

Innomar Technologie GmbH

*Parametric Sub-bottom Profilers*  
**SES-2000**  
*New Developments 2009*

**INNOMAR Technologie GmbH**  
Rostock, Germany

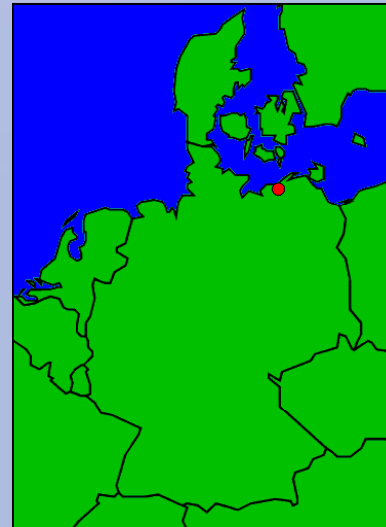
[www.innomar.com](http://www.innomar.com)  
[info@innomar.com](mailto:info@innomar.com)

*Aquadyne's TAS, Oscarsborg, October 2009*



# Innomar Technologie GmbH

- Founded in 1997 in Rostock (Germany)
- Main product line: SES-2000 parametric sub-bottom profilers
- More than 100 units sold
- Renting pool of SES-2000 systems and accessories (GPS, motion sensors, SVP)
- Hard- and software development according to customers' requirements
- QM certified by DIN EN ISO 9001: 2008



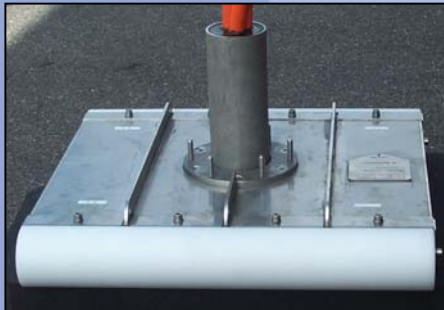
# SES-2000 *compact / light / (standard)*

- Water depth range 1 ... 400m (500m)
- Vertical resolution up to 7cm
- Penetration depth up to 50m
- Primary frequency about 100kHz
- Secondary frequency (4) 5 ... 15kHz
- Pulse length 66 ... 800 $\mu$ s
- Pulse repetition rate up to 50s<sup>-1</sup>
- Transducer 0.3m × 0.26m / 15kg
- Beam width  $\pm 1.8^\circ$  @ all frequencies
- Side Scan Extension optional @ 100kHz
- SES-2000 *standard*: beam steering & stabilizing;  
full waveform data



