
INGEN
GROUP
2025 CATALOG

INTRODUCTION

INGEN GROUP, a recognized expert in subsurface exploration and materials characterization, is a key player in meeting the challenges of **geological and geophysical engineering**. Since its creation, INGEN GROUP has been committed to providing innovative and reliable solutions to its partners, whether they operate in the energy, construction, infrastructure or natural resources sectors.

INGEN GROUP stands out for its **innovative**, customer-focused approach, combining **technical expertise with tailor-made solutions** to meet the specific requirements of each project. We support our customers in understanding and optimizing their geological environment.

INGEN GROUP includes the following entities:

INGEN INNOVATIONS GEOSCIENCES — **Exploration | Research & Development**

Rocks Lab — **Rock and materials analysis laboratory**

INGEN LOGGING — **Geological monitoring of deep drilling (Mudlogging)**

INGEN ENVIRONNEMENT — **Geoviticulture**

FBSOLUTIONS — **Distributors of RTK GNSS receivers and GPR**

Trust INGEN GROUP to explore, analyze and enhance your environment in all its dimensions. Together, we can push back the frontiers of exploration and turn your ideas into reality.

EXPLORATION

INGEN INNOVATIONS GÉOSCIENCES carries out studies to provide an informed vision of the geological context of your project.

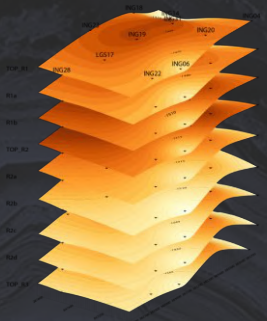
We bring our innovation and know-how to bear on projects in all the following geosciences fields:

- Geothermal exploration, both deep and shallow,
- Underground storage,
- Native hydrogen and lithium research,
- Conventional resources and mining.

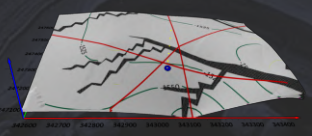
All processes have been internalized to provide a complete service. Our in-house laboratory provides the analytical production capacity needed to manage assignments from field campaigns to modeling and geostatistics.

We provide advice and expertise on :

Basin studies
Stratigraphy, Sedimentology & Diagenesis

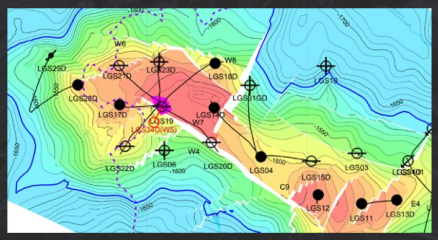


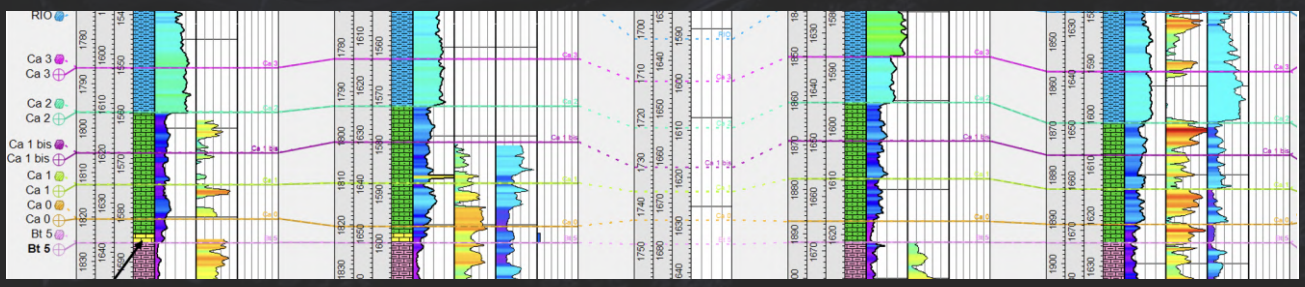
Conceptual Model
Integration of geophysical and well data, modeling / geostatistics (GIS / 3D)
Microfacies / Electrofacies
Prediction of lithological heterogeneity



Reservoir caracterization
Reservoir quality analysis and modeling
Pore pressure evaluation, geosteering, chemosteering

