

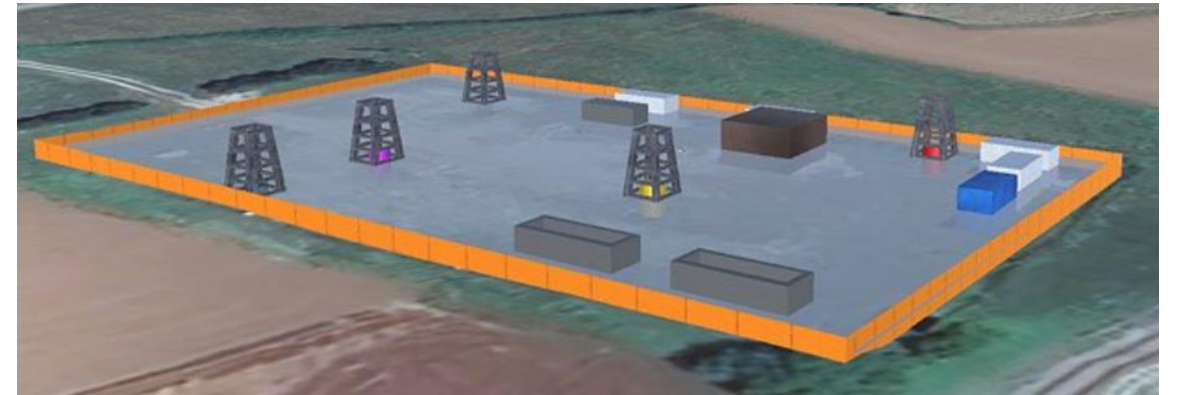


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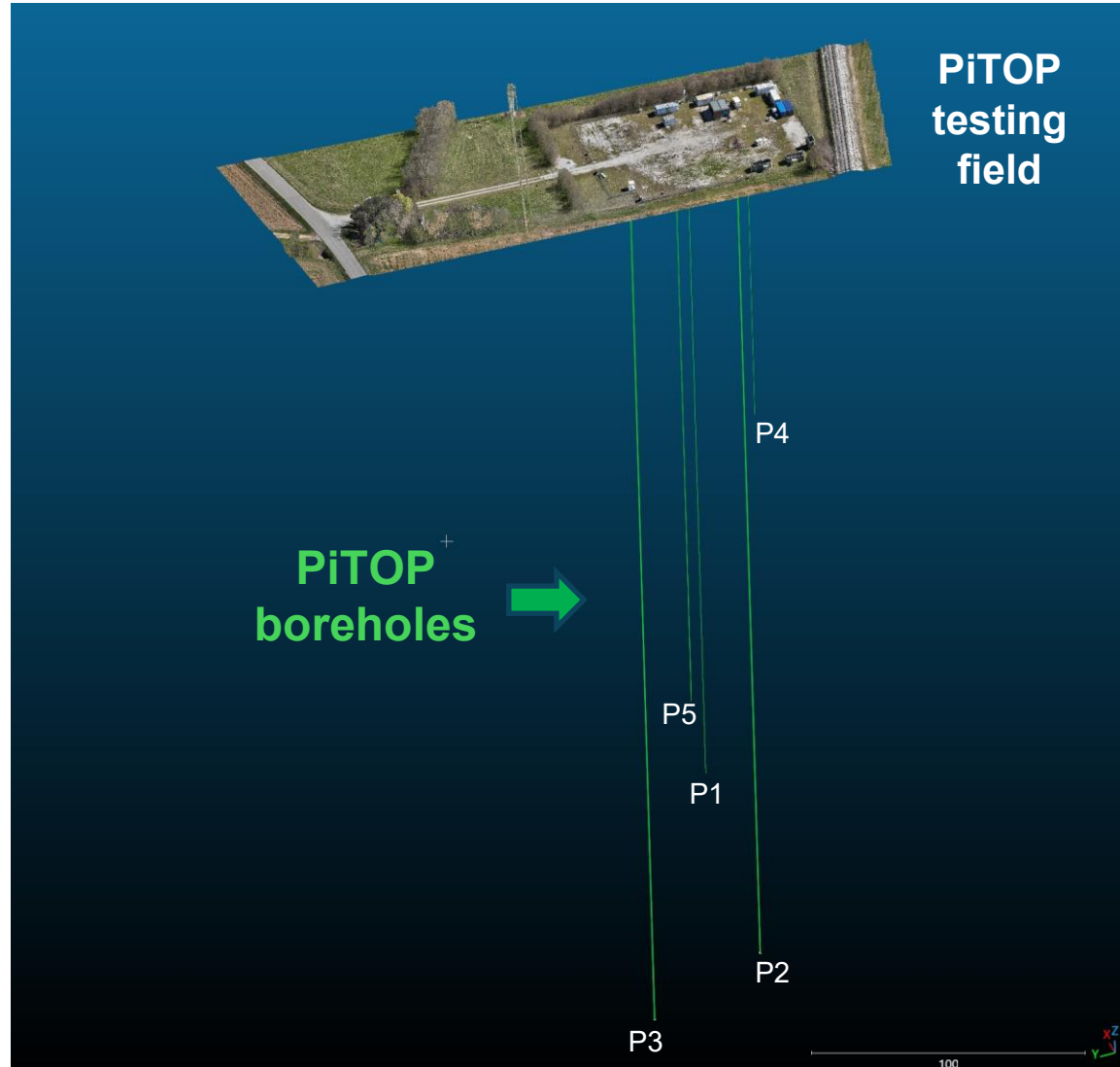
Virtual access to onshore and offshore
boreholes in Europe: access to data and
products at the **Italian geophysical testing site**
PiTOP (OGS-ECCSEL)

