



radarteam

COBRA

PLUG-IN GPR KIT

Long-Range Penetration GPR

최대 120M 투과 심도 장심도 GPR



**UAV 운영 탑재
핸디형, 카트형, 차량 운영
국내 산악지형 탐사
WIRELESS 방식의 편리함**

코탐은 스웨덴 RADAR TEAM의 국내 독점 판매처 입니다.



[구입문의] 코탐(주) 070.5102.0297 / 용역 및 기술문의 / 010.5188.6962 / <http://www.kotam.co.kr> / kotam2014@gmail.com

COBRA PLUG-IN GPR

Real time sampling
with **0-120 m**

PENETRATION





CUTTING-EDGE TECHNOLOGY — High Penetration Real Time Sampling GPR

MONOSTATIC ANTENNA — Better performance vs. conventional bistatic GPR

AIRBORNE & AIR-COUPLED — Easy to operate, even in non-walkable terrain

PERFORMANCE — 45 dB increased S/N-ratio versus conventional GPR

GPR — Fits all our popular low frequency SE-antennas

HANDHELD RUGGED CONTROL UNIT — Included, with DGPS

WIRELESS BLUETOOTH OPERATION — No cables, less ringing

LOW POWER CONSUMPTION — 16 hours between charges

COMPACT AND LIGHT — Complete system below 7 kg

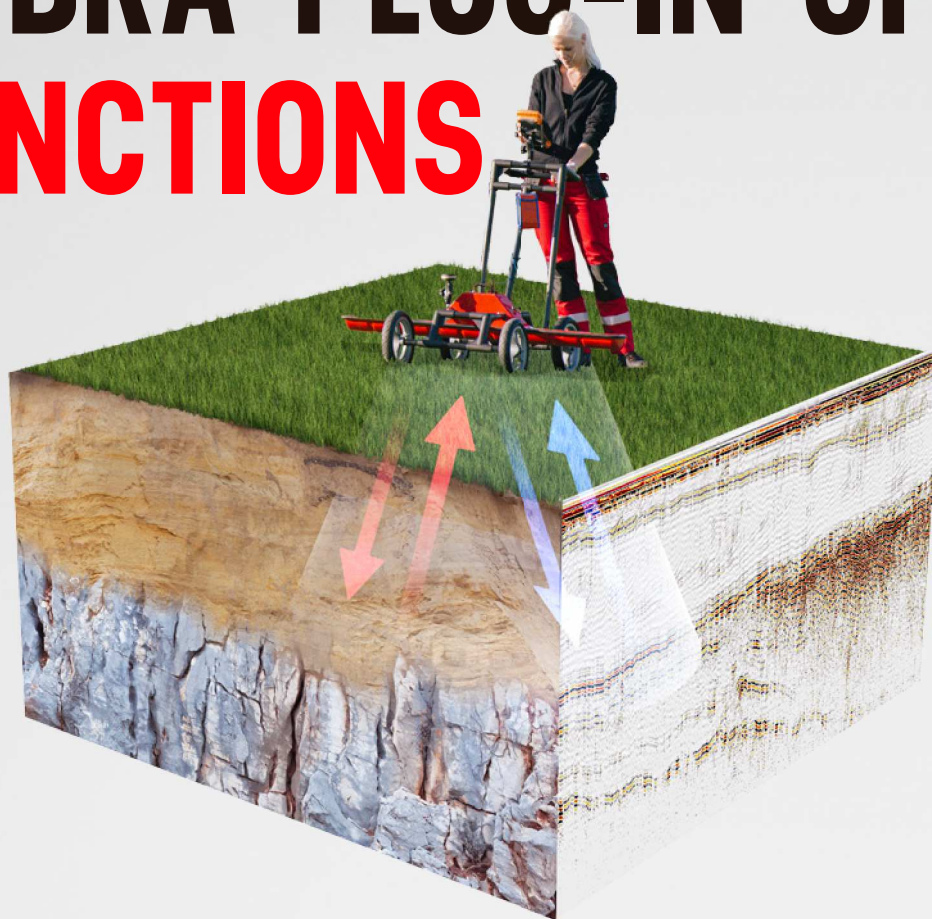
UNPARALLELED PENETRATION — Up to 120 m depths

LOW TRANSMITTER OUTPUT — Less ringing in data

POST PROCESSING SOFTWARE — Included

**REPLACE YOUR POWER-HUNGRY, BULKY,
GROUND-COUPLED CONVENTIONAL GPR-SYSTEM**

COBRA PLUG-IN GPR FUNCTIONS



REAL TIME SAMPLING

The Cobra Plug-In GPR uses Real Time Sampling of the radar signal. Today major manufacturers use conventional interleaved sequential sampling, giving only a down converted replica of the real signal.

The Real Time Sampling allows for 32,000 stacks/second resulting in an amazing 45 dB increased signal-to-noise ratio.

Note that only a 30 dB increased S/N-ratio roughly double the penetration ability of a typical conventional GPR-system.

A low voltage transmitter reduces power consumption and eliminates ringing. The use of power-hungry, high voltage transmitters is no longer needed; in such case transmitter power must be increased 32,000 times to be comparable!

WIRELESS

Wireless Bluetooth connection between GPR and control unit replaces interfering coax-cables and fragile fibre optic links. An Ultra Rugged Mesa PDA with embedded software is used for data collection. Data is stored in standard SEG-Y geophysical format.

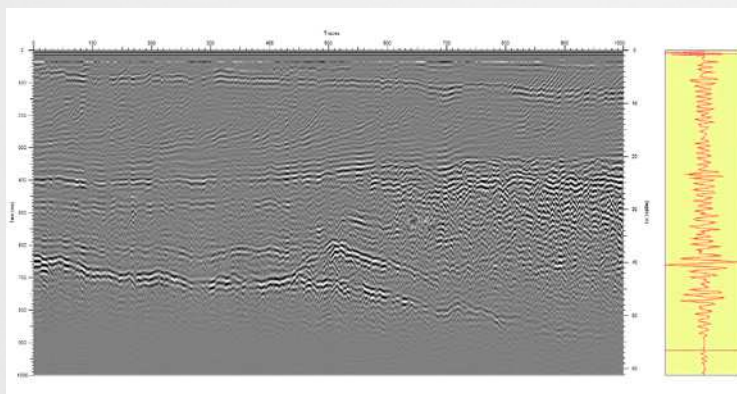
The complete GPR-unit plugs into a single SUB-ECHO Antenna, any selectable model. No need for bistatic configuration.

