FEBUS optics

The reference in distributed sensing

Real-time and distributed monitoring solutions

using fiber optics

Acoustics, Temperature & Strain

ISO 9001 ISO 14001 ISO 27001 *from 2026*

21/11/2025

To Protect and To Save

PROTECT PEOPLE AND ASSET – SAVE RESOURCES AND ENERGY

- A reference in **DFOS for 10 years**
- **60 employees** all around the word
- Manufacturer of all DFOS devices **DAS**, **DTS** & **DSS**
- Service & supply in **+ 35 countries**
- From **OEM** to **turnkey solutions** provider on-site
- **Industrialized** production
  Strong **R&D**
  Patented **solutions**
- **FEBUS' Test Center** to accelerate R&D

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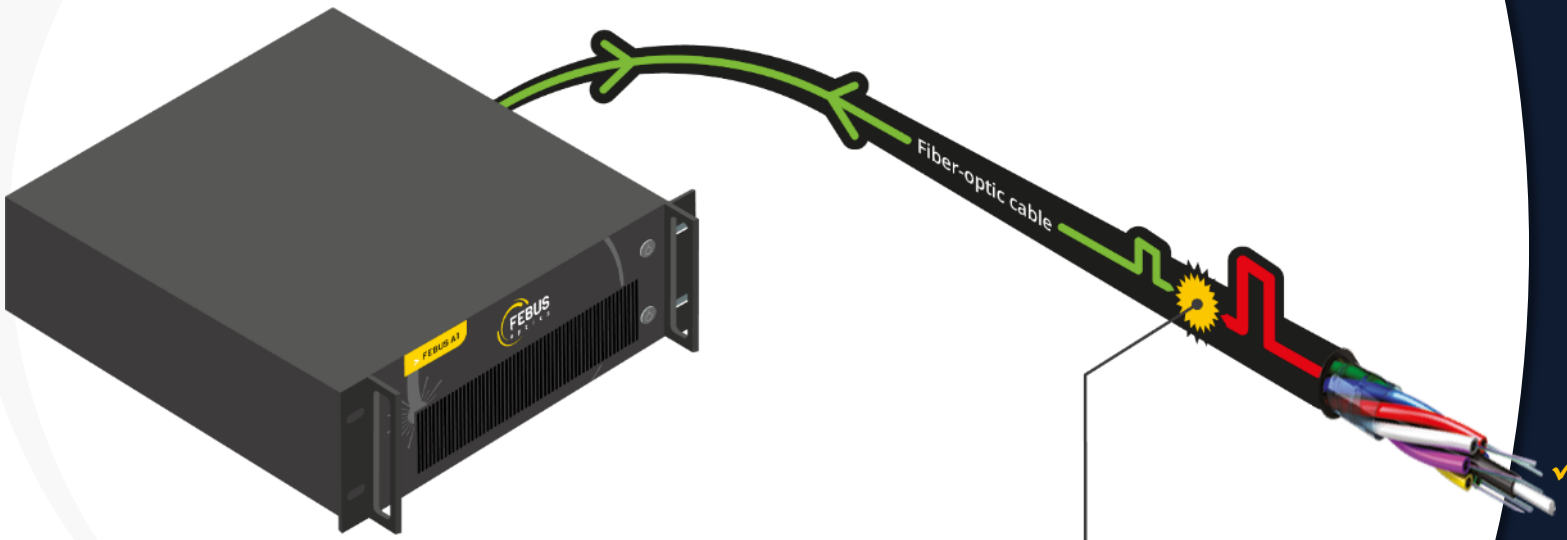
Our Technologies

General principle of Distributed Fiber Sensing (DFOS)



- ✓ **Manufacturing of all kinds of DFOS device**
  - **ACOUSTIC**
    DAS (Distributed Acoustic Sensing),
    Rayleigh technology
  - **TEMPERATURE**
    DTS (Distributed Temperature Sensing),
    Raman or Brillouin technology
  - **STRAIN**
    DSS (Distributed Strain Sensing),
    Brillouin technology

- ✓ **Main benefits of the FEBUS units**
  - High **performance**, **cost-effectiveness** & **robustness**
  - **Easy** to install & to use
  - Use **standard** fiber optic cable
  - Ranges of **more than 200 km**

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Our Main Applications

CABLE MONITORING

- ✓ Faults detection
- ✓ Hotspots and RTTR/DCR
- ✓ Cable movements
- ✓ Partial discharges
- ✓ External threats detection

PIPELINE MONITORING

- ✓ Leaks Detection (LDS)
- ✓ Third-Party Intrusion (TPI)
- ✓ Ground movements
- ✓ Shocks detection
- ✓ Pig tracking

WELL MONITORING

- ✓ Well integrity
- ✓ Production optimization
- ✓ Fracking operation monitoring

INTRUSION DETECTION

- ✓ Perimeter security (PIDS)
- ✓ Interoperability with VMS/hypervisors
- ✓ Monitoring of fences & borders (buried cable)

SEISMIC/ NATURAL HAZARDS

- ✓ Seismology/ Volcanology/ Glaciology
- ✓ VSP
- ✓ 2D/3D/4D acquisitions
- ✓ Induced seismicity
- ✓ Onshore/Offshore

STRUCTURAL HEALTH MONITORING

- ✓ Strain & settlement
- ✓ Leaks in dams & levees
- ✓ Landslides
- ✓ Railway/Road
- ✓ Fire detection
- ✓ Seismic acquisition

Our Offer

Stand-alone device

A1/G1/T1

- **Hardware**

Data acquisition

including

- **FOLog**

(FEBUS software)

Configuration, QC, visualization, pre-processing

or

FEBUS complete solution

A1/G1/T1

\+

FO Suite
proprietary alerting software

- *Automatic generation of notifications in case of alert*
- *Localization & visualization of the alert on a map*
- *Dedicated algorithms*
- *Event recognition & classification*
- *Communication protocol MODBUS/IP*

A complete solution dedicated for each application:

- **FOGrid** *cable monitoring*
- **FOPipe** *pipeline monitoring*
- **FOWell** *well monitoring*
- **FOGuard** *intrusion detection*

Our Main Benefits

- ✓ Provide high performance in all types of DFOS devices (DAS, DTS, DSS)
- ✓ **On-custom**, responsive support & expert services throughout the project
- ✓ Turnkey solutions combining **distributed** monitoring & **real-time alerting** using **machine learning**
- ✓ **Interoperability** with any SCADA, VMS or Third-Party System
- ✓ Tailored training to the client's needs
- ✓ **On-site** and **remote** implementation by our experts