PITOP: GEOPHYSICAL TEST SITE WITH INSTRUMENTED WELLS

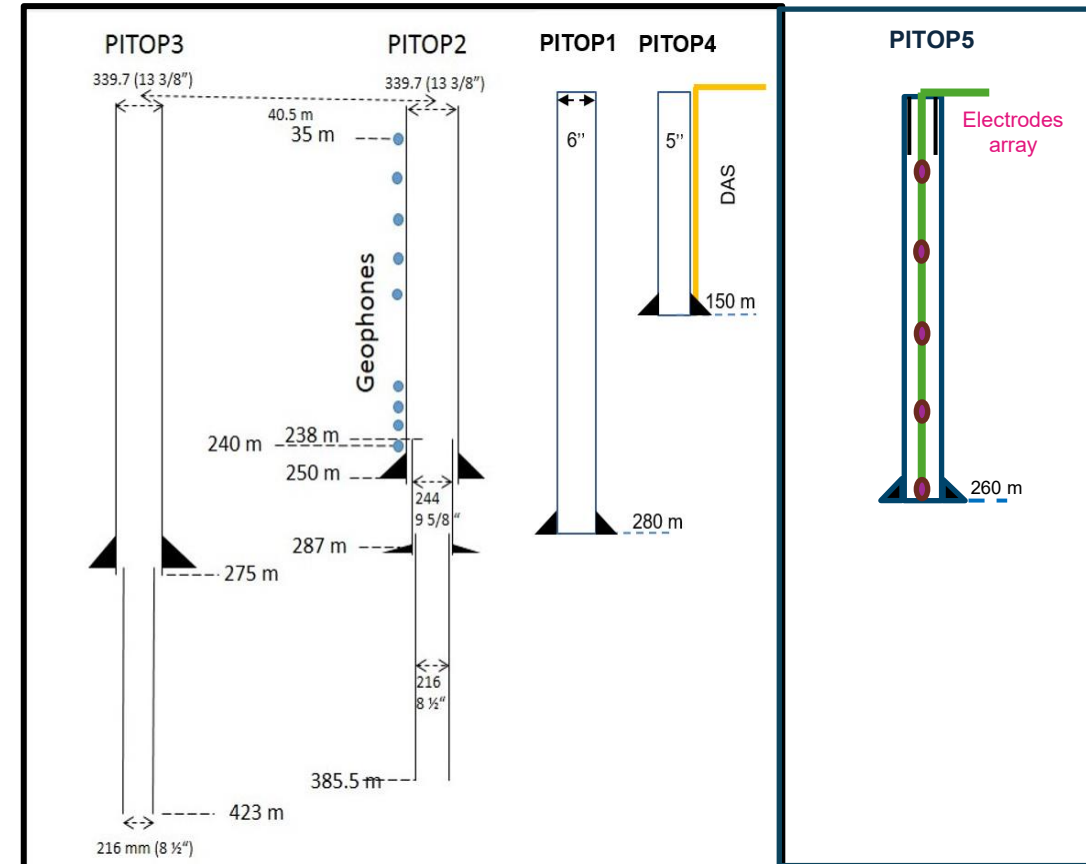


PITOP covers an area of approximately 22,000 m² and was designed and developed with the aim of providing a facility for the study and experimentation of **geophysical methods**, **new technologies** and **borehole/surface tools** under **realistic conditions**

PiTOP BOREHOLES

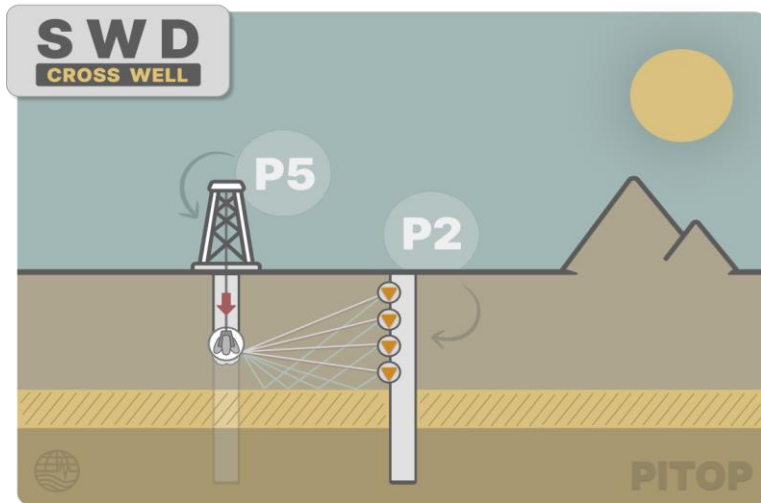
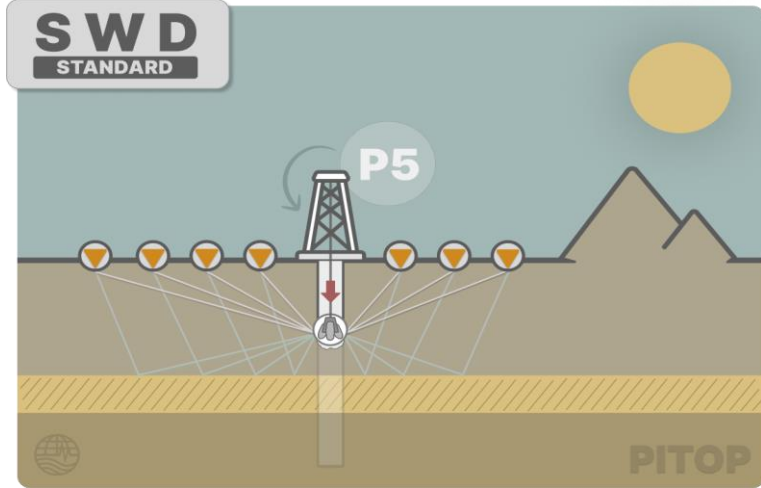