The SUBECHO-antennas can all be used airborne and in air-coupled operation and in any type of terrain. No need to cut trail paths anymore, not even in dense bush vegetation were ground coupled snake antennas have problems passing. Just lift the antenna above the bushes or in worst case use an octocopter UAV to carry the small and compact Cobra Plug-In.

Wireless operation, hand held data logger, low power consumption and an air coupled antenna add flexibility, ruggedness and durability and the most compact and deepest penetrating GPR-system available on the market.

Maximum penetrations in good conditions, low conductivity, are listed below:

COBRA
PLUG-IN
SAMPLE
DATA



SOIL TYPE RDP-VALUE	Dry soil $\epsilon_r=4$	Average soil $\epsilon_r=9$	Wet soil $\epsilon_r=16$	Very wet soil $\epsilon_r=25$	Water $\epsilon_r=81$
Depth @ 1600 ns	120 m	80 m	60 m	48 m	27 m

RTS 기법으로 초당 32,000회 중합(Signal/Noise 비율 = 108배 향상)

REAL TIME SAMPLING ADVANTAGE

In February 2012 we made a comparison study between the **COBRA PLUG-IN GPR**, a Real Time Sampling GPR, and a conventional Sequential/ Interleaved Sampling GPR, the GSSI SIR-3000 GPR.

The performance study was made the same day, on an ice road passing Lule River and used the same **SE-150** model antennas.

THE DATA

The data below shows the same 115 m long distance with cut raw data from the systems, top sample from 200 to 500 ns range and bottom sample from 1000 to 1200 ns range. The samples clearly illustrate the advantage of using Real time Sampling Technology compared to conventional sampling

• LESS RINGING

– Explained by wireless operation, no cables and lower transmitter output voltage (40V vs. 1200V)

• LESS HIGH FREQUENCY NOISE

– Seen as “snow” or “speckle” in the lower sample SIR-3000 data. (45 dB increased S/N-ratio)

• BETTER RESOLUTION

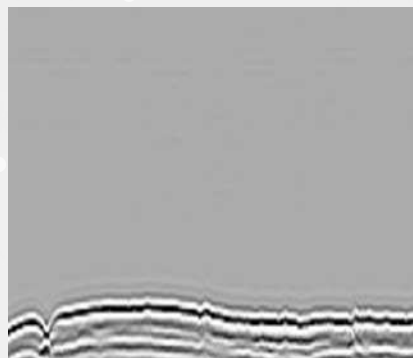
– Monostatic antenna for Cobra Plug-in GPR and Bistatic for SIR-3000 (Smeared reflections with SIR-3000)

링잉 잡음 감소

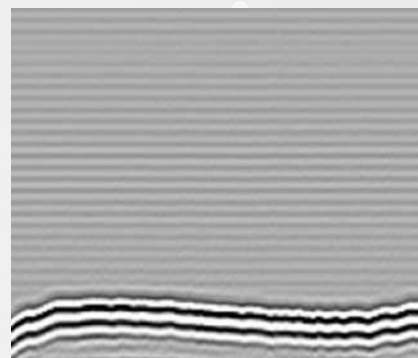
고주파수 잡음 감소

향상된 해상도

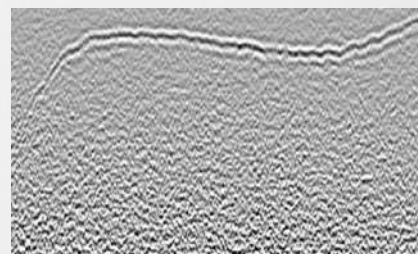
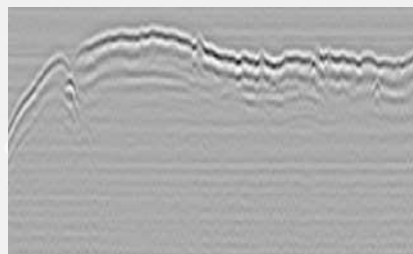
CUT DATA RANGE
200-500 ns



SIR-3000 GPR RAW DATA



CUT DATA RANGE
1000-1200 ns



GPR-SYSTEM: Radarteam Cobra Plug-In
GPR-TYPE: Real Time Sampling System
PRF-RATE: 156 kHz
TIME RANGE: 0-1600 ns
TRANSMITTER: Utsi Electronics Ltd, 40 V

ANTENNA: Radarteam SE-150 [1 monostatic mode]
ANTENNA DEPLOYMENT: Handheld 60 cm above ice
STACKING: 32,000 stacks/s
POWER: Integrated 11.1 V/ 6.6 Ah, 73 Wh
OPERATING TIME: 16 hours continuous
TOTAL WEIGHT: 5 kg [including battery]

GPR-SYSTEM: GSSI SIR-3000
GPR-TYPE: Time Equivalent Sampling, 512samples/trace
PRF-RATE: 50 kHz
TIME RANGE: 0-1200 ns
TRANSMITTER: Geoscanner AB, VHT-501, 1200 V
HIGH POWER SUPPORT: Geoscanner AB, PRF-600
RECEIVER: Geoscanner AB, RX-501
ANTENNAS: Radarteam SE-150 [2 in bistatic mode]
ANTENNA DEPLOYMENT: Cart, 10 cm above ice
STACKING: 5 stacks
POWER: 73 Wh [SIR-3000], SLA 12V [PRF-600]
OPERATING TIME: 4 hours continuous
TOTAL WEIGHT: 23 kg [including batteries and cart]



카트형 운영

CART WITH TACTICAL CRADLE



차량장착형 운영

CAR TRAILER KIT

RECOMMENDED OPTIONAL ITEMS

Enhance your
survey experience

국내 산악지형에 최적화된
핸디형 운영



HANDLE & CRADLE

APPLICATIONS & USES

The **COBRA PLUG-IN GPR** can be used to see the inside of very deep materials and structures up to 120 m depths

GEOTECHNICAL SAFETY APPLICATIONS

Geotechnical stratigraphy and soil structure studies.

