

Echoes 3 500 T1-T3

High-resolution sub-bottom profiler

Echoes 3 500 offers high-resolution seismic reflexion data to characterize sedimentary architecture and geological features. Echoes 3 500 is available with one (T1) or three (T3) transducers, allowing a wide range of operational conditions from shallow to deep ocean environments. Echoes 3 500 systems enable river, lake and ocean surveys regardless of the seabed topography.

FEATURES

- Spectrum coverage of 1.7 to 6 kHz
- T1 portable Chirp system
- Vertical resolution 20 cm
- Penetration up to 150 m in clays
- Penetration up to 20 m in sand
- T1 one-man portable system
- Pole- and hull-mounted systems
- 2-way T1/T3 modular configuration

BENEFITS

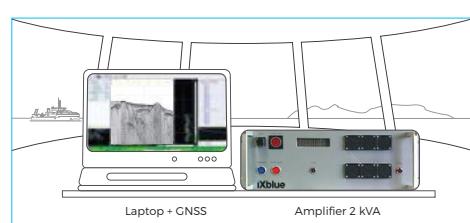
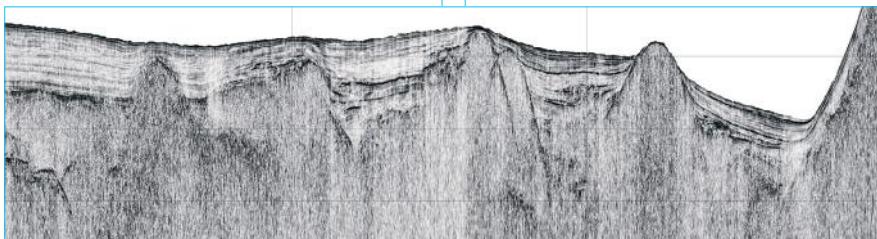
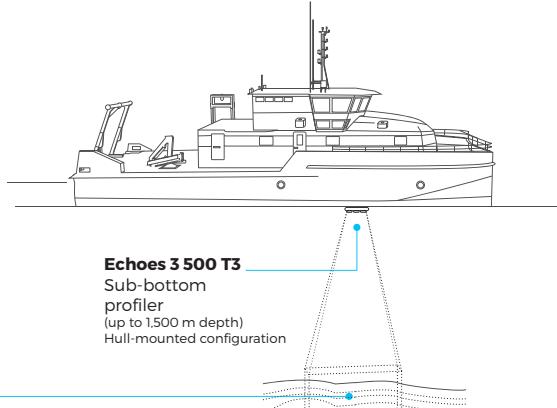
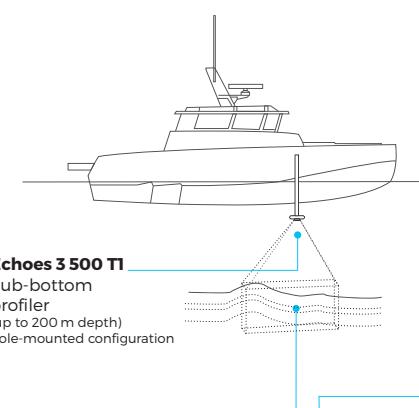
- True flat bandwidth ultimate resolution capacity and power efficiency
- Perfect positioning and heave compensation
- Compatible with any bathymetric echosounder

DELPH SEISMIC SOFTWARE

- All-in-one optimized geophysical processing and interpretation
- Easy access to all data collected for geologists and geophysicists
- Compatible with leading industry sensors and formats
- Best possible 2D/3D QC
- Visualization and reporting capabilities

APPLICATIONS

- Pre and post dredging
- Sedimentology and paleoseismology
- Archeology and Geo-archeology
- Object detection buried (boulders, pipelines)
- De-risking survey



Technical specifications

Array configuration T1//T3	1 // 3 tonpilz transducers mounted on a plate
Operational frequency range	1,700 Hz - 6,000 Hz
Mean acoustic level T1//T3	195 // 203 dB (ref 1µPa@1m) @ 2 kVA
RVS (Receiving Voltage Sensitivity) (ref. 1µPa) T1//T3	-172 // -163 dB
Beam aperture @ 3.5 kHz	45°
Vertical resolution (c=1,500 m/s)	20 cm