PITOP WELLS SKETCH

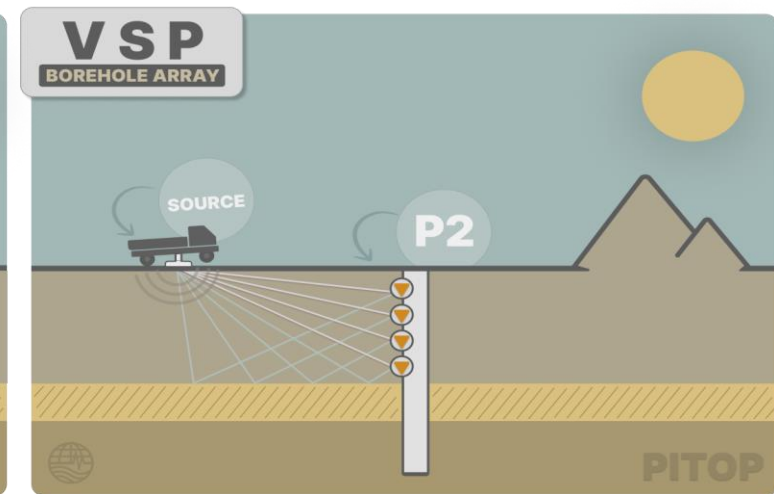
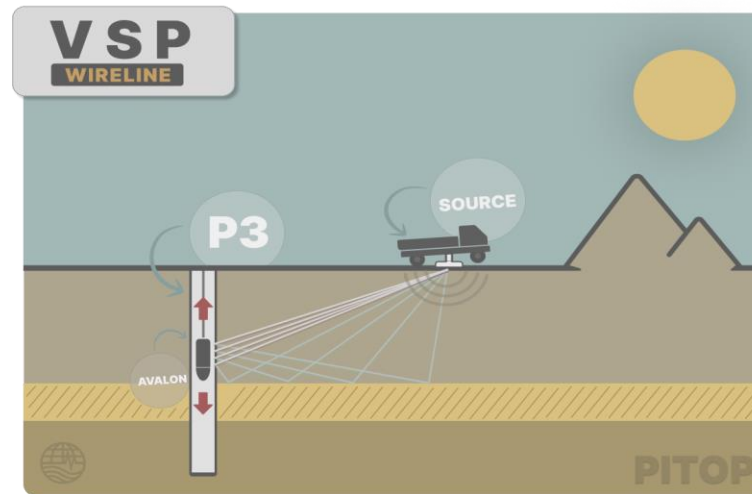
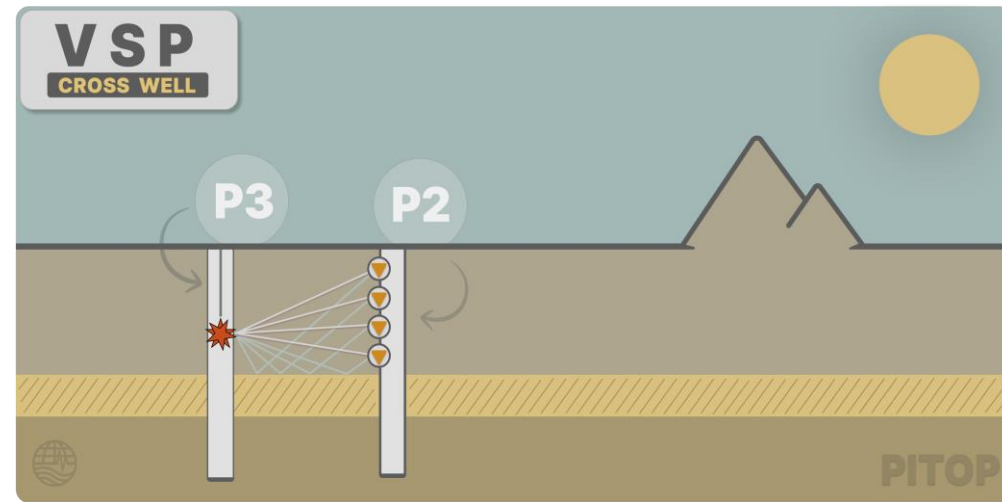


EXAMPLES OF POSSIBLE GEOPHYSICAL TESTS IN PITOP

Seismic While Drilling (SWD)



Vertical Seismic Profiling (VSP)

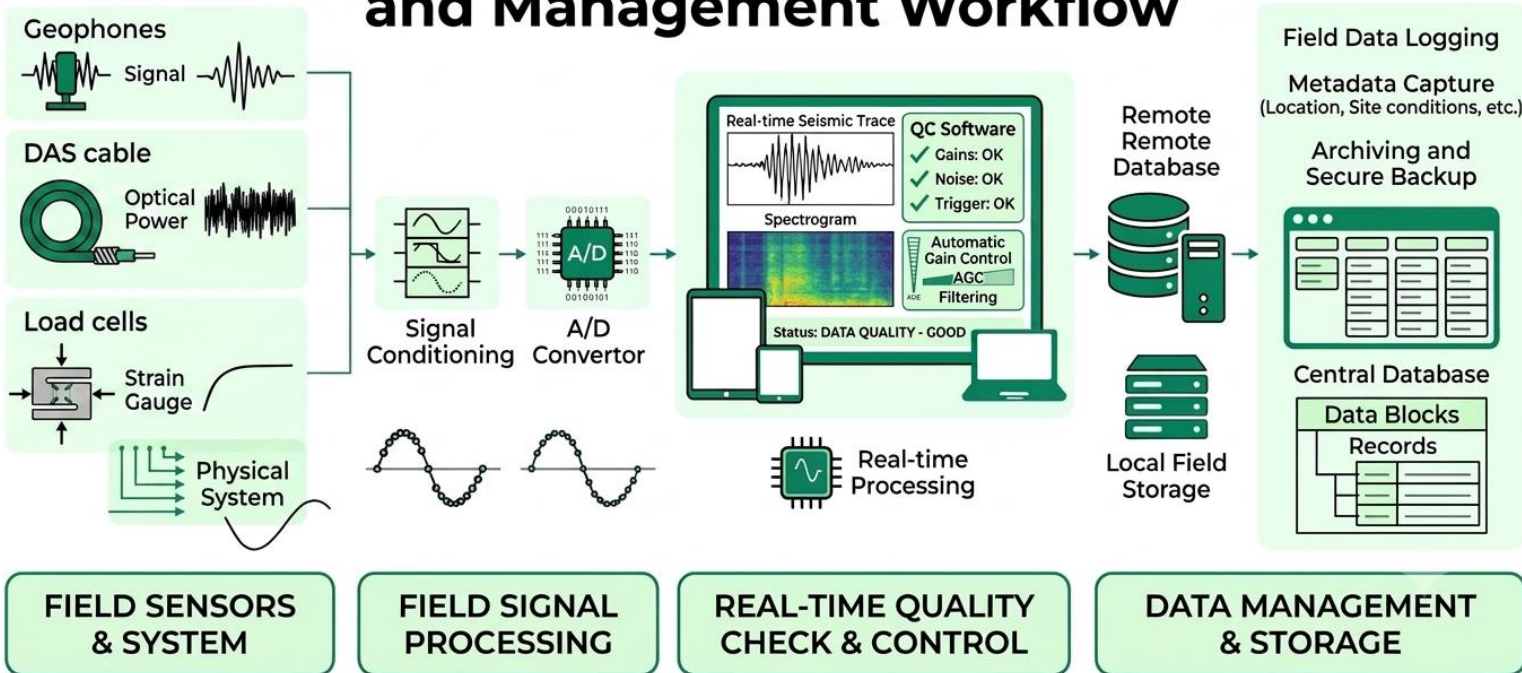


FURTHER FACILITIES/SERVICES AVAILABLE IN PITOP

Hardware/software for acquisition systems and data management

Remote connection to data/instruments through virtual access

Geophysical Testing Data Acquisition and Management Workflow



<https://pitop.ogs.it/>

Acknowledgements:

Geo-INQUIRE is funded by the European Commission under project number 101058518 within the HORIZON-INFRA-2021-SERV-01 call.

