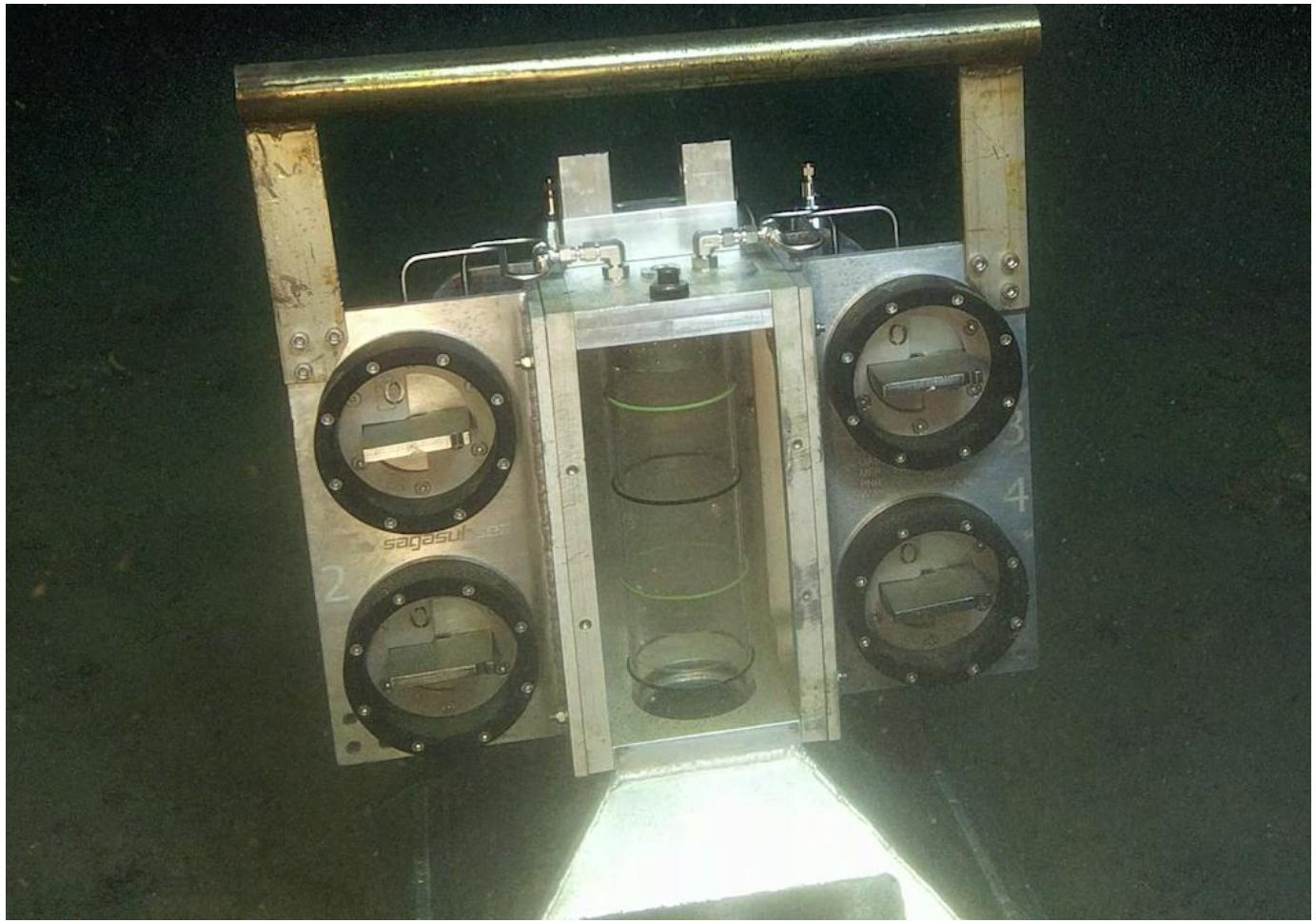
Seabed lander

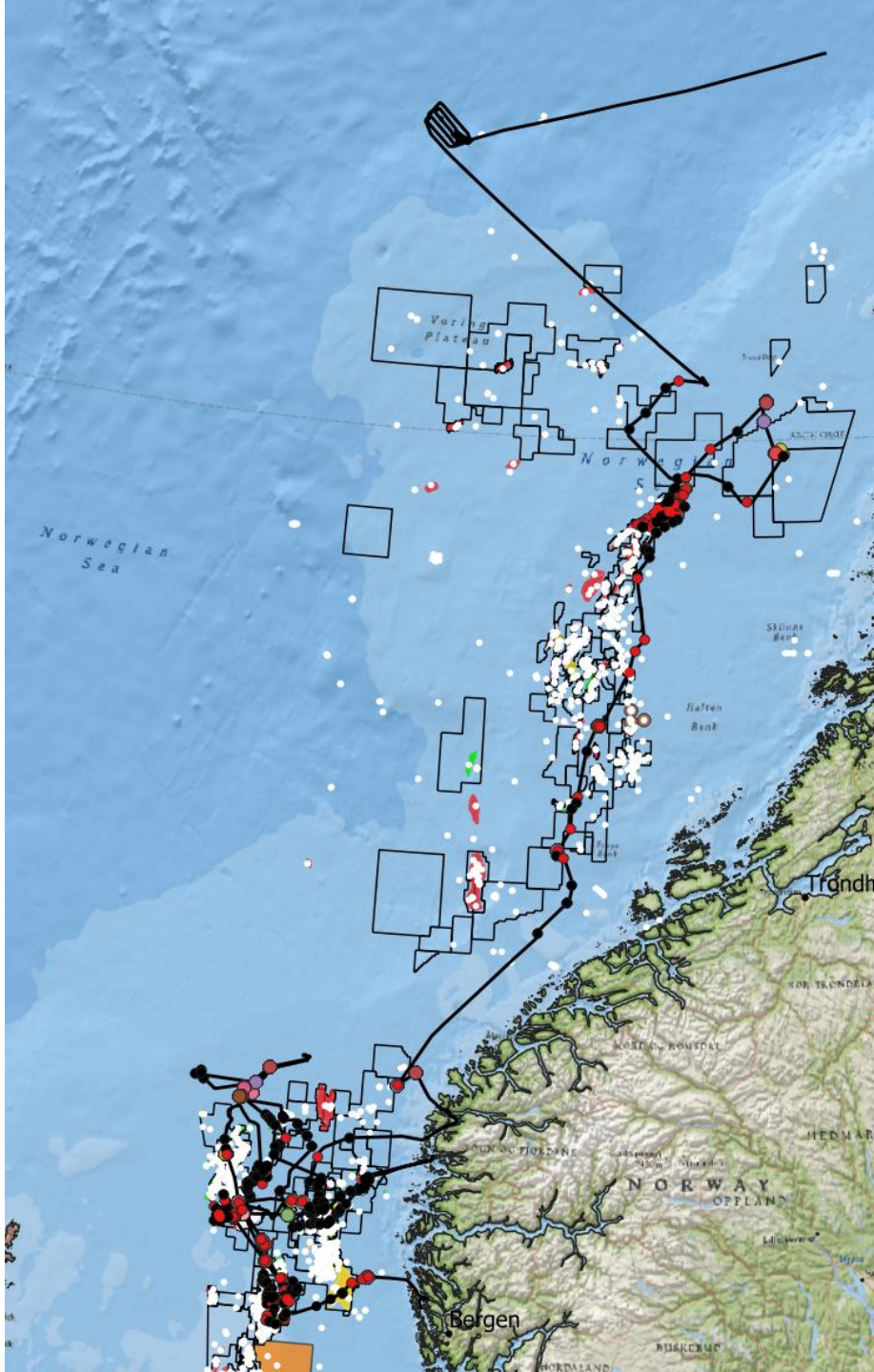
Kronprins Haakon



Overview Operations

Surveyed wells using water column data
241 wells (including NPD22, WELLFATE2024, EXTREME24)
30.3% of exploration wells with WAMS
Sampling of gas at WAMS and NOMS

