# Efficiency of seismoacoustical methods during engineering exploration and mapping of bottom sediments

**Dr. Oleg Levchenko**
P.P. Shirshov Institute of Oceanology
Russia

R. Ananiev, N.Dmitrevskty, L.Lobkovsky, L.Merklin, A.Pleshkov, K.Roginsky

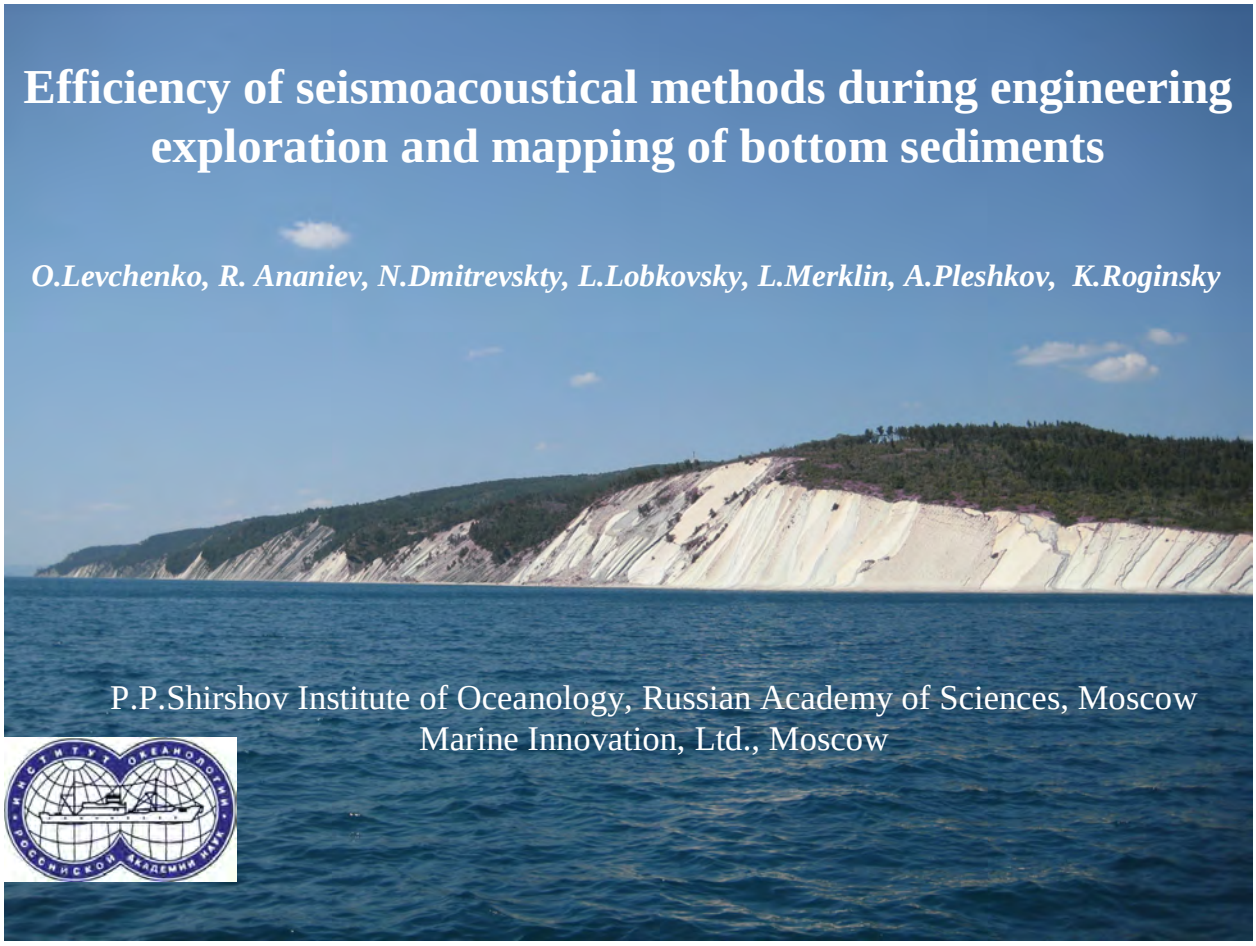
**Contact**

Address P.P. Shirshov Institute of Oceanology,
Russian Academy of Science
Moscow
Russia

Website www.ocean.ru
Email olevses@rambler.ru

# Efficiency of seismoacoustical methods during engineering exploration and mapping of bottom sediments

*O.Levchenko, R. Ananiev, N.Dmitrevskty, L.Lobkovsky, L.Merklin, A.Pleshkov, K.Roginsky*