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FEBUS G-Series/B-OTDR: Present

- ✓ B-OTDR technology and **single-ended** acquisition
- ✓ **Fast measurement** with patented advanced processing
- ✓ Different form factor: FEBUS G1-C is **compact & autonomous**
- ✓ FEBUS G2: **Independent & simultaneous** DSTS measurements
- ✓ **Long range/Standard FO cable**
  (assuming 0.2 dB/km attenuation)*
  - **10 km*** @1 m spatial resolution in 1 min
  - **70 km*** @10 m spatial resolution in 1 min
  - **100 km*** @20 m spatial resolution in 30 min

FEBUS G1-R

FEBUS G1-C

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FEBUS A-Series/DAS: Present

- ✓ **Low noise:** 1 picostrain/√Hz (with standard fiber)
- ✓ **Dynamic range:** Up to 135 dB @1 Hz
  (PRF @100 kHz, relative to noise floor at 1 Hz)
- ✓ **Multi Gauge-Length:** 3 multiple gauge length in real-time
  (down to 1 m, no upper limit)
- ✓ **Long range/Standard FO cable**
  (assuming 0.2 dB/km attenuation)
  - **80 km*** @10 m gauge length
  - **100 km*** @20 m gauge length
  - Up to **200 km*** with 2 channels @ 20 m GL
- ✓ **Low frequency:** 5 nanostrain/√Hz (@ 10-3 Hz) with correction

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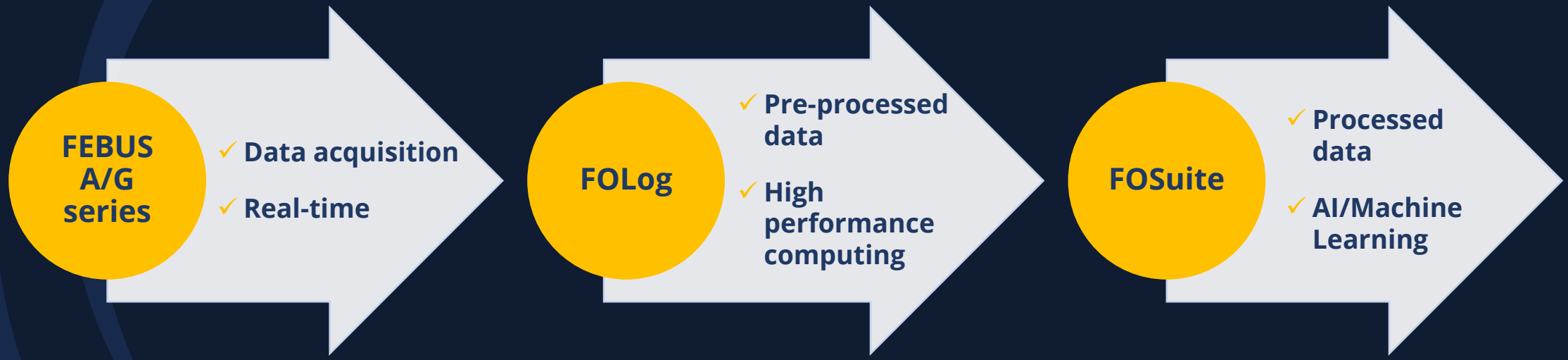
FEBUS Products: Future

High performance **computing**

Very long **range**

AI

FEBUS Interrogators-Data analysis



FEBUS Products: Easyness to use

- ✓ **Complete Settings Flexibility** with possible complete customization of the workflows and capability to simultaneously run them (data visualization, processing and streaming in real-time and/or with a third-party unit)
- ✓ **Lifetime support** for universities/research institutes with no extra cost
- ✓ **Open data format for post processing** of raw or engineered data (HDF5) format, and/or commercial standards (SEG-Y, only post processing)
- ✓ **Single-ended**
- ✓ System designed for remote internal or external local network access
- ✓ **Easy streaming via ZeroMQ**