Depth to bedrock.

Identify voids under: roads, airports, tunnels, railways.

Safety control of embankment dams (piping/voids in core and fractures in bedrock under dam).

Control of remaining barrier distance to abandoned water filled tunnels in coal mines (must exceed 60 m for safety).

Airborne mapping of frazil ice build up in streaming water.

Tunnel & rock quality inspection.

Karst caves and sinkhole mapping.

Mapping of frost sensitive soils under roads- and railways.



SNOW & ICE RESEARCH

Airborne and ground based mapping of glacier ice thickness.

Airborne detection of dangerous crevasses before passing





GROUNDWATER AND MINERAL PROSPECTING

Groundwater supply from sand- and gravel deposits.
Detection of water bearing fracture zones in bedrock.
Locate gemstone pockets in pegmatite,
nickel laterite, bauxite delineation.
Kimberlite exploration.
Mineral placer exploration-paleochannels.
Sand & gravel deposits exploration.
Peat bog investigation and mapping.
Marble prospecting and quality inspection.

ENVIRONMENTAL SURVEYS

Locate hazardous waste.
Delineation of landfills, contaminant plumes and product spills.
Mapping of water and sediment depths of lakes and rivers.



ARCHEOLOGY

Mapping of deep buried structures, pyramids, tunnels and chambers.

MILITARY & SECURITY

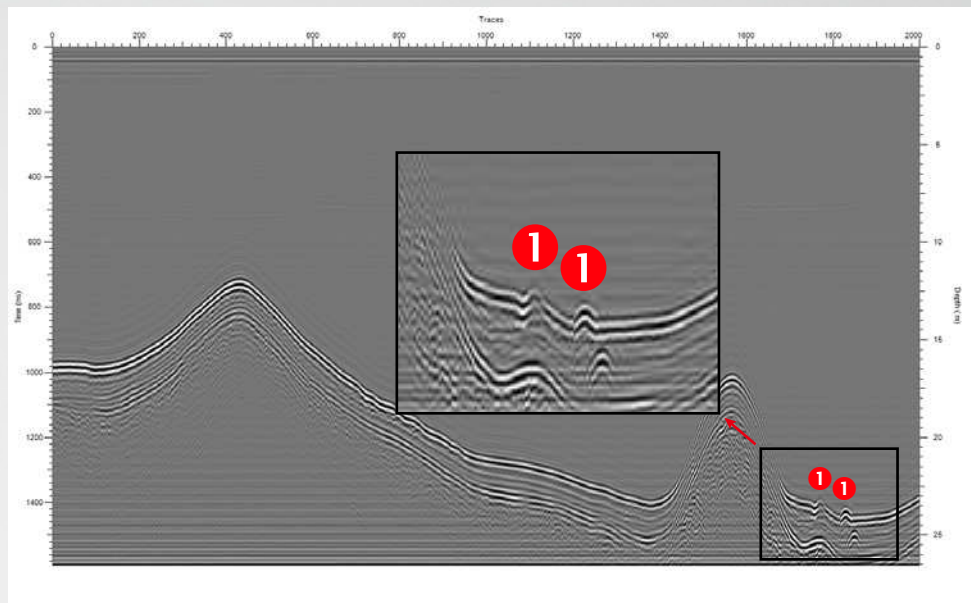
Locate deep clandestine tunnels/bunkers in militarized zones
and around borderlines and prisons.



하상, 호수 운영

COBRA BATHYMETRY



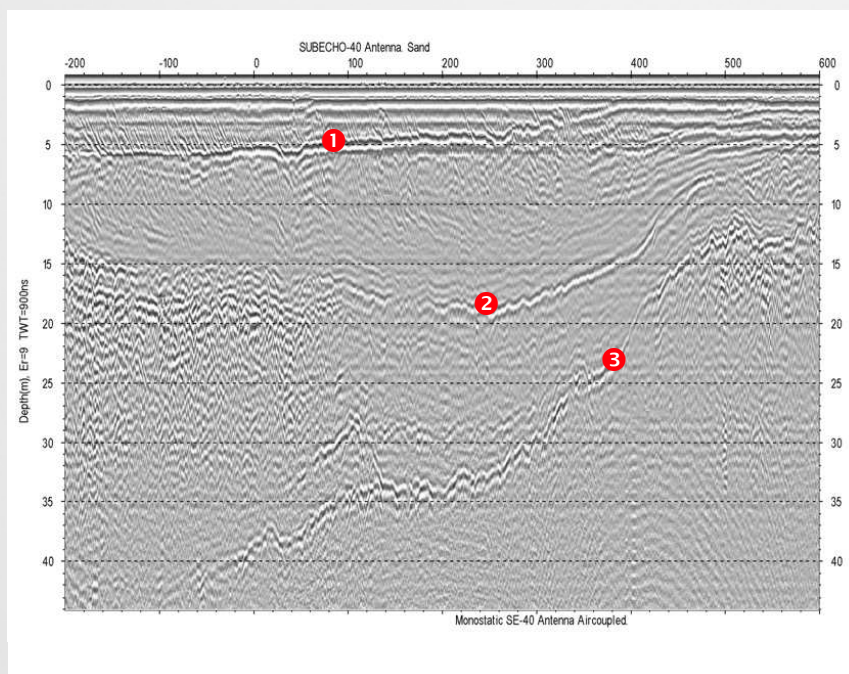


**DEEP PENTRATION IN LAKES AND RIVERS
BATHYMETRIC MAPPING OF WATER AND SEDIMENTS
COBRA PLUG-IN SAMPLE DATA**

- ① Targets in 5 m sediment layer at 25 m depth



GROUNDWATER PROSPECTING



GROUNDWATER PROSPECTING DATA SAMPLE

- ① Groundwater table
- ② Aquiclude
- ③ Bedrock



EMBANKMENT DAM SURVEYS

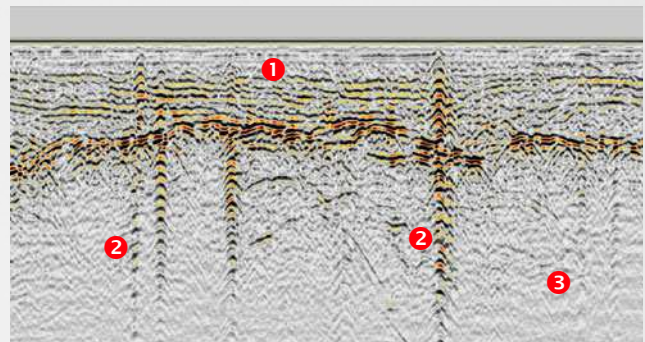




Safety control of earth embankment dams is a common application with the **COBRA PLUG-IN GPR**.