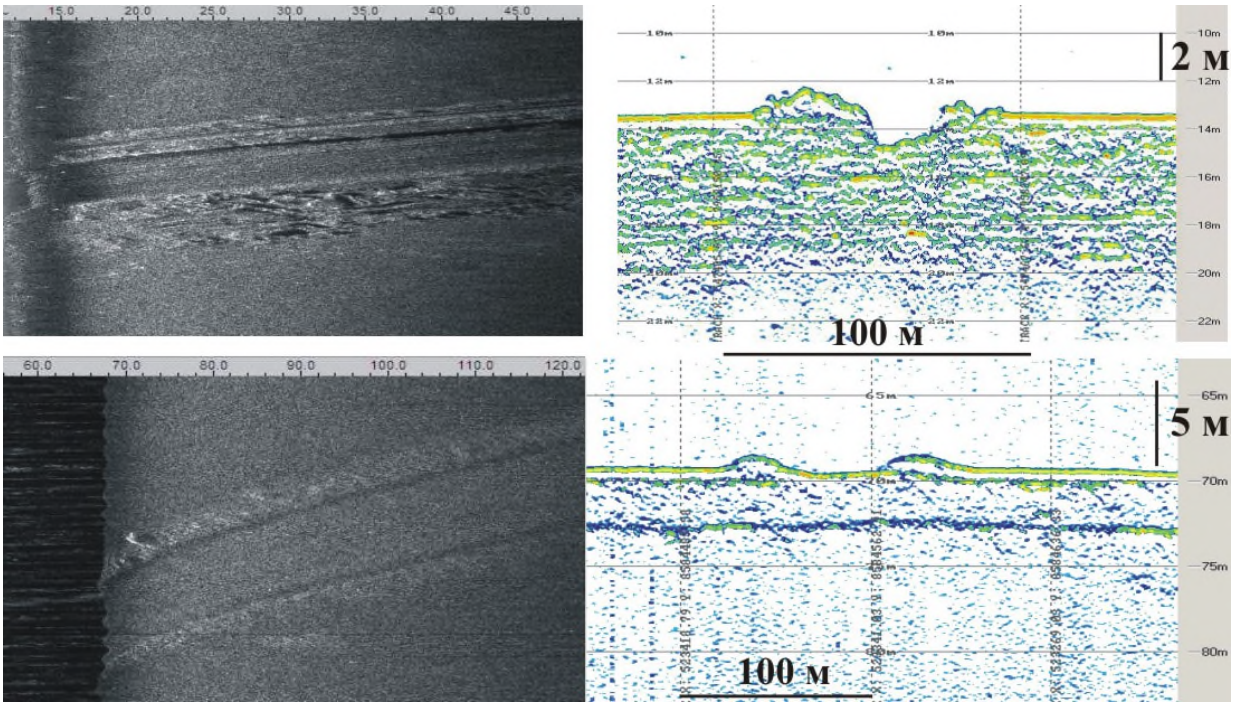
P.P.Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow
Marine Innovation, Ltd., Moscow

**Modern engineering explorations, prospecting of natural resources and archaeological researches over the water areas sure to involve detailed bottom survey with distinct acoustical methods (bathymetry, side scan sonar survey, seismoacoustical profiling). These methods are often carried out separately because of different technical particularities, for example in consideration of specificity as vessel runs along survey lines with onboard installed antenna or towed one.**

**Institute of Oceanology works successfully with echosounder-subbottom profilers SES-2000 nearly 10 years over different water areas from shallow-water rivers and lakes to deep-water seas and oceans. Some examples.**

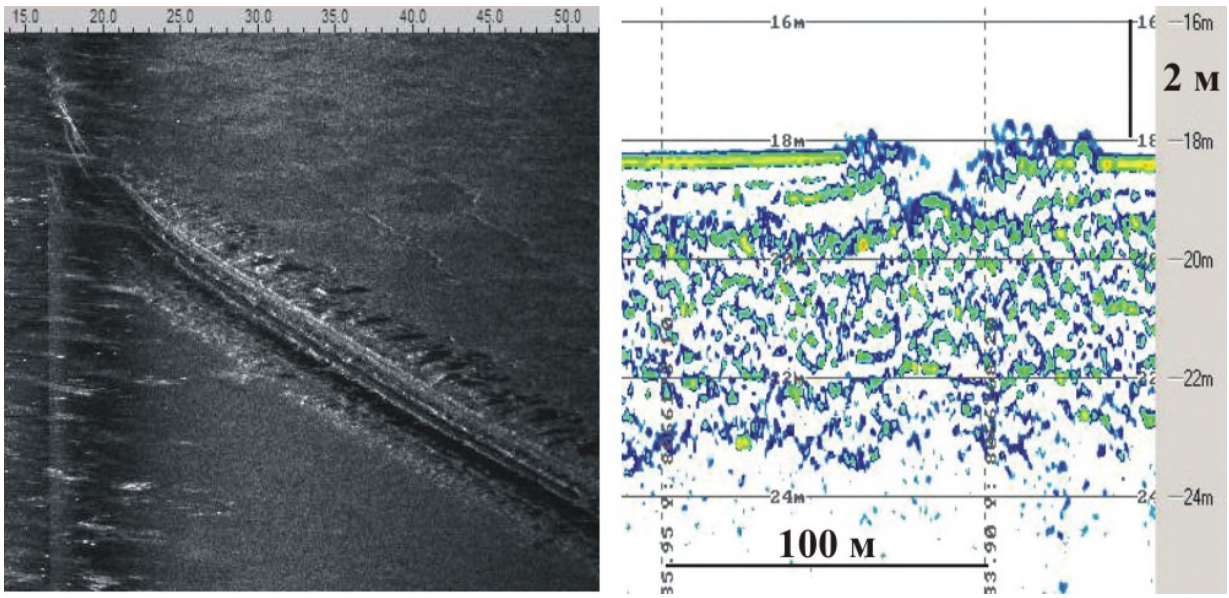
# The Arctic Ocean, Laptev Sea. Natural exaration: iceberg plougmarks and ice scours