Mechanical specifications

Echoes 3500 Array

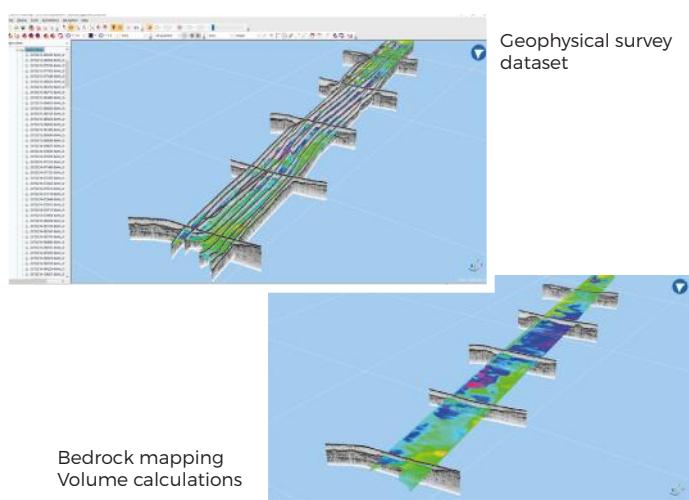
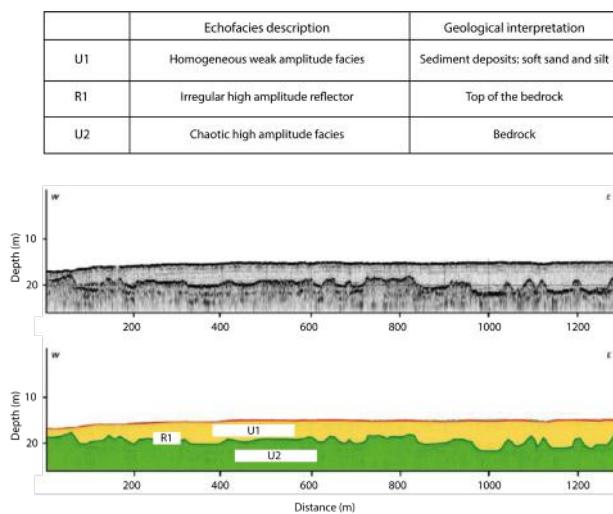
Recommendation for water depth below transducers T1//T3	1 to 200 m // 1 to 1,500 m
Height	384 mm
Diameter T1//T3	450 // 680 mm
Weight in air / water T1//T3	57/42 kg // 160/120 kg

Echoes 3500 Topside unit

Signal emission power / Echoes mean power	2 kVA / 350 W
Length / width / height	482 mm / 482.6 (19") mm / 177 (4U) mm
Weight	15 kg
Mounting	Rack-mounted
Deck cable length T1//T3	20 m // 50 m

Case Study in sandy environments

Geophysical characterization and reports using Delph Acquisition and Interpretation Softwares



Echoes 10 000

High-resolution sub-bottom profiler for shallow water

Echoes 10 000 is a high-performance sub-bottom profiler offering high-resolution of seismic reflexion profiles. Operating from 1m to 150m water depth, this portable system enables river, lake and ocean surveys regardless of the seabed topography.



FEATURES

- Widest spectrum coverage (5 – 15 kHz)
- Portable Chirp system
- Vertical resolution < 8cm
- Penetration up to 40 m in clays
- Pole-mounted system

DELPH SEISMIC SOFTWARE

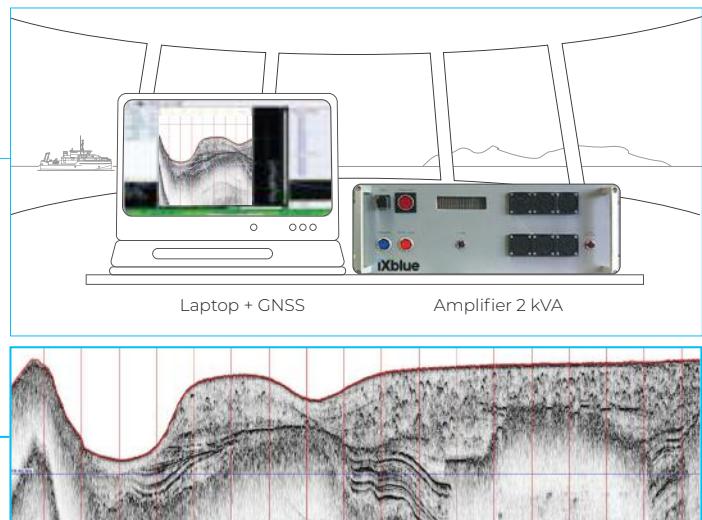
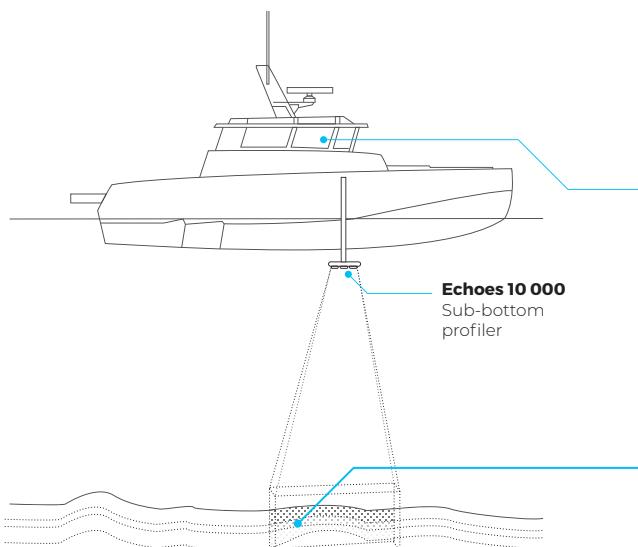
- All-in-one optimized geophysical processing and interpretation
- Easy access to all data collected for geologists and geophysicists
- Compatible with leading industry sensors and formats
- Best possible 2D/3D QC
- Visualization and reporting capabilities