EMBANKMENT DAM SURVEY DATA SAMPLE

- ❶ Dam core with voids
- ❷ Fractured bedrock and voids above in dam core
- ❸ Solid bedrock



HAZARDOUS VOIDS

The core of the dam is built up with compressed layers of impermeable soil. Hazardous voids, so called piping, can be detected with GPR.

The cause of these voids is often water filled fractures in the bedrock below the dam that sooner or later will erode the core.

To prevent further damages in the dam core these voids and cracks must be injected with dense material like bentonite and concrete.

The radargram above illustrates a 75 m long distance with fractured bedrock that has created voids in the core of the dam.

After injection the dam is re-surveyed to insure that injection has been successful and all voids disappeared.

COBRA PLUG-IN GPR – TECHNICAL SPECIFICATIONS

COBRA PLUG-IN GPR UNIT

Dynamic range	192 dB [32 bit]
Transmitter output	40 V
Time range	0-1,600 ns
Maximum depth range	120 m [RDP=4]
Sampling interval	3.125 ns [320 MHz]
PRF-rate	156 kHz
Stacking	32,000 stacks/s, 45 dB increased S/N-ratio
Power	Integrated 11.1 V/ 6.6 Ah, 73 Wh Li-Ion battery
Charger	Mascot 2241 3-cell Li-Ion
Operating time	16 hours continuous use
Mechanical	Size: 190 x 140 x 80 mm [L x W x H] Weight: 1 kg [including battery]

COBRA PLUG-IN CONTROL UNIT / CU

Ultra Rugged PDA	Mesa Geo Notepad
Processor	806 MHz PXA320
Operating system	Windows Embedded Handheld 6.5 Pro
Memory and data Storage	256 MB RAM, 4 GB Flash
Display	5.7" High visibility backlit VGA LCD, [640x480 px resolution]
Keyboard	15 control buttons, 5 way navpad
Ports	RS-232, USBx2, 12 V DC, audio jack
Mechanical	Size: 136 x 220 x 51 mm [L x W x H] Weight: 1 kg [including two batteries]
Environmental	IP67 water-and dustproof, operating temperature: -20°C to 50°C, MIL-STD-810G approved
Power	Smart Li-Ion batteries, 38 Wh
Operating time	16 hours operating time
Wireless connections	Bluetooth 2.0+EDR [30 m range], WiFi 802.11b/g, Quad-band 3G GSM/GPRS/EDGE, data communication interface, SMS
Camera	3.2 MP resolution with autofocus, geotagging
GPS	Integrated real-time SBAS with 2-5 m typical accuracy

COBRA PLUG-IN ANTENNAS SUBECHO MODELS

	Model SE-40	Model SE-70	Model SE-150
BW [10 dB], Bandwidth [MHz]	15-105 [90 MHz]	20-140 [120 MHz]	20-280 [260 MHz]
Center frequency@ $\xi_r=9$ [MHz]	52	80	124
BW/CF-ratio [%]	173	150	210
Vertical resolution@ $\xi_r=9(\lambda/4)$	48 cm	31 cm	21 cm
Horizontal resolution@depth= λ	141 cm	88 cm	59 cm
Size [L x W x H]	200 x 15 x 21 cm	139 x 15 x 21 cm	92 x 22 x 22 cm
Weight [kg]	4.7	3.7	3.5



radarteam

Any Platform GPR-systems

Airborne: Drone/helicopter



Rivers/Lakes by: Drone/Boat



Car Trailer & Winch Kit



Winch Controlled: Car/ATV

Foldable Smart Cart



Practical in Rugged Terrain

해외 유사 장심도 GPR 제품과 비교

(Cobra SE-70,150 종심도 모델과 비교)

Deep Penetration: Real Time Sampling GPR-systems compared (~100 to 300 MHz)



Green box= Best value/ Red box =Worse value

SPECIFICATION /FEATURES	Cobra Plug-In MF	MALA GX HDR	Cross Over D-C	pulseEKKO Ultra	GS Series
Origin Manufacturer/Country :	Radarteam Sweden	MALA GS Sweden	Impulse Radar SE	Sensors&Softw. CA	GSSI Inc. USA
Introduced on GPR-market, year:	2012	2014	2016	2018	2019
GPR/Antenna Model Name, LF/HF-model:	SE-70/ SE-150	GX80 / GX160	CO730 Dual Antennas	pulseEKKO Ultra	50200 HS
Antenna central frequencies (MHz):	80/160 MHz	80/160 MHz	70 & 300 MHz	100/200 MHz	200 MHz
Max Depth, Manufacturers values (v=0.1 m/ns):	40/40 m	40/31m	Up to 20 m	No values found	21 m
Vertical resolution @ v=0.1 m/ns, and $\lambda/4$: (cm)	15.5 - 31 cm	15.5 - 31 cm	8 - 36 cm	12.5 - 25 cm	12.5 cm
GPR/Antenna Weight (kg):	4.5/4.3 kg	24.6/10.7 kg	19.7 kg	8.6/7.8 kg	17.4 kg
Tx/Rx Antenna Footprint Size, operational (m^2):	0.17/0.20	0.79/0.34	0.73	0.92/ 0.46 (c/c 0.8m)	0.42
Battery capacity/ GPR/Ant consumption, Weight:	94Wh/4.1W, 0.5 kg	97 Wh/15.6 W, 0.5 kg	108 Wh/18 W, 0.5 kg	56 Wh/7.8 W, 1.6 kg	94Wh/23.5W, 0.5 kg
Control Unit: Model/Cap./Cons. (@ max NIT-rate):	DT372TR 7"/62Wh/6W	OEM 8"/250Wh/24W	FZ-A2 10"/31Wh/3.5W	OEM 8"/108Wh/15W	FZ-G1 10"/48Wh/8W
Control Unit/Operating system:	PC+RTK GPS/Windows	OEM CU/Linux	Tablet/Android	OEM CU/Linux	Tablet PC/Windows
Control Unit: Battery Life:	10 h	10 h	9 h	7 h	6 h
Control Unit/Weight (incl. Power supply):	1.1 kg	3.2 kg	0.88 kg	5.4 kg	1.3 kg
System Operation Time, min-max (hours):	10-20 h	6-10 h	6 - 8 h	7 h	4-6 h
System Total Power Consumption (W):	10.1 W	39.6 W	21.5 W	22.8 W	31.5 W
Total System Weight, GPR/Antenna, CU:	5.9 - 6.1 kg	14.4 - 28.3 kg	21.1 kg	14.8 - 15.6 kg	19.2 kg
Operation: Ground coupled(GC)/Air coupled(AC)	GC/AC (Drone)	Only GC	Only GC	Only GC	Only GC
High Accuracy GPS included, RTK GNSS-10mm	YES	NO	NO	NO	NO
Wireless operation: (GPR/Antenna to CU)	YES	OPTIONAL	YES	NO	YES
Included Post Processing Software	YES	NO	NO	NO	NO
Website:	www.radarteam.se	www.guidelinegeo.com	www.impulseradar.se	www.sensoft.ca	www.geophysical.com