Operation Geology
Geological monitoring of drilling





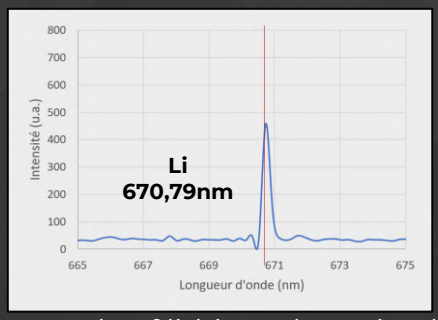
LABORATORY

GEOCHEMESTRY – LASER SPECTROSCOPY

LIBS is a portable analyzer that measures all the elements of the periodic table, from H to U. Free from ionizing radiation, this innovative analysis technique not only detects but also quantifies the elements present. LIBS calibration depends on the nature of the "matrix" and must be adjusted to suit the samples analyzed. This is why INGEN has developed specific calibrations for elemental quantification on solids or brines, both for its own use and for its customers.

Applications in the following fields

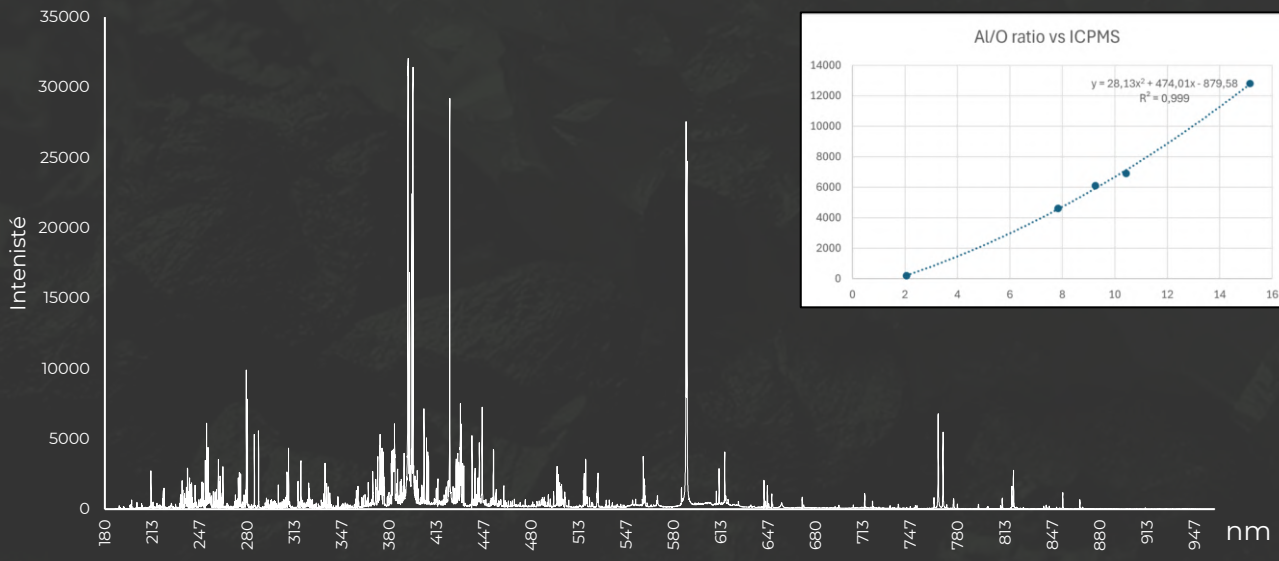
- Polluted sites and soils (copper, lead, cadmium, etc.)
- Mining exploration (uranium, lithium, cobalt, titanium, etc.)
- Resource exploration - hydrogen, O&G, water, storage (CCUS)
- Chemosteering



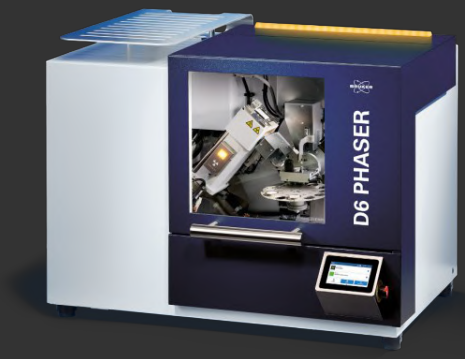
Example of lithium detection by laser spectroscopy

We have developed specific calibrations for the following themes:

- Sedimentary rock calibration
- Evaporitic rock calibration
- Vineyard-specific soil calibration: Cu / Fe / Ca / N / Mg / C
- Oxides and HC calibration: analysis of oxidation residues in boreholes
- Si base calibration
- Specific calibration on request