**Sub-bottom profiler SES-2000-standard, Side-scan sonar Hydra**



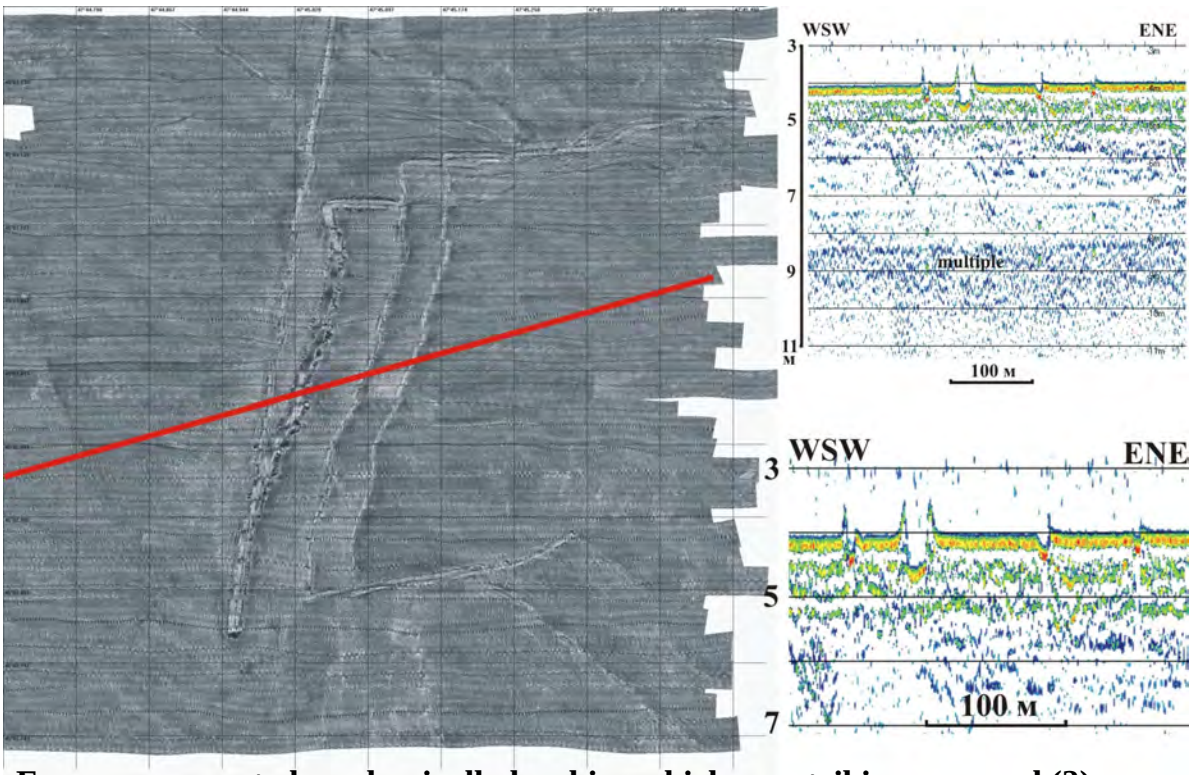

The Arctic Ocean, Laptev Sea. Natural exaration: iceberg plougmarks and ice scours