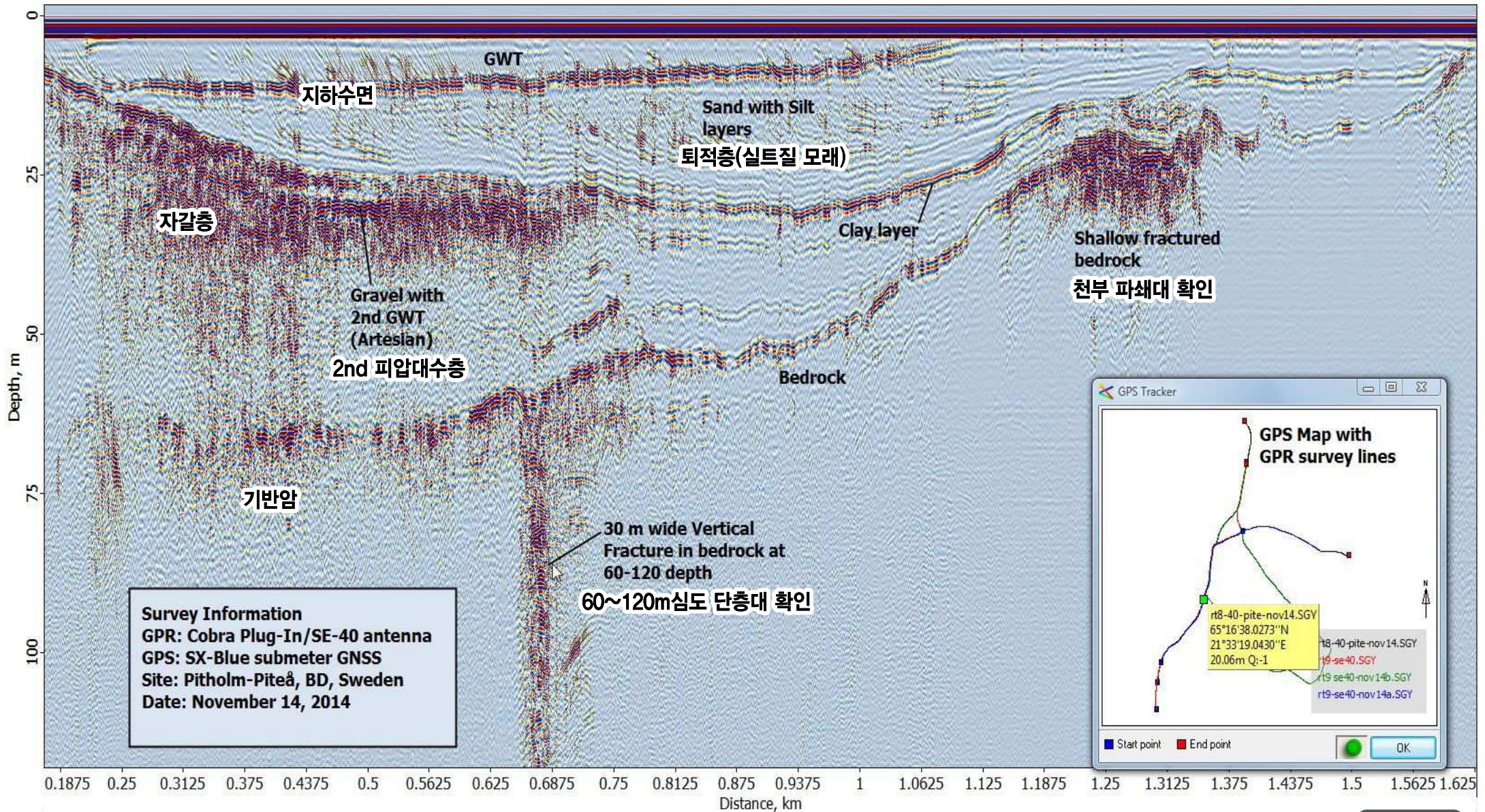


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초장심도 GPR 탐사 사례(단층 및 지층)

Cobra Plug-In GPR with SE-40 Antenna. Deepest possible penetration GPR available. (0-120 meters)