Case studies

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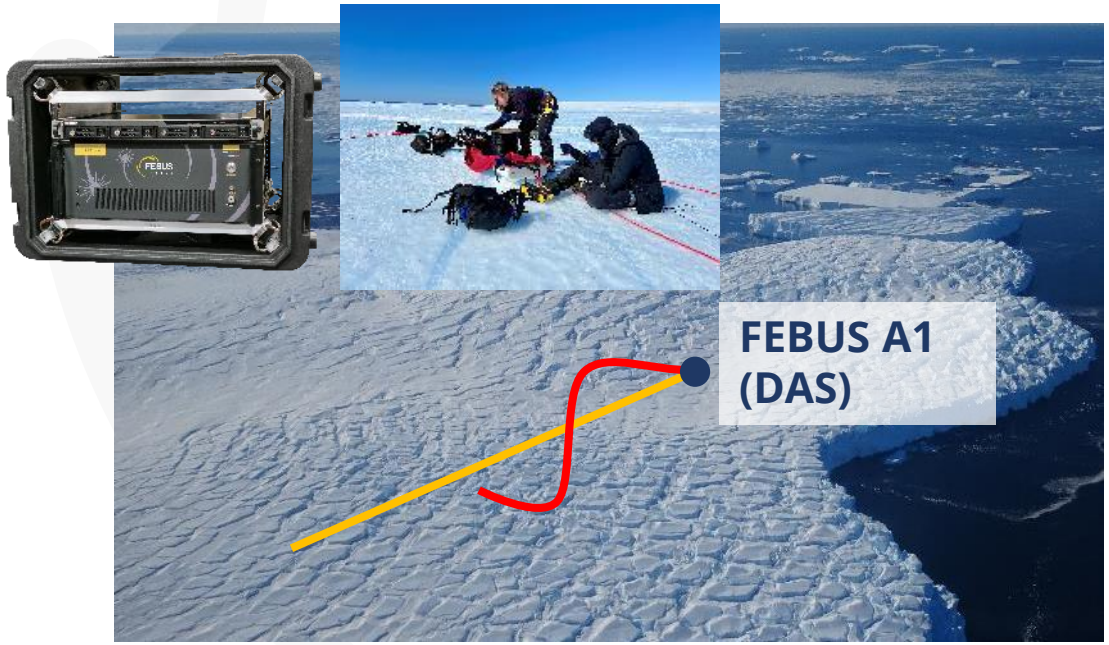
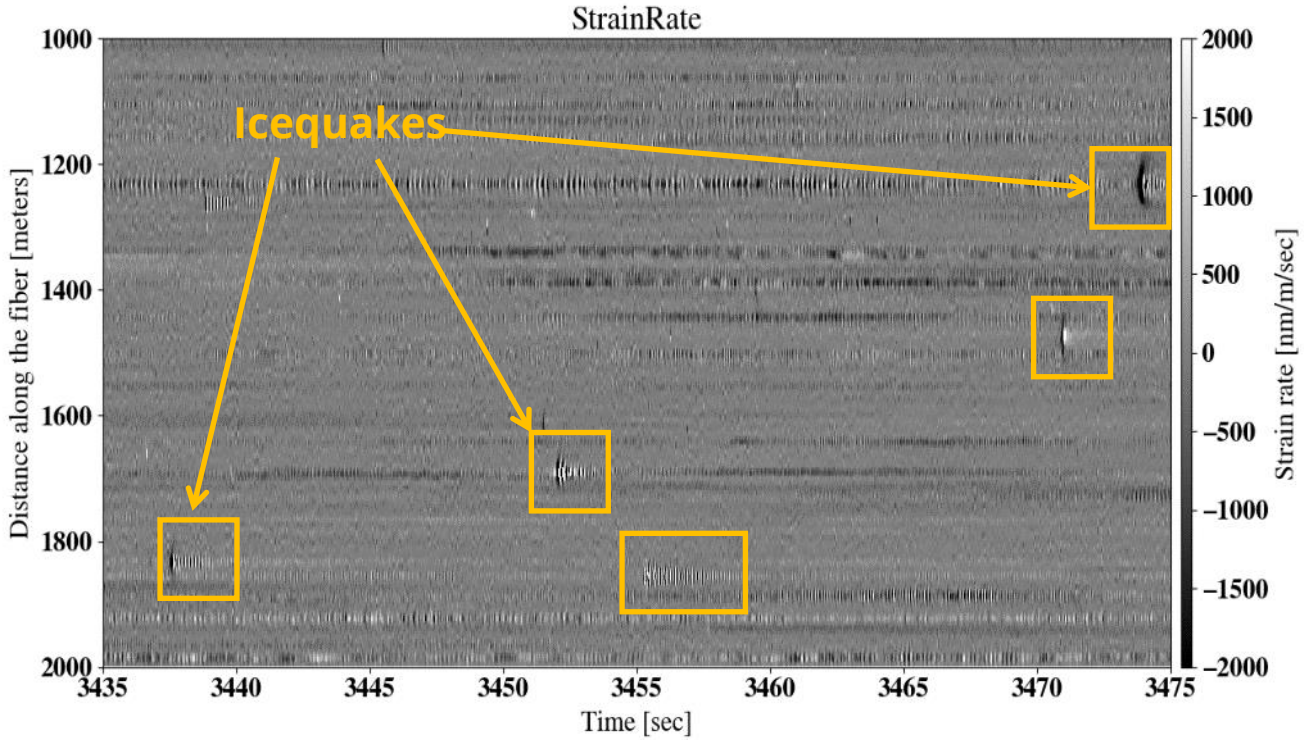
Study of cryoseismicity in Antartica: Astrolabe glacier

Experimental setup

- ✓ **A FEBUS A1 Dual channel system** connected to two fiber optic cables:
  2 km linear fiber and **2 km « zig zag » fiber**



Strain rate data recorded along the Linear fiber



- ✓ **A lot of icequakes were recorded** and can be used to image the structure of the glacier

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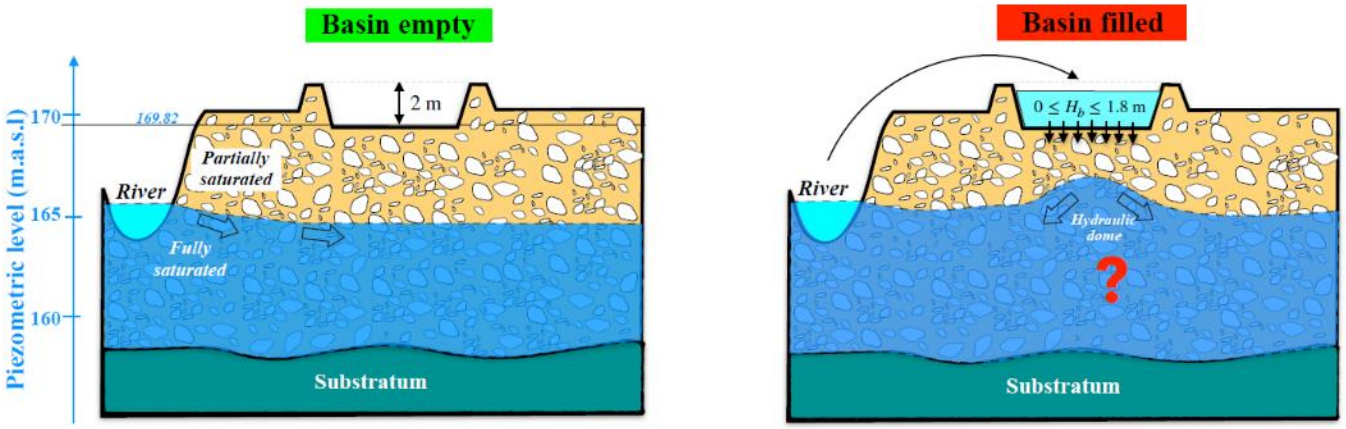
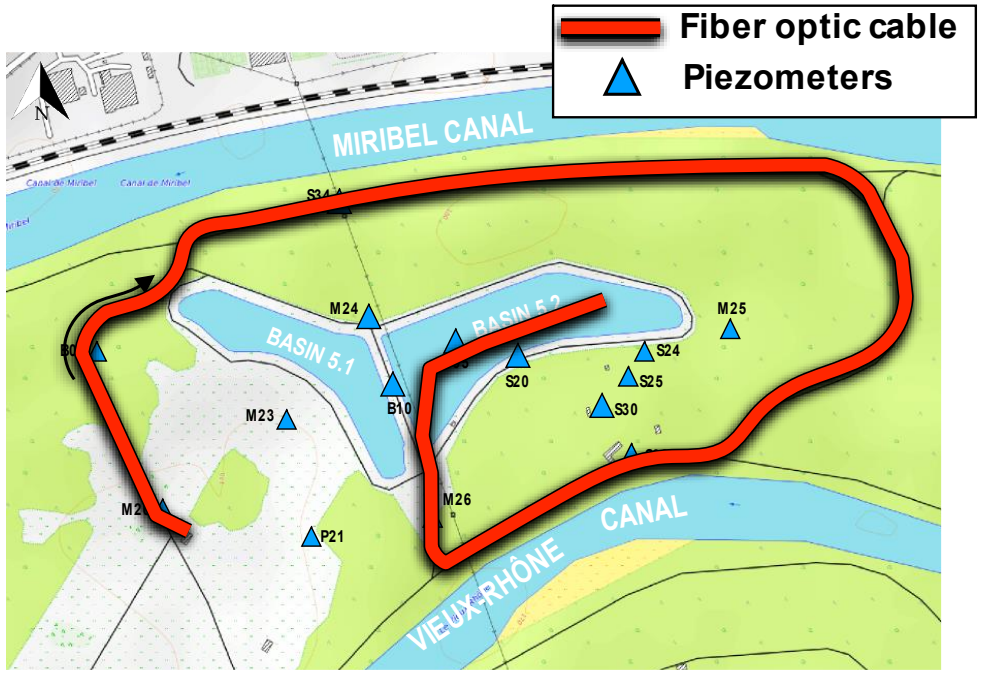
Groundwater monitoring with passive seismic