Sub-bottom profiler SES-2000-standard, Side-scan sonar Hydra



# The Caspian Sea. Artificial exaration

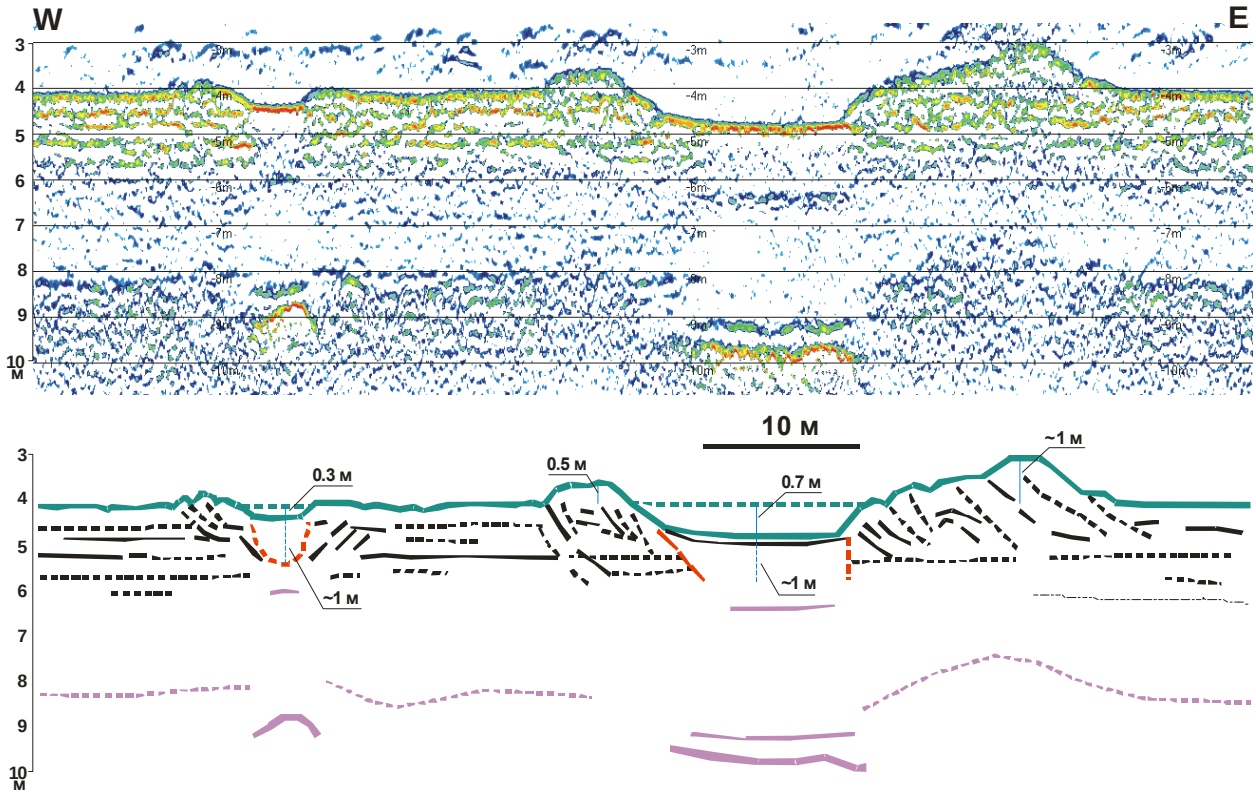
## Side-scan sonar Hydra, Sub-bottom profiler SES-2000-standard




**Furrows excavated mechanically by ships which are striking aground (?)**

# The Caspian Sea. Artificial exaration

## Sub-bottom profiler SES-2000-standard

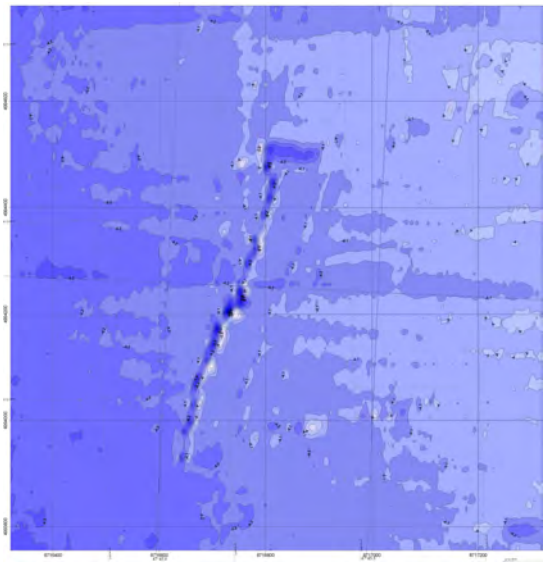


# The Caspian Sea. Artificial exaration

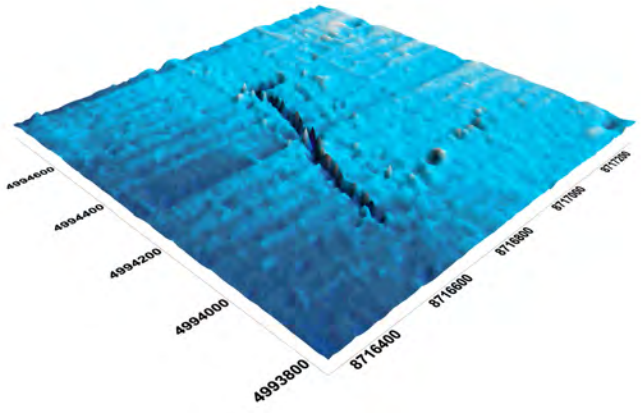
**Sub-bottom profiler SES-2000-standard**

