SGRPC
DNME Technology
СИБИРСКАЯ ГЕОФИЗИЧЕСКАЯ
НАУЧНО-ПРОИЗВОДСТВЕННАЯ КОМПАНИЯ
ОБЩЕСТВО С ОГРАНИЧЕННОЙ ОТВЕТСТВЕННОСТЬЮ

BRIEF
COMMERCIAL INFORMATION
ON DIFFERENTIALLY NORMALIZED
METHOD OF ELECTRICAL PROSPECTING (DNME)

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The last modification of Differentially-Normalized Method of Electrical prospecting (DNME) together with seismic prospecting allows with success of **90%** on land and ~ **93%** on sea to discover hydrocarbon accumulations (using the effect of **induced polarization - IP**) within the explored areas and outline the fields regardless of the type of traps used and the facial properties of the holding reservoirs. Also it allows to avoid expenses connected with drilling of dry wells of any purpose**.**

DNME is intended to select the physical effects related to deposits of hydrocarbons. On the basis of numerically modeled results of the field observations of electromagnetic transient fields and its differential transforms (by space and time) is done by level-by-level defining of all parameters that are characterizing the electrical attributes of rocks (resistivity, chargeability, relaxation time, exponent) for the whole section of sedimentary mantle. It's found that in presence of hydrocarbon deposits these parameters change in a definite way.

Axial dipole-dipole array system with the galvanic excitation and receiving coil diapason to first kilometers is being used. With the use of modern equipment on the basis of 24 bit ADC it's possible to register the signals of transitive processes in an interval from 2 milliseconds to 2 – 4 seconds with a digitization step of 0.25 milliseconds. Step by profiles is from 50 meters and to 1 kilometer.

The method had undergone the approbation in the most different geological and geophysical conditions, like in a search of deposits under the halogen-carbonate a badly conducting screen, under conditions of widely developing trappean magmatism, in regions of ancient and juvenile platforms, in continental cavity, in the marginal hogging, and on the shelf. The results of method do not depend upon the type of a trap (structural, structurally tectonic, structurally lithologic and such) and collectors (terrigenous, carbonate).

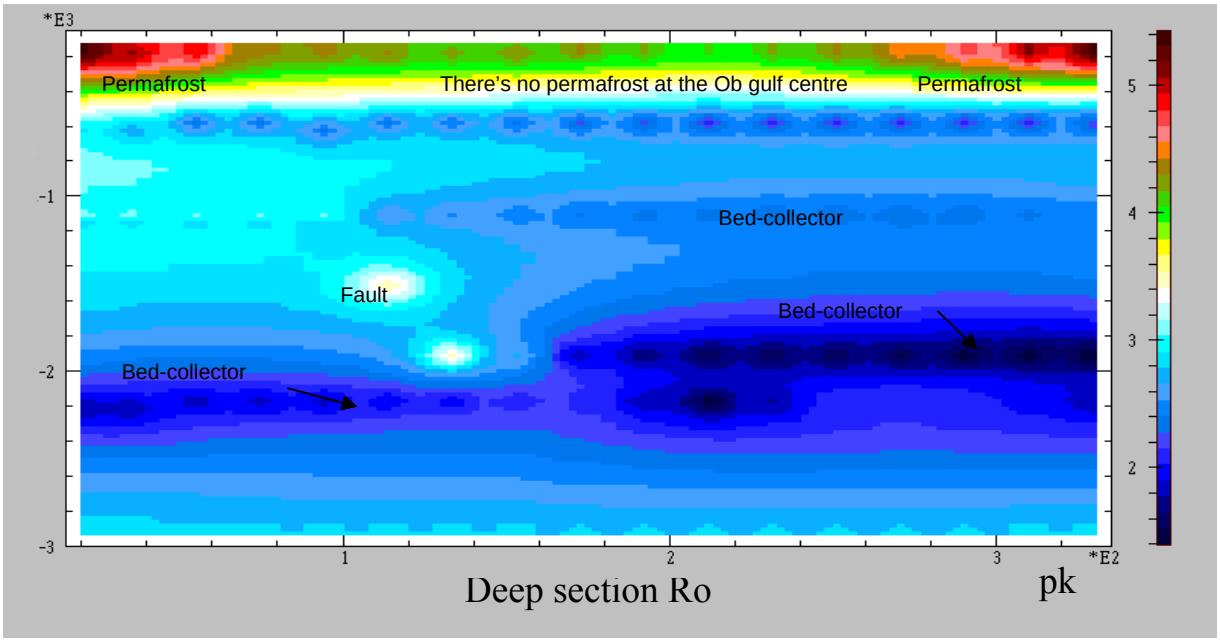
The method had been successfully used in solving oil and gas tasks in complex with the seismic on the wide range of territories: on the **Siberian platform** in the regions of Irkutsk and Krasnoyarsk (terrigenous and carbonate Riphean and Vendian-Cambrian productive complexes), on the **East-European platform**, in **Baltic regions** (terrigenous collectors of Cambrian), the size of traps contains first hundreds of meters), on the **West Siberian platform**, on the north of Tyumen region (terrigenous sediments of Mesozoic), in **Timano-Pechorskaya oil and gas province**, in Tengizskoye and Korolevskoye oil fields in **West Kazakhstan**, in Dagan deposits in **central China** (karst cavities and reef carbonate sediments), in **Selenga Depression** - Buryatia republic, on the **island of Sakhalin** (deltaic deposits), in **Amour hogging** in Evreyskaya Autonomic Region and Piyam hogging in **Southern China** (Continental terrigenous sediments), and on the **Caspian Sea, Azov Sea and Kara Sea shelf's**, for search of the deposits located on depths from 200 m up to 5 km.