Lyon water catchment (France)

- ✓ The water catchment **provides drinking water to 94 % of the city** of Lyon (France)
- ✓ The site uses **a controlled recharge system** through infiltration basins that create a localized **hydraulic dome**
- ✓ **We monitor this hydraulic dome with seismic methods (FEBUS A1 – DAS)**



Seismic Experiment



- ✓ We deployed **3 km of fiber optic cable** around a pair of infiltration basins.

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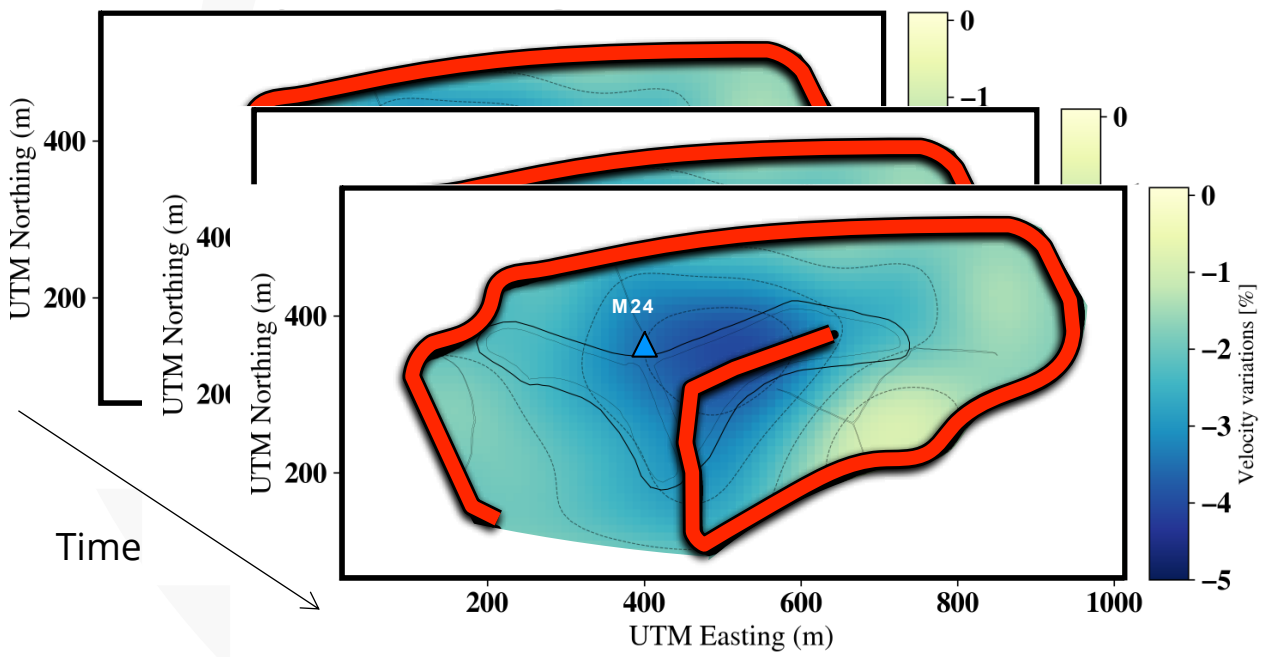
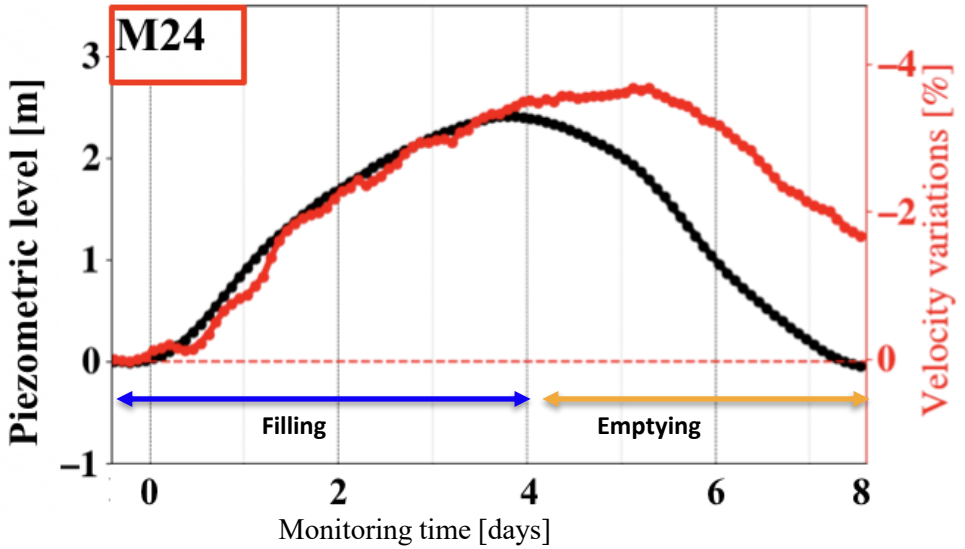
Groundwater monitoring with passive seismic