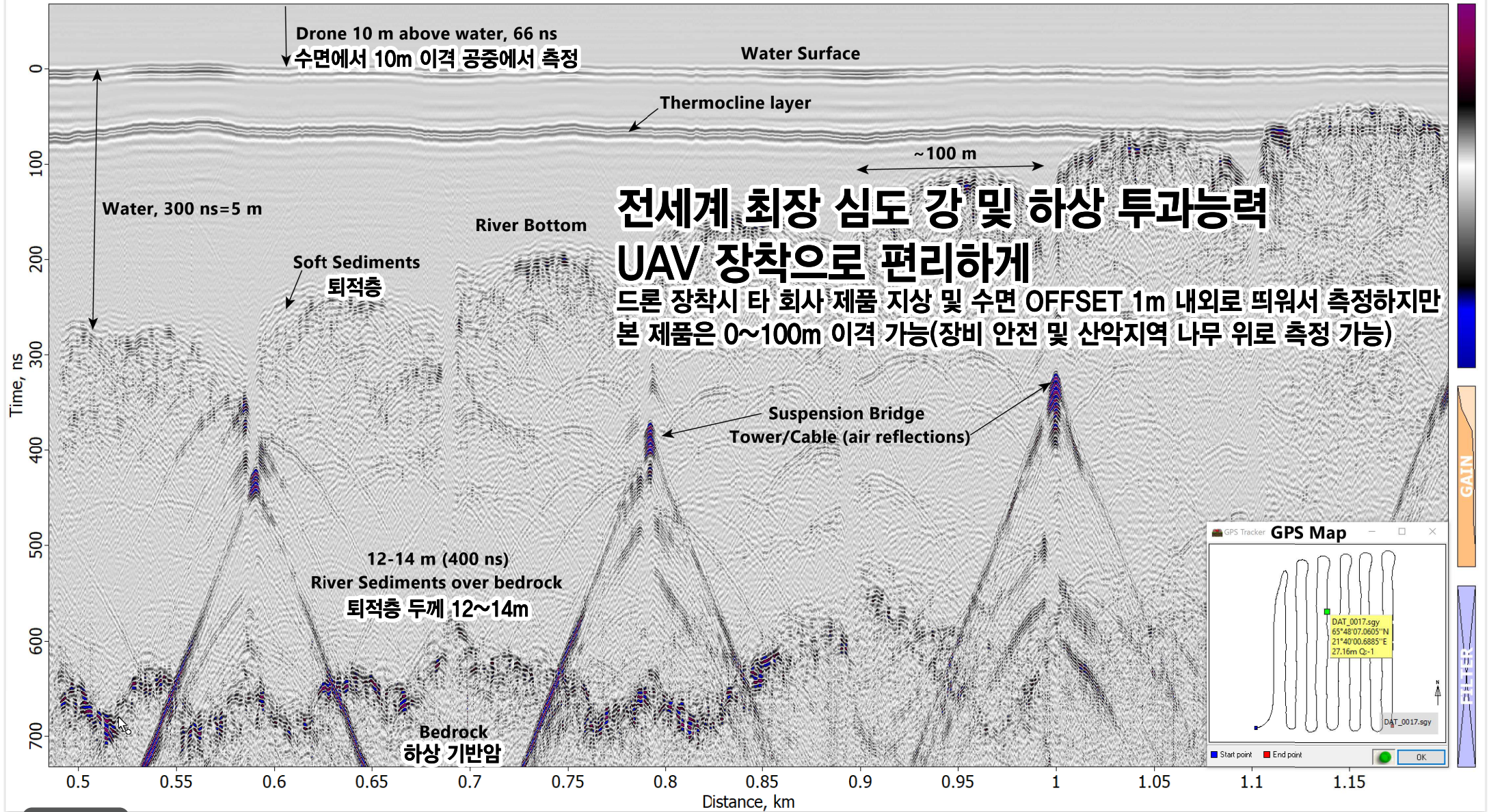
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초장심도 GPR 탐사 사례(드론 하상 측정)

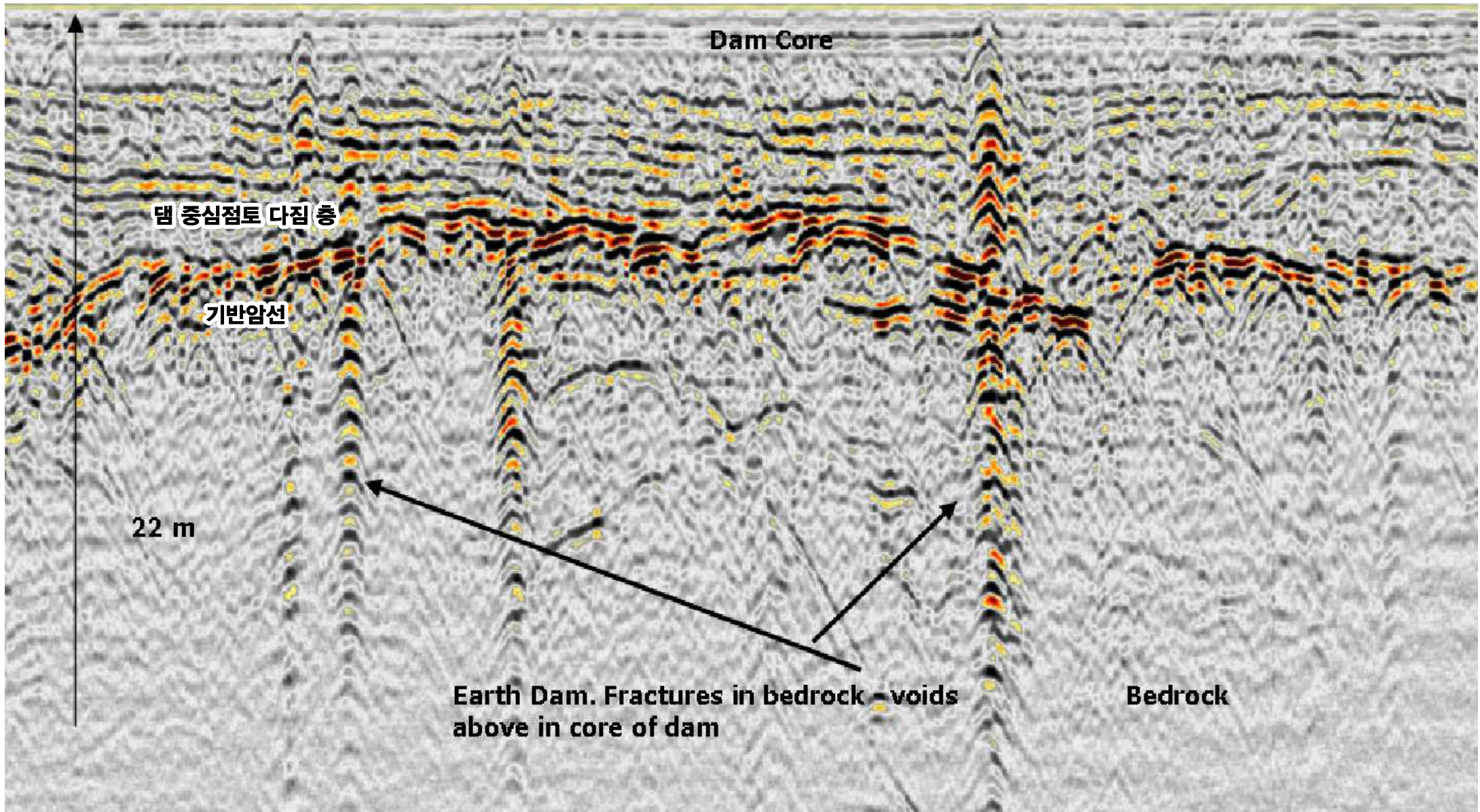
Drone Bathymetry Survey of Lule River, Sept. 19, 2019. Cobra GPR Plug-In_MF with SE-150 Antenna.