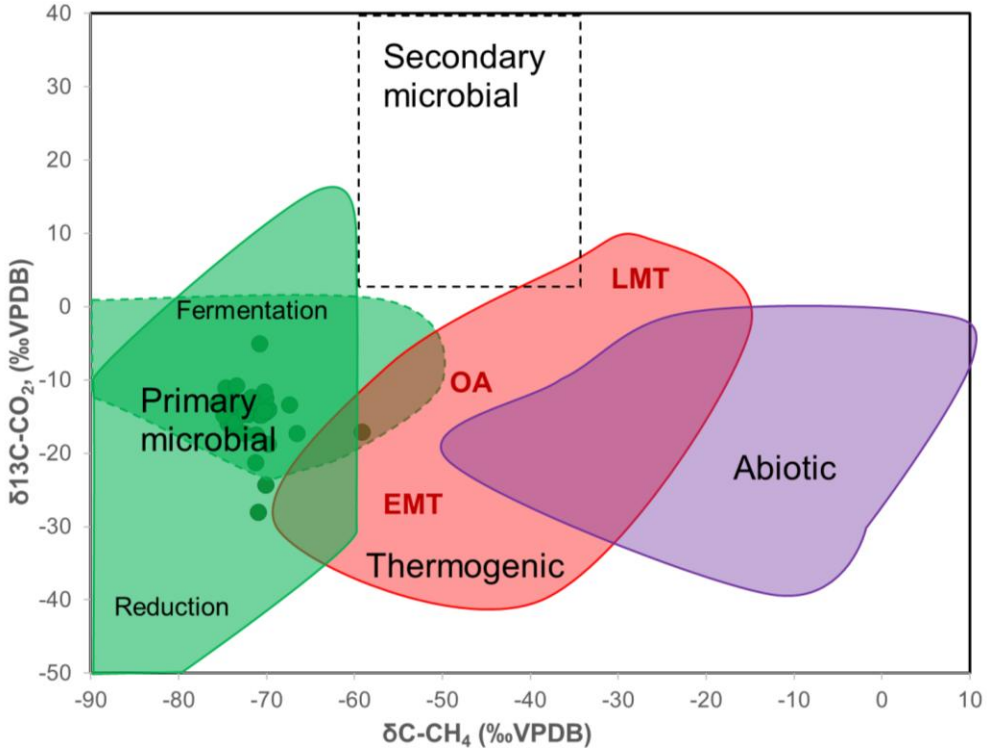


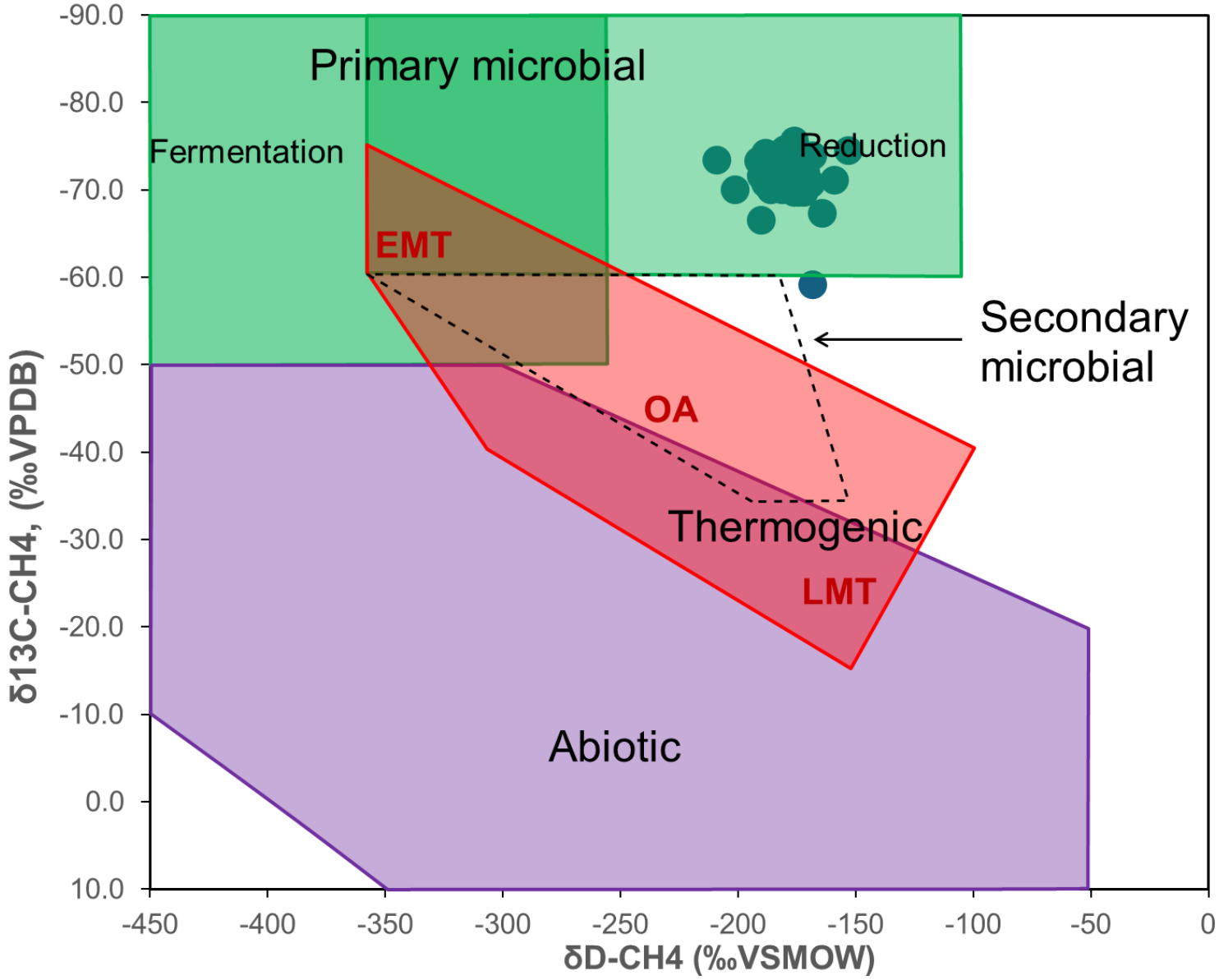


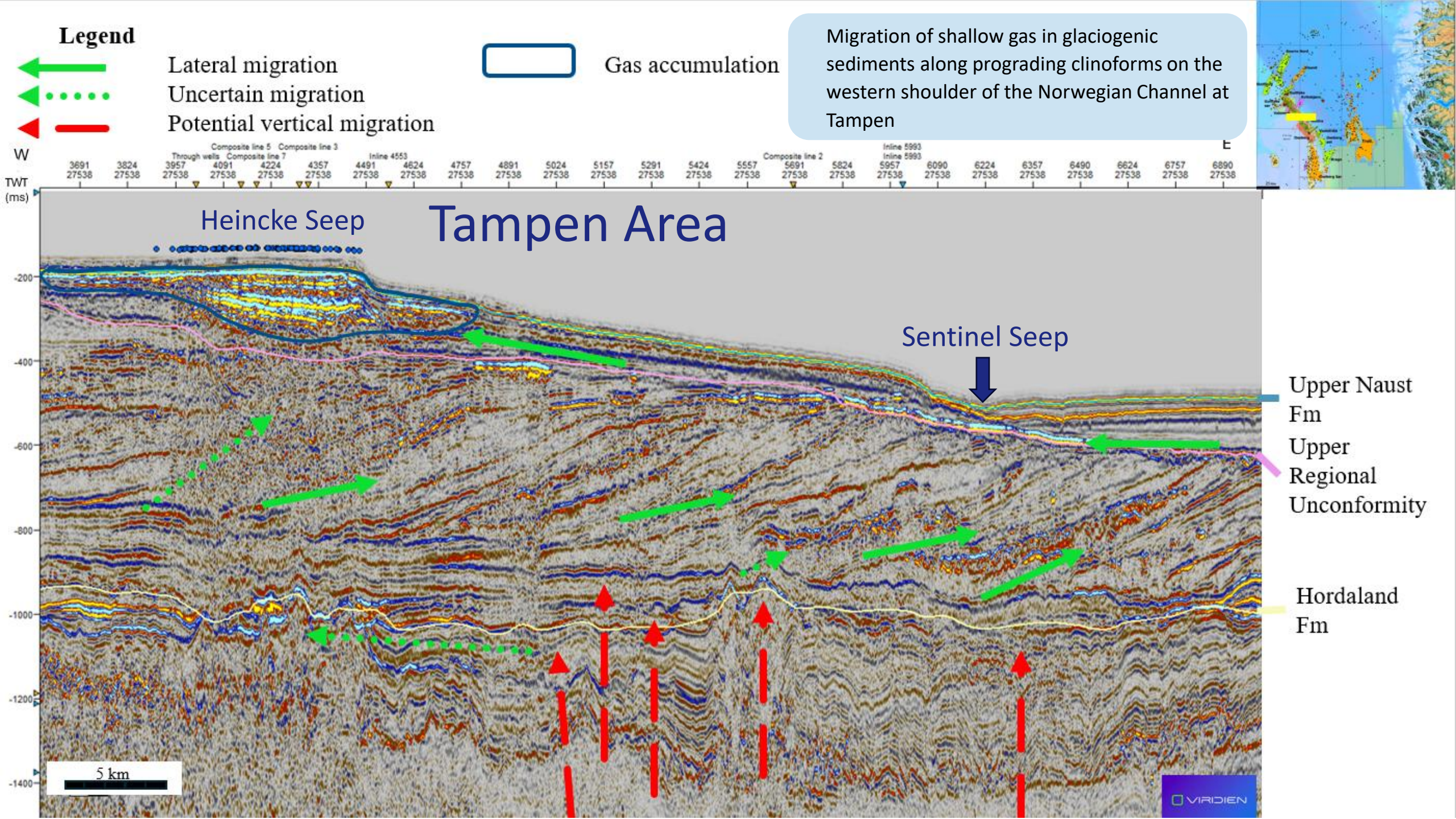
Microbial Gas | Shallow Origin

CH_4 and CO_2 with microbial signature

WAMS and NOMS



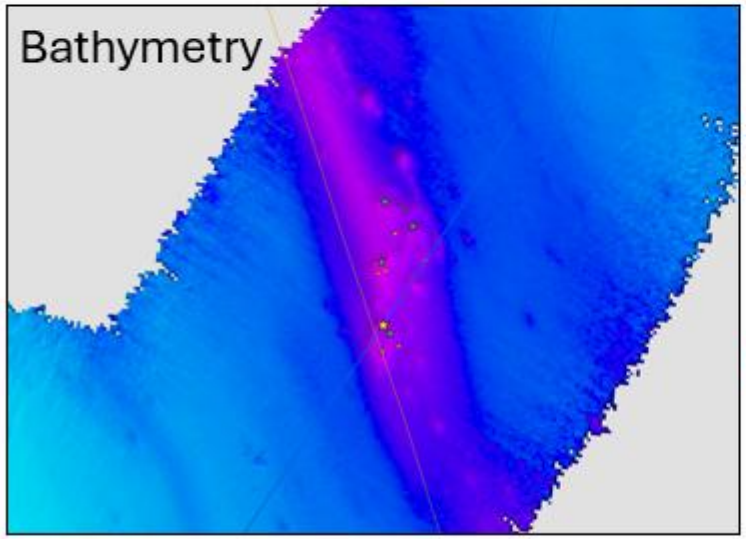


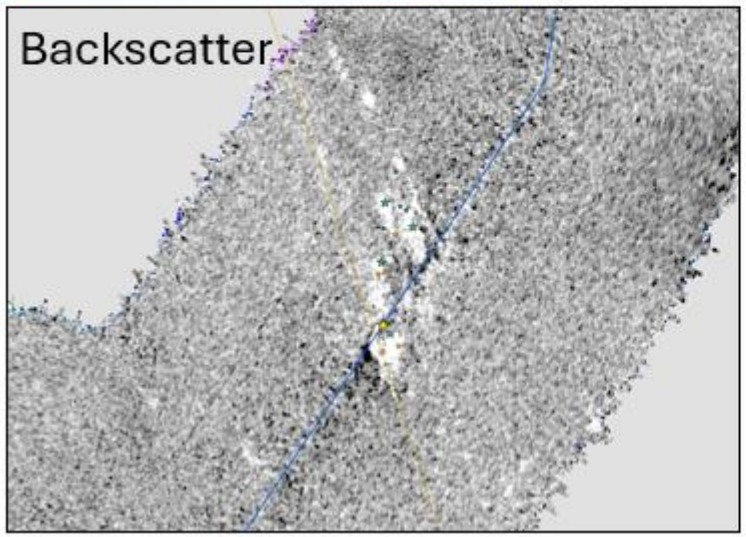

Legend
Lateral migration
Uncertain migration
Potential vertical migration
Gas accumulation
Migration of shallow gas in glaciogenic sediments along prograding clinoforms on the western shoulder of the Norwegian Channel at Tampen
W
E
TWT (ms)
Heincke Seep
Tampen Area
Sentinel Seep
Upper Naust Fm
Upper Regional Unconformity
Hordaland Fm
5 km
VIRIDIEN