ECCSEL ERIC was established by the European Commission implementing decision of 9 June 2017 (EU) 2017/996.

References:

- OGS PiTOP website: <https://pitop.ogs.it/> - Transnational Access, SeisDAS Project 2025, EXP1, DOI: 10.13120/ODTM-JX93)
- ECCSEL ERIC PITOP page: <https://eccsel.eu/catalogue/facility/?id=126>
- Geo-INQUIRE website: <https://www.geo-inquire.eu/>
- EU - Next Generation EU Mission 4, Component 2 - CUP B53C22002150006 – Project IR0000032 – ITINERIS - Italian Integrated Environmental Research Infrastructures System
- Geophysical exploration case histories at the PITOP geophysical test site – A key facility in the ECCSEL-ERIC consortium: an overview. Bellezza et al., Bulletin of Geophysics and Oceanography, 2025

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SCREENSHOTS FROM PITOP WEBSITE NAVIGATION

PITOP: website access to boreholes monitoring and experimental data



WELLS STRATIGRAPHY

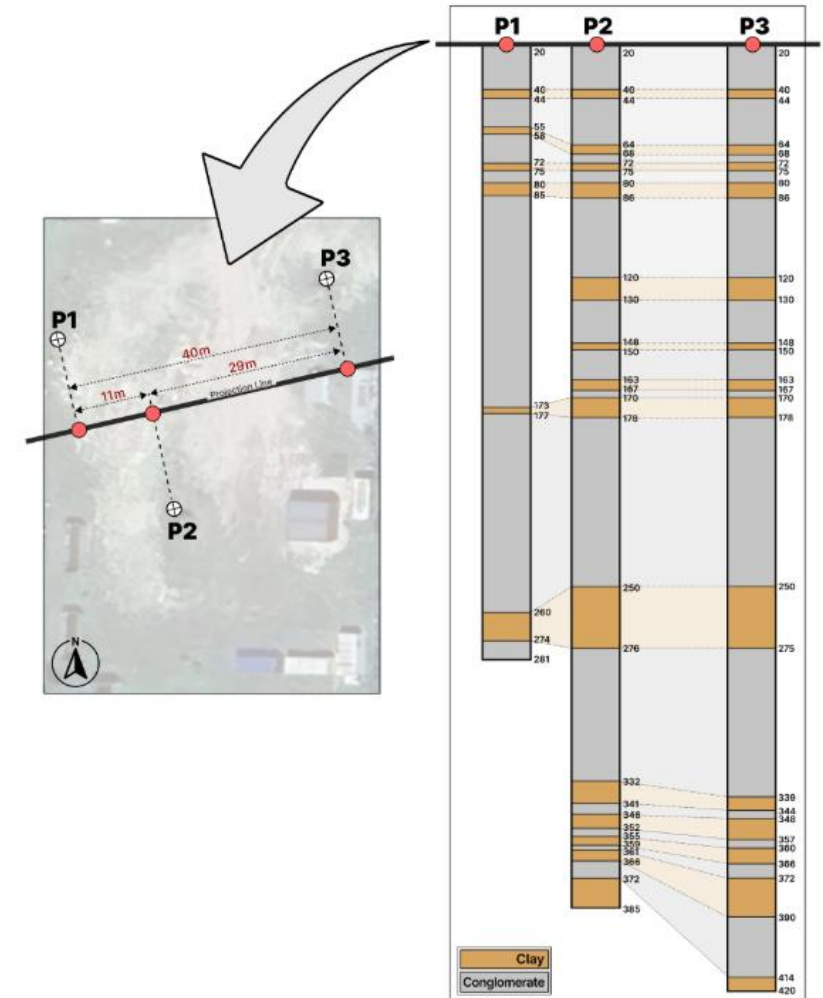
Well Stratigraphy

Introduction

The site stratigraphy is reconstructed by integrating cuttings/core descriptions with geophysical logs acquired in the PITOP wells.

The detailed analysis of both cuttings and core, sampled during drilling, enables reconstructing the stratigraphy of the site. The PITOP2 well has the greatest and most complete data of the site, acquired during 121/4" and 81/2" phases (from 42 to 282 m and from 282 to 385.5 m, respectively). During the drilling of the PITOP2 well, Baker Hughes Inteq, a mudlogging company, sampled cuttings from depths ranging from 44 to 385.5 m, which provided a detailed lithological description (masterlog). Gravels and lightly cemented conglomerates with limestone and dolomitic clasts are alternated to soft and plastic brown ocher clay until the first 180 m. The same lithologies, but with a greater cementation of the conglomerates and different coloured (beige-brown-grey) clay that is silty at times, are found up to the bottom of the well. Furthermore, Schlumberger Limited acquired several electric logs in the PITOP2 well after both phases (121/4" and 81/2") and in the PITOP3 well only after the 81/2" phase. The recorded well logs are listed in the Table below.

Well	Run	Logs	Interval (m)
PITOP2	1	DSI – GR - EMS	246.0 - 41.5
PITOP2	2	DSI – GR - EMS	387.5 - 250.0
PITOP2	3	USIT - CBL	250.0 - 41.0
PITOP2	4	Gyro survey	387.5 - 0.0
PITOP3	1	DSI – GR - EMS	426.0 - 97.6
PITOP3	2	DSI – GR - EMS	333.0 - 253.7



Stratigraphic correlation among PITOP1, PITOP2 and PITOP3.