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저수지 댐 장심도 GPR사례



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UAV 장착에 최적화된 GPR SOLUTION



GPS GEO-TAGGING

SE-70, 150 안테나 장착 가능

지상에서 최대 100m 이상 고공 측정 가능(업계 최고)

국내 산악지형 및 도심지 지형 · 지물 회피 측정 가능

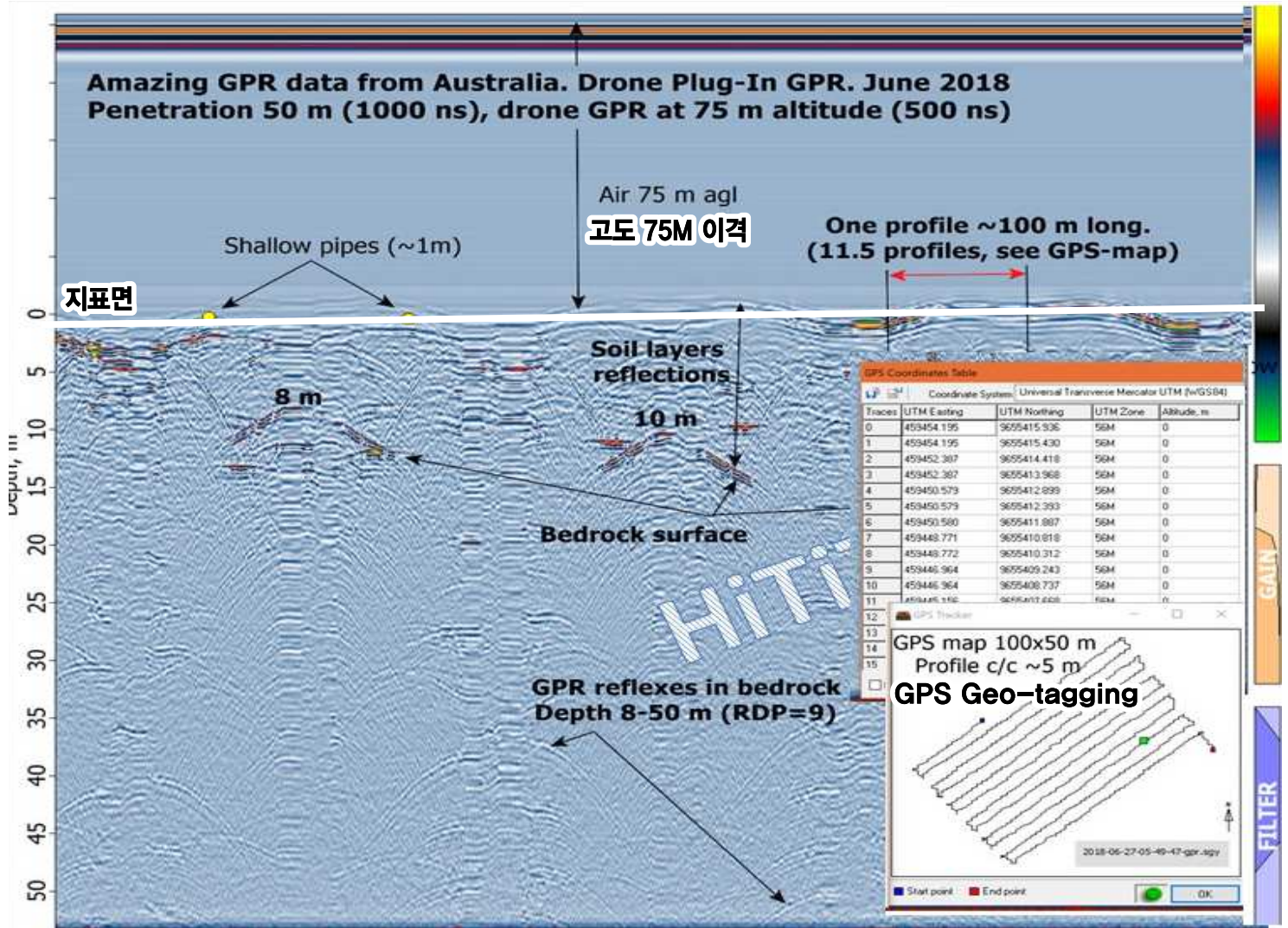


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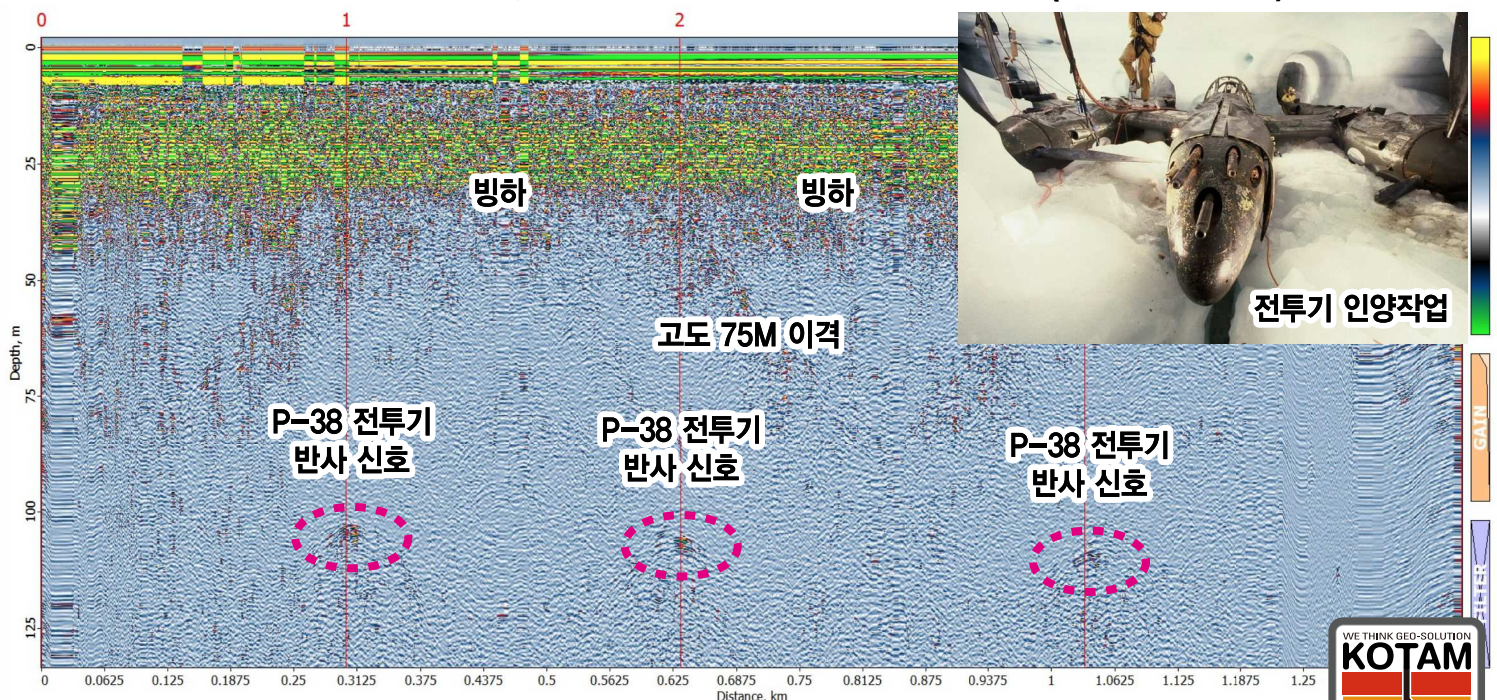