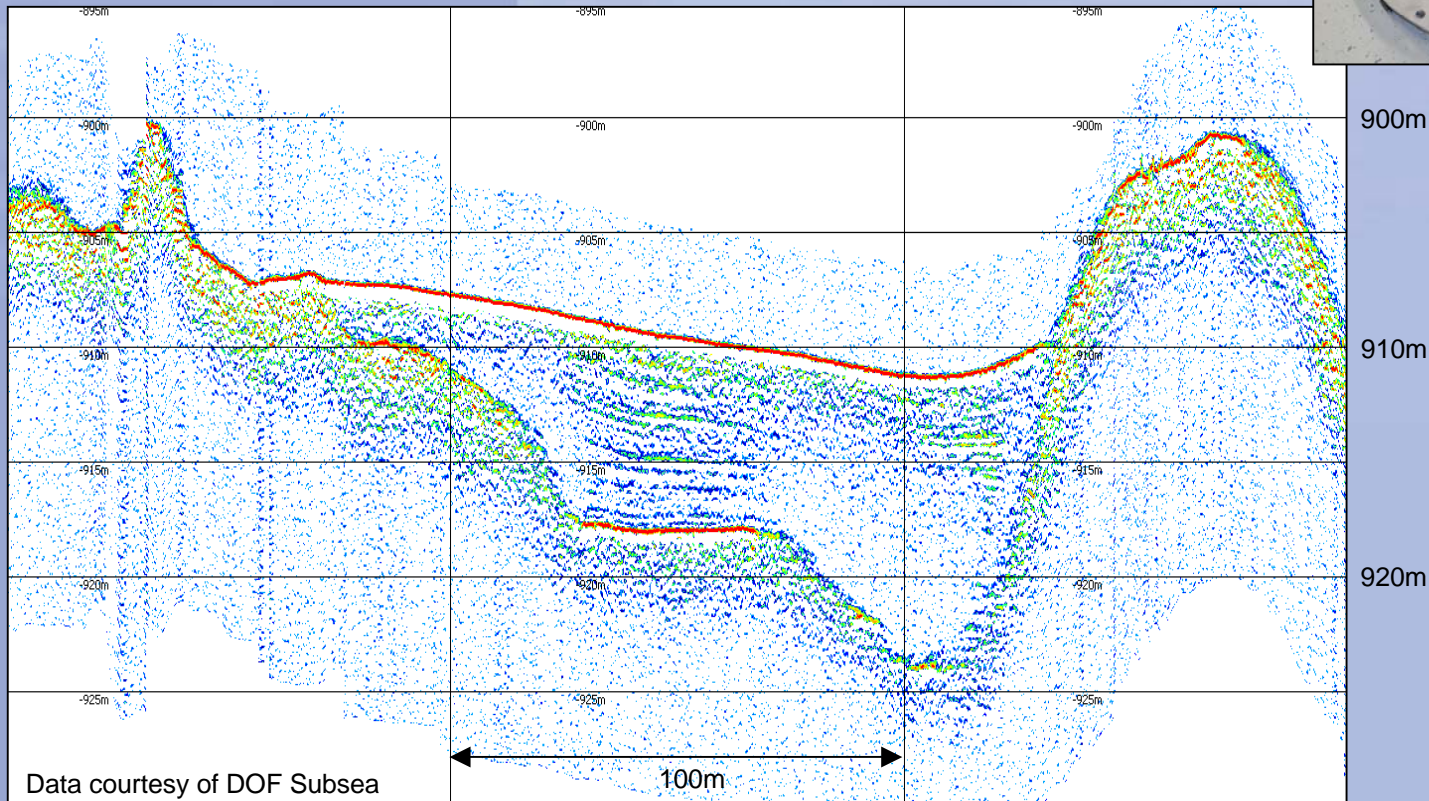
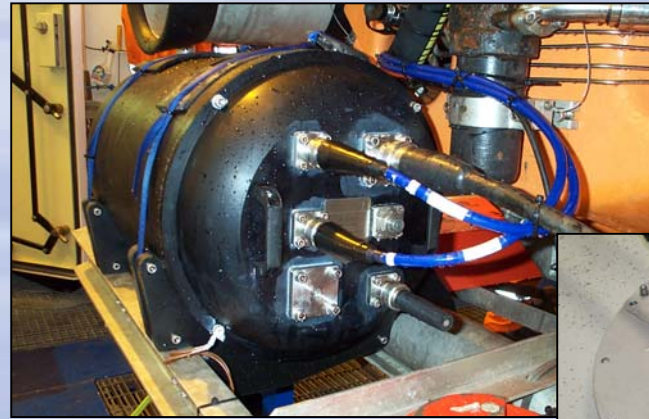
# SES-2000 medium / (deep)

- Water depth range 5 ... 2000m (6000m)
- Vertical resolution up to 7cm (15cm)
- Penetration depth up to 100m (150m)
- Primary frequency 100kHz (35kHz)
- Secondary frequency 3...15kHz (2 ...7kHz)
- Chirp signal optional
- Pulse repetition rate up to 30s<sup>-1</sup>
- Beam width  $\pm 1$  (1.5)<sup>°</sup> @ all frequencies



