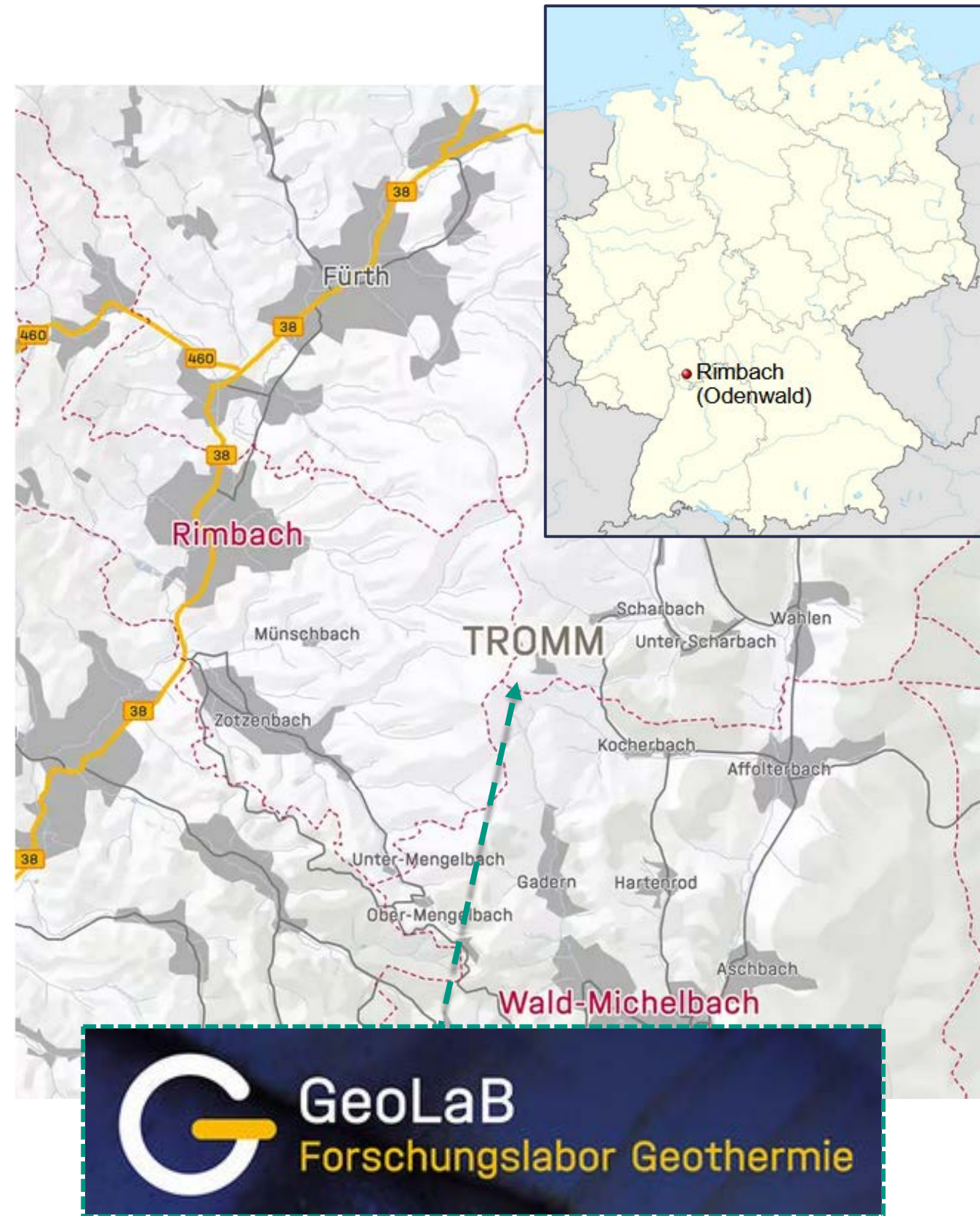
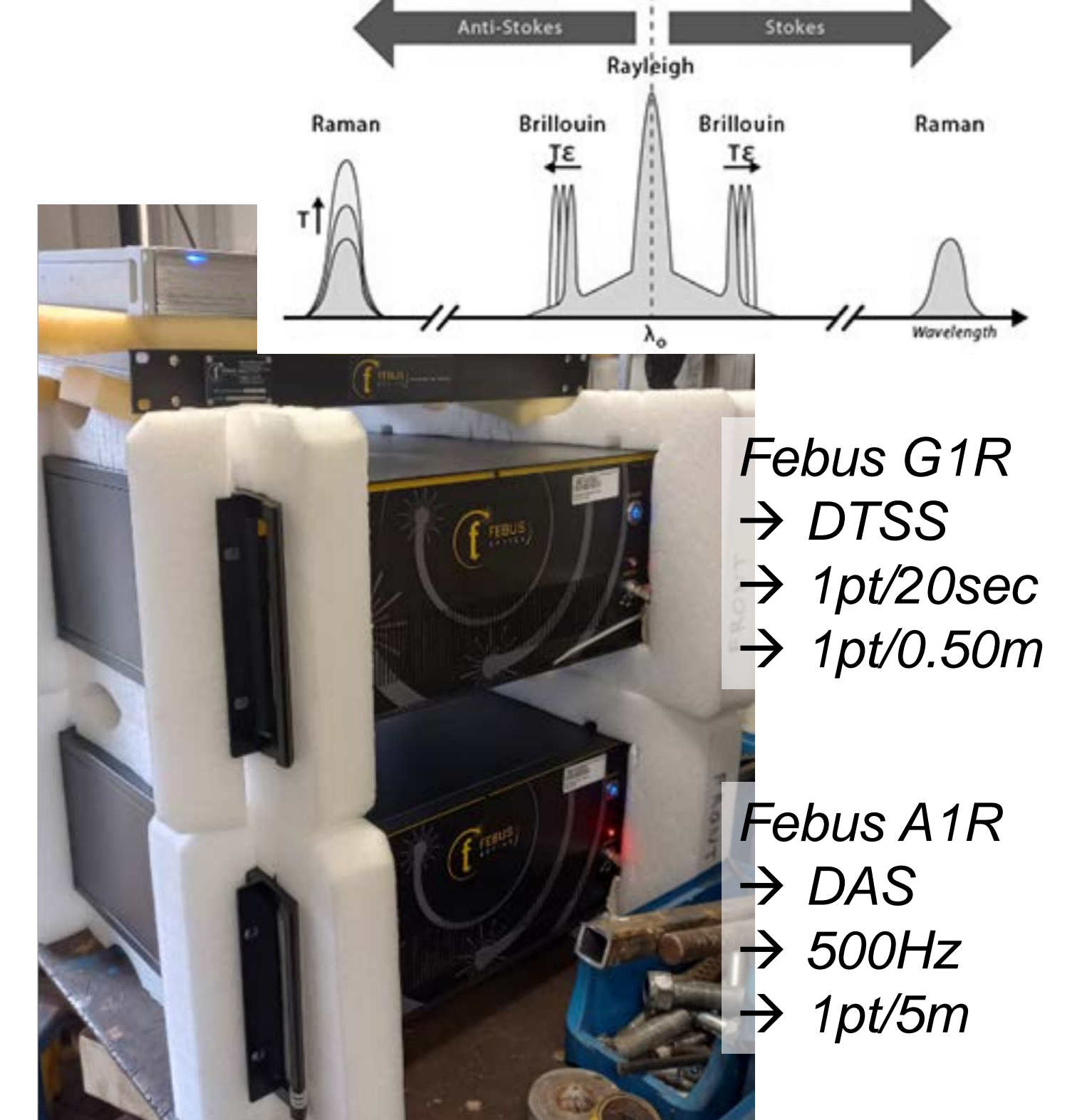