MINERALOGY – X RAY DIFFRACTION



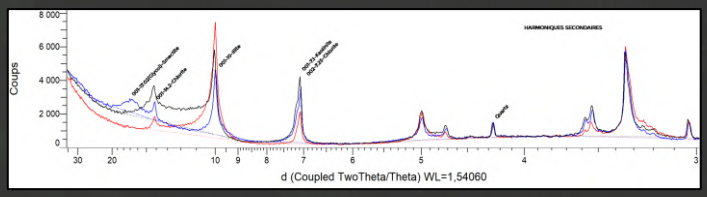
X-ray diffraction (XRD) enables us to carry out qualitative and/or semi-quantitative analyses of the minerals making up your soils and materials.

Equipped with the latest generation of X-ray diffraction (D6 Phaser from Bruker), we provide you with precise, non-destructive mineralogical information.

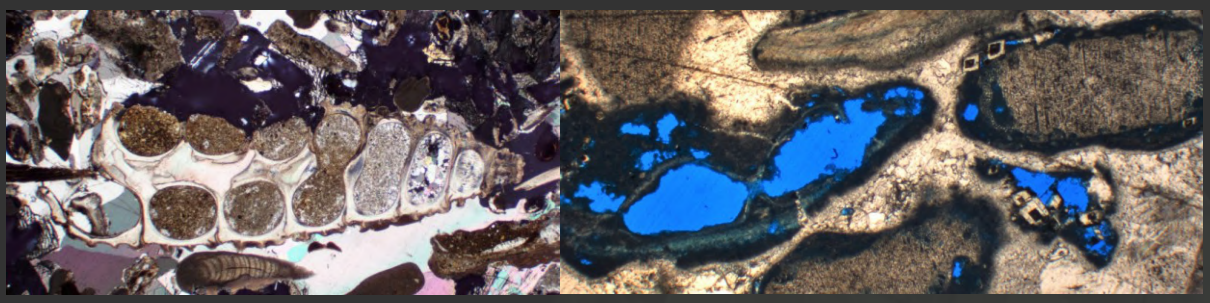
With this revolutionary benchtop XRD platform, which combines operability and flexibility, we are able to carry out your XRD for clay minerals and powders in the shortest possible time.

Applications in the following fields

- Geotechnics (clay shrinkage and swelling / construction),
- Resources / Exploration,
- Quarries and Mines.



PETROGRAPHY – NATURAL ROCK



ROCKSLAB describes your samples on thin sections and carries out petrographic analysis of different rock types (carbonate, silicoclastic, metamorphic, plutonic, etc.) in accordance with NF EN 12407 standards.

They include, according to your themes:

- Description of grain types, textures and structures,
- Fracture diagenesis,
- Paragenetic analysis,
- Visual assessment of mineralogical phases and characterization of porosity (quantified by color thresholds).

Applications in :

- Oil & Gas
- Geothermal
- CCUS
- Geotechnics
- Quarries & Mines

CHROMATOGRAPHY

Both on site and in the laboratory, we use TCD Helium / Argon chromatographs for the quantification of organic and inorganic compounds in the gas phase.

- Cycle time 35s : Methane → Pentane + CO_2/H_2S/He/H_2
- Cycle time 45s : Methane → Hexane (global) + CO_2/H_2S/He/H_2

iC_4 / nC_4 / iC_5 / nC_5 differentiated. Hexane isomer differentiation on request.
We can work on site (mobile laboratory unit / mudlogging) analyzing drilling fluids or soil samples (gas soil monitoring). Our system is combined with constant flow/volume deaerators. The equipment is also available in the laboratory for isotube or sample bag analysis.
Other compounds can be analyzed on request.

SOILS & BACKFILL : GTR

Soil classification according to the Guide des Terrassements Routiers (GTR), including tests for :

- Granulometry,
- Sedimentometry,
- Atterberg limits,
- Methylene Blue Value (VBS),
- Water content.

SHRINKAGE & SWELLING EXPERTISE

INGEN has developed expertise in the analysis of clay minerals. We work on long-term studies of soil evolution by combining :

- Clay mineral analysis,
- Shrinkage limits,
- Soil compaction rates, combining geophysical methods, sequential laboratory analysis and site monitoring.

SPECIFIC EXPERTISE ON REQUEST

Do you have any special requests? Don't hesitate to contact us to discuss it with our experts. We can offer you innovative solutions.