BENEFITS

- True flat bandwidth ultimate resolution capacity and power efficiency
- One-man portable system
- Perfect positioning and heave compensation
- Compatible with any bathymetric echosounder

APPLICATIONS

- Pre and post dredging
- Sedimentology / Paleoseismology
- Archeology and Geo-archeology
- Buried objects detection (boulders, pipelines)
- De-risking survey



Technical specifications

Array configuration	7 tonpilz transducers mounted on a plate
Operational frequency range	5000 Hz - 15000 Hz
Mean acoustic level	202 dB (ref 1µPa@1m) @ 2kVA
RVS (Receiving Voltage Sensitivity) (ref. 1µPa)	-172 dB
Beam aperture @ 10 kHz	30°
Vertical resolution (c=1500m/s)	8 cm

Mechanical specifications

Echoes 10 000 Array

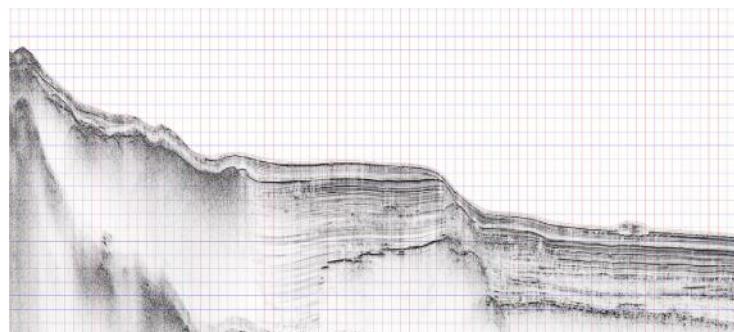
Recommendation for water depth below transducers	1 to 150 m
Height	191 mm
Diameter	380 mm
Weight in air / water	26 kg / 12 kg

Echoes 10 000 Topside unit

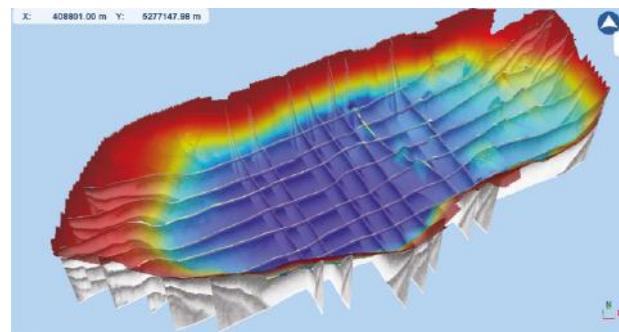
Signal emission power / Echoes mean power	2 kVA / 350 W
Length / width / height	486 mm / 483 (19") mm / 177 (4U) mm
Weight	15 kg
Mounting	Rack-mounted
Deck cable length	20 m

Results

High-resolution sub-bottom profiling data

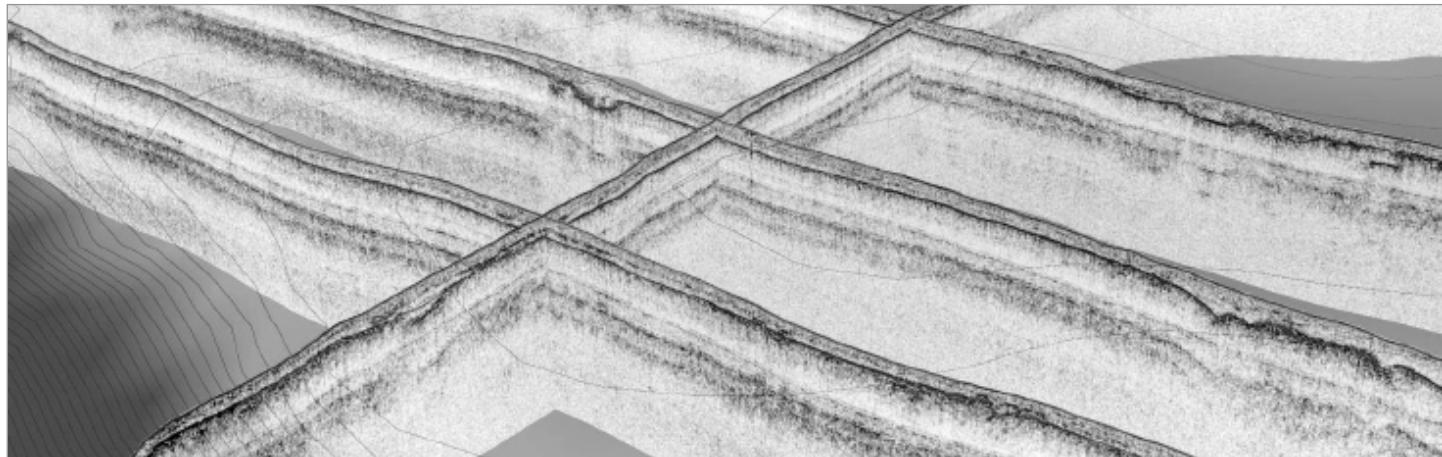
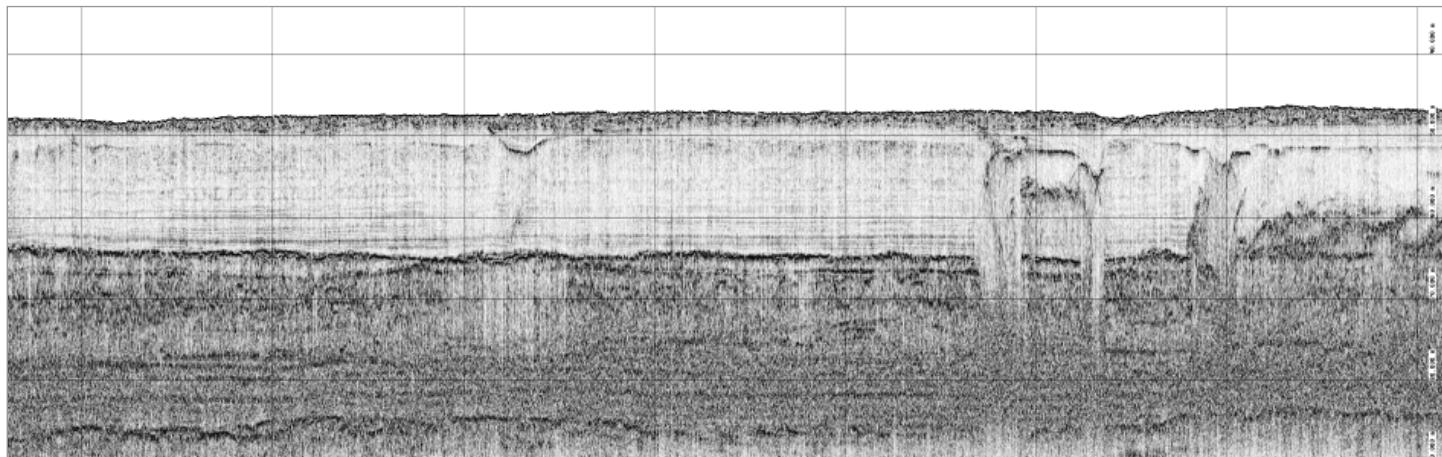