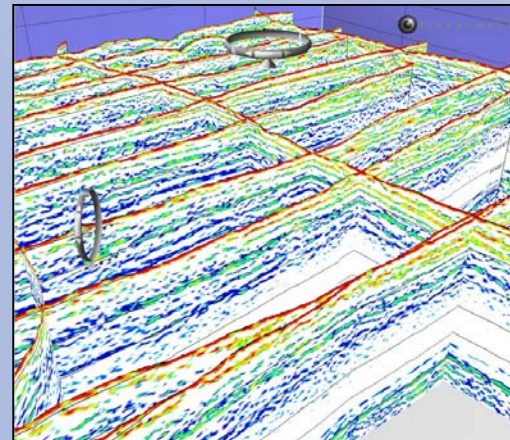
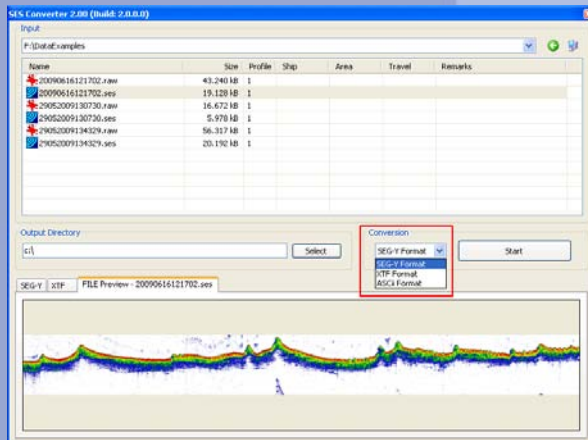
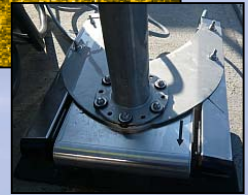
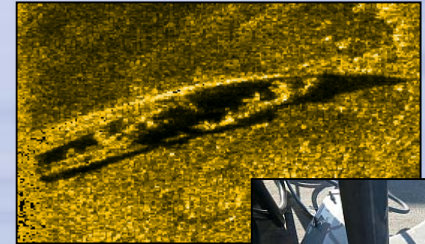
# SES-2000 ROV

- Like SES-2000 *standard*
- Depth below sea surface up to 2000m



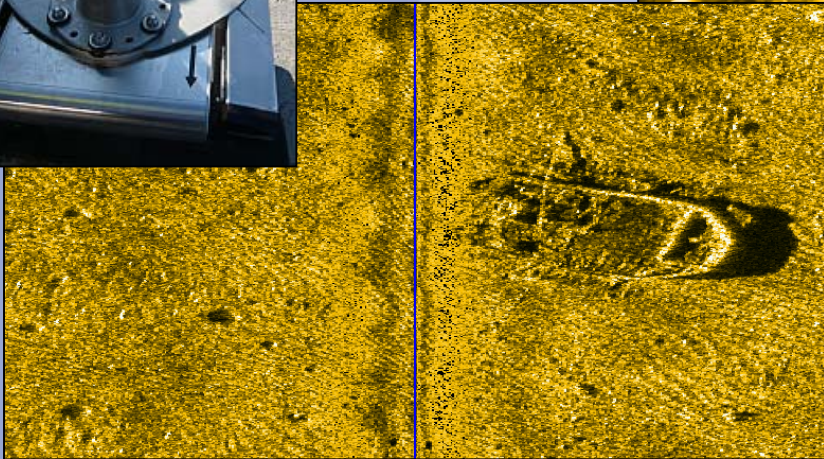
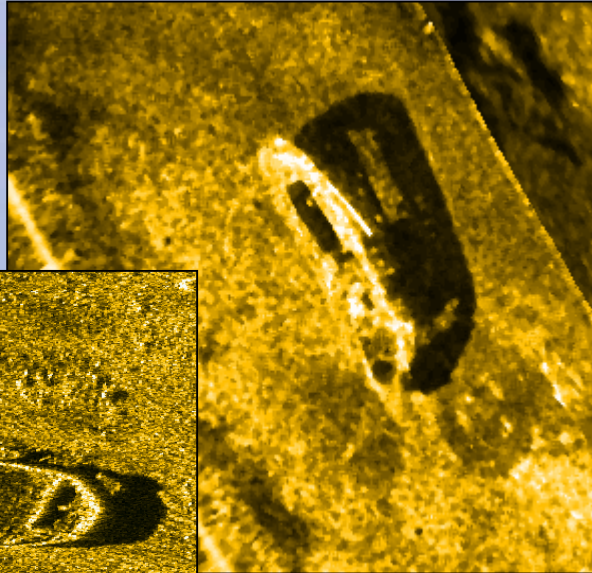
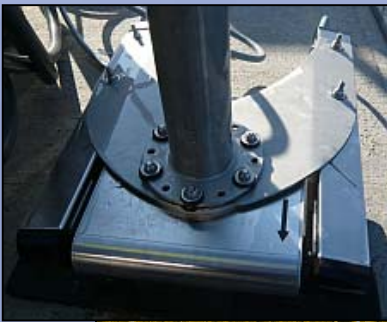
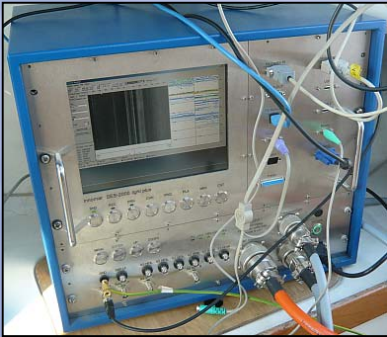
# SES-2000 Developments in 2009