Time lapse tomography

Velocity variation maps that highlight the creation of a « seismic dome »



Pointwise comparison with piezometers



- ✓ **Good correlation** between
  - **DAS based-velocity variations**
  - and **piezometric level**
- ✓ The delay during the emptying phase is explained by the **desaturation** of the vadose zone

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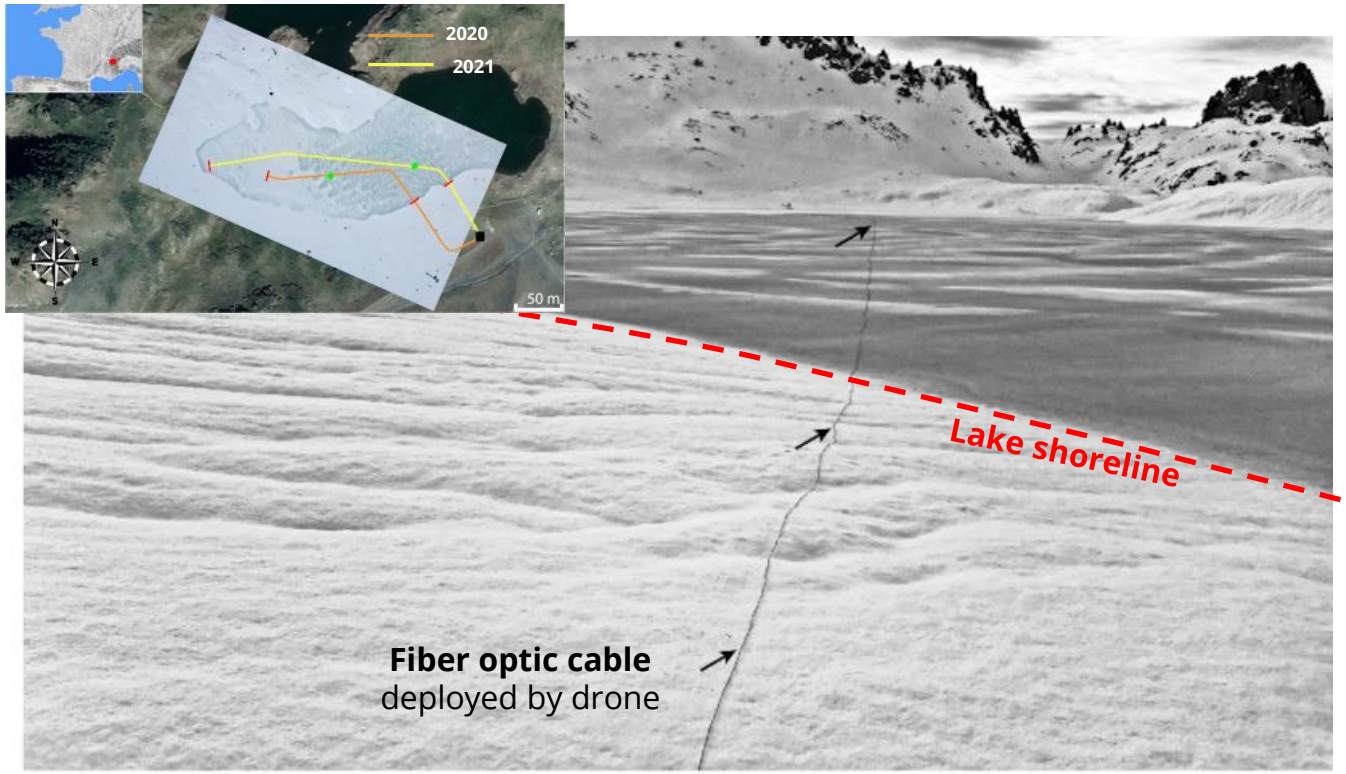
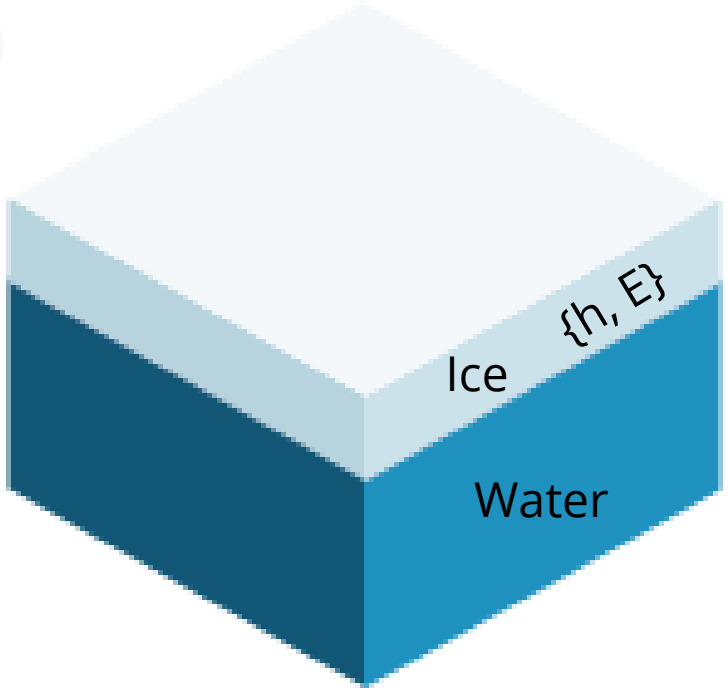
Study on a frozen mountain lake in Chamrousse, France

Experimental set up





- ✓ This study aimed at demonstrating **the ability of FEBUS A1 (DAS) system** to measure:
  - the **thickness (h)** of a floating ice layer
  - and **ice resistance (E)**.