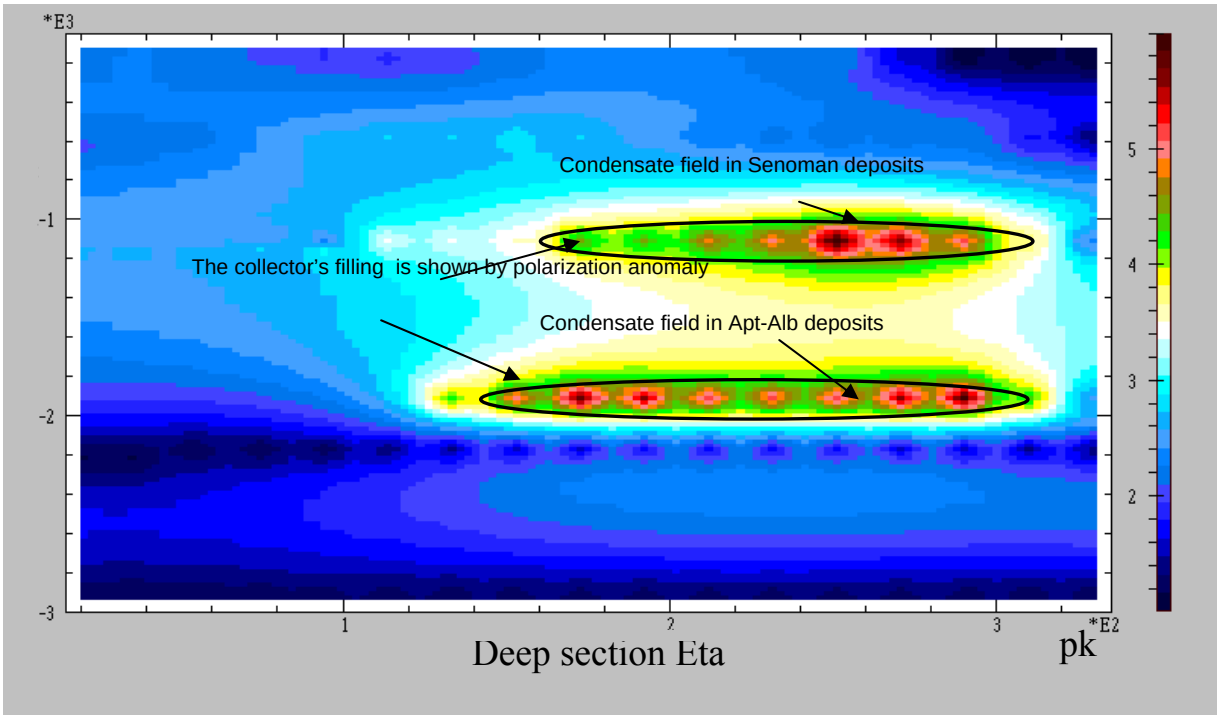
Our main customers are major Russian oil and gas companies such as **LUKOIL Oil Company**, **GAZPROM**, **Rosneft Oil Company**. Also, at different times our partners in Russian