2025 RATES

Analysis or measurements *Type d'analyse ou mesure*		Unit *Unité*	Price *Prix* (€ excl. Tax)
Petrography / *Pétrographie*			
Petrology on thin sections (include porosity) - binocular magnifier *Pétrographie sur lame mince (dont porosité) - loupe binoculaire*		Sample *Échantillon*	71
Thin section preparation *Préparation lame mince*	w/ coloration *Avec coloration*		38
	wo/ coloration *Sans coloration*		35
Étude pétrographique des granulats appliquée à l'alcali-réaction NF P 18-543			319
Clays characterization and rate of swelling clay / Caractérisation des argiles et taux de gonflants			
XRD - Clay (oriented paste) *DRX argile (pâte orientée)*		Sample *Échantillon*	216
XRD - Whole rock (powder) *DRX - roche totale (poudre)*			148
Methylene blue *test Essais au bleu VBS* XP P094-068			33
Geomaterial characterization / Caractérisation géomatériaux			
Grain-size distribution *Granulométrie / Sédimentométrie* ISO 17892-4	Ø < 2mm	Sample *Échantillon*	55
	Ø > 2mm		99
Phi/K Measurement *Mesures Phi/K*			264
Calcimetry *Calcimétrie*			33
Atterberg limits *Limites d'Atterberg* ISO 17892-12			41
pH measurement *Mesures pH*			17
Résistivity + pH *Résistivité + pH*			110
Geotech soil classification Classification *GTR* NF P11 300			253
Shrinkage limit *Limite de retrait* XP P94-060-1			41
Volumic mass *Masse volumique* NF EN 1936			32
Chemical analyses / Analyses chimiques			
LIBS analysis *Analyse LIBS* (Laser Spectroscopy / *Spectroscopie Laser*)		Sample *Échantillon*	65
ICPMS			On demand *Sur demande*
Miscallenaous / Divers			
Rush charges *Surcout urgence*			x2
Sample preparation *Préparation échantillon*	Qty < 3	Sample	35
	Qty > 3	Batch	200
Contaminated sample *Echantillon contaminé* (HC)		Sample	On demand *Sur demande*

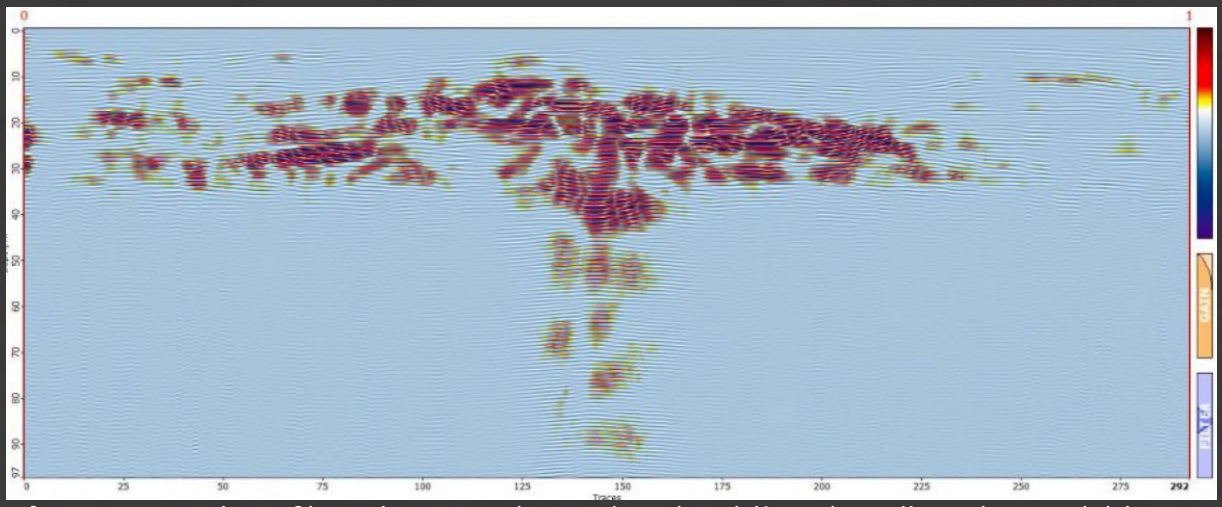
GEOPHYSICAL MAPPING

KARST & CAVITY DETECTION

INGEN INNOVATIONS GEOSCIENCES has built up a wealth of experience in geophysical acquisitions since its creation, working with a wide variety of players (quarries, mines, local authorities, geotechnical companies, civil engineering firms, etc.):