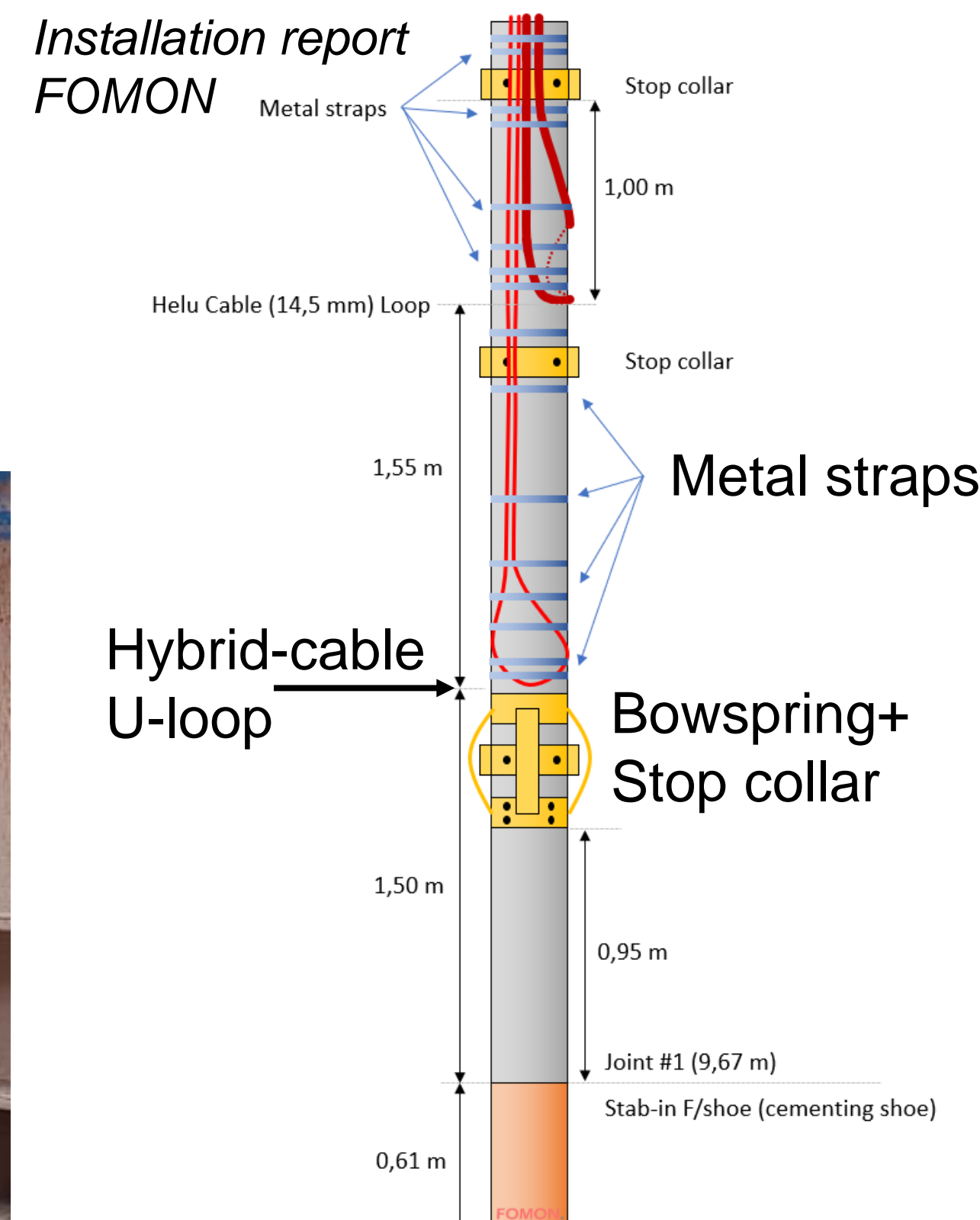