- New shallow-water system: SES-2000 *light plus*
- Multiple Transducer System SES-2000 *MTX*
- Improved SES-2000 *medium* for permanent installation
- Transducer with anti-fouling
- Full-waveform data acquisition for SES-2000 *light*
- Software improvements according to customer's requests (SESWIN, ISE, SES Converter)



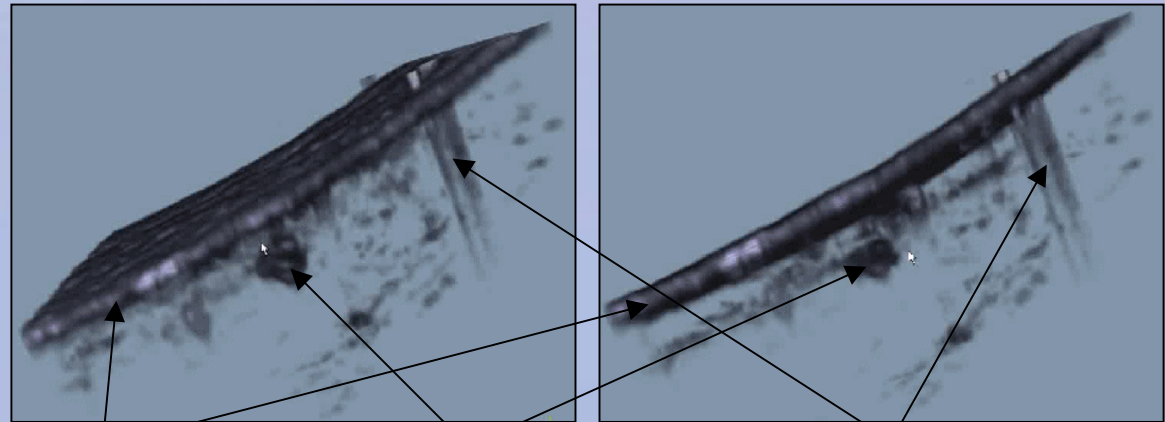
# SES-2000 *light plus*

- SBP like SES-2000 *light*
- Side Scan frequencies 250 + 435kHz  
water depth 1 ... 30m  
beam width  $\pm 0.5^\circ$   
pulse type CW, chirp



# SES-2000 *MTX*

- SBP with array of 3 parametric transducers used for TX/RX
- Focus on object detection in small areas (e.g., archaeological surveys)
- High data density allows good 3D-Visualisation of SBP data



seabed

wreck

wooden posts

(Data example from an archaeological survey in Northern Germany.)

# Improved SES-2000 *medium* for hull-mounting

- only 1 electronic cabinet with shock absorbers  
→ easier installation, less connections and easier to maintain
- transducer with improved isolation of structure-borne noise
- 1 unit delivered (to be installed in November)



4 vibration isolators supporting the transducer within a mounting frame

mounting frame with reduced contact area to the ship's hull (remaining gap filled by foam sleeve)



# Anti-Fouling for SES-2000 Transducers

- permanently hull-mounted transducers affected by fouling



Transducer used for TX/RX

Transducer used for RX only

SES-2000 medium transducers after operating about 1 year (North Sea)

- Innomar tested anti-fouling paints
  - compatibility with transducer material
  - acoustic performance
- first transducer coated with anti-fouling delivered