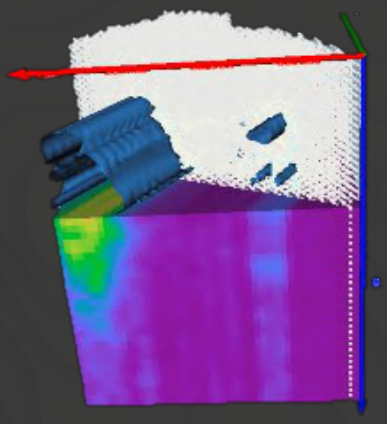
- Geophysical services to detect cavities, galleries and aquifers,
- Imaging for 3D modeling of certain geological formations

Low-frequency radars (GPR 80MHz) are used for deep imaging.
INGEN has a range of equipment enabling it to work at all scales (3D radar, 450MHz and 80MHz single-antenna) - to a depth of 80m.



Above: Detection of karstic networks on the Plombières les Dijon plateau (chimney and associated “guts”). The imagery of these chasms, regularly inspected by speleologists, is confirmed.

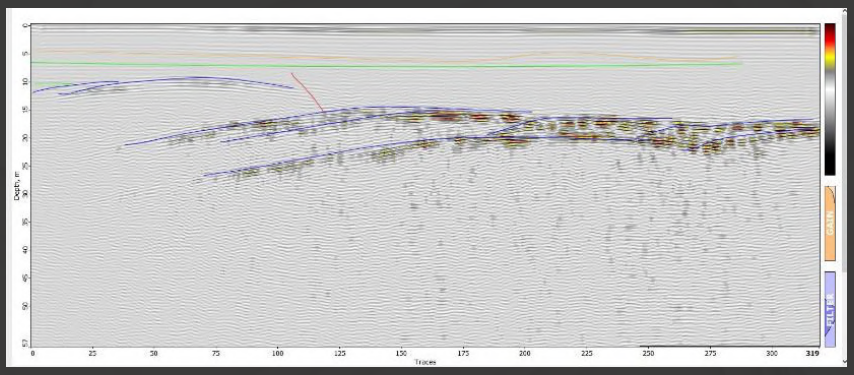
Opposite: Model of the top of former mining galleries in the municipality of Montceau-les-Mines. Today, many of these galleries pose a risk to overlying dwellings. Detecting and referencing the post-mine environment is a key issue.



IMAGING AND GEOLOGICAL MODELING

GPR technology provides an image of the subsoil through the reflection of electromagnetic waves. Changes in material density, water saturation and lithological alternations all influence the propagation of EM waves.

A radargram is therefore the result of all these variables and takes the form of superimposed reflectors. Like a seismic profile, radar imagery can be used to **model the geological structures** traversed.

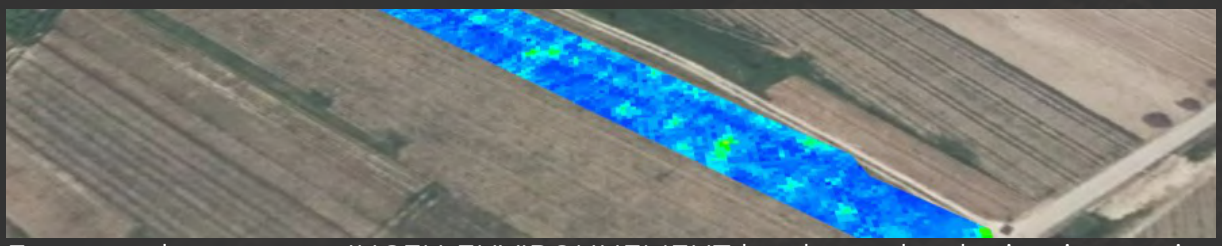


The 2D radargram opposite shows the signal obtained during a drone / 80 MHz radar acquisition at 15m altitude. It shows the arrangement of large ripples / dunes (Oxfordian Oolitic Limestone) buried beneath the marl.

The use of a suitable “grid” to record profiles enables redundant information from several 2D radargrams to be transposed into a 3D surface. This makes it possible to **image the geometry of a layer, horizon, cavity or any other detectable feature** (foundations, buried structure, etc.).

