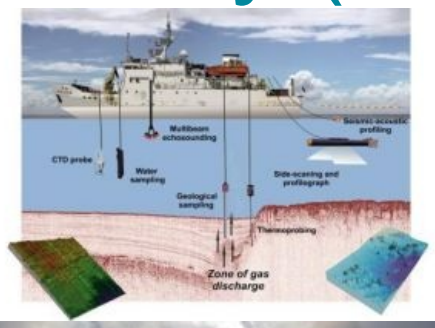
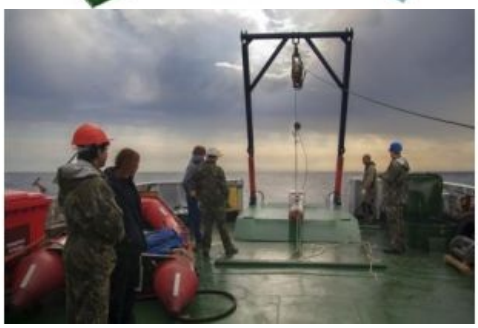
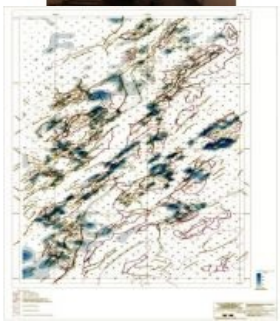
VNIIOKEANGEOLOGIA

Offshore Surface ÂGeochemical Survey (OSGS)







The all-Russian Scientific Research Institute for Geology & Mineral Resources of the Ocean (VNIIOkeangeologia) is situated in St. Petersburg, Russia and is currently the leading scientific organisation of the Russian Federation Ministry for Natural Resources in the field of geological studies of the continental shelf, the Ocean, the Arctic and the Antarctic.

The Institute was established in 1948 in Leningrad (now Saint Petersburg) to carry out geological surveys and mineral prospecting on the coast and islands of the Soviet Arctic. Ores in theTaimyr-Norilsk region, diamonds of Yakutia, oil of Northern Siberia and the minerals on the islands of the Arctic Ocean were discovered and exploited. The Institute has mainly been responsible for implementing the national programme of geological research of the South Polar region of the Earth since the first Soviet Antarctic Expedition (1955-56).

In the 1960s, the Institute and its expeditions launched a systematic geological and geophysical research study of the Arctic Ocean solving geopolitical and resource problems of national importance.

Nowadays, VNIIOkenageologia provides a wide range of services in the fields of geology, geophysics and geochemistry including offshore prospecting of hydrocarbon fields (oil, gas, gas hydrates), geological engineering, seismological research and laboratory analyses. Our experience was gained in various global waters, from the Arctic Ocean to tropical seas.

VNIIOkeangeologia has many scientific experts: it has an associate member of the Russian Academy of Sciences, 23 Doctors of Science (DSc) and almost 70 PhD graduates.

In recent years we have focused our attention on complex offshore geochemical surveys. Why?

Oil companies have a wide range of technologies to help them locate oil and gas reservoirs deep beneath land and sea. But this search remains a complex business. Success is never certain.

In the early days of oil exploration, oil companies and prospectors really had no idea what they were looking for. They focused their search on areas near seepages, where hydrocarbons bubbled up naturally in pools. Then they sunk a drill and hoped for the best. The rate of success has improved greatly since those early discoveries, from 10% or less to more like 50%. Drilling is still the only sure way to find out whether there is oil or gas down there. But drilling is very expensive. Each project can cost tens of millions of dollars or more. So before drilling, it is very important to improve the odds for success as much as possible.

The main targets of the modern offshore surface geochemical surveys include mapping the presence and distribution of oil and gas seepage indications in order to identify areas with a high potential for petroleum reservoirs. Another side of the survey is to reduce the areas to be searched by helping to focus exploration efforts on highly promising areas with respect to hydrocarbons. The OSGS also enables the prediction of the oil versus gas potential of prospective structures.

VNIIOkeangeologia has been developing offshore surface geochemical exploration methodologies through cooperative programmes with the oil industry for the last 10 years. During this period, VNIIOkeangeologia performed various geological and geochemical surveys, not only for the Ministry of natural resources and ecology of the Russian Federation but also for large Russian and international oil companies (including GAZPROM, ROSNEFT and ExxonMobil). These activities have provided our team with unique experience in interpreting

offshore surface geochemical data. During the last decade, more than 40,000 samples have been analysed from the Arctic seas offshore Russia, the South China Sea, and the Sea of Okhotsk.

Geochemical surveys and the prediction of hydrocarbon deposits are based on the property of hydrocarbon systems to form lithogeochemical anomalies within as well as on subsurface sedimentary rocks and the surface air layer. In subaqueous conditions this means surface sediments and bottom waters. Offshore surface geochemical surveys provided by VNIIOkeangeologia are a mix of 'light' geophysical, geological and laboratory work that enable us to find geochemical anomalies of gaseous and liquid hydrocarbons in bottom sediments and makes it possible to determine a correlation between them and the presumed hydrocarbons reservoir.

Offshore surface geochemical survey (OSGS) is useful at both the initial (before seismic survey) and the final (before drilling) stages of exploration work because it gives a chance to evaluate the oil and gas potential of the area being studied as well as outlining the perspective structures. Sometimes OSGS is called 'unconventional', despite being used by the largest oil companies and smallest independents, as a method to explore for oil and gas. Geophysicists are often inclined to criticise the SGC as giving conflicting results. But it is well known that different geophysical teams can reach totally different conclusions as a result of interpreting the same seismic data. So we believe that the correct conclusion is the point of adequate and sophisticated interpretation of any dataset. For OSGC one of the most important things is to discriminate thermogenic signatures caused by migration of hydrocarbons from petroleum deposits against the signal of hydrocarbons belonging to recent OM produced during diagenesis.

There are several ways of planning the OSGS according to the results expected and local geological settings. If data of seismic profiling and multibeam echo sounding and/or side scanning is available, sampling stations are outlined over the geophysical anomalies indicative of seabed seepage. If the OSGS is the first stage of exploration work it is relevant to carry out aerial mapping of the water area being studied.

Needless to say, this sort of study is much less expensive and far less damaging to the environment than random drilling.

Outcomes of the OSGS are summarised interpretive products that combine the different information into a complex map which clearly shows the magnitude and compositional signature of a range of datasets acquired during the survey. Products include projecting compositional geochemical data acquired utilising advanced methods of gas chromatography (GC), gas chromatography mass-spectrometry (GC/MS), total scanning fluorescence (TSF) and maps summarising anomalies. Summary maps may also include regional geologic or structural data.

High-resolution geophysical interpretations are compiled onto seabed features and shallow structural interpretations to overlay geochemical survey maps. Seabed features maps include seep mounds, mud volcanoes, pockmarks and other information mapped from multibeam side-scan sonar data. Structural interpretations include a map of faults, fractures, channels, gas charged zones and other subsurface features mapped from the high-resolution geophysical data.

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