Bottom topography (bathymetry map)

Plan view



3D Geometry

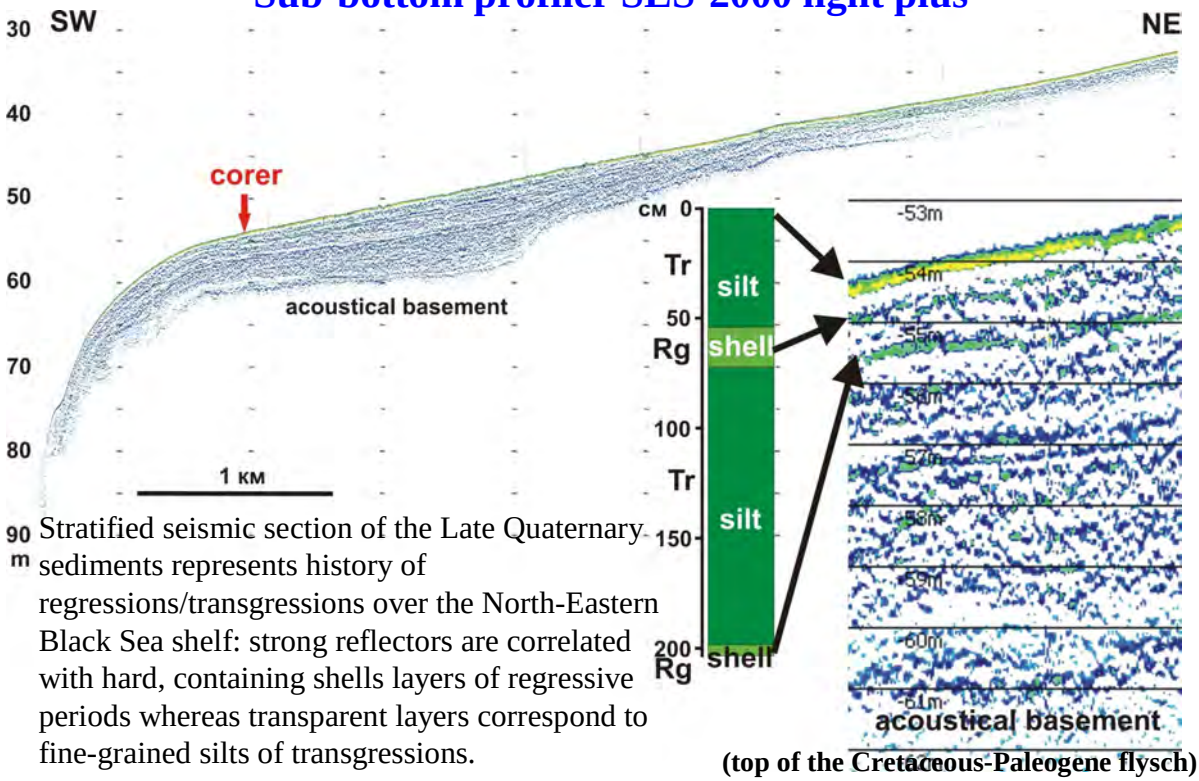



**Besides troubles and discomfort (installation of GPS, MRU; cabling ets), separate using of distinct acoustical methods increases significantly time of work and its cost consequently due to greater spending of ship time – most expensive cost in marine studies. To reduce these expenses and enhance efficiency of the works, these three methods - bathymetry, side scan sonar survey, seismoacoustical profiling, must be carried out simultaneously along the same track.**

**In July 2013 company «Marine Innovation, Ltd.» together with Shirshov Institute of Oceanology carried out methodological works in the Black Sea on the Caucasian shelf near Gelendzhik. New profiler «SES-2000 light plus» (Innomar Technology GmbH) allowed carrying out side scan sonar survey simultaneously with bathymetry survey and continuous high resolution profiling.**