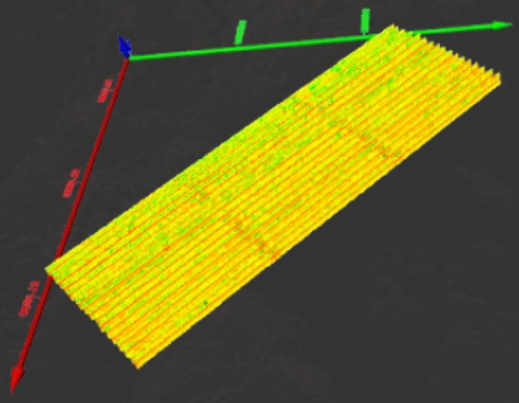
Interpolated data from radar acquisition, coupled with drilling and mapping data, can be used to create complete geological models. Opposite, aerial imagery combining **cavity positions, stratigraphic intervals** identified by drilling and the interpolated surface of the roof of one of the carbonate formations derived from radargram processing.

GEOVITICULTURE



For several years now, INGEN ENVIRONNEMENT has been developing innovative subsoil analysis techniques. In partnership with the CIVC (Comité Champagne), we carry out geophysical acquisitions of Champagne vineyards to **determine water content, soil compaction and the detection of drains.**

Objective: to carry out **GPR mapping** of the entire agricultural/viticultural estate in order to complete a pedogenetic study and/or carry out a geological interpretation of the subsoil. The aim of these studies is to provide the winegrower with a **better understanding of his/her subsoil** and to associate the evolution of the plant observed with the evolution of the subsoil in order to adapt cultivation practices and thus practice **precision viticulture**.
All these services are carried out at very high resolution. The precision obtained makes it possible to work on the scale of the **vine stock**.



Elemental analysis of soils by laser spectroscopy :

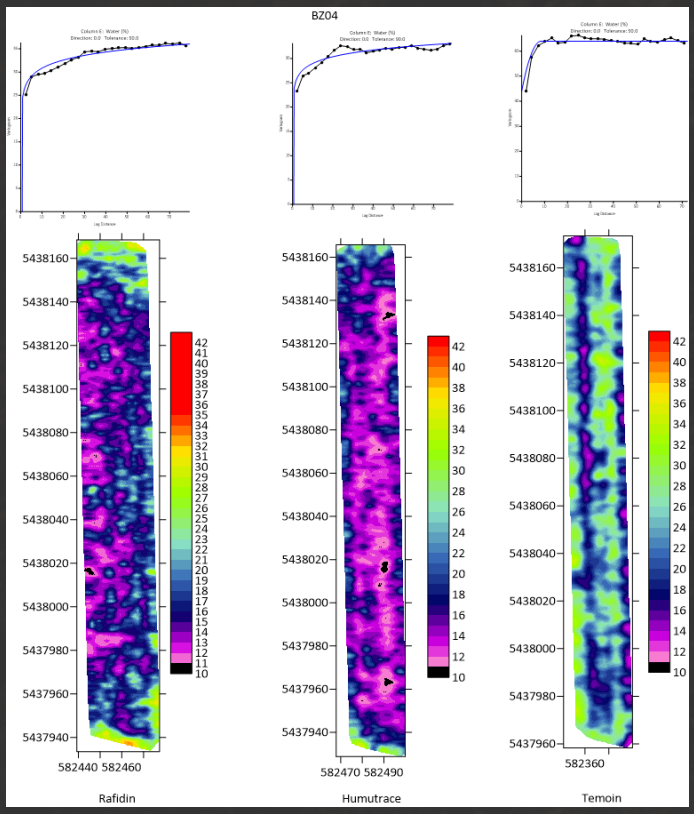
- Immediate, georeferenced results
- Spot or parcel measurements
- Dynamic monitoring
- Low operating costs

Modeling of volume water content distribution and compaction at parcel scale:

- Non-destructive method
- Shielded GPR not influenced by the presence of metal stakes
- Similar to TDR probes
- Vertical resolution ± 10cm

GPR technology is sensitive to the amount of water present in the formations studied. Water is both an asset and an obstacle in electromagnetic geophysics.
On a lake or glacier, it will be a very good wave vector (fresh water) for bathymetry applications or monitoring the stability of the snow cover, for example.
On the other hand, for water trapped in rock pores, the multiple changes of state offered by such an inhomogeneous medium for wave propagation literally “consumes” and absorbs the energy of the wave train, de-facto reducing the depths of investigation.

