

Boomer subbottom profilers

Principle: The boomer is an electromagnetically driven sound source. The source is usually mounted on a towed catamaran and a separate hydrophone array (streamer) is used for a receiver. The sound is generated when a capacitor bank is discharged through one or more flat spiral coils and causes one or more copper or aluminium plates adjacent to the coil to flex away from the coil/s. This flexing creates an acoustic shock wave.

Basic features: Conventional boomer sources have a typical frequency of 0.5-1.5 kHz and a pulse length of 100-200 μ s. They are marked by a clean source signature and good repeatability. Penetration is up to 100 m (possibly deeper in very soft sediments). In very shallow water (< 3 m) boomer sources prove inadequate due to the receiver array length and offset, which causes destructive stacking of the signals.

Resolution and horizontal precision: Vertical resolution ranges between 25 and 50 cm. Because the reflected signal is generally picked up by a hydrophone array ('streamer') deployed at some distance behind the source, the registration of the positions of features recorded is not as precise as with systems where the source and receiver(s) are directly adjacent. The 'Seistec' boomer overcomes this problem and was designed specifically for shallow water environments. It has a line-in-cone receiver located adjacent to the boomer plate so no separate streamer is needed. Thanks to its high peak frequency and large operational bandwidth the Seistec has a resolution of 25 cm.

Platforms: Some boomers can be operated from small (semi-inflatable) vessels. In addition to the energy source (see photo) also a seismic recording system must be installed.

Advantages:

- Imaging of sandy, silty and clayey sediments
- Quite high resolution, good signal repeatability, deep penetration
- Operated from small vessels
- Seistec boomer: very shallow water + high resolution
- High potential for landscape reconstruction

Disadvantages:

- Very sensitive to the sea state (waves, wind)
- 2D image of the subbottom, no 3D
- Small features (< meter range) can most likely not be detected
- Conventional boomers cannot be used in very shallow water
- Image distorted by gas in sediments

Literature

Simpkin, P.G. 2005: The Boomer sound source as a tool for shallow water geophysical exploration. *Marine Geophysical Researches* 204 (2005), 171-181.

Baltzer, A., Tessier, B., Nouze', H., Bates, R., Moore, C. and Menier, D. 2005: Seistec seismic profiles: A tool to differentiate gas signatures. *Marine Geophysical Researches* 204 (2005), 235-245.



Fig. 1 Typical boomer system: boomer plate and catamaran, hydrophone streamer and energy source.



Fig. 2 Seistec boomer source with line-in-cone receiver. (© RCMG Universiteit Gent)

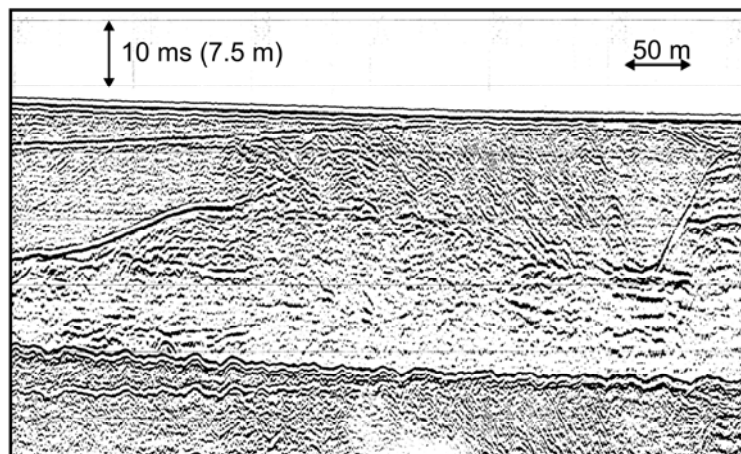
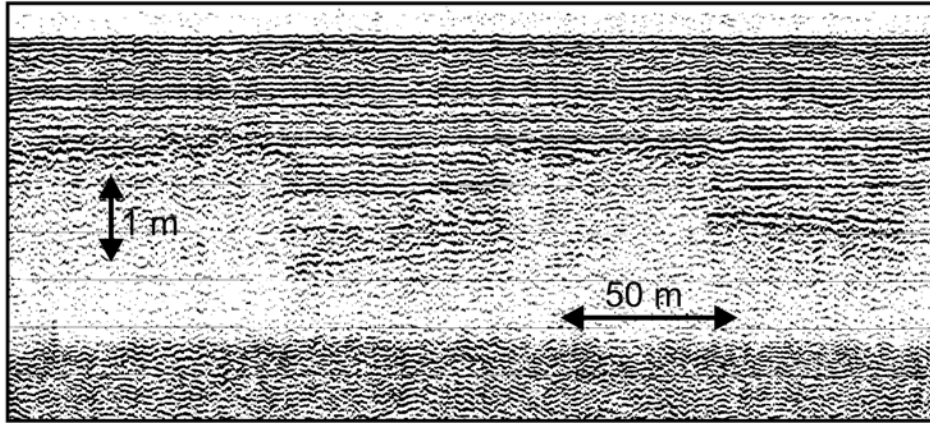


Fig. 3 Typical boomer profile recorded over a buried palaeovalley system in the Venice lagoon (© RCMG Universiteit Gent).



*Fig. 4. Seistec boomer profile off the Belgian coast showing different levels of upward gas migration.
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