Bathymetry & layers modeling using Delph



Echoes Series & Delph software

Sub-bottom profiler solution.
iXblue optimized way to gather
geophysical Georeferenced Data



FEATURES

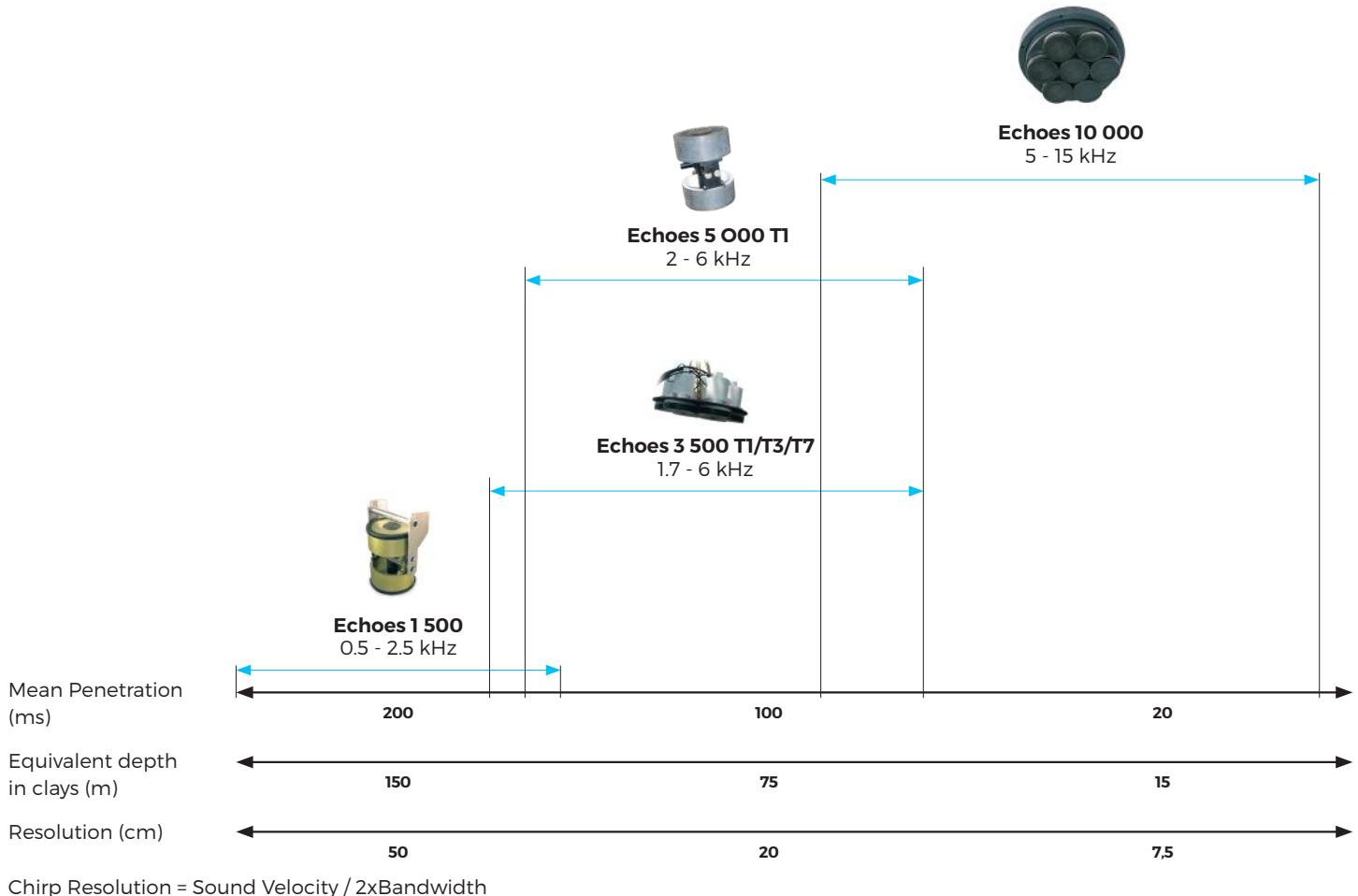
- Any integration:
Hull or Pole Mounted, Towed
or Autonomous Vehicle integrated
- Any application:
Geosciences, Geo-Archaeology, Dredging,
Offshore Energy