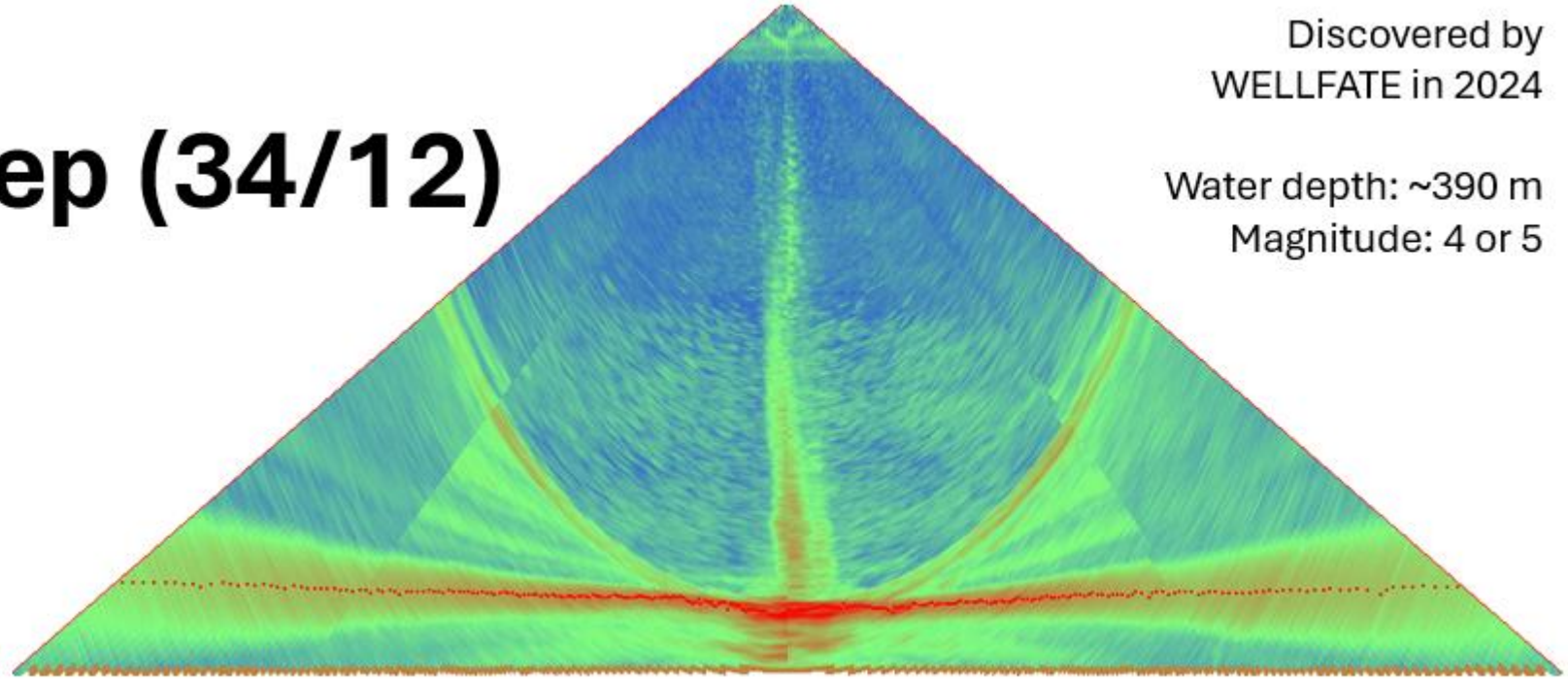
The Sentinel seep (34/12)