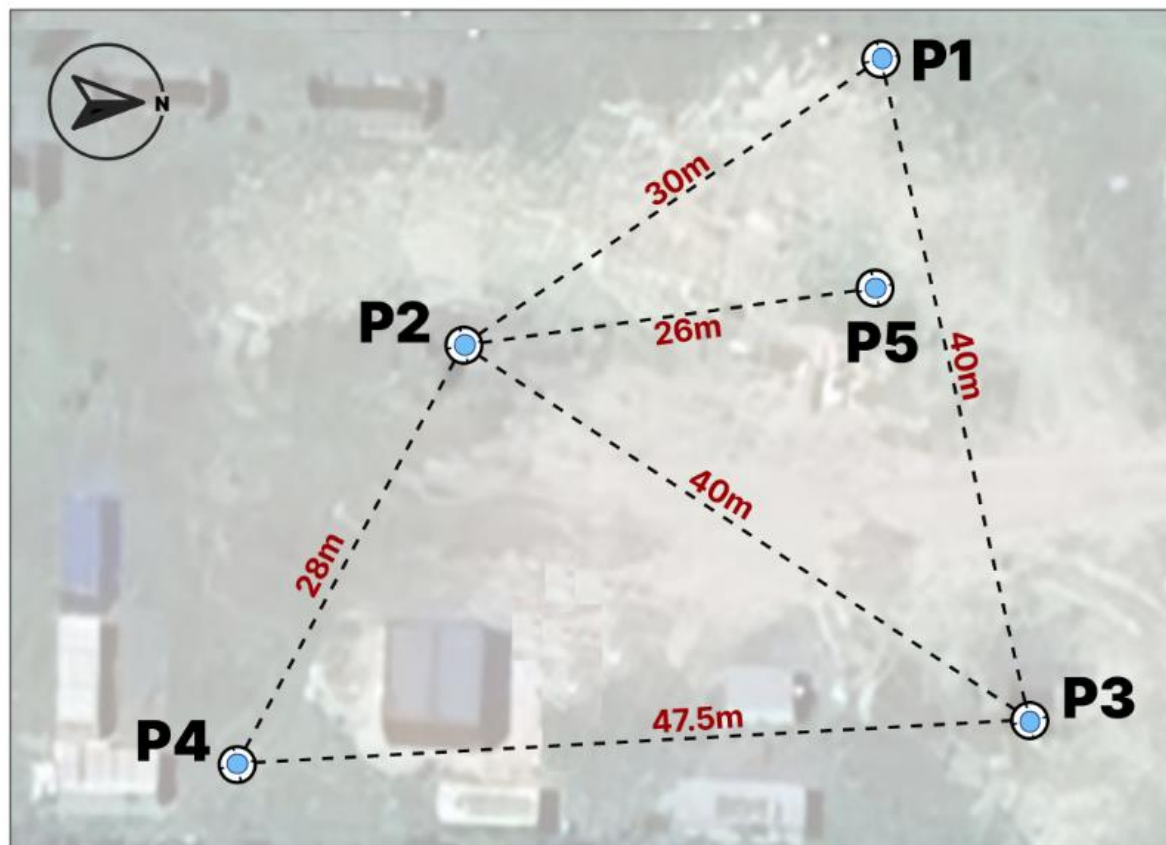
The geological layers at the PITOP site are primarily sub-horizontal, but from 275 meters to the bottom of the wells, they show a slight inclination, as interpreted from the PITOP2 and PITOP3 electric logs. The variable thickness of the conglomerate layers indicates a continental depositional environment, shaped by terrigenous sedimentation within an alluvial fan or plain. This process is closely linked to the activity of the Meduna and Cellina Streams.

[Home](#) / [Boreholes](#) / Map

Well Map

Introduction

An interactive aerial map of the site: click on a borehole to open its dedicated page. At the bottom, a 3D rendering shows the installed instrumentation.



PiTOP boreholes map (click a marker to open the borehole page).

PITOP4 - P4

Introduction

Borehole instrumented with a high-sensitivity optical fiber line, installed from the wellhead down to 150m.



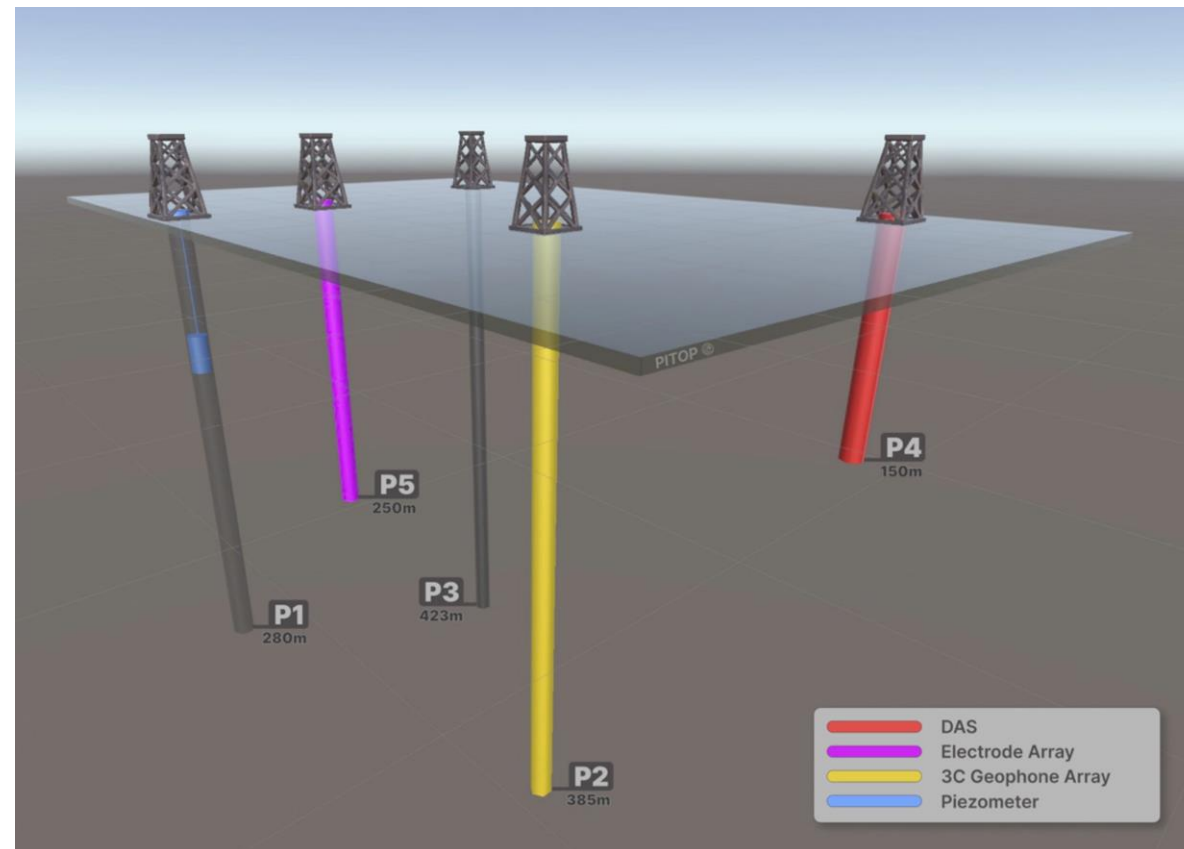
PITOP4 (P4) borehole.

