First results of the 2025 seismic campaign at the EMR-site

2D reflection seismic and DAS-VSP acquisition

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Outline



The 2025 active seismic campaign with an active source

- Learning from 2022 active source campaign
- Adjusting acquisition parameter
- Preliminary results



The 2025 vertical seismic profile (VSP) acquisition into a distributed acoustic sensing (DAS) cable

- Installation of DAS-cable
- Preliminary results



Summary

- Next steps



Comparison of the shallow (0-700ms) results





Learning from the 2022 campaign

- ▲ Structural barely interpretation enabled
- ▲ The noise of the 3 Vibs is interfering
 → Difficult to remove
- △ 10m receiver spacing too sparse for sampling the noise
- → Recommendation for 2025 acquisition
 - Reduce receiver spacing and source point spacing
 - Use only a single & lighter Vib at reduced power
 - No interference
 - Reduced harmonic noise
 - Allows to access smaller roads
 - Start the sweep at a lower frequency
- ▲ Selection for the 2025 campaign:
 - Single eVib operating at 7kN between 2-120Hz was selected
 - 4m source and receiver spacing
 - Cost & quality compromise



2025 active seismic program finished 11.04.2025

- ▲ ~ 90km of 2D lines acquired
 - Enabling geological interpretation between borel
 - ~Along potential legs of the ET
- ▲ 5 DAS-VSP's
 - @Cottessen, Vijlen, Teuven, Obsinnich, Herbesthal
 - To enable
 - A detailed velocity model
 - Depth conversion of seismic data
 - Measuring absorption in 1-15Hz range
 - Higher resolution imaging close to the well bore
 - "3D" cross-spread & VSP at Herbesthal with ELVIS and e-Vib source
 - 8m*8m receiver spacing
 - 8m source spacing in-line
 - 40m source spacing cross-line



Line ET2025-001:

Source point example



First break picking for tomographic inversion





Generalized linear inversion of first break picks



Non-linear tomographic inversion







Comparison of inversion results





Preliminary stack of Line ET2025-001



W

Preliminary stack of Line ET2025-002 Ν CDP 723 4200 4310 4420 4530 4640 4750 4860 4970 5080 5190 5300 54 0 5630 5740 5850 5960 6070 6180 6290 6400 6510 66)840920101011201230134014501560167017801890200021102220233024402550266027 500

Preliminary interpretation of ET2025-002 at Hombourg

- A Top Dinantian (blue line) ties very well with Hombourg well and good to trace in southern direction
- Base Dinantian/top Famennian (brown line) presumed based on thicknesses and geophysica contrast of base. Thickening in southern direction is consistent with regional knowledge





Jeff Deckers, VITO



3D Cross-spread using 3C ELVIS source & geophones





Alex Jaron, RWTH

Installation of fiber optical cable

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Overview of installed Fiber Optic cables for DAS-VSP



Overview of installed Fiber Optic cables for DAS-VSP



Test location and installation - Cottessen

- The well at Cottessen is located in South Limburg, The Netherlands
- The well is approx. 200m deep
- A single fibre optic cable loops through the well and is cemented outside the casing
- Continuity (OTDR) off the fibre showed a point of increased loss towards the bottom of the well (damaged fibre)









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The Equipment and parameters

Equipment

- Acquisition unit: Febus A1-LR interrogator
- Seismic Source: Farraday Storm 10 Electric Vibroseis

Acquisition parameters

Interrogator:

- Sampling interval: 2m (Channel spacing), Sampling rate: 4000 Hz
- Gauge length: 8m, Total Cable length: +/- 420m Seismic source:
- Sweep: 2-120Hz, 24s duration, low dwell
- Shot interval: 4m, 3 sweeps per shot location
- Max offset 900m



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Some "raw shots" of the walk-away VSP @Cottessen

Shot around 65m distance from well

Shot around 5m distance from well

Depth . 200m _ Depth : 200m Depth Depth Depth 1 200m Depth 200m 200m 200m SP 001 ~@1m 🔛 SP 004~@5m 🔛 SP 049~@65m 🚺 SP 052~@69m SP 046~@61m SP 007~@9m

Time [ms]

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First break picking

Depth = channel * 2m



Source points after up/down separation, linear moveout correction (LMO) + corr. stack



Summary and some future steps

- Successful seismic acquisition campaign in Q1 2025
 - Acquired some 90km of 2D data, showing near surface reflections
 - Acquired 5 VSP's including low-fold crossspreads
 - Cottessen, Vijlen, Teuven, Obsinnich, Herbesthal
- ▲ Finalize seismic processing
- Interpretation of VSP's and seismic lines
- Create an integrated 3D subsurface model
 - Geotechnical and civil engineering
 - Hydrological modelling
 - Geophysical modelling





To be continued...

Question?



Symposium, Bologna, 26-30 May 2026