BENEFITS

- The widest spectrum coverage
(150Hz-15kHz Transducers)
- True Flat Bandwidth Ultimate resolution capacity
& power efficiency
- Optimized processing and data interpretation software

PRODUCT RANGE

Echoes product range



Software

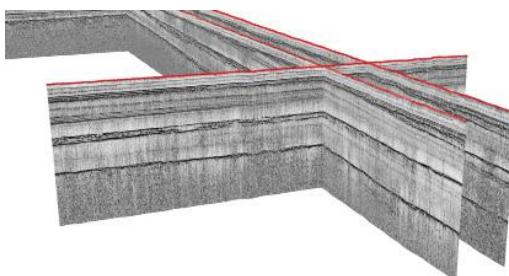
Analog Single/ Multi-Channel Seismic

Delph Analog Acquisition Unit
1 to 24 channels
High-resolution analog seismic –
Sparkers – Boomers – Airguns –
Marine geology – Geophysical
Survey



Acquisition & Interpretation Software

Delph Acquisition Raw data logging, QC
Delph Interpretation Processing, Interpretation, Mapping



APPLICATIONS

Marine/lacustrine geosciences - Paleoclimate

ECHOES 5 000

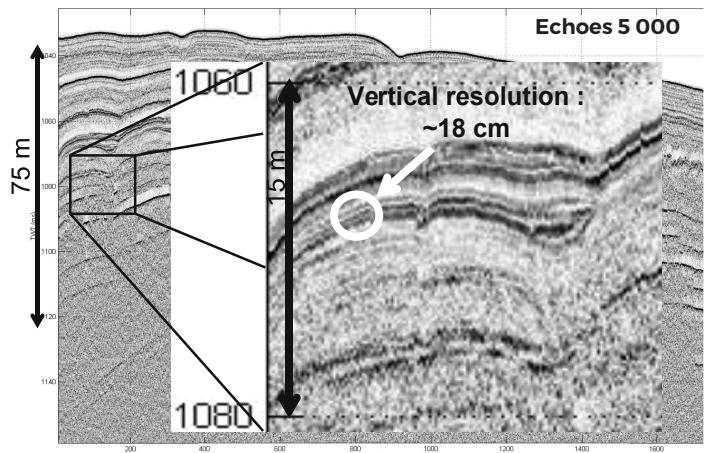
- **Frequency:** 2000-6000 Hz
- **Array:** 213/291 mm (diam x H)
- **Weight (air/water):** 11/7 kg
- **Set-up:** Pole & Tow-Fish
Mounted, AUV/ROV
- **Resolution:** 18 cm
- **Mean penetration:** 50 m

Relevance

- High-resolution seismic reflection profiles
- Operable from shallow to deep waters
- Sedimentary dynamics related to:
 - Hydrological variability,
 - Geo-hazard,
 - Flood,
 - Earthquake,
 - Tsunami,
 - Erosion,
 - Anthropisation, etc.



Lake



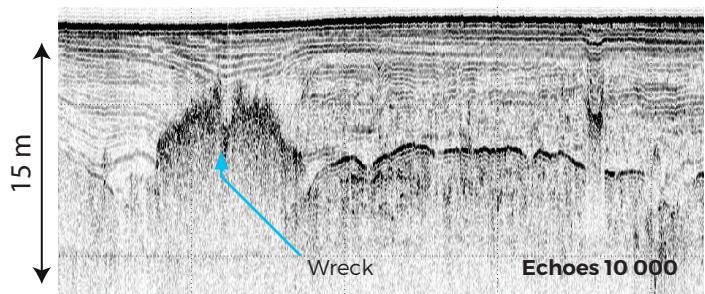
Archaeology & Geo-Archaeology

ECHOES 10 000

- **Frequency:** 5000-15000 Hz
- **Array:** 380 x 191 mm (diam x H)
- **Weight (air/water):** 26/12 kg
- **Set-up:** Pole/Hull-Mounted
- **Resolution:** 8 cm
- **Mean penetration:** 20m

Relevance

- Identify artefact buried in sediments
- Designed for shallow waters
- High-resolution seismic reflection profiles for:
 - submerged prehistoric archaeology,
 - estimation of site volume,
 - post-excavation interpretation,
 - sedimentary processes.