PITOP4 was drilled in 2014 and reaches a depth of about 150 m. From an instrumentation perspective, it is equipped with a high-sensitivity optical fiber line installed from the wellhead down to 150 m, enabling DAS measurements.

Key data

Depth	150 m
Diametro Casing (in)	5
Construction	2014
Purpose	Geophysical testing and studies
Instrumentation	Optical fiber (DAS)
Location (Lat, Lon)	40.19851059, 12.8170937

[Back to top](#)



INSTRUMENTATION

pitop.ogs.it/instrum-overview.php

OGS Istituto Nazionale di Oceanografia e di Geofisica Sperimentale

PiTOP Borehole geophysical test site

Italiano

Home About Boreholes Instruments Methods Transnational Access Observational Data

[Home](#) / Instruments

Instrumentation Overview

Introduction

Overview of the instrumentation available at the PITOP test site, organised by category: seismic sources, sensors and measurement systems, acquisition systems and control systems. Each entry links to the detail page of the individual instrument or instrument family.

Continuous seismic sources

Vibroseis vibrational sources, from compact portable units to truck-mounted systems.

- › Elvis VII
- › IVI Minivib
- › Prakla VVCAVE
- › SOV — Surface Orbital Vibrator

Impulsive seismic sources

Sources that generate seismic waves through underwater electrical discharges or accelerated ground impacts.

- › Sparker SBS-52
- › AWD — Accelerated Weight Drop

pitop.ogs.it/instrum-sensors.php#avalon-gsr

Italiano

Avalon SLIM GSR

[Avalon SLIM GSR](#) is a borehole geophone system designed for seismic acquisition in wells. Recording the wavefield directly at depth improves survey resolution and allows accurate control of the source-receiver geometry. At PITOP, this type of sensor is particularly useful for VSP experiments, crosswell surveys, borehole-source tests, and comparisons with downhole optical fibres.



Avalon SLIM GSR borehole geophone.

[Home](#) / [Transnational Access](#)

Transnational Access

Introduction

This page provides an introductory overview of transnational access in general and specifically those carried out at the PiTOP site, with links to dedicated pages, datasets, and documentation.

[Summary](#)[Geo-INQUIRE](#)[TA program](#)[TA @ PiTOP](#)

Summary

The Transnational Access (TA) activities concerning the OGS “PiTOP” site were carried out within the framework of a TA program of the Geo-INQUIRE project, aimed at developing and testing borehole seismic investigation methods, with potential applications such as underground CO₂ underground storage and energy-related applications.

The datasets resulting from the various experiments conducted in this context include seismic data in SEG-Y format, survey logs, acquisition geometries, and other supporting documentation.

Key facts

- **Framework:** Geo-INQUIRE (Horizon Europe)
- **Period:** 2022–2026
- **Coordinator:** GFZ Potsdam
- **Access modes:** On-site & Remote
- **Scope:** Seismology, CCS, Volcanology, Tsunami, Landslides, HPC

The SeisDAS project

The SeisDAS project aimed at the “*Evaluation of distributed acoustic sensing (DAS) signals in cross-well and surface seismic applications for high resolution imaging of the subsurface*”. Several tests have been performed within this project, using different energization methods and various acquisition instruments.

[Exp1](#) [Exp2](#) [Exp3](#)

Experiment “Exp1”

In this page, the experiment Exp1 is described and the relevant datasets are made available to the scientific and industrial community. This test is a VSP carried out in the well [PITOP2](#), using a Vibroseis truck (Minivib) as the acoustic source and both a borehole geophone array and a downhole DAS fibre cable as receivers.

The objective of Exp1 is to evaluate DAS responses in a VSP configuration at PITOP2, comparing recordings from a downhole fibre cable interrogated by Silixa iDAS/Carina with a co-located 3C borehole geophone array, under controlled Vibroseis energization.

[Experiment layout](#) [Acquisition parameters](#) [Dataset & geometry](#)

Key facts

- **Project:** SeisDAS ([Geo-INQUIRE](#) Transnational Access)
- **Experiment:** Exp1 – VSP in well [PITOP2](#)
- **Source:** [Vibroseis Minivib](#)
- **Receivers:** 3C borehole geophones, DAS downhole cable
- **Interrogators:** Silixa iDAS, Silixa Carina
- **Data format:** SEG-Y
- **Access:** Open dataset (Exp1)

Layout of the experiment and equipment

A sketch of the test configuration is reported in Figure 1.