Discovered by
WELLFATE in 2024

Water depth: ~390 m
Magnitude: 4 or 5

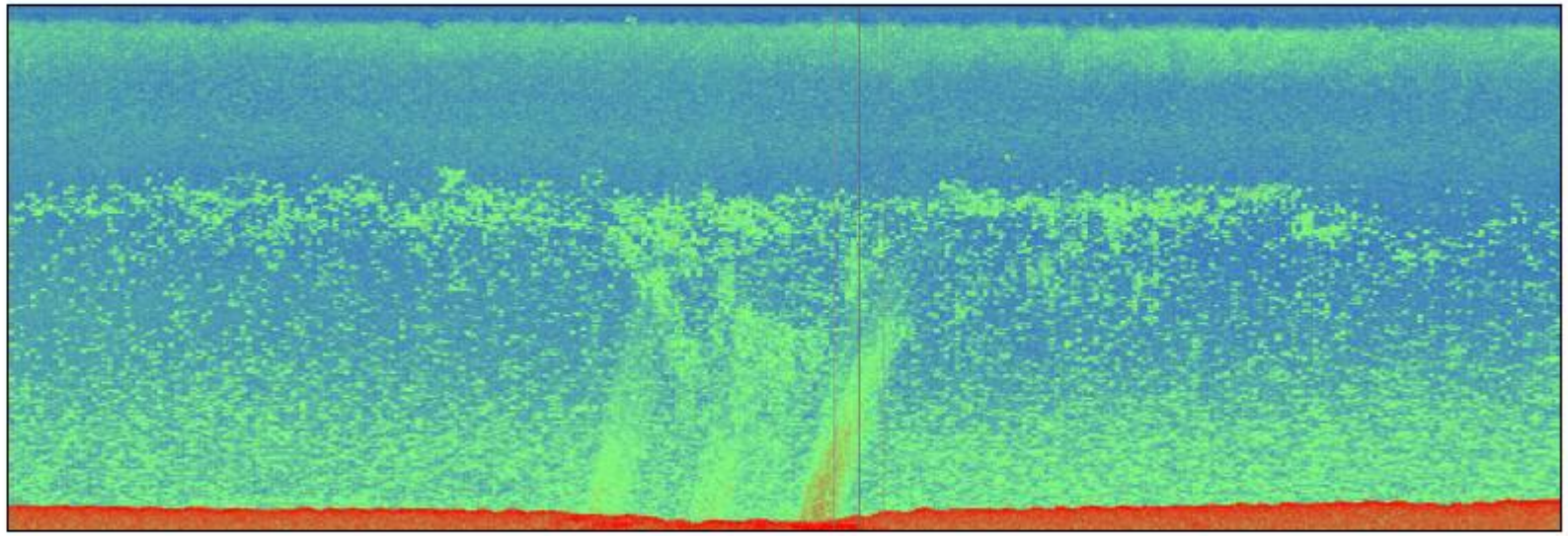




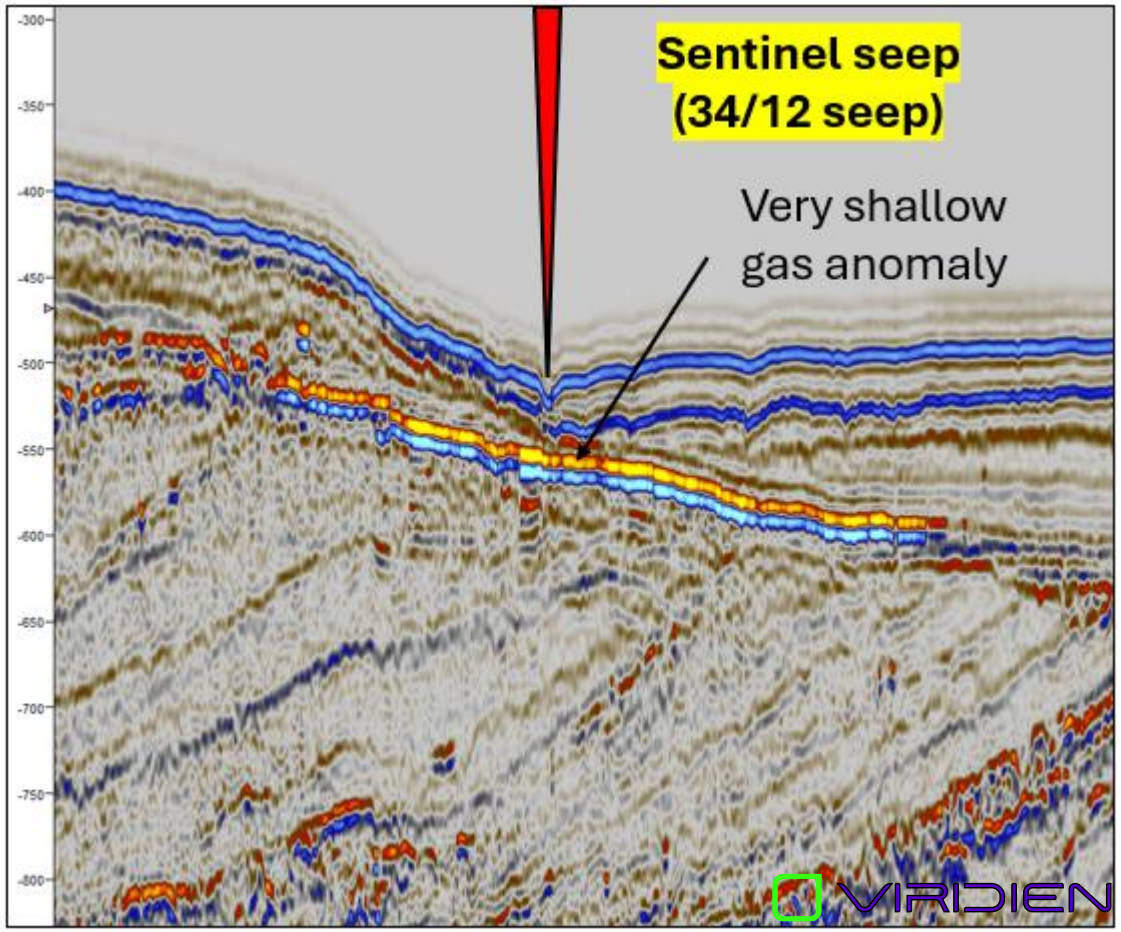


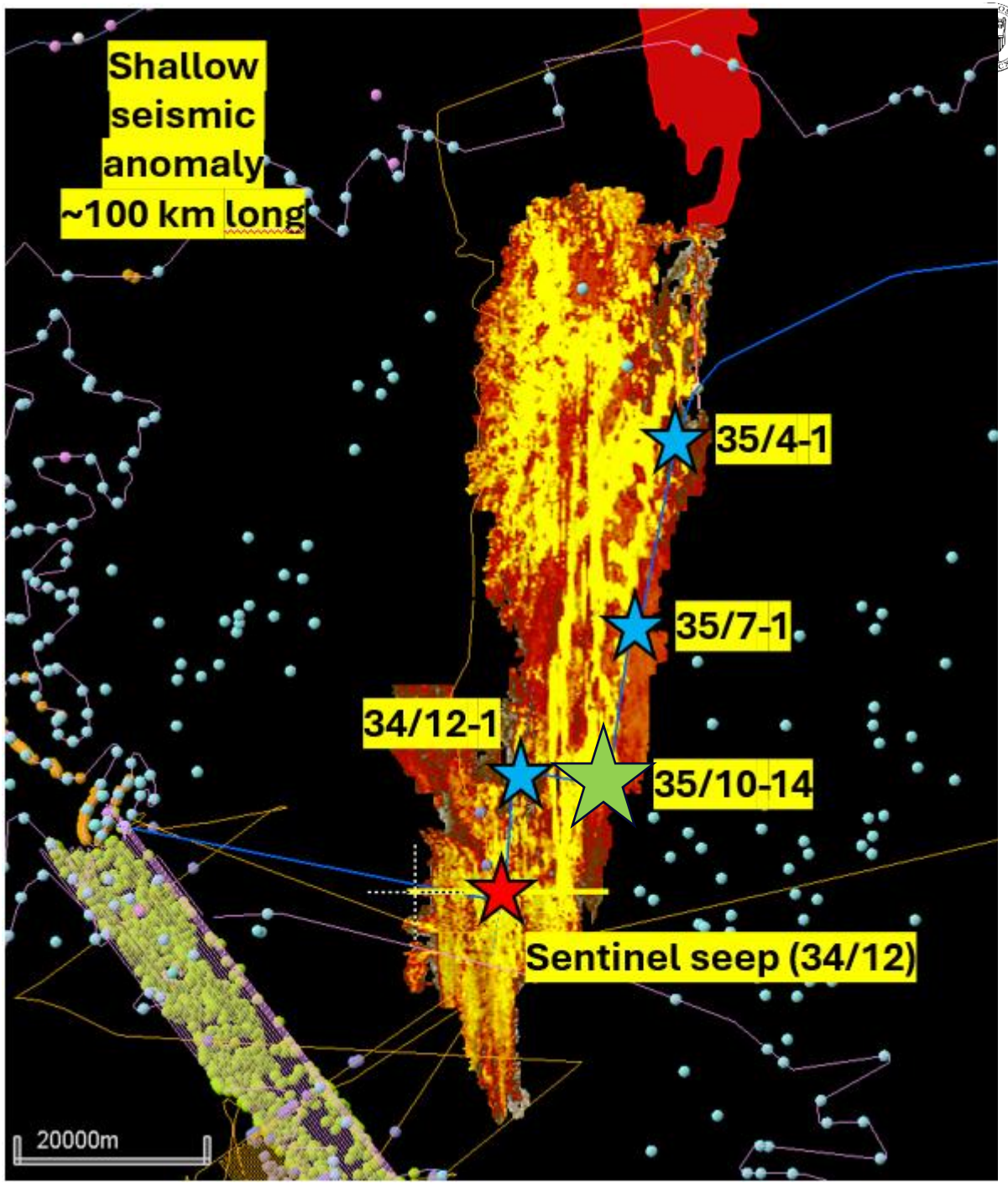
Dive 21

Gas sample: 05-GasS-15

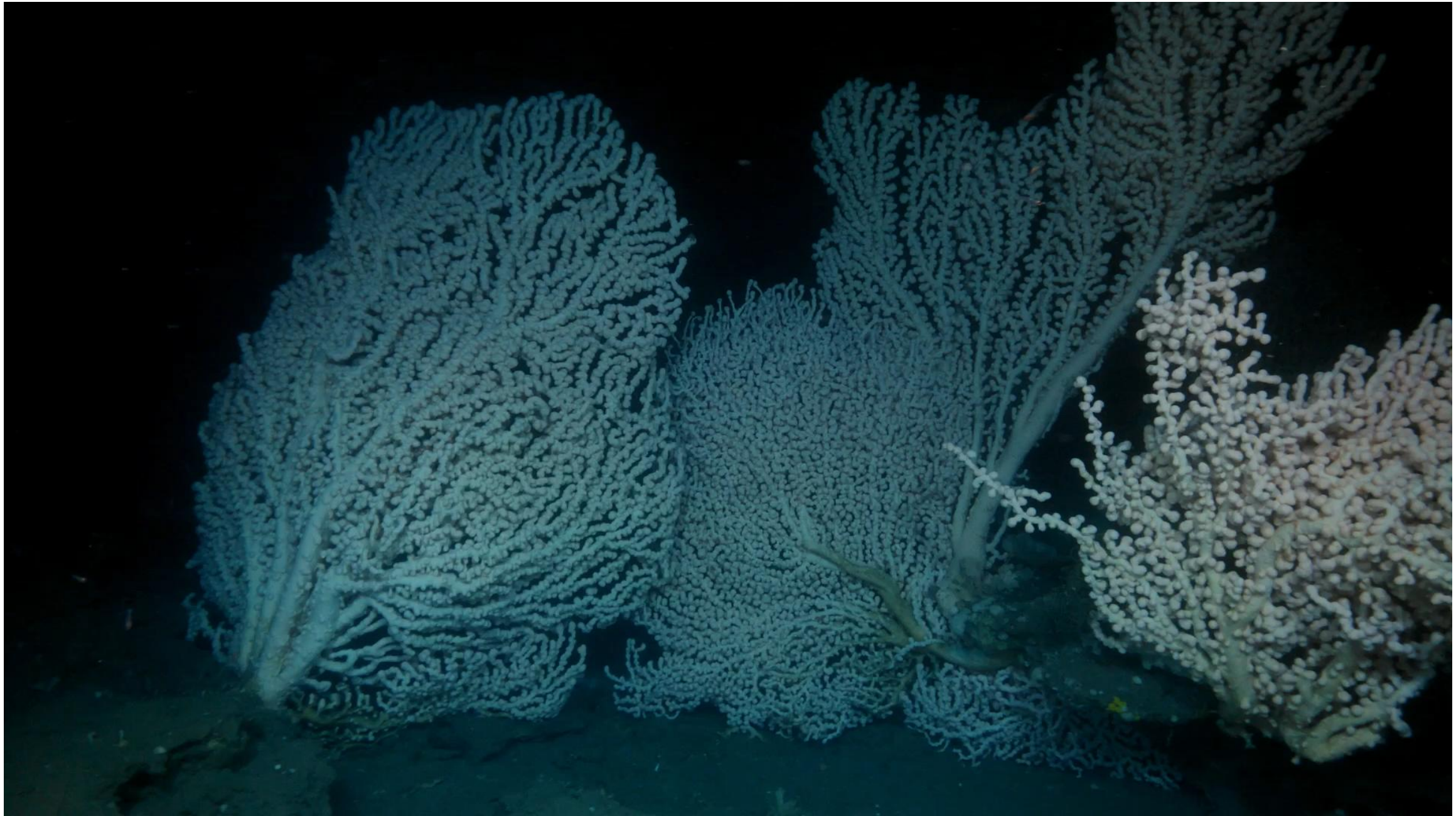


The Sentinel seep and shallow seismic anomaly Dive #21