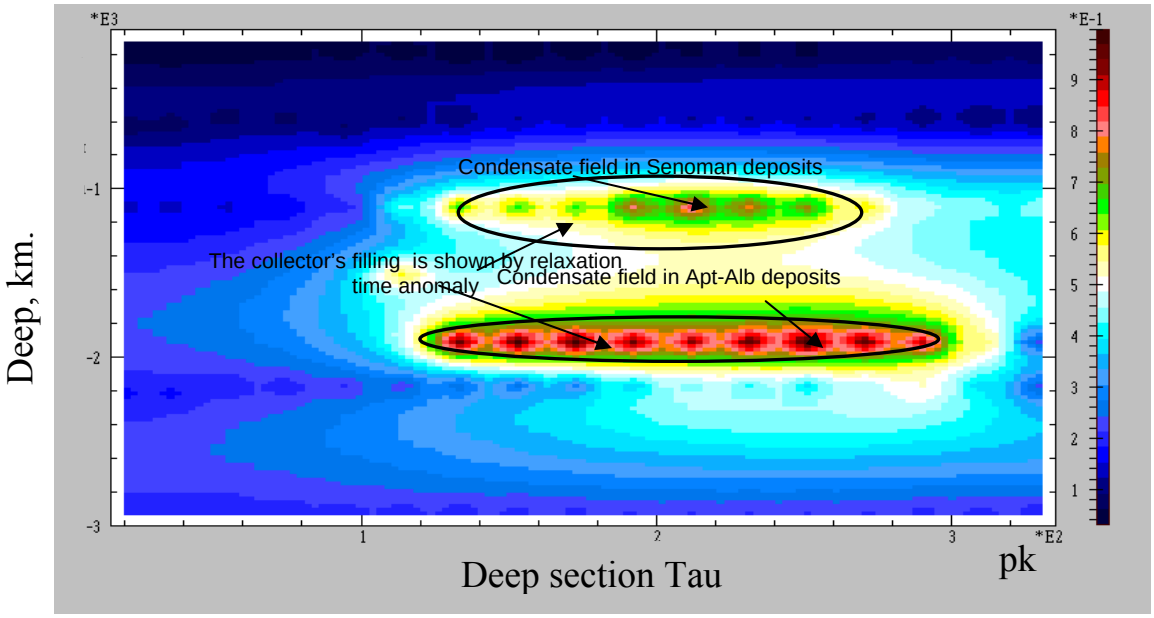
Federation were RITEK, Bratskecogas (an ITERA affiliate), Surgutneftegas, Caspian oil company, CentrKaspneftegaz, Priazovneft, GeoPromTrans, Saratovneftegaz, Ulyanovskneftegas, Petromir, SNGK, **Wintershell** (Germany) and others; in Kazakhstan: Kurmangazy Petroleum, Atash Co. Ltd. and Turb-Karagan Operating Company B.V. and also **Ministry of natural resources and ecology of the Russian Federation**.

Siberian Geophysical Research Developed Company has completed 30 000 running km of DNME works.

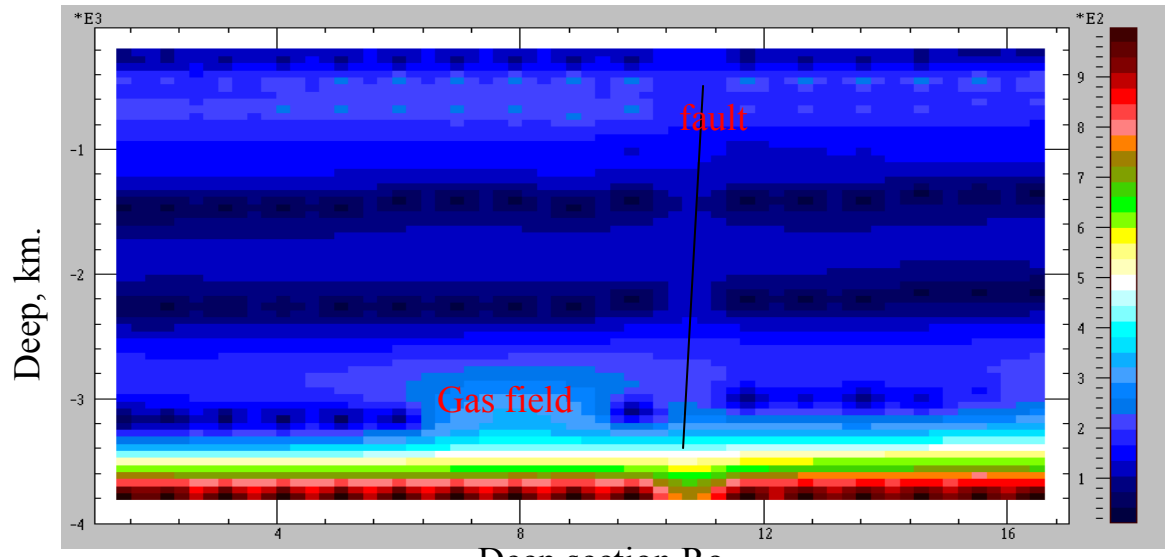
As an example below are represented geo-electrical sections by one of the profiles that is crossing the Ob having filled.