Research environment and technical aspects

- GeoLAB – Flow experiments under controlled conditions
- EXPLORATION PHASE – Find out more about the geological structures in Tromm area



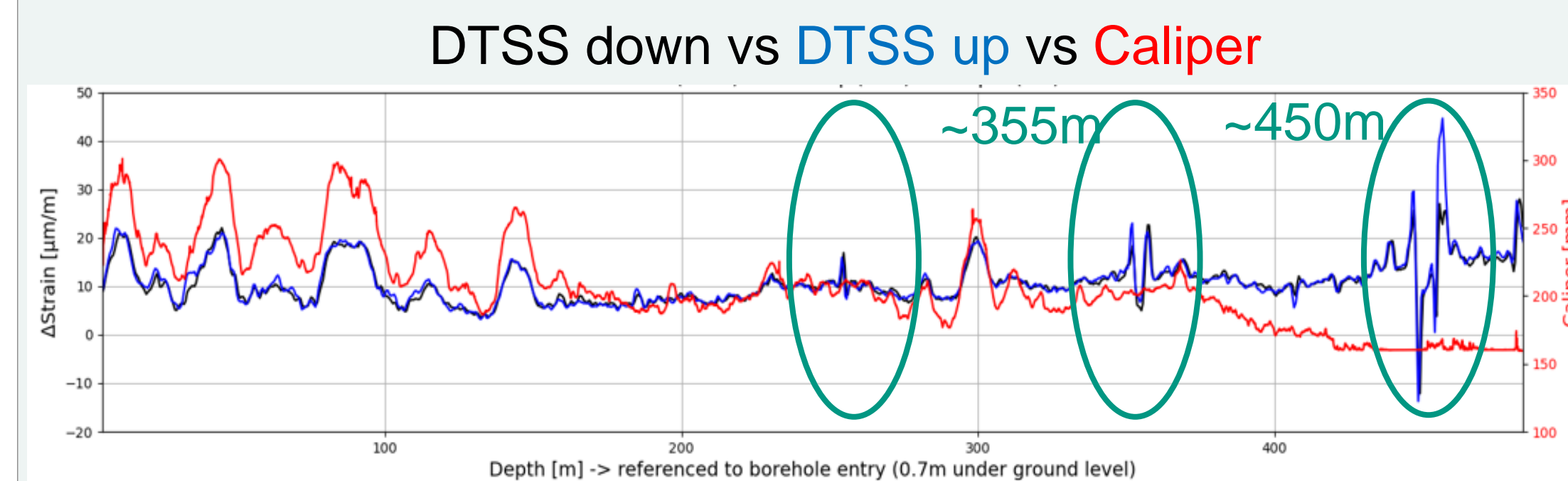
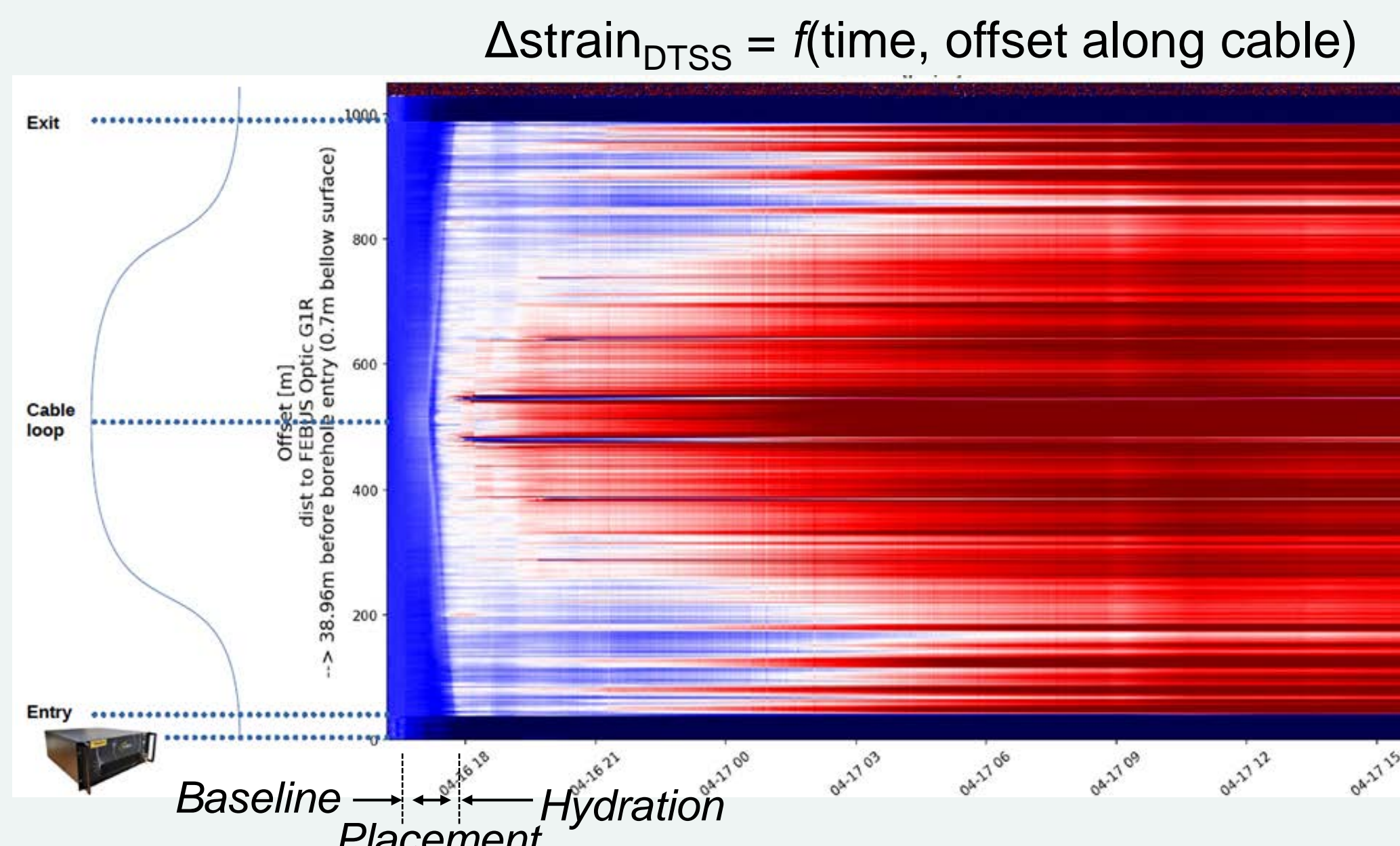
- GeoLaB-1 (with FOC U-loop) and -2 exploration wells drilled from the same pad
- DAS / RAYLEIGH → Dynamic sensing of strain(-rate), high sampling-rate
- DTSS / BRILLOUIN → Static sensing of strain (thermal and mechanical effects)



Assess the cementation and analyse thermo-mechanical processes from DAS + DTSS data