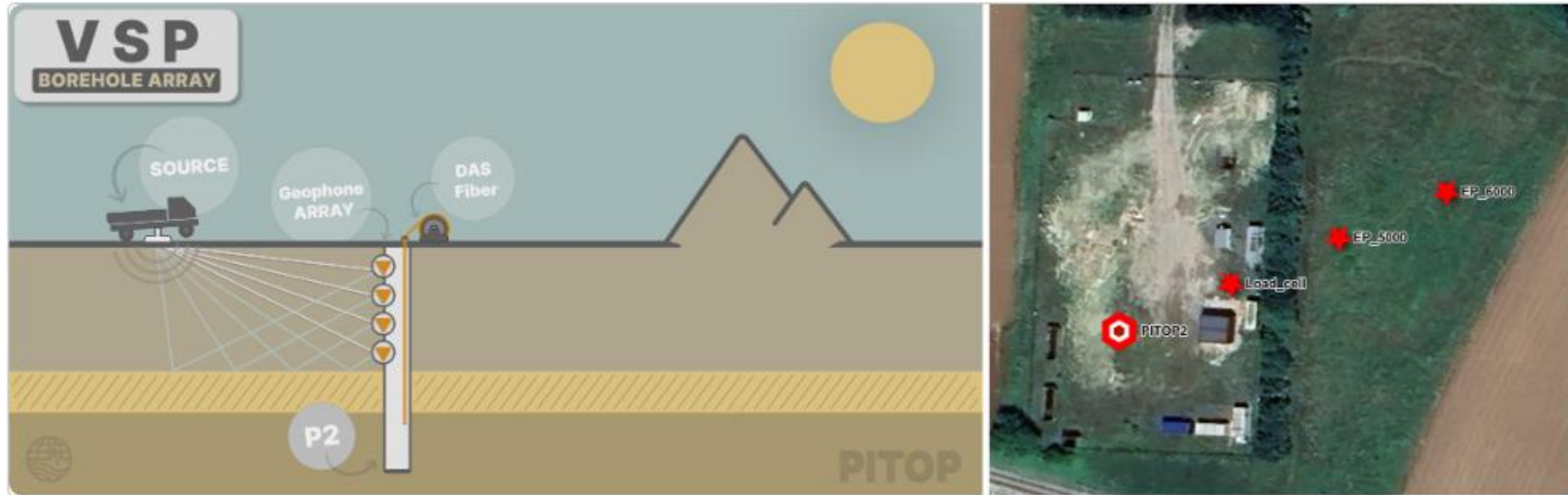


Figure 1. Left: Schematics of the VSP test performed in PITOP2 in the SeisDAS project. Right: Top view of the site, sources location (Load cell, EP_5000, EP_6000) and receivers location (in PITOP2).

Site & Source

- **Site location:** PiTOP
- **Source:** Vibroseis Minivib (P mode)

Receivers & Interrogators

- **Receivers:** Borehole 3C Geophones;
DAS downhole cable
- **Interrogators:** iDAS (Silixa Ltd);
Carina (Silixa Ltd)

Acquisition main parameters

Source parameters

Parameter	Value
Sweep length (s)	16.0
Start frequency (Hz)	10.0
Stop frequency (Hz)	300.0
Start taper (s)	0.8
Stop taper (s)	0.8
Load force (N)	2200

Receiver parameters

Parameter	Borehole geophones	Fiber Optics (iDAS)	Fiber Optics (Carina)
Tracf range	H1: 2101 - 2130 H2: 2201 - 2230 Z: 2301 - 2330	12260 - 12934	22658 - 23000
Number of channels	90	675	343
Number of samples	18000	18000	18000
Record length (s)	18.0	18.0	18.0
Sampling interval (s)	0.001	0.001	0.001

Dataset and measurement geometry

The provided data set consists of 1 survey with several energization points. All the data is provided in the [SEG-Y](#) format.

Contents of the SEG-Y files

- Trace data for each geophone or sensor
- Shot position and geometry
- Acquisition parameters:
 - Sample rate
 - Number of traces
 - Record length
 - Header information



Access to resources. Here you can find the technical document, the DOI landing page, and the data folder.

[Data specification \(PDF\)](#)

[DOI landing page](#)

[Open data folder \(EXP3\)](#)

For citation purposes, please refer to the DOI provided.

EXP3

Layout of the experiment and equipment

A sketch of the test configuration is reported in Figure 1.

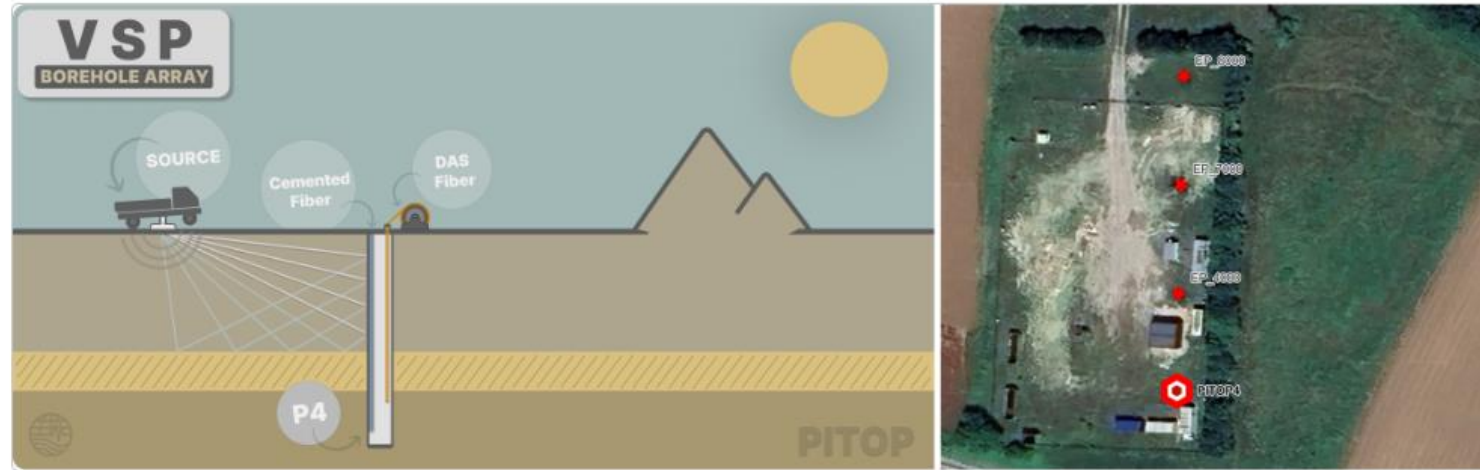


Figure 1. Left: Schematics of the surface test performed in the SeisDAS project. Right: Top view of the site, sources location (EP) and receivers location in PITOP4 (cemented or suspended DAS cables).

Site & Source

- **Site location:** PiTOP
- **Source:** Vibroseis Minivib (P mode)

Receivers & Interrogators

- **Receivers:** Cemented and suspended DAS cables
- **Interrogators:** iDAS (Silixa Ltd); Carina (Silixa Ltd)

Dataset and measurement geometry

The provided data set consists of 1 survey with several energization points. All the data is provided in the [SEG-Y](#) format.

Contents of the SEG-Y files

- Trace data for each geophone or sensor
- Shot position and geometry
- Acquisition parameters:
 - Sample rate
 - Number of traces
 - Record length
 - Header information



Access to resources. Here you can find the technical document, the DOI landing page, and the data folder.