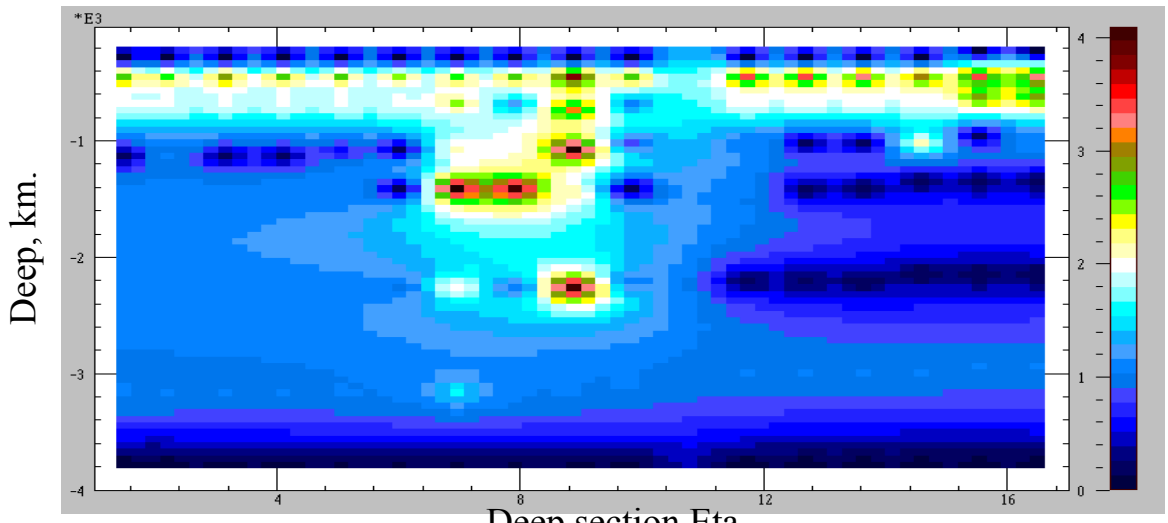




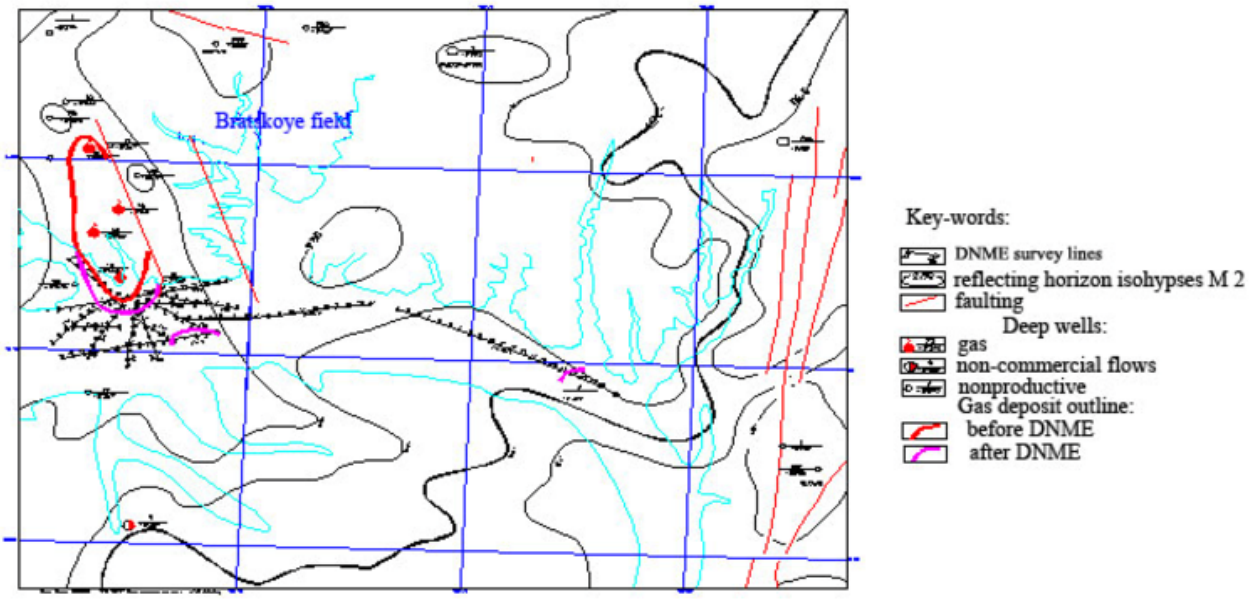


Below are represented the results by one of the profiles of Bratsk gas-condensing deposits on the Siberian platform (the Irkutsk region).