Calibration of measurement points; correlation with logging data

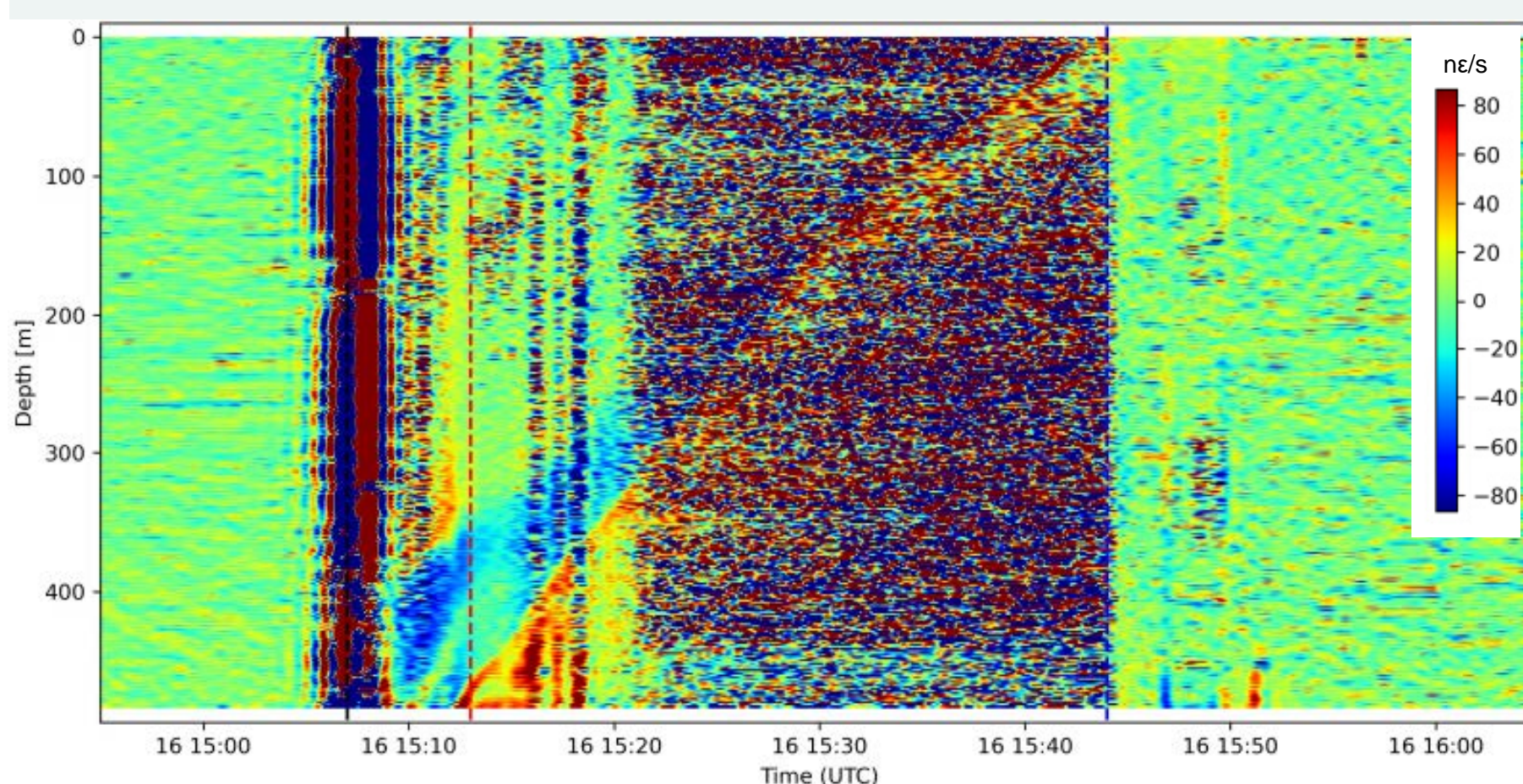
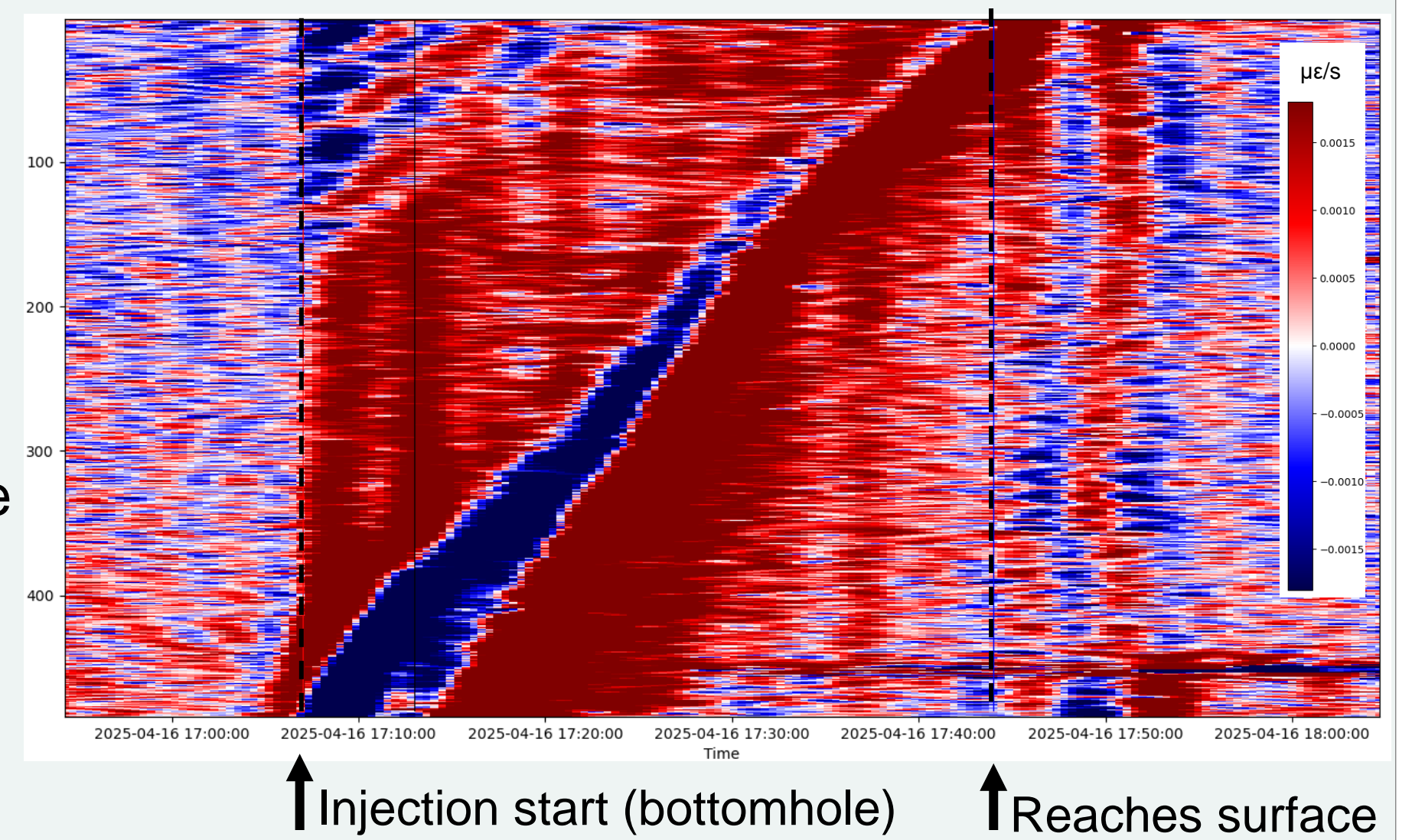
- U-loop installation
- Mirror effect
- DTSS: no amplitude calibration
- Relative strain rather than absolute measurements
- Calibration of sensing points location / fiber refractive index
- Correlation with independent measurements (Caliper log)