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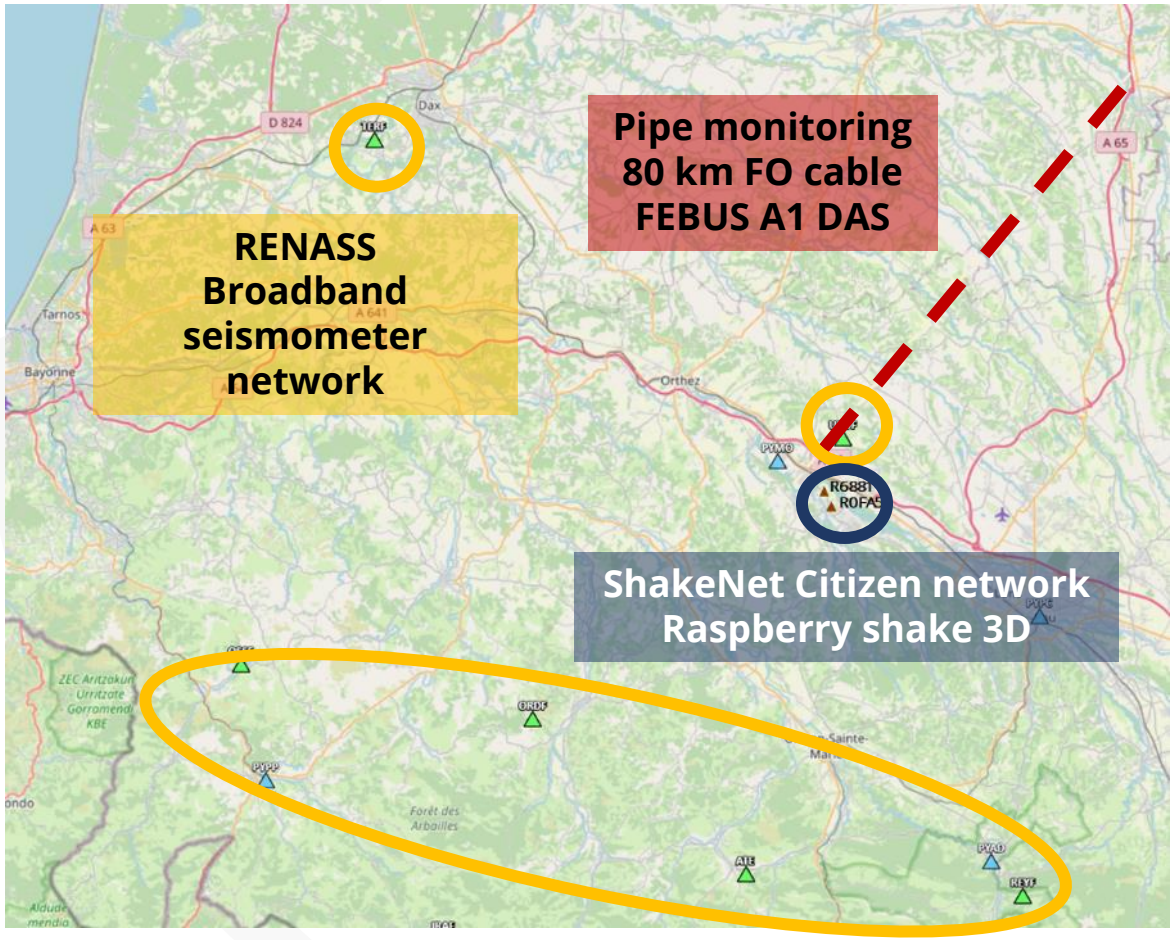
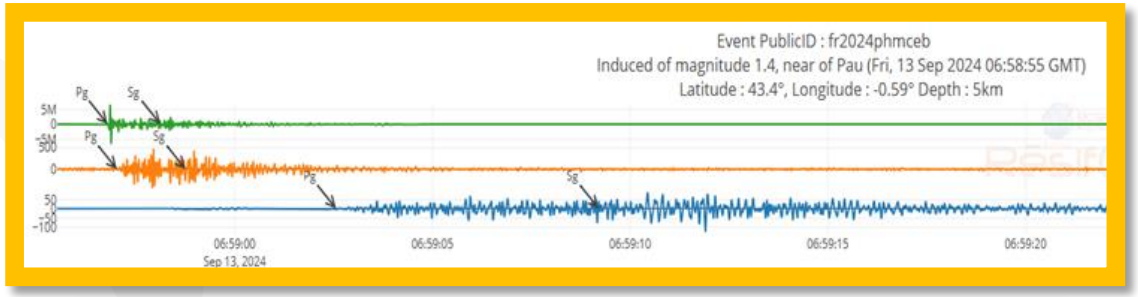
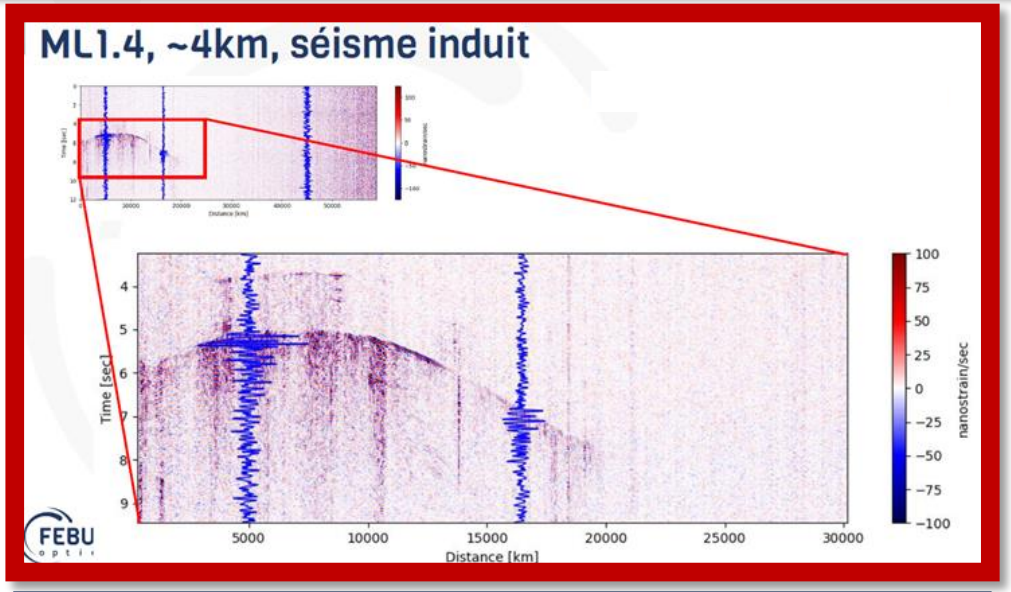
SLHUB-FODAS capabilities