# SESWIN Improvements

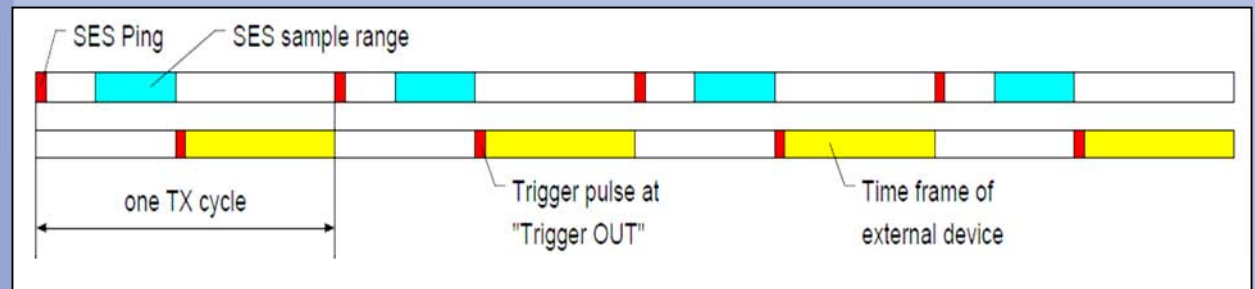
- New synchronisation modes for SBP + MBES surveys
- Lever arm correction for motion sensor data
- Dual Range
- Window resizable
- Quick Controls

Quick Controls dialog box showing settings for LF and HF frequencies, range start, area, and profile. The dialog is split into two panes: 'Depth Range' and 'Threshold Process'. The 'Depth Range' pane shows 'LF-Frequency: 12 kHz' and 'LF-Pulses: 2'. The 'Threshold Process' pane shows 'LF 30 dB' and 'HF 6 dB'. Below these are checkboxes for 'High Energy Mode', 'Multi Frequency Mode', 'Dual Range Mode', 'Beam Steering Mode', 'Allow High Pulse Rate', 'Deep Sea Pulse Mode', 'Burst Mode', and 'Chirp Mode'. At the bottom, there is a 'Range Start' dropdown set to '30 m', an 'Area' input field, a 'Profile' dropdown set to '1', and an 'Apply New Profile' button.

System Settings dialog box showing various configuration options. The 'Mode' section has radio buttons for 'Internal Trigger', 'External Trigger', and 'Alternating Trigger'. The 'External Trigger Settings' section includes sliders for 'Delay between sync pulse and ping [µs]' (set to 0), 'Delay as percentage of range [%]' (set to 0), and 'Number of pings for one sync pulse' (set to 1). The 'Alternating Trigger Settings' section includes sliders for 'Internal pings prior to external device' (set to 1), 'Number of external pings' (set to 1), and 'Time frame of external device [µs]' (set to 100000). The 'Burst Mode Settings' section includes a slider for 'Percentage of active time frame [%]' (set to 50). Buttons for 'OK' and 'Cancel' are at the bottom.