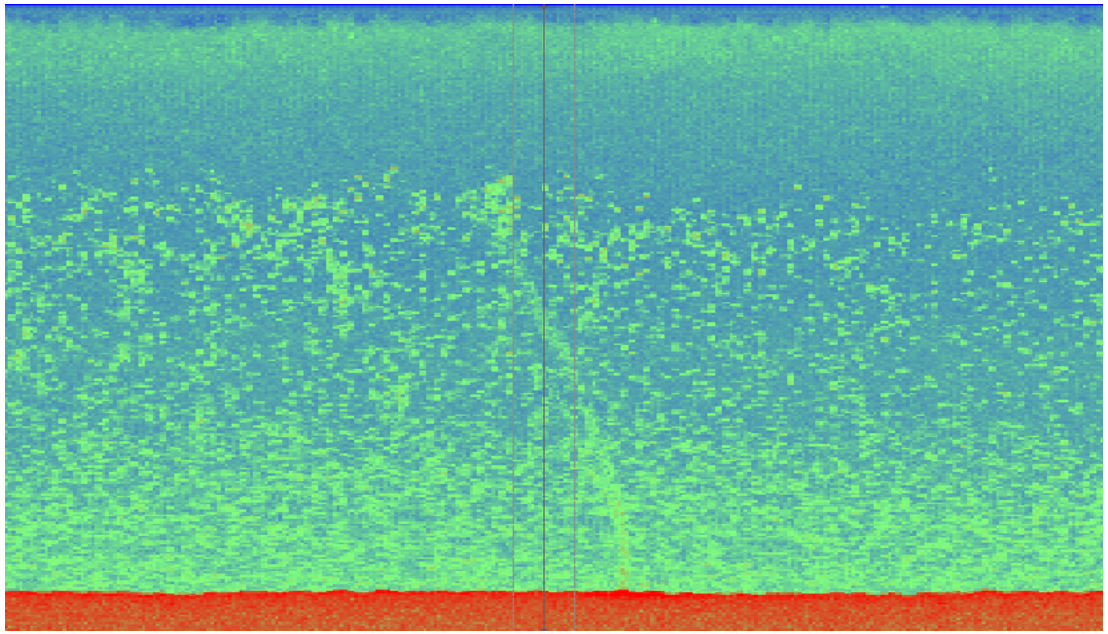


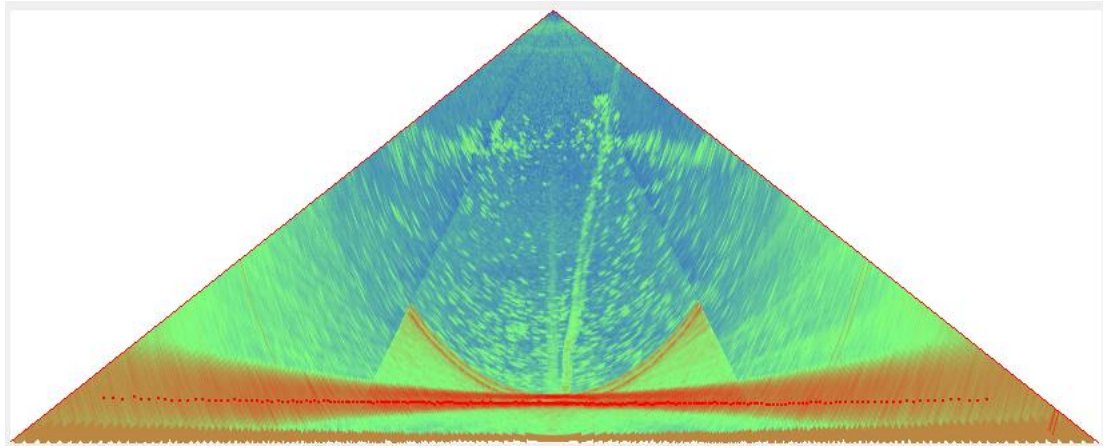
Dive #21 | Sentinel Seep Site 34/12



Dive #28 | 35/10-14

- Type: Exploration
- Status: Plugged ?
- Drilling Operator: Equinor Energy AS
- Completed Date: 29.10.2024
- Content: Dry
- Water Depth: 376
- PL1185 (Equinor, Vår, Sval, AkerBP)