APPLICATIONS

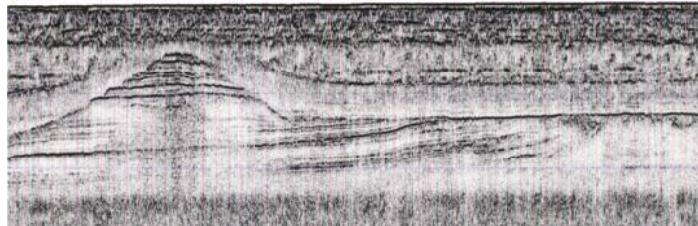
Pre & post dredging

ECHOES 10 000

- **Frequency:** 5000-15000 Hz
- **Array:** 380x191 mm (diam x H)
- **Weight (air/water):** 26/13 kg
- **Set-up:** Pole/Hull-Mounted
- **Resolution:** 8 cm
- **Mean penetration:** 20 m

Relevance

- High resolution seismic reflection profiles
- Operable from shallow to deep waters
- Stability and distribution of sediments
- Nature and volume of sediments to be dredged
- Estimation of consistency and strength of sediments using Delph software



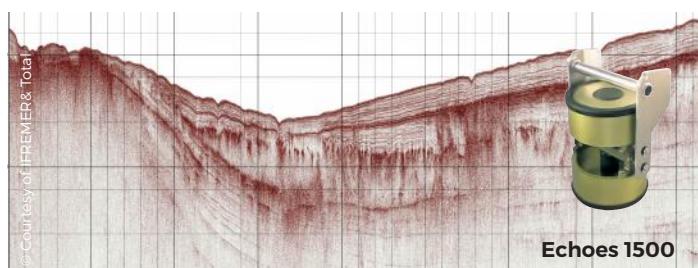
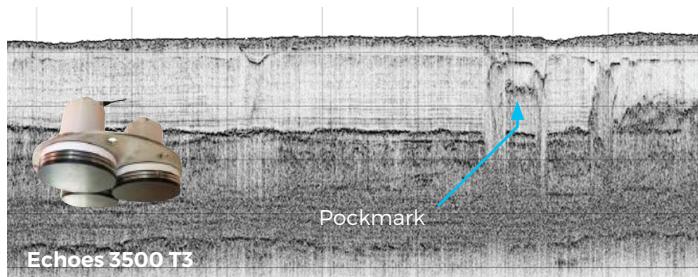
Offshore energy

ECHOES 3500 T3 // 1500

- **Frequency:** 1700-5500 // 500-2500 Hz
- **Array:** 680x384 // 455X584 mm (diamxH)
- **Weight (air/water):** 161/120 // 90/60 kg
- **Set-up:** Pole/Hull Mounted // Fish, Tow-fish, AUV, ROV
- **Resolution:** 20 // 50 cm
- **Mean penetration:** 50 // 100 m

Relevance

- 3500 // 1500: shallow to -medium // - full ocean depth
- Nature and structure of the first 300 meters of sediments
- High-resolution seismic reflection profiles for:
- Marine platforms implantation,
- Route/boulder clearance,
- Pockmark detection,
- Seabed roughness,
- Bedrock depth.
- Geo-acoustic inversion modeling



FOCUS ON IXBLUE TECHNOLOGY

Echoes Natural Frequency beam opening Vs Parametric system

CASE STUDY 1: GEOLOGICAL STRUCTURES

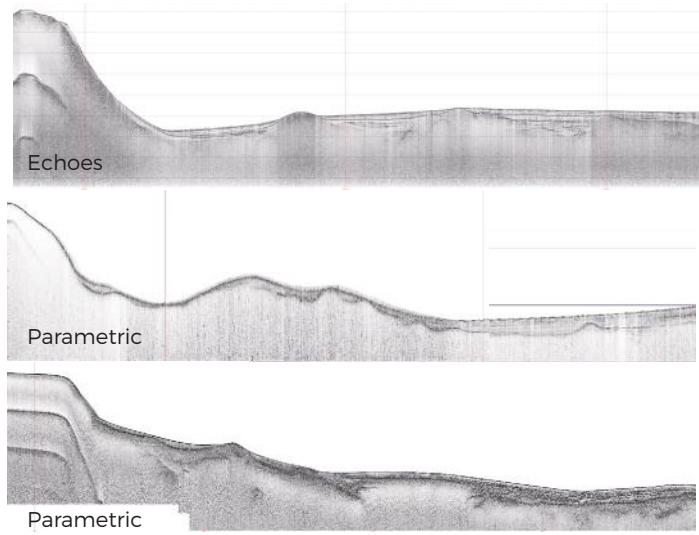
Parametric 3.5°



CHIRP 15° to 20°

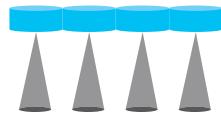


Whether through rough weather or environmental conditions, Echoes performs equally in without performance degradations.