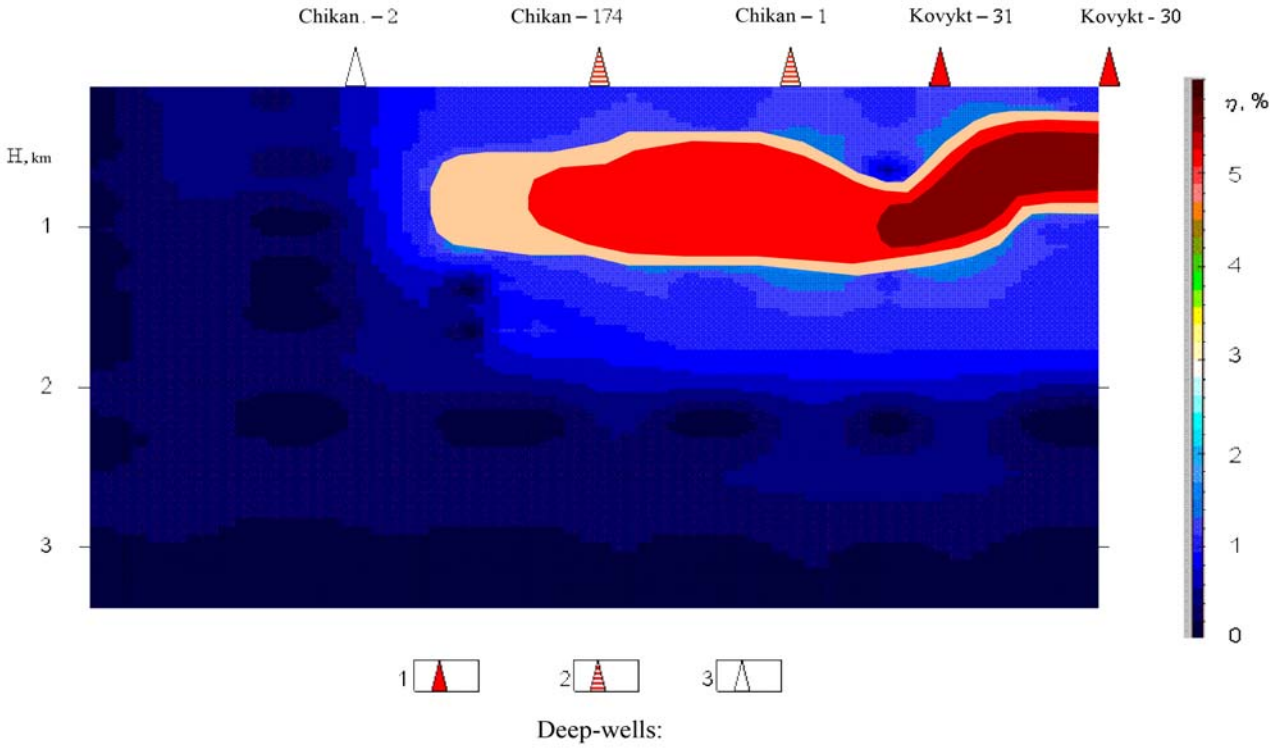


As consequence of DNME works the position of southern limit of Bratskoe field was clarified and new prospective areas presumptively connected to HC accumulations were determined.