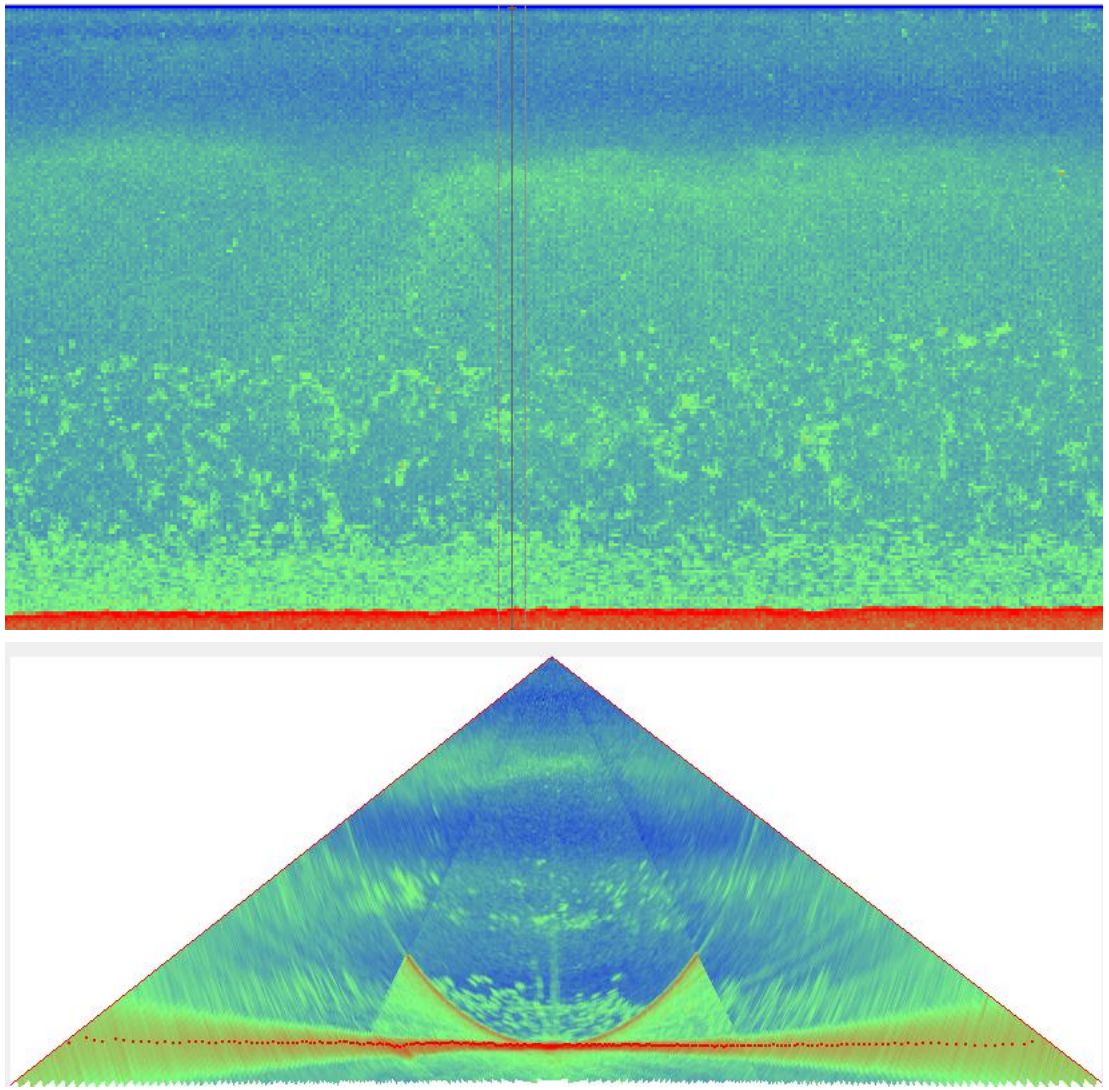




Magnitude 3

Dive #39 | 34/7-27

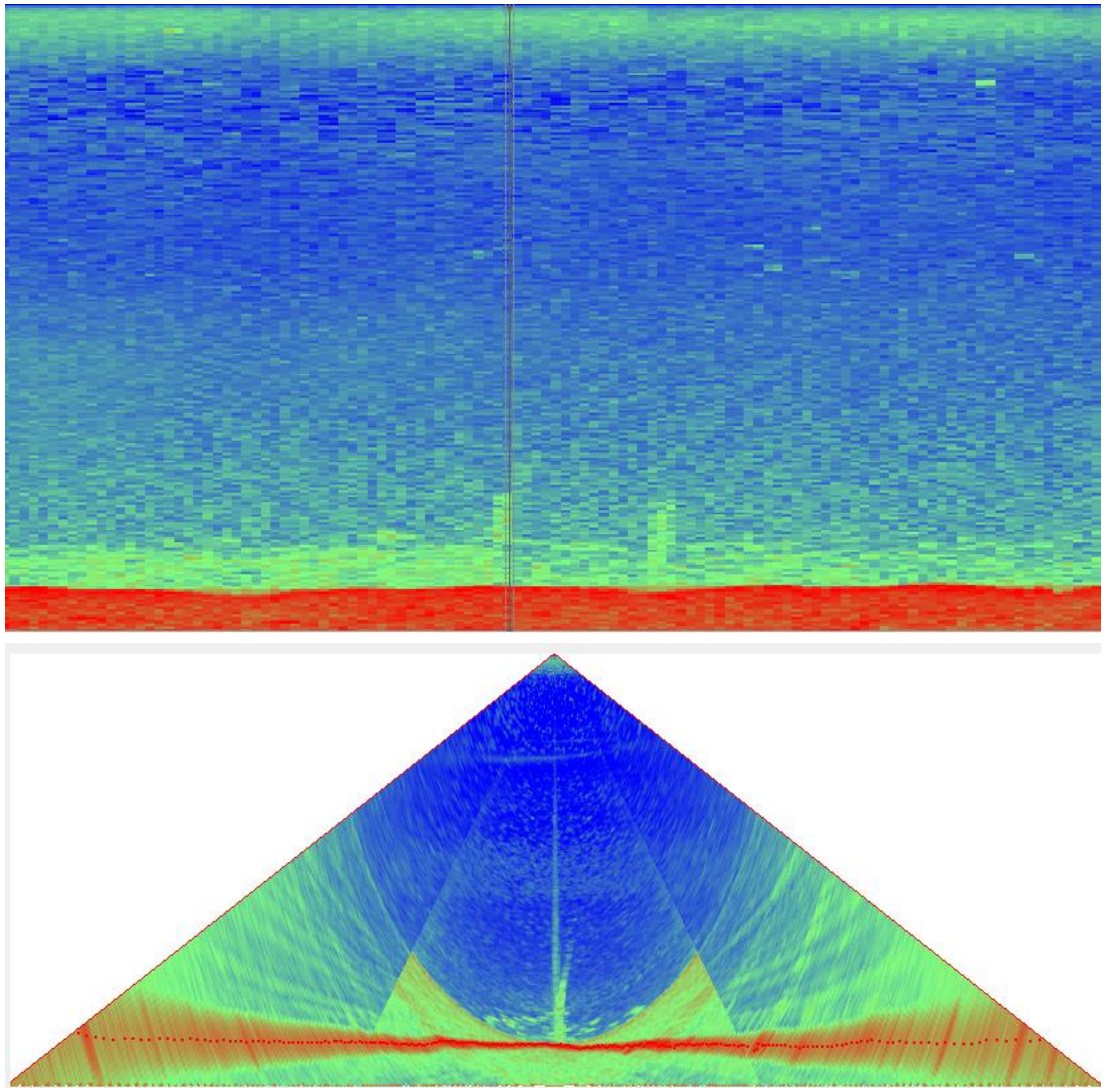
- Type: Exploration
- Status: P&A
- Drilling Operator: Mobil Exploration Norway INC
- Completed Date: 07.10.1998
- Content: Dry
- Water Depth: 311
- PL089 (Equinor, Petoro, Vår, Inpex, Harbour)