- Significant correlation during cement hydration
- Thermal response: ↑space, ↑cement, ↑strain
- Additional local mechanical response

Data processing and observation of cement placement

- DTSS data:
- Differentiation with time
- dDTSS/dt
- Lowpass filtering
- Below 0.2 Hz
- Cable compression (blue)
- Mudcake rises in borehole
- Cable extension (red)
- Higher temperature
- Cement reaches cable

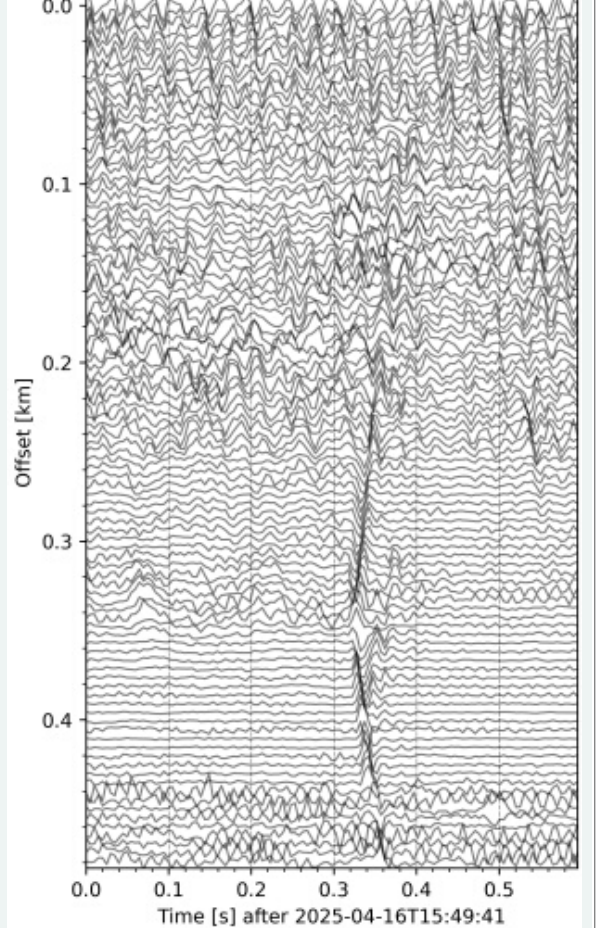
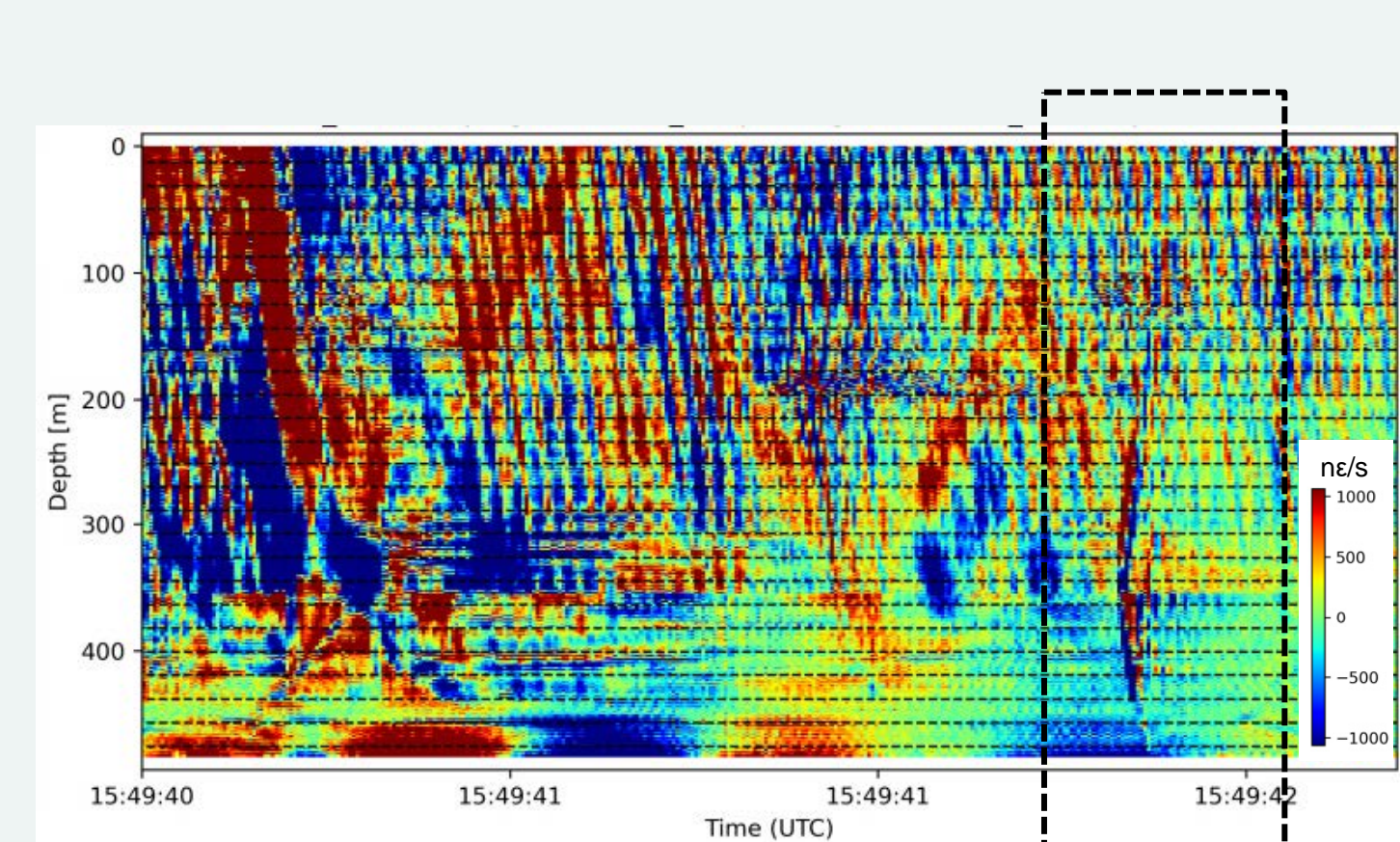
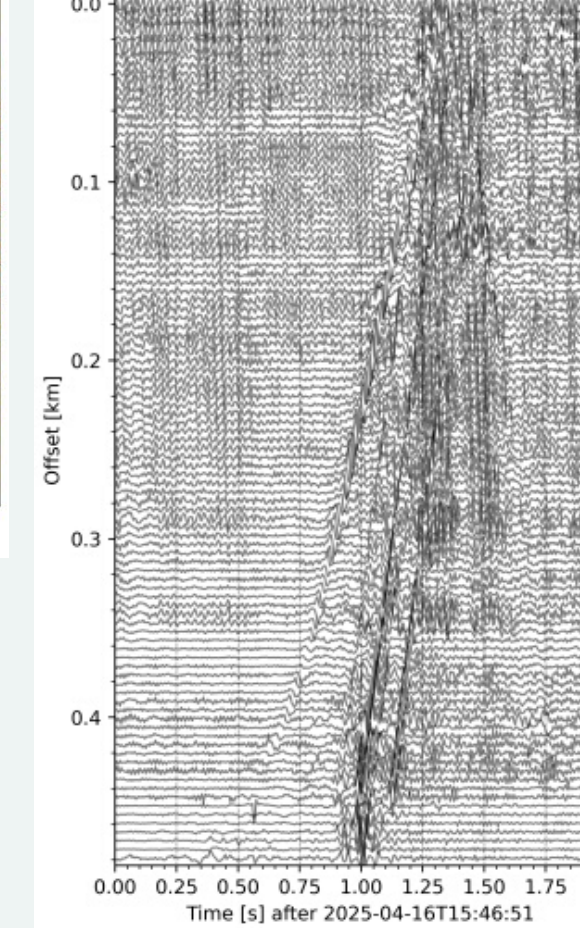
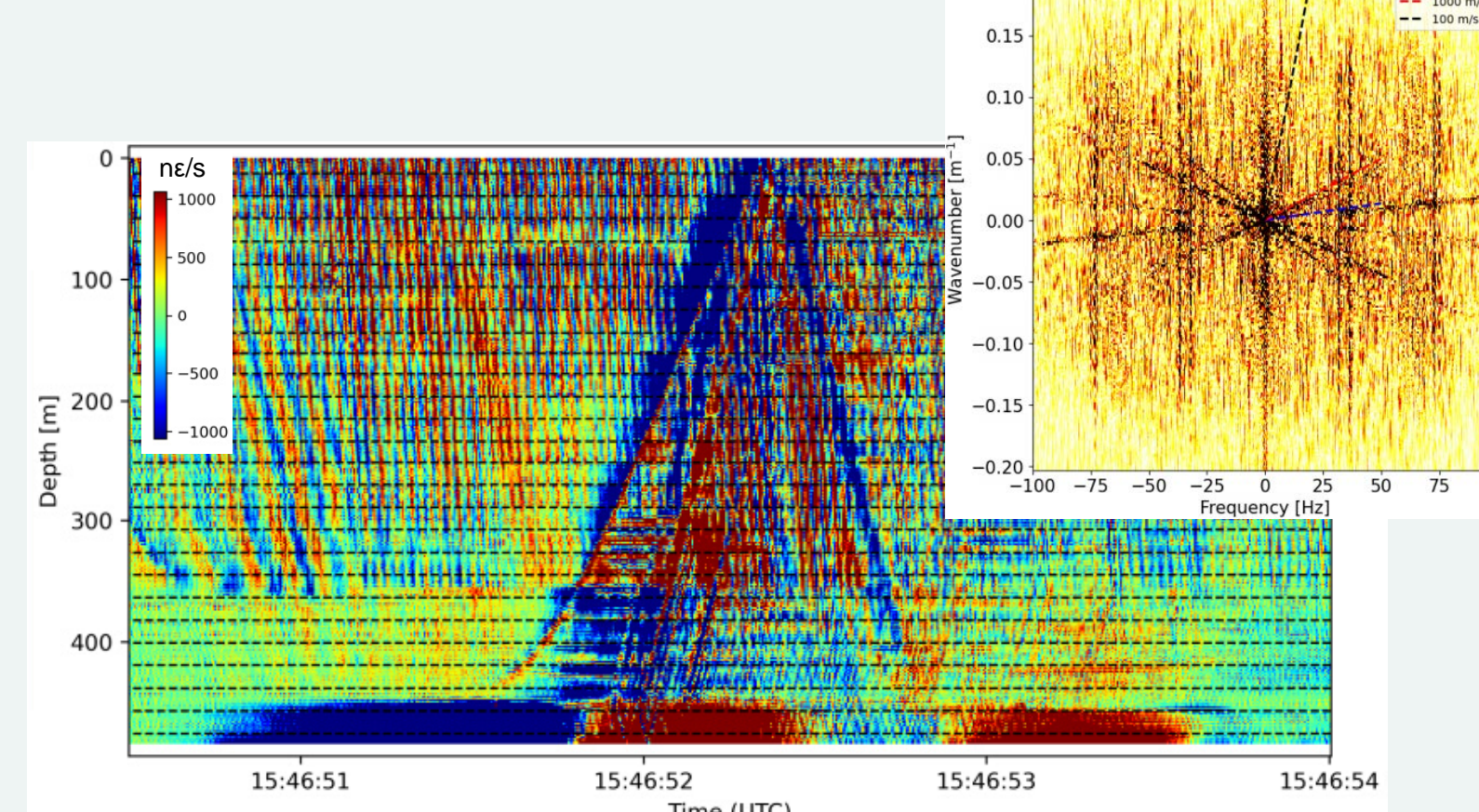
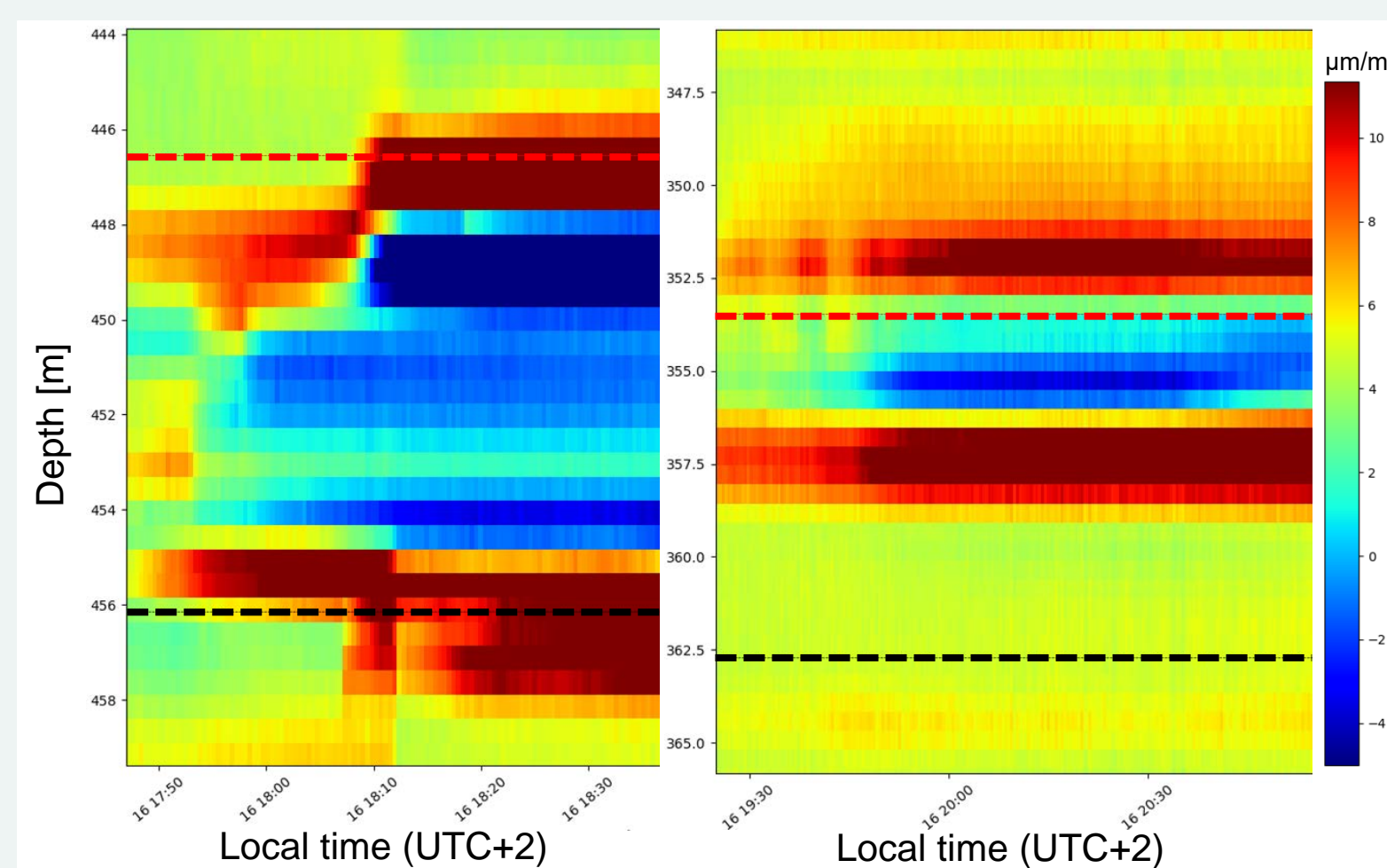


