Sparker subbottom profilers

Principle: A seismic sparker generates an acoustic pulse by discharging an electrical pulse between electrodes located on the tips and a ground point on the sparker body, in the conducting medium of seawater.

Basic features: Conventional sparkers typically are within the frequency range 0.05-4.0 kHz with a pulse duration of 1-5 ms. Different sparker types can be applied to depths ranging from 5 to 4500 m with a penetration of the seabed down to 750 m for the low-frequency range. They are marked by a clean source signature and good repeatability. Some of the systems are able to emit pulses of up to 16 kJoule. In very shallow water (< 5 m) sparker 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 40 cm and 3 m. Because the reflected signal is picked up by a hydrophone array ('streamer') deployed at some distance away from 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.

Platforms: Some smaller sparker sources can be operated from relatively small (semi-inflatable) vessels. In addition to the energy source (capacitor bank) also a seismic recording system must be installed.

Advantages:
- Imaging of sandy, silty and clayey sediments
- Good signal repeatability, deep penetration
- Can be operated from medium-small vessels
- High potential for large-scale landscape reconstruction

Disadvantages:
- Medium to low resolution
- 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 sparkers cannot be used in very shallow water
- Image distorted by gas in sediments

Literature

Labaune, C., Tesson, M. and Gensous, B. 2005: Integration of high and very high resolution seismic reflection profiles to study late Quaternary deposits of a coastal area in the western Gulf of Lions, SW France. Marine Geophysical Research 2-4 (2005),109-122

Le Pichon, X., Şengör[b], A.M.C., Demirbağ, E., Rangin, E. Et al. 2001: The active Main Marmara Fault. Earth and Planetary Science Letters 192-4, 595–616.

Fig. 1Multi-tip sparker, cable and floaters (© Geo Resources)

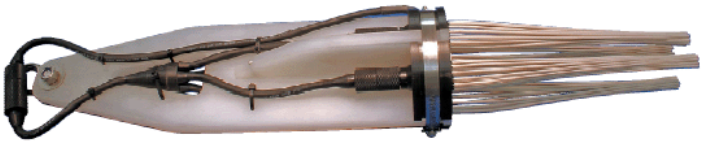

Fig. 2 ”Squid-like” sparker source (© Applied Acoustics)

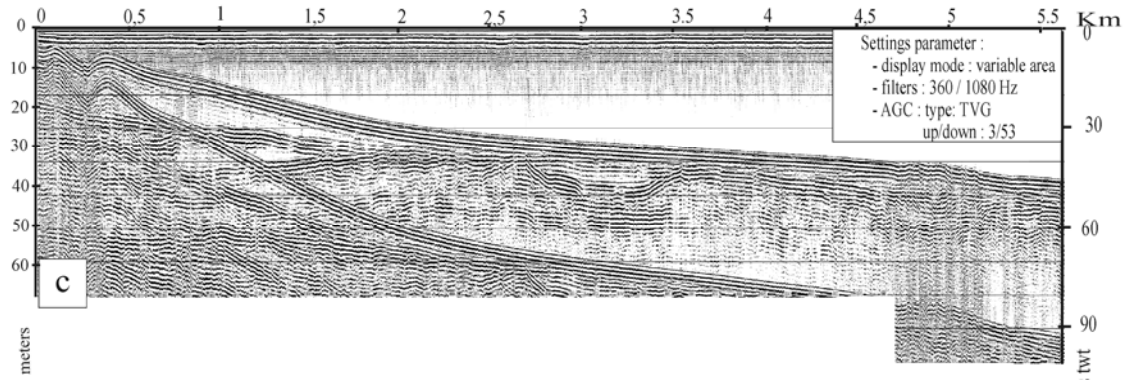

Fig. 3 Sparker profile recorded in the Gulf of Lyons (France). Deeper sediments are largely obscured by the strong seafloor multiple. (© Ifremer)

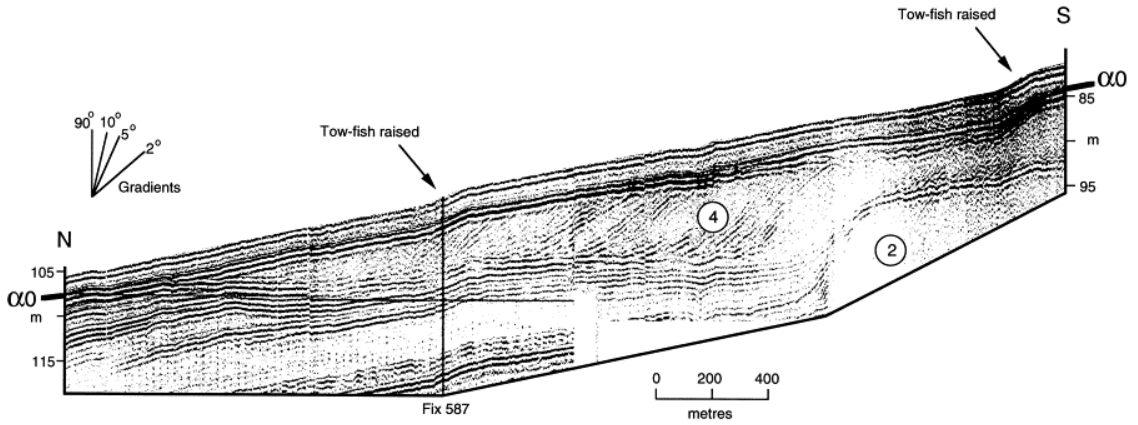

Fig. 4 Sparker profile across the southern margi of the Marmara Sea. (© University of Newfoundland)