# The Black Sea. Bottom deposits structure

## Sub-bottom profiler SES-2000 light plus

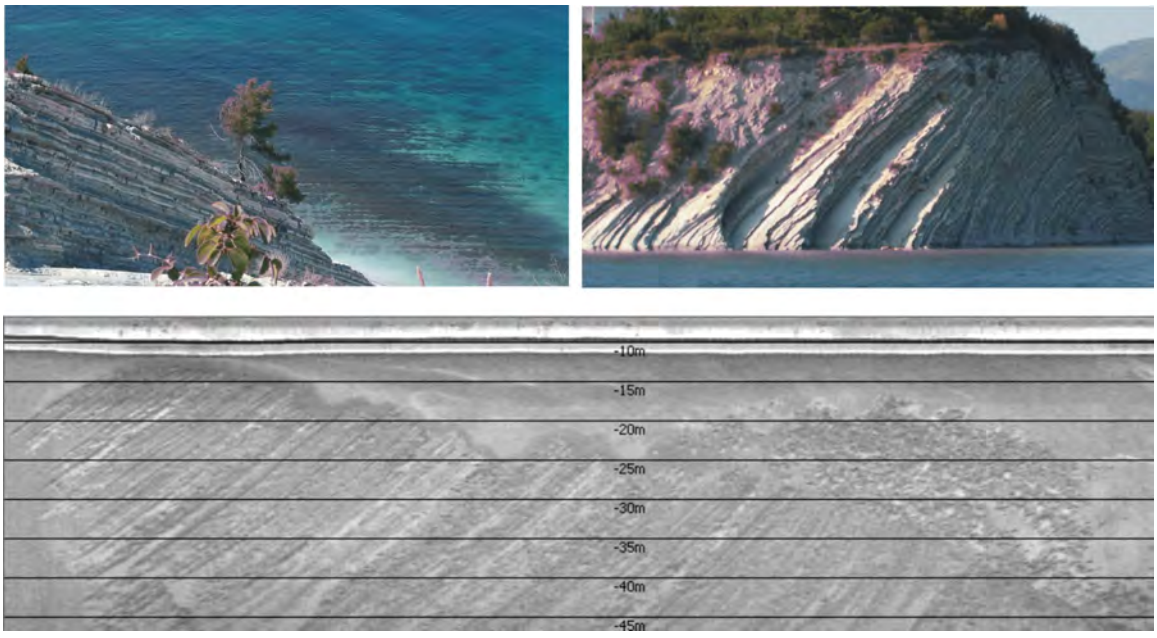



Stratified seismic section of the Late Quaternary sediments represents history of regressions/transgressions over the North-Eastern Black Sea shelf: strong reflectors are correlated with hard, containing shells layers of regressive periods whereas transparent layers correspond to fine-grained silts of transgressions.