✓ **Detection of a ML 1.4 local earthquake**







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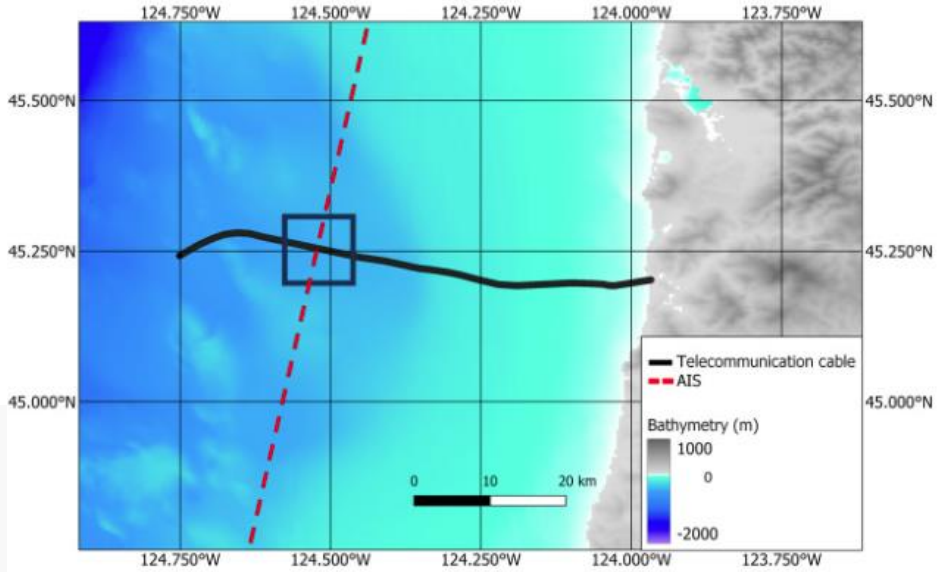
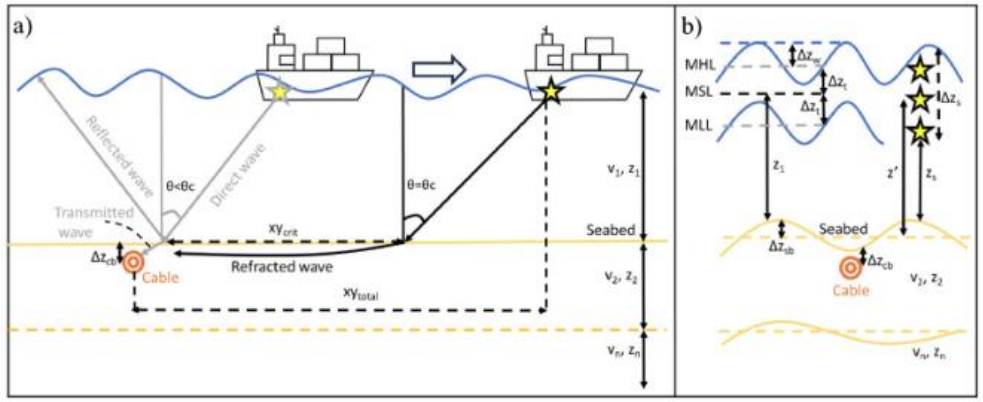
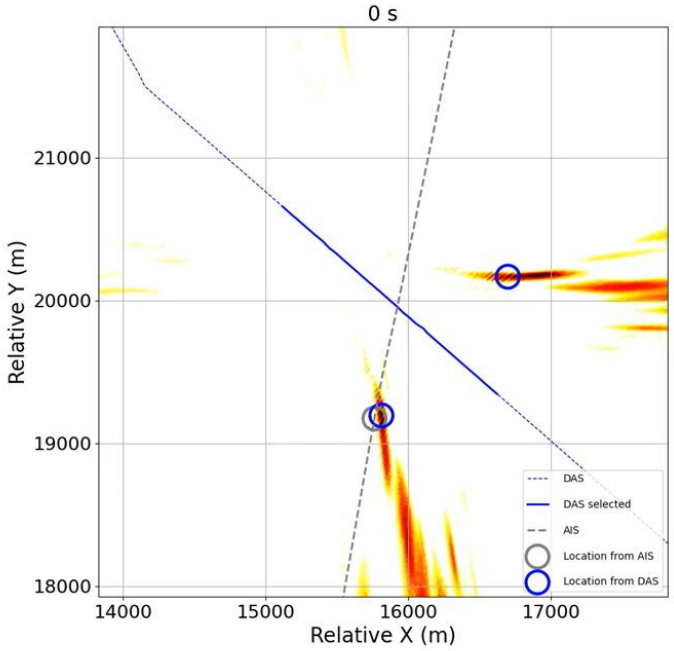
Boat tracking in North Sea, TNO