 [Data specification \(PDF\)](#)

 [DOI landing page](#)

 [Open data folder \(EXP3\)](#)

For citation purposes, please refer to the DOI provided.

SeisDAS – Data format specifications

The dataset produced within the SeisDAS project includes as many files as recorded shots, organized in subfolders, one for each shot point, for a total of 3 shot points (EP).

Each record file is written in SEG-Y format¹; it includes a reel header which precedes the data part of the file.

The reel header is a fundamental component for describing seismic data in the SEG-Y format. It consists of **3600 bytes**, divided into two main parts:

Textual File Header (3200 bytes)

- It is encoded in **EBCDIC**, formatted in 40 rows, each one including 80 characters.
- Contains descriptive information as shown below (e.g.):

```
C01 - - - - - DATA PROPERTIES - - - - -
C02 FUNDER NAME: Geo-INQUIRE - Horizon Europe Grant 101058518
C03 PROJECT NAME: SeisDAS - Transnational Access 2025, EXP3
C04 GEOPHYSICAL COMPANY: OGS
C05 OBSERVER: FABIO MENEGHINI
C06 USER GROUP LEADER: OGS
C07 FACILITY/SITE LOCATION: PiTOP - OGS test site
C08 - - - - - RECORD PROPERTIES - - - - -
C09 ACQUISITION TYPE: SEISMIC
C10 Datum elevation [m]: 256
C11 Source depth [m]: 0
C12 Main receiver depth [m]: 149.0
C13 RECEIVER WELL: PiTOP-4
C14 WATER LEVEL AT RECEIVER WELL [m]: 0.0
C15
C16 CLAMP INDEX: 0
C17 SOURCE LOCATION ID: 4000
C18 - - - - - SOURCE PARAMETERS - - - - -
C19 DESCRIPTION: OGS MINIVIB - P wave mode
C20 SWEEP FREQUENCIES [Hz]: 10 - 300
C21 SWEEP LENGTH [s]: 16
C22 START-END TAPER (cosine) [s]: 0.8, 0.8
C23 LOAD PEAK FORCE [1bf]: 2000
C24
C25
C26
C27
C28
C29
C30
C31
C32
C33
C34
```

¹ For a complete and official description, you can consult the SEG-Y Rev 2.0 specification published by the Society of Exploration Geophysicists:
https://library.seg.org/pb-assets/technical-standards/seg_y_rev2_0-mar2017-1686080998003.pdf

Binary File Header (400 bytes)

- Starts at byte **3201** and ends at byte **3600**
- Encoded in binary format and includes:
 - Number of traces per record** (3213–3214)
 - Sampling interval (µs)** (3217–3218)
 - Number of samples per trace** (3221–3222)
 - Data format code** (3225–3226): 5 = IEEE floating point notation

Trace Header (240 bytes)

The **trace header** in the **SEG-Y (SEG-Y)** format is a crucial part of the file that contains seismic data. Each *trace* (i.e., a recording of a seismic signal) is preceded by a header that describes the characteristics of that trace. This header follows a standard structure and includes information useful for processing and interpreting the data.

In the standard SEG-Y format (version 1, as defined by the SEG Technical Standards Committee), the trace header consists of **240 bytes** and includes fields with information such as:

byte n.	field name	value type	description
1-4	trac1	int32	trace sequence number within line
5-8	tracr	int32	trace sequence number within segy file
9-12	fldr	int32	original field record number
13-16	tracf	int32	trace number within the original field record
17-20	ep	int32	energy source point number
37-40	offset	int32	distance from center of the source point to the center of the receiver group
41-44	gelev	int32	receiver group elevation
45-48	selev	int32	surface elevation at source
49-52	sdepth	int32	source depth below surface
53-56	gdel	int32	Datum elevation at receiver group - ground level
57-60	sdel	int32	Datum elevation at source - ground level
61-64	swdep	int32	water table at source
65-68	gwdep	int32	water table at receiver
69-70	scalel	int16	scalar to be applied to all elevations and depths
71-72	scalco	int16	scalar to be applied to all coordinates
73-76	sx	int32	source coordinate x
77-80	sy	int32	source coordinate y
81-84	gx	int32	group coordinate x

85-88	gy	int32	group coordinate y
89-90	counit	int16	Coordinate units: 1=meters
109-110	delrt	int16	delay recording time in ms
115-116	ns	uint16	number of samples
117-118	dt	uint16	sampling interval in us
125-126	corr	int16	correlated: 1=no; 2=yes
153-156	msdepth	int32	measured source depth
157-158	year	int16	year data recorded
159-160	day	int16	day of year
161-162	hour	int16	hour of day
163-164	minute	int16	minute of hour
165-166	sec	int16	second of minute
173-174	grnofr	int16	sensor id
205-208	ntr	int32	number of traces
211-212	gl	int16	Gauge length in cm.
213-214	azimuth	int16	azimuth angle between receiver and source in degrees/100
223-224	sfreq	uint16	sampling frequency in Hz
229-232	gdepth	int32	true vertical depth of the receiver
233-236	mgdepth	int32	measured depth of receiver
237-240	cabdist	float32	F.O. trace cable distance from interrogator

All data is written in Big Endian format.



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m28g-7x76

Search Max results (default 100)

100

DOI: 10.13120/M28G-7X76

(<https://data.datacite.org>)

Title

SeisDAS exp3 2025

Description

The SeisDAS project aimed to evaluate distributed acoustic sensing (DAS) signals in cross-well and surface seismic applications for high-resolution subsurface imaging. Several tests were conducted within this project using different energization methods and acquisition systems. The experiment Exp3 consists of a vertical seismic profiling (VSP) survey conducted in the PITOP4 well, using a Vibroseis truck (Minivib) as the acoustic source and both cemented and suspended downhole DAS fibre-optic cables as receivers. The resulting datasets are made available to the scientific and industrial communities. Funded by the EU through Horizon Europe Grant 101058518 (Geo-INQUIRE) - Geo-INQUIRE DOI: 10.3030/101058518

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- Luigi, Lucerna Lucerna Luigi

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[Click here to browse dataset entries](#)

☐	Nome	Data di modifica	Dimensioni	Azione
☐	📁 EP4000	30/03/2026 10:23:19		↓
☐	📁 EP7000	30/03/2026 10:23:19		↓
☐	📁 EP8000	30/03/2026 10:23:19		↓