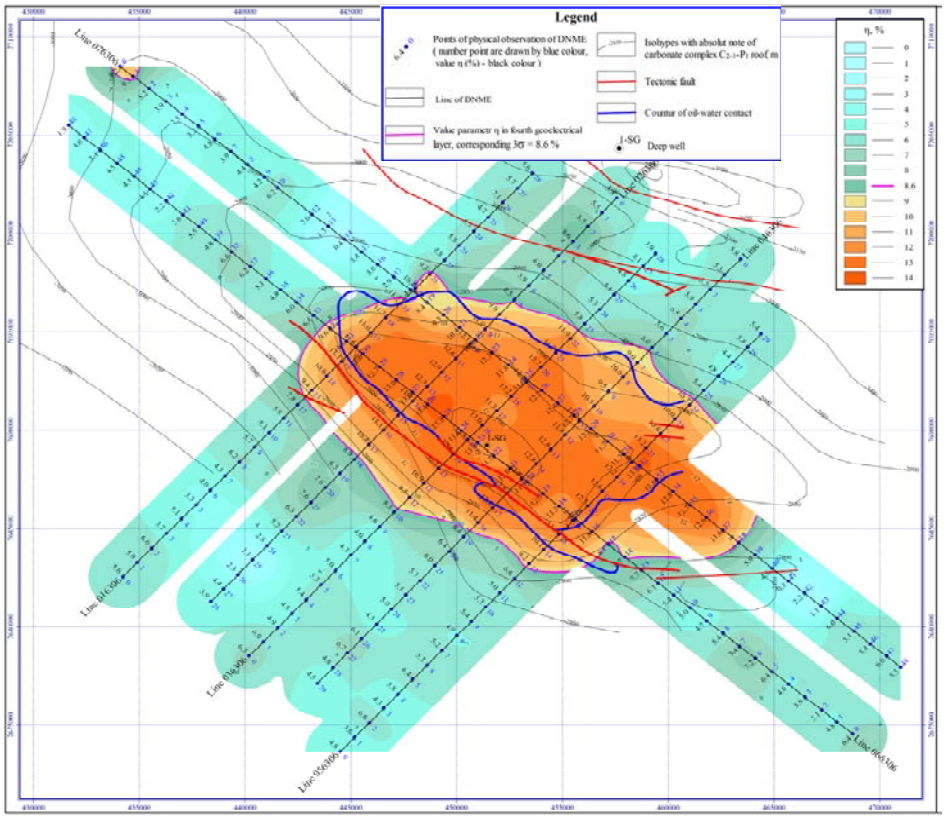
Represented above geoelectric section of polarizability coefficient (Eta) distribution was constructed by interpolation of field density determination technique in STADIA software system. The illustration shows growth of IP response from nonproducing well Chikanskaya-2 towards low-producing wells Chikanskaya-174, Chikanskaya-1 to prolific wells 31 and 30 of gas-condensate field Kovyktinskoe.

Section of polarizability coefficient (Eta) distribution along the survey line 016302
(constructed in STADIA software system)

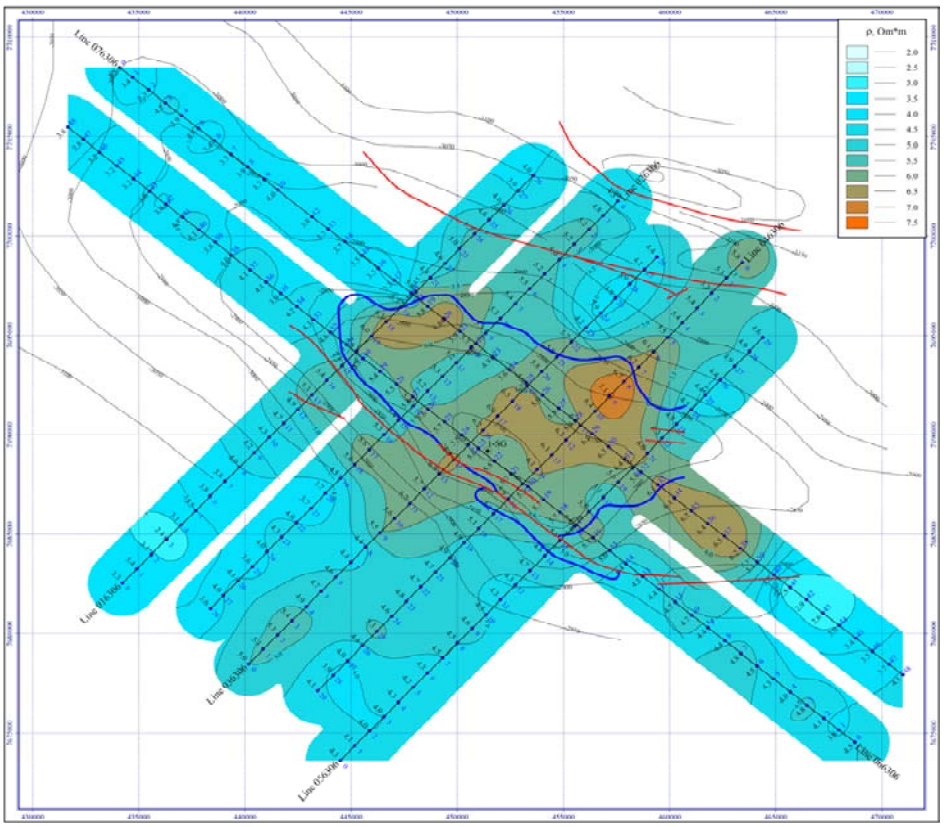


1 - productive, prolific, 2 - productive (according to well logging and low-flow-rate), 3 - non-productive