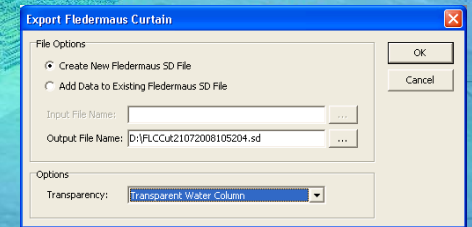
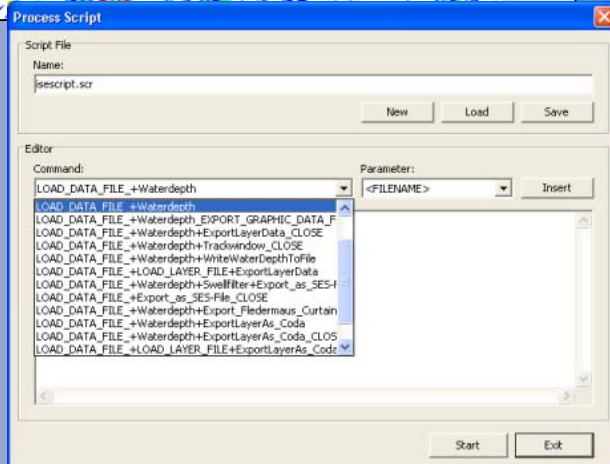
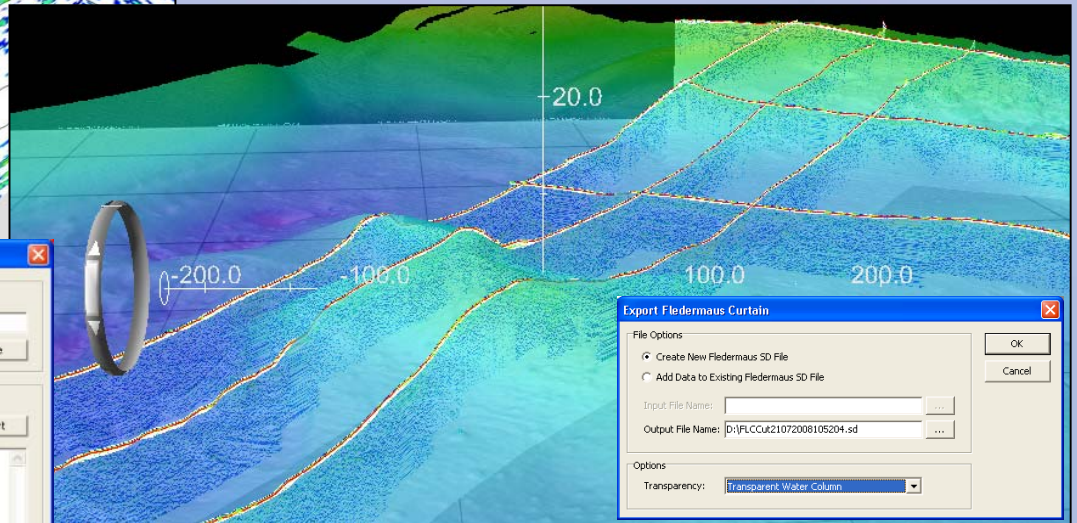
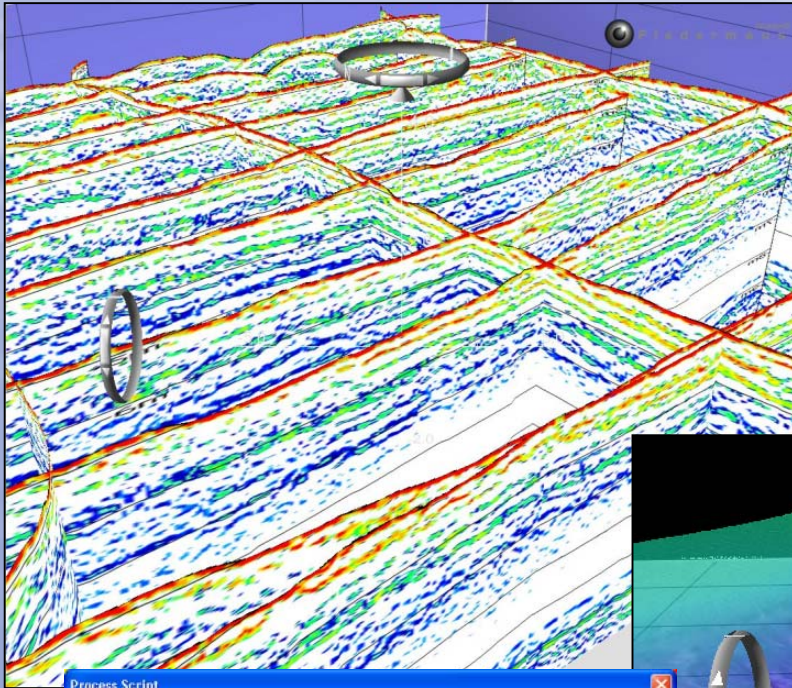
System Interfaces dialog box showing 'Offset from CG to Motion Sensor [m]' and 'Offset from CG to Monitoring Point [m]' with X, Y, and Z coordinates. The 'Lever Arm Geometry' section contains a diagram of a vessel with a monitoring point (MP) and center of gravity (CG). The diagram shows the MP at a height above the CG, with horizontal and vertical offsets. A legend below the diagram defines CG as 'centre of gravity', MS as 'motion sensor', and MP as 'monitoring point'. There is an 'Enable Lever Arm Correction' checkbox.

System Settings dialog box showing 'Extended Range Settings'. It includes sliders for 'Extend Primary Range Above [m]' and 'Extend Primary Range Below [m]', both set to 10. There is a checkbox for 'Set Extended Range to Double Primary Range Length'.