There is a direct relationship between the volumic water content of a soil and the variation in permittivity and amplitude, two parameters that characterize radar EM waves.
It is therefore possible, after signal transformation, to convert a radargram into a vertical map of **soil water content**.
Investigation depths for this method vary between 30cm and 50cm, depending on the water status and geological nature of the substrate.



Mapping of 3 control plots in Champagne, showing the distribution of soil water content (% vol) over the first 30 cm.
This makes it possible to better constrain heterogeneity within a plot and associate other parameters with the phenomenon of water stress.
The Control plot on the right of the figure clearly shows the impact of soil compaction due to mechanized farming. The result is reduced absorption capacity and dry soil on the rows concerned.

More info 👉 ingen-environnement.com

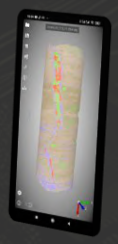
R&D

INGEN's Research & Development capabilities enable it to respond to the specific needs of its customers by designing tailor-made products:

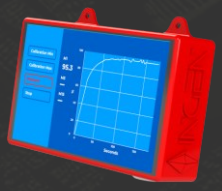
- Design & CAD
- 3D printing
- Customized electronic boards
- Programming languages: Python, Labview, SQL
- Image processing, signal processing, digital processing, data analysis
- IoT and PLC development
- Custom development for geosciences applications

Some examples of our R&D projects:

Field analysis kit for self-flammable black powders
Enabling on-site teams to discriminate hazardous powders quickly and safely.



3D core scanner
Mobile scanner for producing 3D digital twins of drill cores, with mineralogy pre-determination using Artificial Intelligence.



Calcimeter
For carbonate content measurements.

Constant-flow degasser
Used for drilling site analysis to separate mud from gas and obtain valuable reservoir information.

Geological drilling monitoring software
For real-time remote monitoring of drilling operations.

SURFACE LOGGING

Created in 2020, INGEN LOGGING operates its mudlogging units, entirely developed in France. We are involved in :

- Deep geothermal energy in the Paris Basin,
- Gas storage in aquifers and saline cavities,
- Work Over
- Geosteering on drains (O&G / Geothermal)

The configuration of our cabins is adapted to ensure the success of drilling operations. We ensure **well integrity and safety, and optimize the cost of drilling operations**.

CABINS

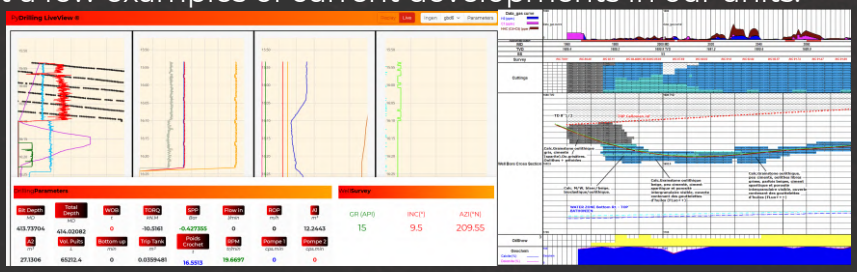
Our cabins are fully designed and manufactured in-house to meet the ever-increasing demands of the market:

- Recording of all drilling parameters (progress, weight, flow rates, tank levels, pH, density, viscosity, H_2S, CH_4, CO_2, etc.).
- Description and analysis of cuttings
- Real-time transmission of drilling data
- Mud gas analysis (including H_2, He) with our latest-generation degasser/chromatograph (constant flow/volume)
- Independent satellite internet connection
- Innovative solutions for the hydrogen, helium and lithium markets.

DEVELOPED BY INGEN

Derived from our R&D programs, the entire software solution was developed in-house. ISM ATEX Level 2 (Design Maintenance Installation) accreditation enables us to develop all the critical elements of the units. Based on remote systems powered by fiber optics and LoRa Radio communication, our units are adaptable to all rigs on the market.
In-house control of all critical points gives our teams and units excellent reliability and responsiveness.

Here are just a few examples of current developments in our units:



More info ☞ ingen-logging.com

RTK GNSS & GROUND PENETRATING RADARS

As the leading distributor of the EMLID brand in France, our subsidiary FB SOLUTIONS supports numerous professionals in a variety of sectors (topography, cartography, hydrography, construction) by offering them :

- High-precision RTK GNSS receivers,
- NTRIP packages,
- Software for field and office use,
- Rugged, waterproof phones and tablets.