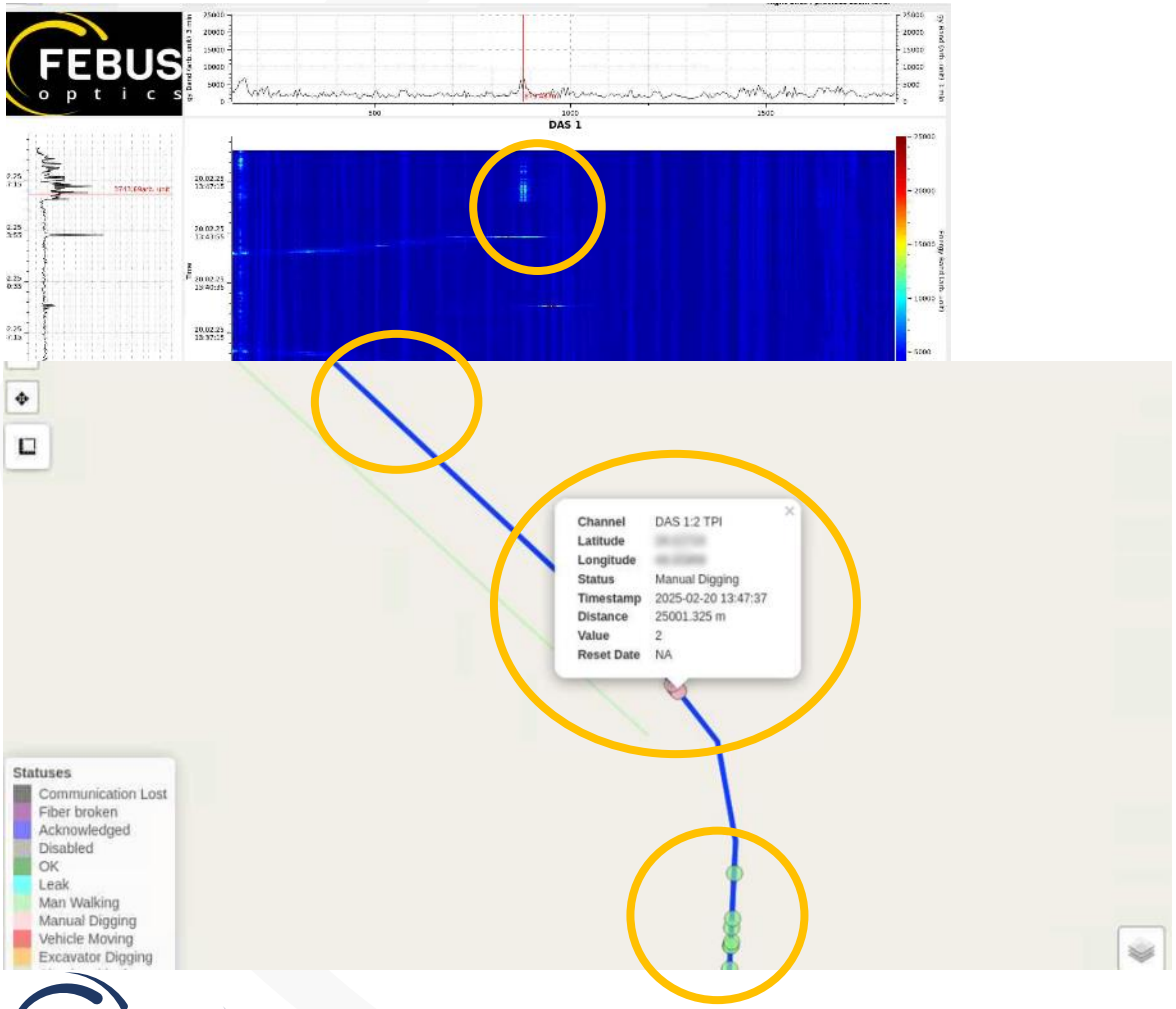


- ✓ Correct calculation of the ship compared to GIS data, using a preinstalled telecommunication fiber

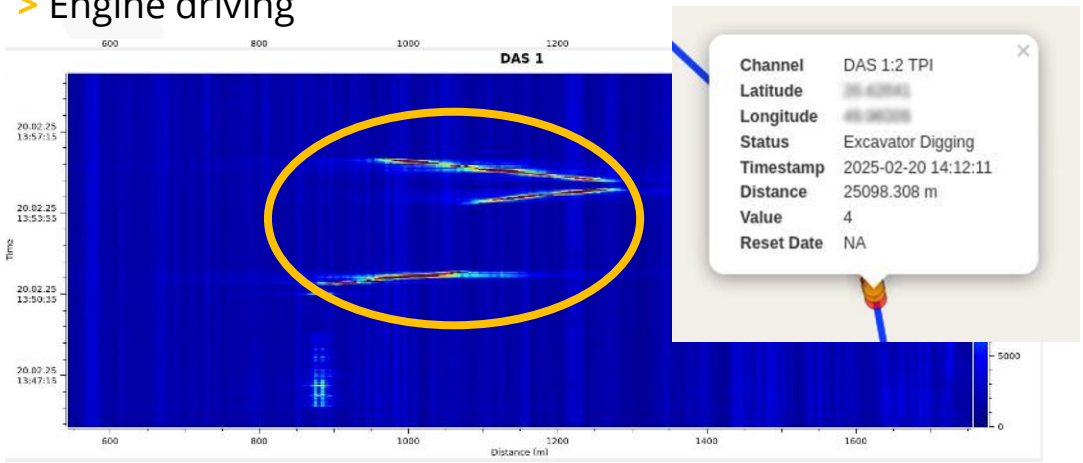


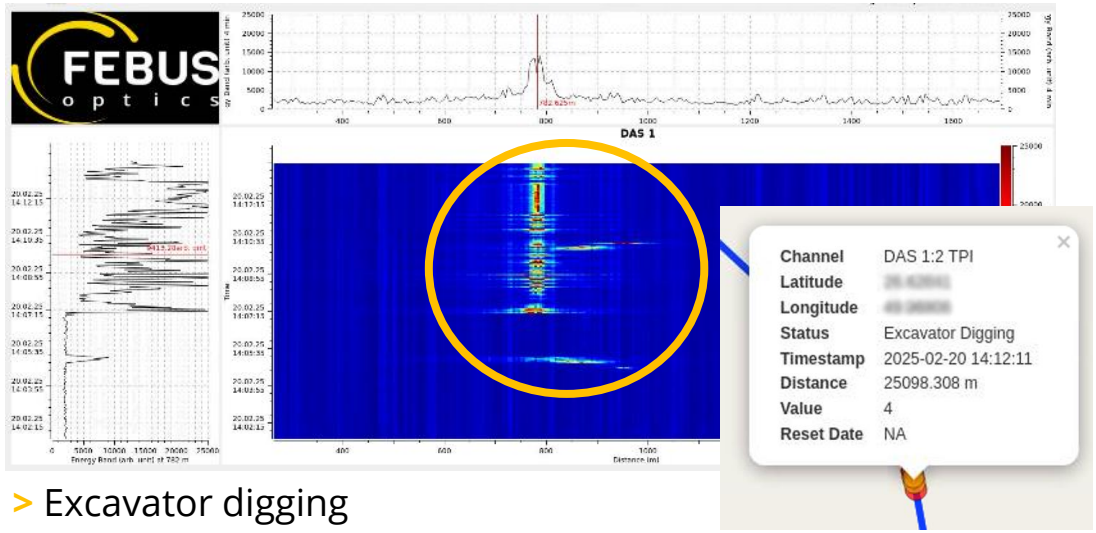
Pipeline third-party intrusion using FEBUS A1

> Man walking + manual digging



> Engine driving





> Excavator digging

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Various threats detected and correctly classified

Conclusion & Perspectives

- ✓ Collaboration with universities is among FEBUS Optics priorities and **our team is fully dedicated to assist academics** in their strategic research projects
- ✓ FEBUS Optics is at your disposal for any further discussion in order to **keep improving our products to meet academic's expectations**
- ✓ FEBUS Optics is **open to discuss partnerships on funded projects**

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