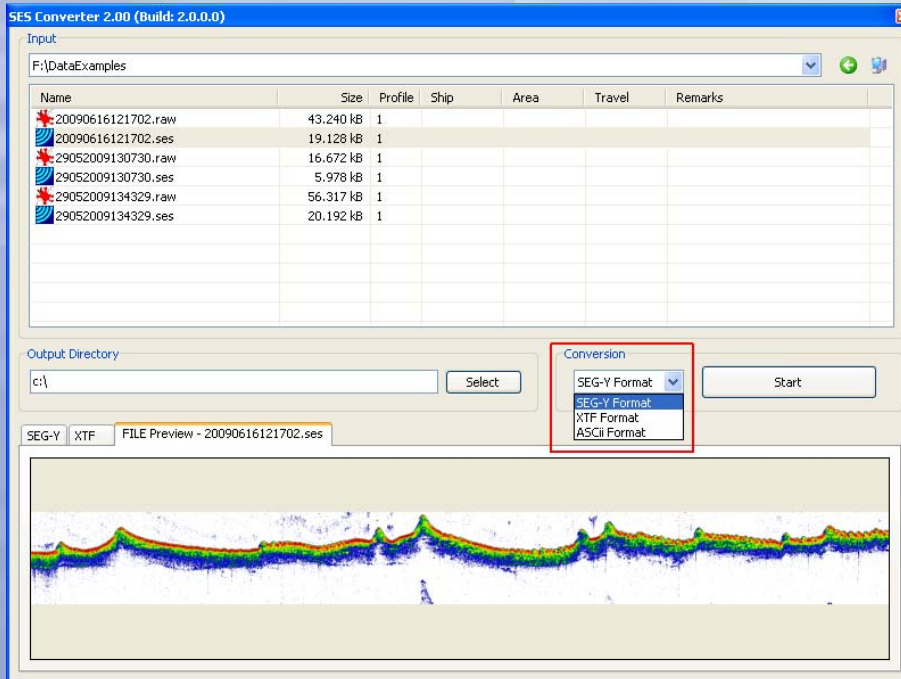


# ISE Improvements

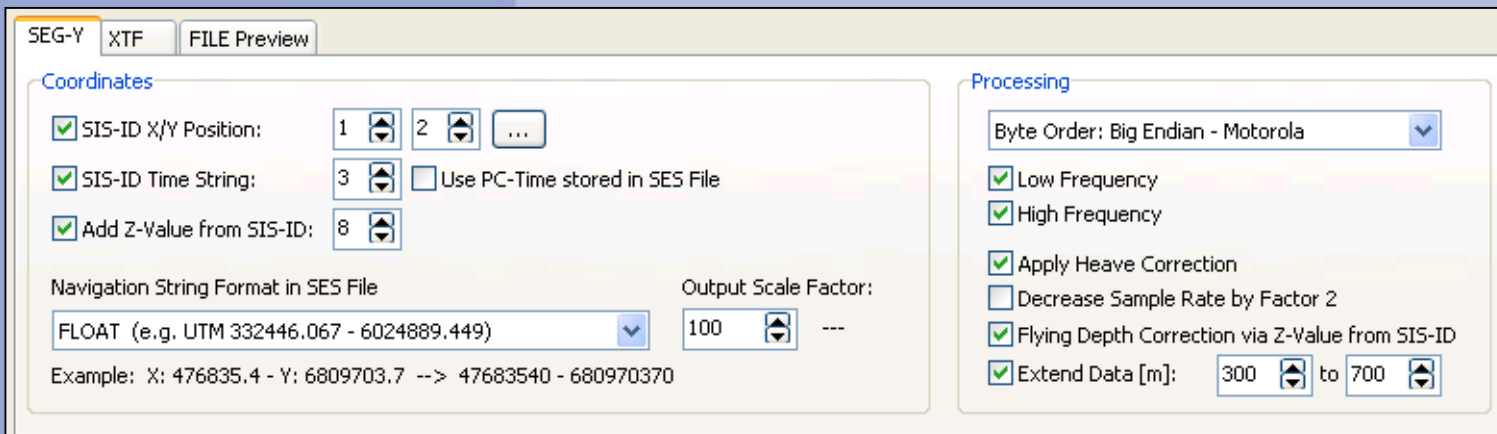
- Editing full-waveform data
- Script processing
- Export processed SES data
- Export to IVS Fledermaus
- Workflow optimized



# SES-Converter V.2.0



- New GUI for improved workflow
- Improved file preview
- Reduced rounding errors
- Heading for XTF
- Additional options for SEG-Y



Innomar Technologie GmbH

***Thank you for your attention!***

*See you at Innomar's 4<sup>th</sup> Workshop "Seabed Acoustics"  
Rostock, 19-20 Nov. 2009*