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UAV 장심도 GPR 적용 사례

지표면 고도 75m 상공에서 드론 장착형 장심도 GPR 사례



2차 세계대전 시기 빙하지대에 추락한 전투기 발굴 사례(약 100m 심도)

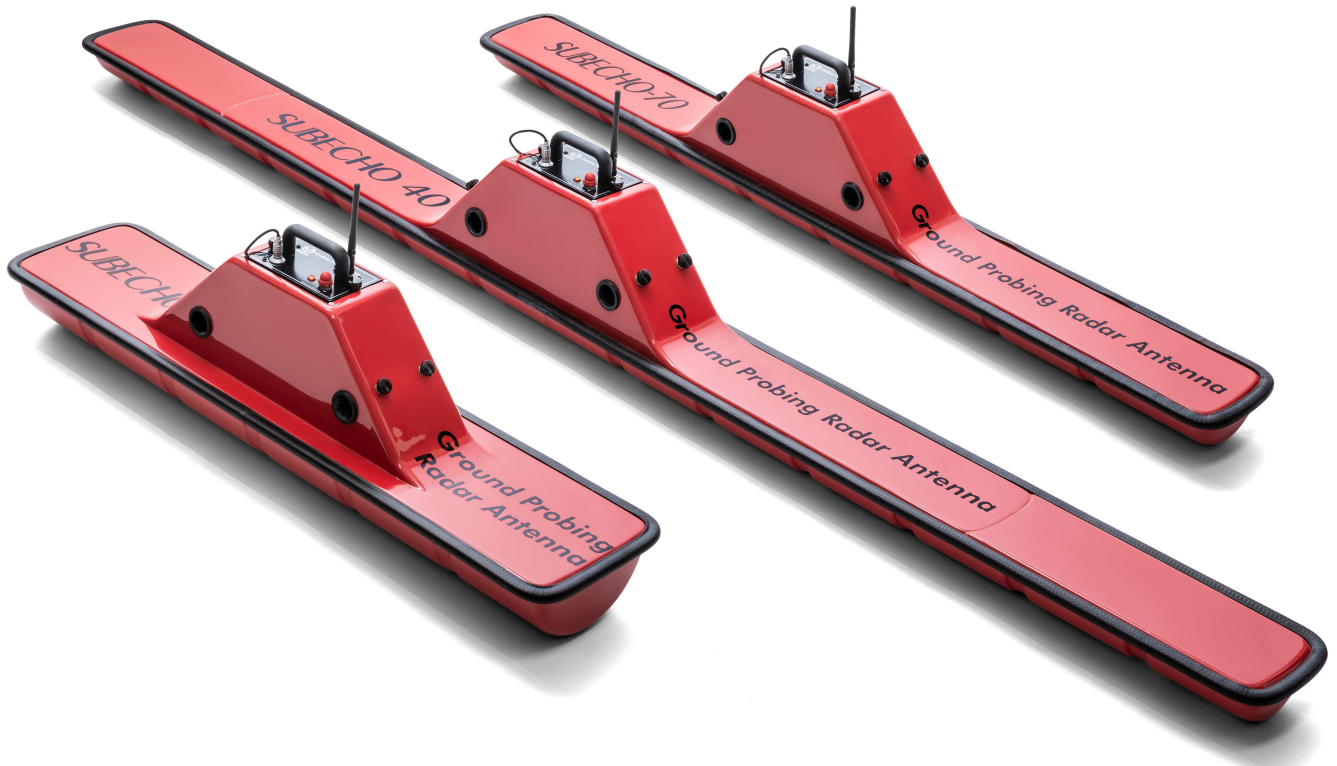


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최대 120m 투과심도 장심도 GPR Long-Range Penetration GPR



UAV운영 탑재 가능
핸디형, 카트형, 차량 운영
숲이 많은 국내 산악지형에 최적화된 장비 운영



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