THE EMLID GNSS RANGE

EMLID

RX

RS2+

RS3

	RX	RS2+	RS3
PRECISION	Centimètre	Centimètre	Centimètre
POIDS	250g	950g	950g
ETANCHEITE	IP68	IP67	IP67
BATTERIE	16h	22h	22h
INCLINAISON	—	—	✓
CARTE SIM	—	✓	✓
ANTENNE LoRa	—	✓	✓
ANTENNE UHF	—	—	✓
PRIX HT	1799€	2199€	2499€

ACCESSORIES

ARTICLE	Price w/o tax
Emlid telescopic rod	299 €
Emlid rod tip	19 €
Emlid 15cm extension pole	49 €
Aluminum tripod	179 €
5/8” camera tripod adapter	19 €
LoRa radio for Reach RS2+/RS3	35 €

LoRa radio for Reach M2	179 €
GNSS antenna for Reach M2	229 €
410-470 MHz UHF antenna	59 €
18W charger	39 €
Wall charger	24 €
Cigarette-lighter charger	24 €
USB-C charging cable	12 €
Rugged carrying case size S	120 €
Rugged carrying case size L	170 €
CABLES	
Serial cable 2m Reach RS2+	49 €
Serial cable 2m DB9 mâle Reach RS2+	59 €
Serial cable 2m DB9 Reach RS2+	59 €
Pixhawk2 cable Reach M2	15 €
GNSS antenna cable 0.5m SMA	19 €
GNSS antenna cable extension 2m SMA	25 €
GNSS antenna cable GNSS 0.5m TNC	29 €
Camera cable Reach M2	75 €
FIELD NOTEBOOK	
Rugged tablet | IP68 | military norm MIL-STD-810H	850 €
Rugged smartphone | IP68 | norme militaire MIL-STD-810H	483 €

More info 👉 fb-solutions.tech

NTRIP SUBSCRIBTIONS

UNIQUES SUBSCRIBTIONS	Par an
Unlimited	900 €
40h/month	650 €
SHAREABLE SUBSCRIBTIONS*	**Per year**
10h	149 €
30h	294 €
40h	375 €
50h	455 €
60h	570 €
100h	800 €
200h	1300 €
300h	1650 €
400h	2050 €
800h	3520 €
1000h	4400 €
M2M SIM CARDS	**Per year**
M2M SIM CARD (1 Go/month)	125 €

- Price in € excl.
- Package prices do not include SIM card
- +€25 one-off activation fee for ordering a SIM card

*For shareable subscibtions:

- 5 users can connect simultaneously (for packages from 10h to 400h).
- 10 users can connect simultaneously (for packages from 800h to 1000h).
- The chosen number of hours is shared by all users.
- To be used up to the expiry of the hourly package, up to a maximum of 12 months.
- Unused hours cannot be carried forward.

More info 👉 fb-solutions.tech

MALA GROUND PENETRATING RADARS

With its extensive experience in geophysics, INGEN has been a distributor since 2023 of MALA, the world's leading brand in georadar technology. Renowned for its precision, robustness and innovation since its foundation nearly 100 years ago, MALA has developed cutting-edge solutions tailored to the needs of professionals in the **construction, archaeology, geology and underground exploration** sectors. Its range of georadars, designed to deliver fast, reliable surveys, enable precise detection of underground structures, infrastructure networks and much more. HDR technology (wider bandwidth) enables higher image resolution. The integration of **Artificial Intelligence** makes MALA products intuitive for beginners and comprehensive for experts.

The MALA range comprises the following components:

EASY LOCATOR CORE

450MHz
Network detection, cavity detection, archaeology, UXO
HDR & IA

MIRA COMPACT

500MHz, 11 antennas
3D, Network detection, cavity detection, archaeology, UXO
HDR & IA

GEODRONE 600

600MHz
Network detection, cavity detection, archaeology, UXO
HDR & IA

GROUND EXPLORER

80-750MHz
Géology, cavity detection,
HDR & IA

Available for sale, lease or short-term rental.
Find out more about the MALA range 👉 ingen-geosciences.com

CERTIFICATIONS

ASSOCIATIONS & PARTNERS

Représentant **BFC**

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