**(top of the Cretaceous-Paleogene flysch)**

# The Black Sea. Bottom deposits structure

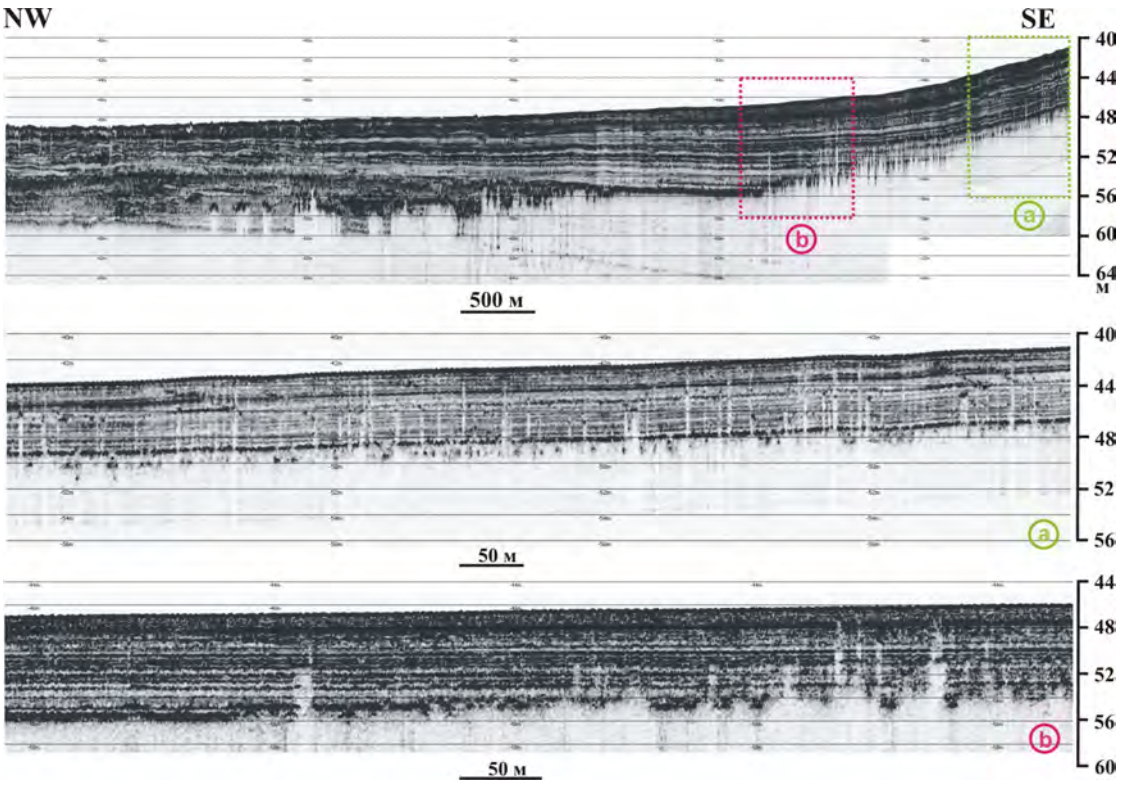
## Side-scan sonar SES-2000 light plus




Acoustical basement. Regular ridges on top of the Cretaceous-Paleogene flysch eroded during several regressions.

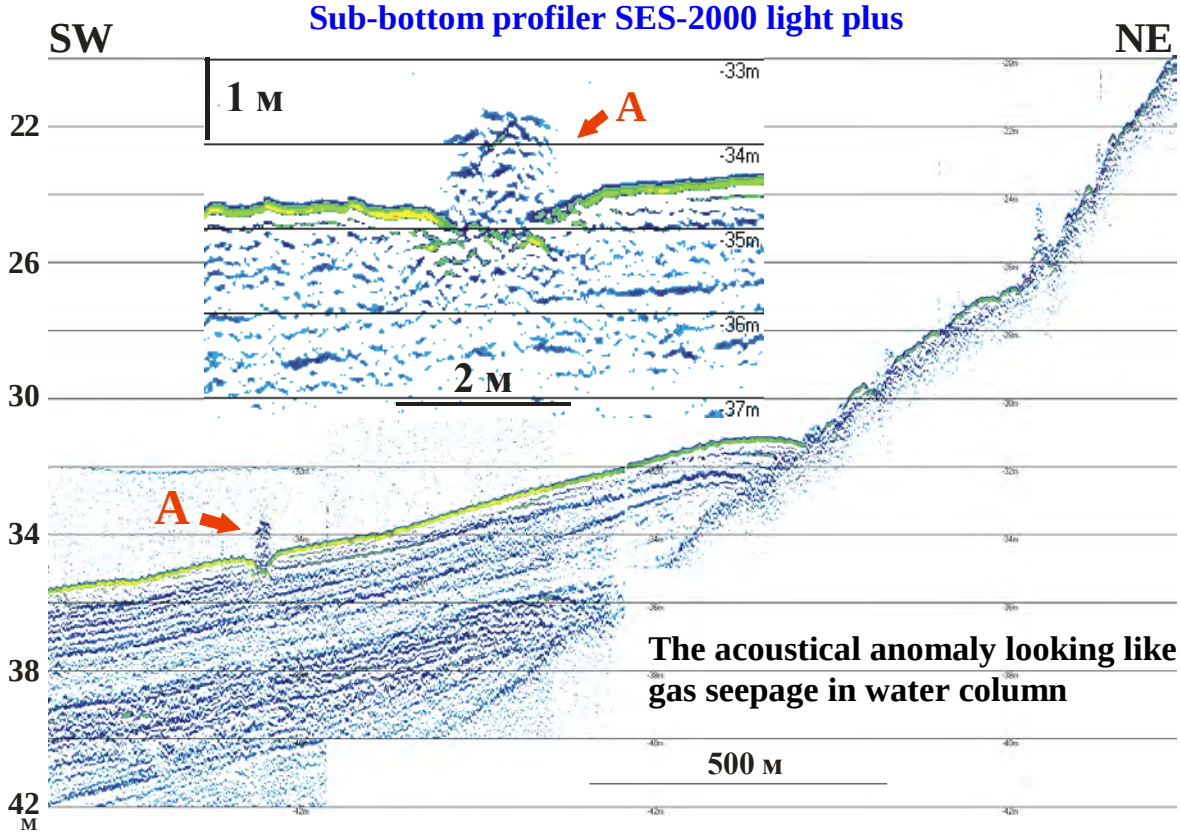
**The Black Sea. Local acoustical anomalies related to shallow gas seepage**