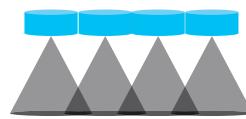


CASE STUDY 2: BURIED OBJECT

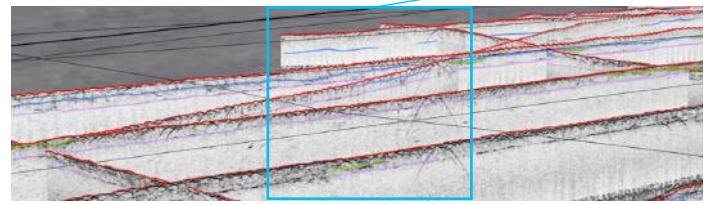
Parametric 3.5°



CHIRP 15° to 20°



15° to 20° aperture with CW short signal at 10 Hz makes rings pipe lauder.



ECHOES

Penetration in sediment

- Full power on the primary frequency in the range 1.5kHz to 15kHz (shallow water models)
- Processing gain function of the bandwidth & SNR function of pulse duration

Vertical resolution is function of the pulse acoustic bandwidth:

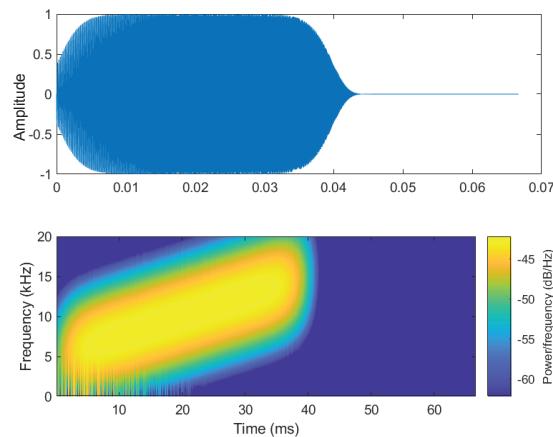
- Bandwidth must be considered at -3dB (efficient power)
- Output level must be linear on the total bandwidth (low distortion)

Horizontal resolution is function of the directivity, pulse rate, vessel speed

- High repetition rate
- Average beam directivity (Single / multi-transducer): 10° – 30°

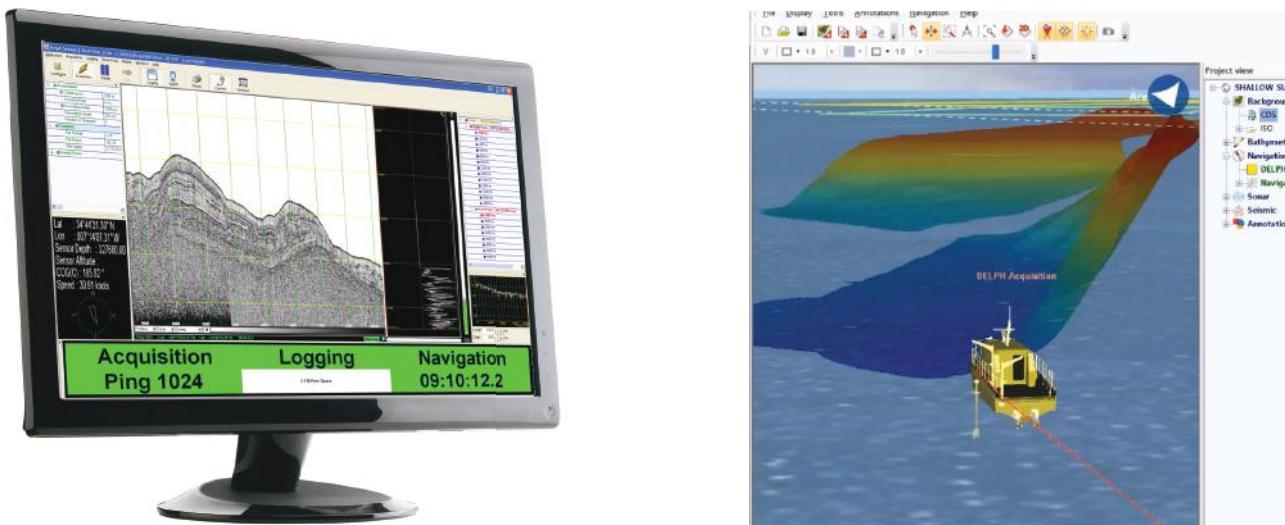
Echoes equipment mobilization

Mechanical: Pole mounting	30'
Wiring: System interconnection	10'
Positioning: Lever arms with MRU & GPS	10'
Software: Echoes & Delph set-up	10'
Total mobilisation time	1 hour