Magnitude 1

Dive #09 | 6608/11-6

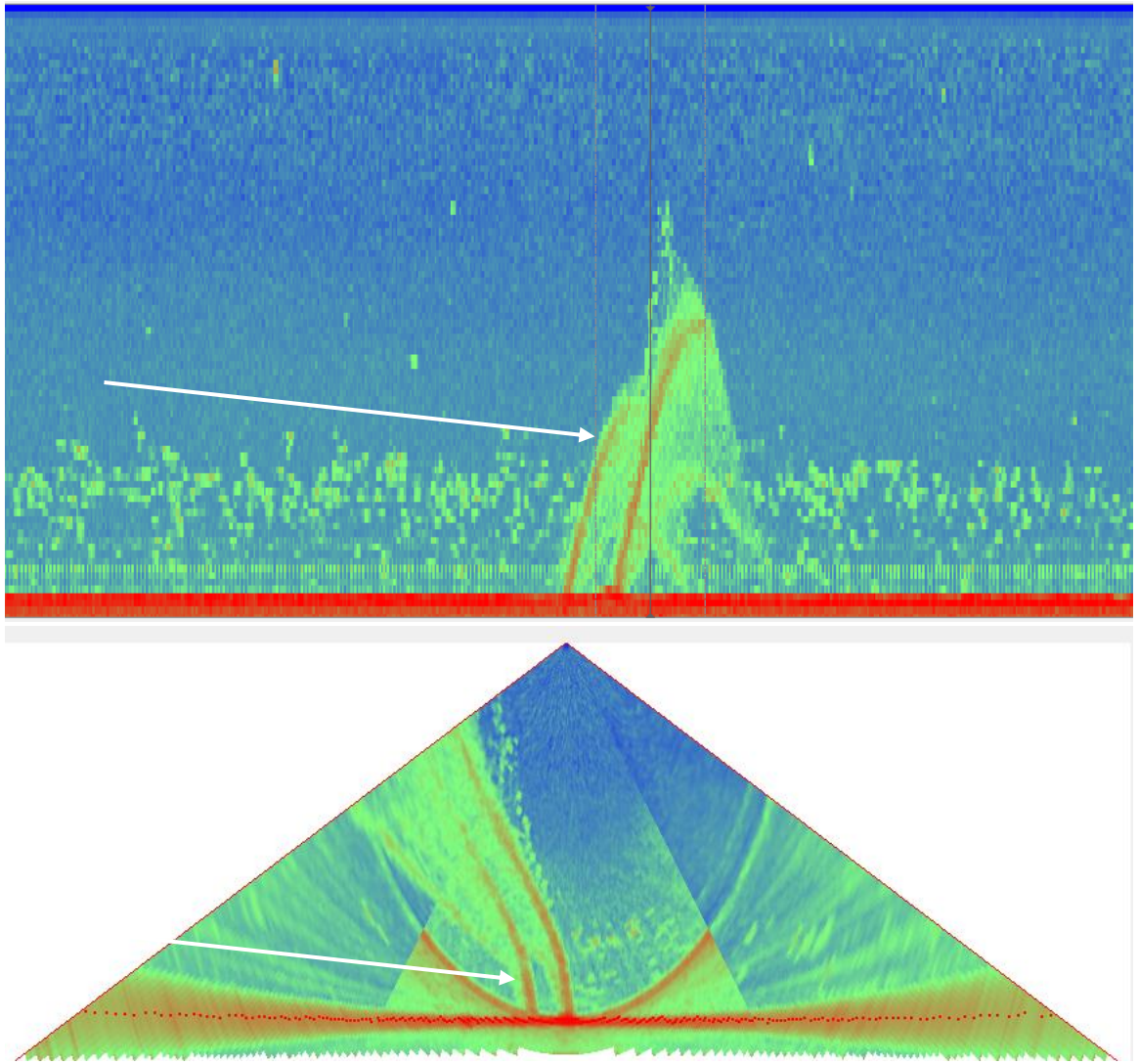
- Type: Exploration
- Status: P&A
- Drilling Operator: StatoilHydro ASA
- Completed Date: 06.08.2008
- Content: Dry
- Water Depth: 357
- After setting the 9 5/8" casing at 1300 m, gas was observed between the 18 3/4" and 30" housing. The gas was sampled by the ROV and isotope analysis indicated that the gas was of a thermogenic origin rather than a shallow microbial or biogenic origin
- PL128 (Equinor, Petoro, DNO)



Magnitude 2

Dive #32 | 34/10-52 S

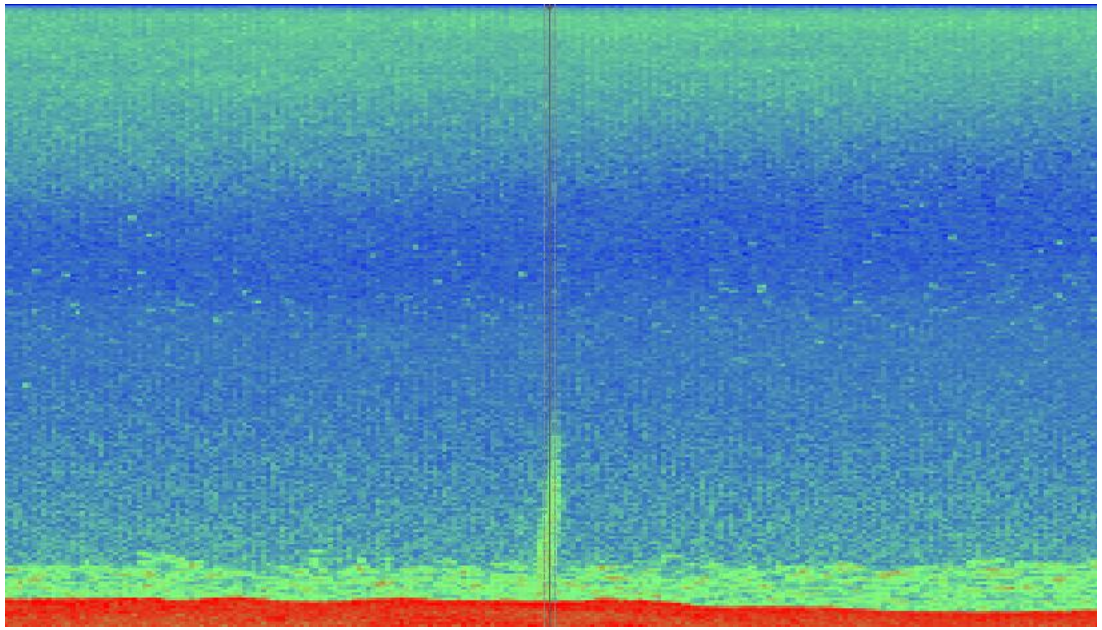
- Type: Exploration
- Status: P&A
- Drilling Operator: StatoilHydro Petroleum AS
- Completed Date: 10.11.2009
- Content: Dry
- Water Depth: 134
- PL050 (Equinor, Petoro, OMV)

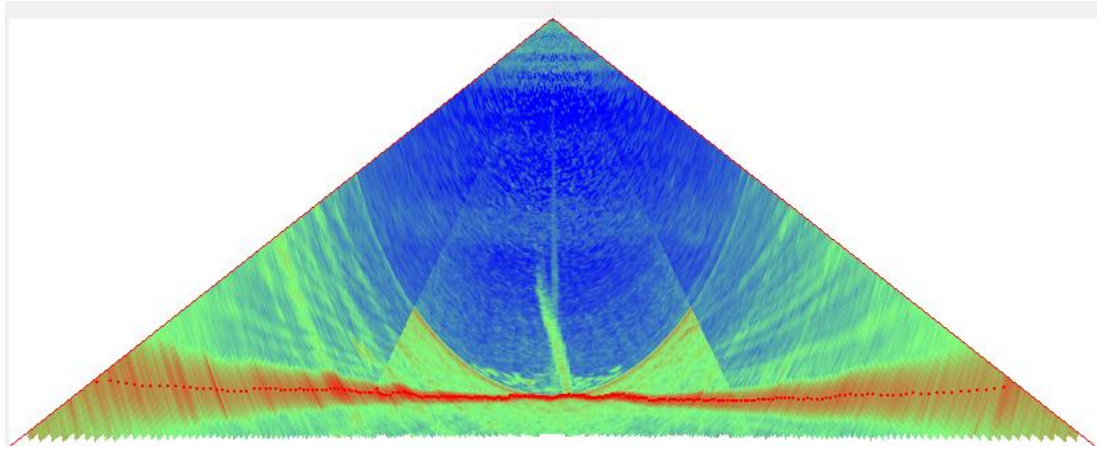


Magnitude 5

Dive #10 | 6608/11-4

- Type: Exploration
- Status: P&A
- Drilling Operator: Statoil ASA (old)
- Completed Date: 23.05.2004
- Content: Oil
- Water Depth: 342
- PL128 (Equinor, Petoro, DNO)





Magnitude 4

Way Forward

Recovery of Seabed Observatory in May 2026

24 hour ROV operations – need additional partner

Sampling overview at wells and natural sites

41 ROV dives with videos

- 35 gas samples in pressurized bottles
- 63 gas flux measurements
- 22 push core samples
- 20 blade core samples
- 14 scoop samples (hard seabed)
- 29 authigenic carbonate samples
- 6 shells
- 2 cement samples

5 gravity cores

18 CTDs

Heincke seep

34/10-15

34/10-19

200 m

NOMS: Naturally occuring methane seep | WAMS: Well-associated methane seep | Image courtesy of NPD (Mattingsdal and Jensen, 2023)