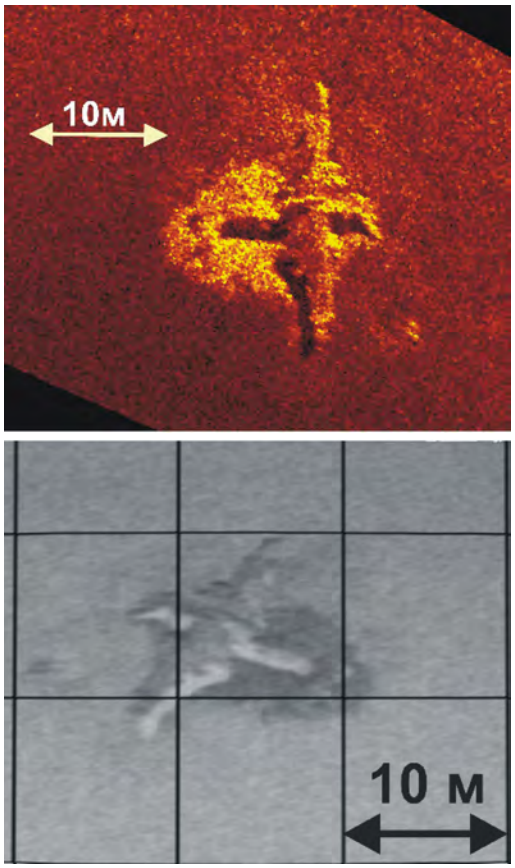
**Sub-bottom profiler SES-2000 light plus**




**The Black Sea. Artificial acoustical in water column**

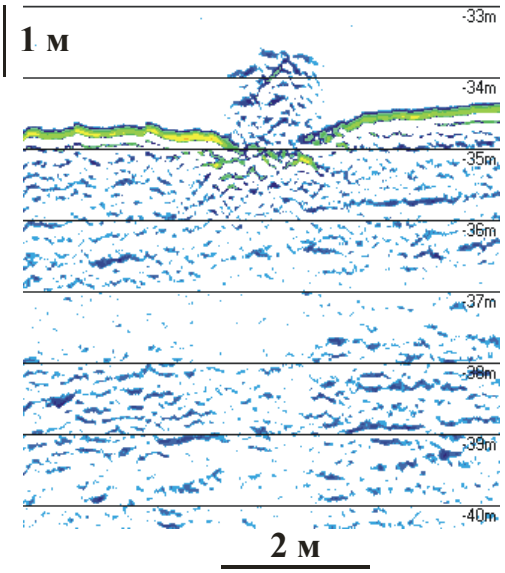
**Sub-bottom profiler SES-2000 light plus**





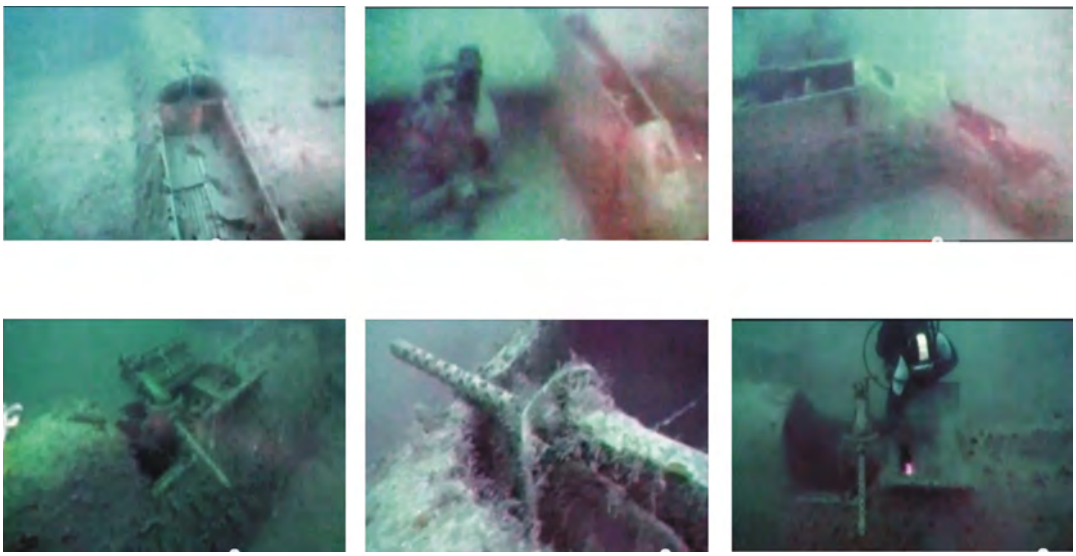

## The Black Sea. The same acoustical anomaly and side scan sonographs related to shoot down airplane

**Sub-bottom profiler and side-scan sonar SES-2000 light plus**




## The Black Sea. Shoot down airplane.

**divers' video film (Internet, web-site: http://www.anapacity.com/dayving-anapa/zatonuvshiy-bombardirovshhik-boston.html)**



**Such result is important argument for complexation of distinct acoustical methods which must be carried out before industrial development of any water areas, for oil-and-gas industry especially (underwater pipelines, platform etc). Actually, main georisks in any underwater construction areas relate to occurrence of gas charged sediments beneath bottom. They could be reason for not only great technical accidents but for large-scale ecological catastrophes too.**


Download: www.innomar.com/seabed-acoustics-2013.php