- DAS data (strain-rate)
- Lowpass filtered
- below 0.02 Hz
- Strong noise due to pumping at surface

- dDTSS traces at depths with additional mechanical responses (around 450 and 355m)
- Connected to **stop colars** / **centralizers**

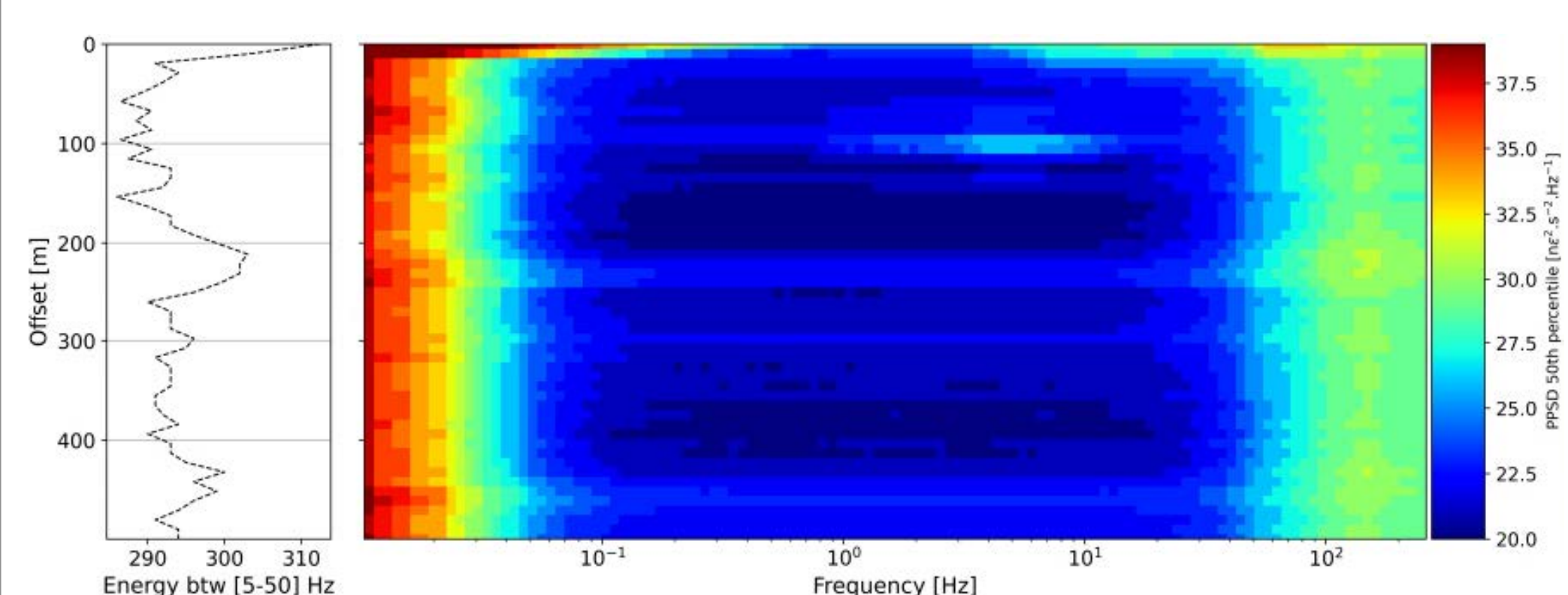
Cement hydration and mechanical effects on DTSS/DAS data

- DAS at higher frequencies, signals propagating at ~3500 m/s from bottom to top + reflection
- 170s after cement reaches top (15:46:50 UTC)
- In connection to mechanical strain build-up (15:49:41 UTC)

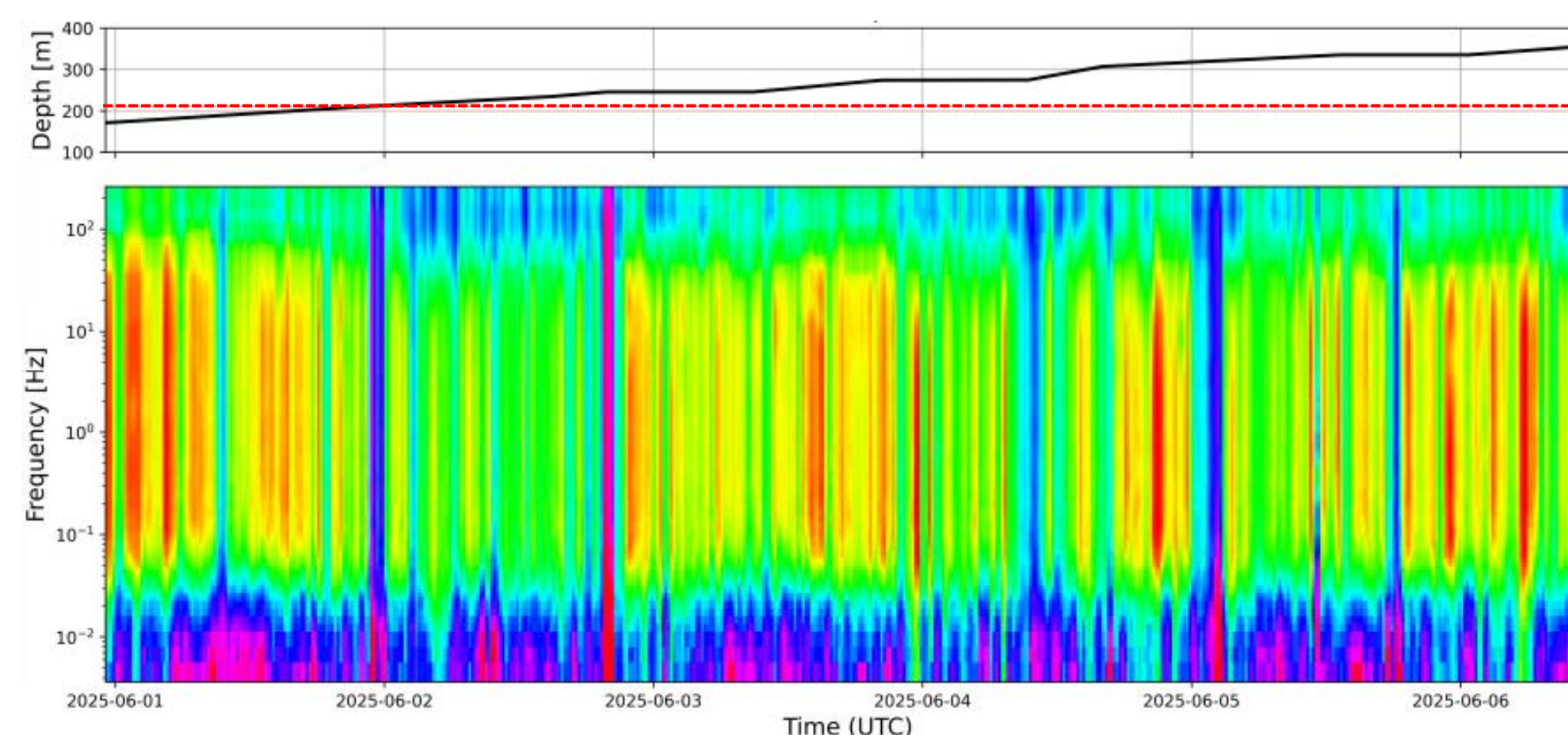


Monitor drilling of GeoLaB-2 with DAS, from GeoLaB-1

- Spectral content of DAS data over depth



- Spectral content of DAS data over time, with drill-bit depth



- No clear systematic signature on strain-rate due to drilling in GeoLaB-2
- Data likely to be affected by anthropogenic surface noise affecting the IU

Take home messages

- DTSS provides valuable insights into cementation dynamics and quality assessment.
- Lower frequency signal less evident on DAS data, while higher frequencies offer complementary information.
- Careful control of recording conditions is essential to ensure high data quality.

Acknowledgment

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