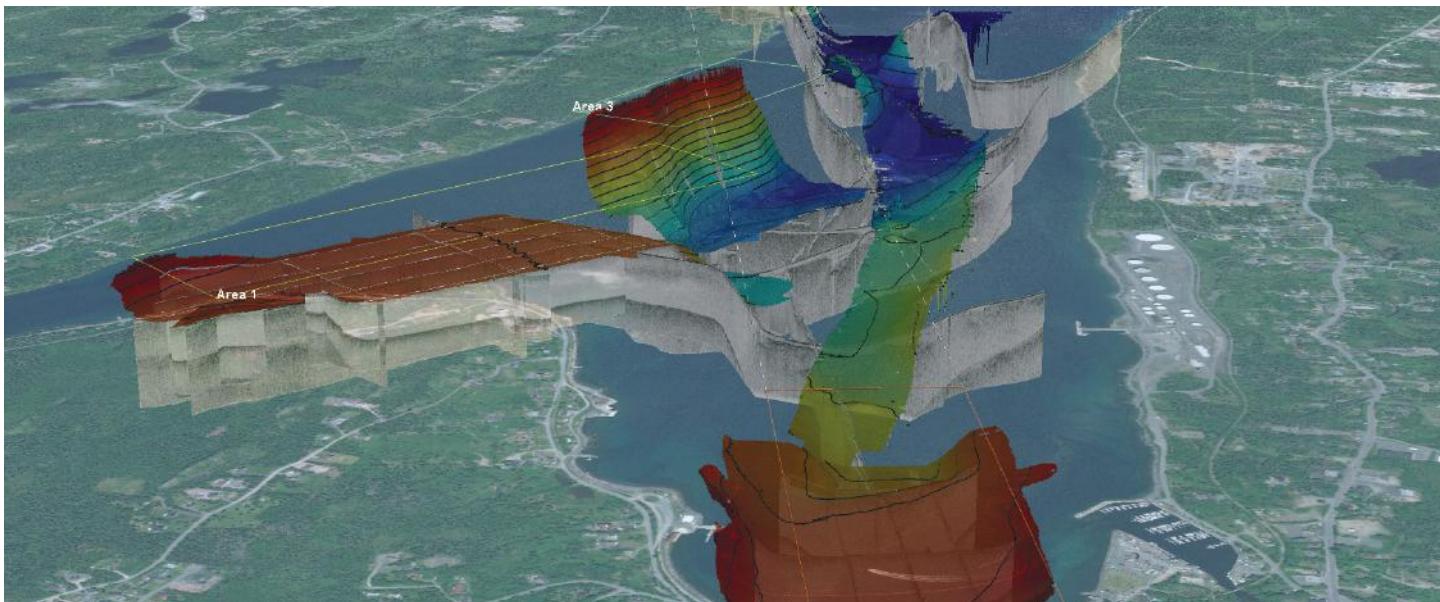


IXBLUE SOLUTION ON THE FIELD

Acquisition & real time monitoring software



3D SBP data processing, interpretation, mapping software



I - Portable & Plug & Play Sensors

II - Perfect geo-referencing

III - Multi-sensor & High-resolution data

IV - Industry standard data formats

V - Efficient data processing

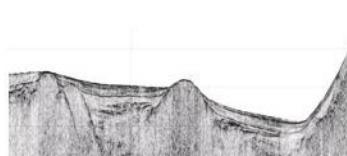
I.



II.



III.



IV.



V.





KNUDSEN

PINGER

PORTABLE SHALLOW WATER
CHIRP SUB-BOTTOM PROFILER



PINGER SBP

Technical Specifications (subject to change without notice)	<i>Low Frequency Channel</i>		<i>High Frequency Channel</i>
	3.5kHz	15kHz	200kHz
<i>Dry End - Echosounder</i>			
Bandwidth	User configurable (up to 20kHz)		
Output Power	up to 2kW	up to 2kW	up to 1kW
Pulse Length (min / max)	62.5µs / 64 ms		62.5µs / 4 ms
Ping Repetition Rate (max)	20 Hz		
Gain	Manual, automatic (AGC), and time varied (TVG)		
Analog Gain	96dB programmable analog gain		
Time Varied Gain (TVG)	20logR, 40logR		
Zoom Display	Dynamic Window Positioning and Sizing		
Units	Meters, Feet, or Fathoms		
User Interface	Control using standard Windows PC		
Digital Data Formats	SEG-Y, XTF, KEB (Knudsen proprietary), ASCII		
Power Supply	24 Vdc		
Operating Temperature	0 - 50 degC		
Enclosure	Portable splashproof case		
Dimensions (length x width x height)	488mm(19.2") x 386mm(15.2") x 185mm(7.3")		
Weight	10.5kg (23lb)		
<i>Wet End - Transducer</i>			
Projector	KELA5701-3.5kHz	KEL291-15kHz	KEL491-200kHz
Impedance	100 Ohms	60 Ohms	60 Ohms
Peak Transmit Voltage Response	149dB	157.5dB	176dB
Receiver	KEL-Hydrophone		KEL491-200kHz
Beamwidth	30 deg @6kHz	12 deg @15kHz	9 deg @200kHz
Peak Receive Voltage Response	-197.2 dB re 1V/uPa		-191 dB re 1V/uPa
Dimensions (length x width x height)	864mm(34") x 514mm(20.25") x 381mm(15")		
Weight	21kg (46lb) - 15kHz Option		
	29kg (64lb) - 3.5kHz Option		
Cable Length	10m(33ft)		
Installation	Pole mount -over the side		



Fiberglass Fairing Assembly



Pinger Wet End shown as shipped

