

Experience of high-frequency seismic data processing in the Black Sea offshore

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During 2009-2010 years, on the JSC «Nadra Concern» Computer Center has been executed the high-frequency seismic-acoustic data processing got within the limits of the Black Sea shelf (north-western offshore part). Data processing was executed with the use of the Echos package (former Focus, Paradigm Company) on the workstations SGI O₂ and SGI Origin2100 server (Silicon Graphics Inc.).

High-frequency seismic observations were executed on a ship “Topaz” (“Prychornomor DGRP” company) with use the following equipment and observation parameters:

- “Bolt” air gun, distance between shotpoints 12,5 m;
- “Xzone Bottom Fish” geophone cable with 48 channels;
- “Xzone Bottom Fish” seismic station, record length 2 s, sampling rate 0,5 ms.

At work a basic attention was paid to elaboration of the advanced processing sequence for high-resolution data with the following purposes:

- increase of information value and depth of upper part of time section;
- efficiency evaluation of different types of migration algorithms.

It should be noted characteristic feature of high-frequency data, namely a too small interval between the receiver point – 3,125 m, that results is the extremely high information density on the linear kilometer of seismic line – 640 CDP traces with a step 1,5625 m, that complicates a visual control of information.

It is necessary to give determination for high-frequency observation. The high-frequency seismic survey (HFS) is the seismic method, in which the acoustic waves with frequency range from 70-80 to 300 Hz are used (Bembel, 1990; Telegin, 2004). The HFS method gives a possibility to research the thin-layer objects which are specific for the Black Sea shelf, mapping of low-amplitude structures, nonstructural hydrocarbon traps etc.

As a result of the completed high-frequency data processing, observed within the north-west Black Sea shelf, it is possible to do the following conclusions:

1. The optimum sequence of the detailed processing of high-frequency seismic data was produced.
2. Most effective type of post-stack time migration in the conditions of high noise level is finite-difference migration in “omega-x” domain.
3. The results of high-frequency seismic data processing are extremely detailed and testify to enough high depth of research and give rise to assert that at the further offshore seismic works with the use of high-frequency seismic method it is possible to recommend the increase of record length up to 2 s.

References

1. Bembel R.M. (1990) High-frequency three-dimensional seismic prospecting. – Novosibirsk, Nauka, 152 p. (in Russian).
2. Telegin A.N. (2004) Marine seismic survey. – Moscow, Geoinformmark press, 237 p. (in Russian).