Examples of geological results of DNME work on Barents Sea



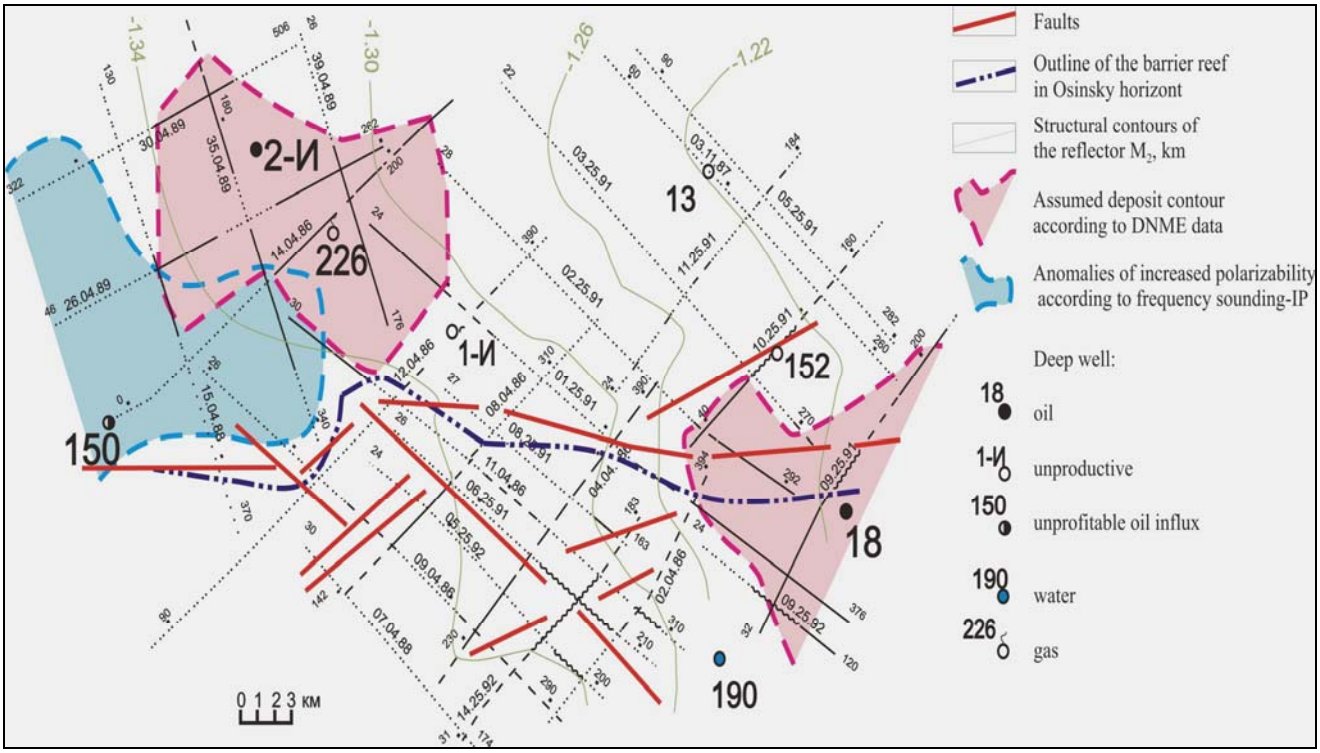
Distribution of polarizability coefficient η in the fourth geoelectrical layer based on the structure of carbonate complex C2-3-P1 roof



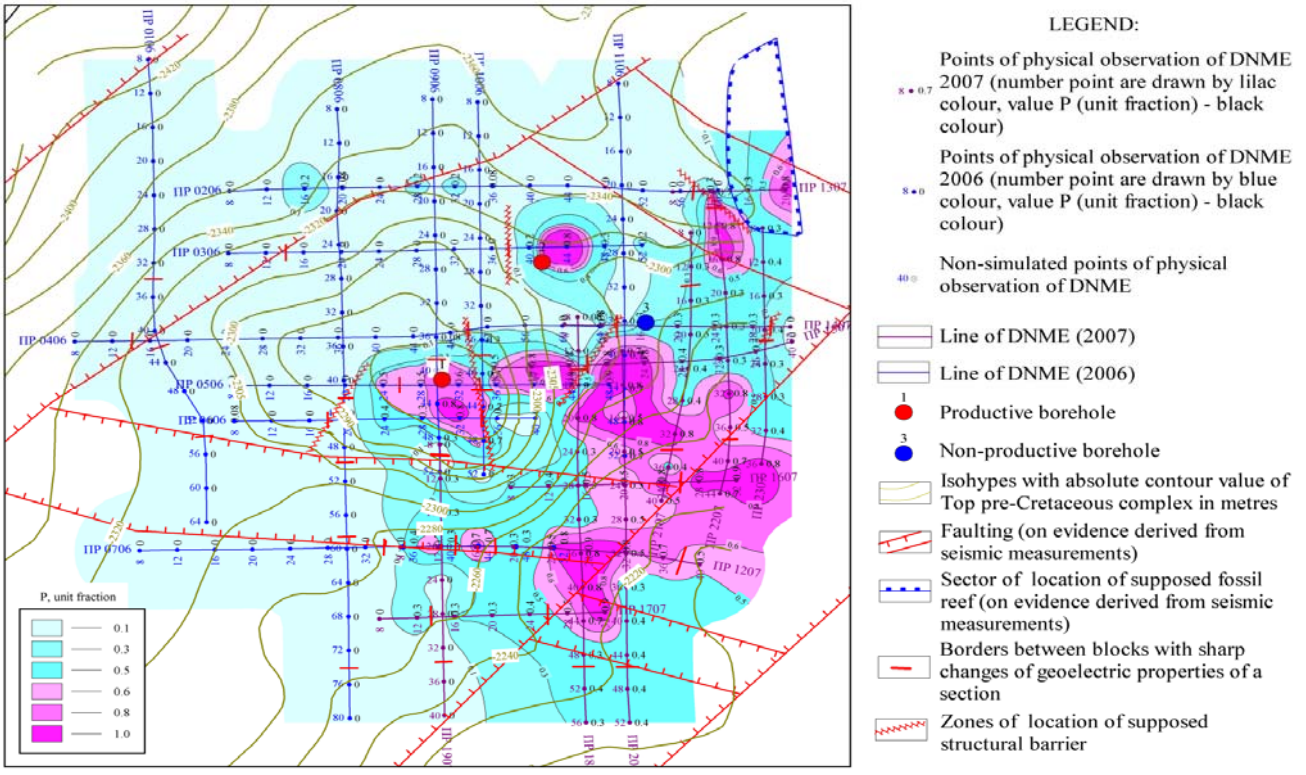
Distribution of electric resistivity in the fifth geoelectrical layer based on the structure of carbonate complex C2-3-P1 roof

Below are represented the comparison of results of two differential technologies of geo-electric prospecting **DNME** and FS-IP (Frequency Sounding-Induced Polarization) on Ignyalinskaya area (Nepa arch of East Siberia). All surveys were carried out simultaneously before deep wells drilling.

According to DNME three wells have been drilled: two well gave commercial inflows of oil (wells Nr. 18 and 2-*И*) **and one - commercial inflow of gas** (well Nr. 226)**.**



Northern part of Caucasus – field detection in non-structural trap whereby IP anomalies cross the depth contours.



The data presented in the tables below illustrates the statistics of successful application of Differentially-Normalized Method of Electrical prospecting both on sea and land.

DNME works conducted:	producing wells **confirmed**/non-confirmed forecast	non-production wells **confirmed**/non-confirmed forecast
Siberian platform (18 blocks)		
before drilling exploration wells	**34**/2	**13**/3
after drilling	17/0	20/1
West Siberia (5 blocks)		
before drilling exploration wells	**11**/1	**3**/0
after drilling	6/0	3/0
Volga-Ural oil-and-gas Province (19 blocks)		
before drilling exploration wells	**14**/2	**4**/1
after drilling	10/0	4/0
Timan-Pechora oil-and-gas Province (22 blocks)		
before drilling exploration wells	**16**/2	**4**/0
after drilling	14/0	6/0
North Caucasus (21 blocks)		
before drilling exploration wells	**12**/1	**5**/0
after drilling	7/0	4/0
Baltic Syneclise (17 blocks)		
before drilling exploration wells	**15**/1	**1**/0
After drilling	2/0	-
Middle Amur Depression, Jewish autonomous region (2 blocks)		
before drilling exploration wells	**1**/0	-
after drilling	-	-

Statistics of successful application of DNME on land:

For production wells – forecast confirmed in 103 cases, not confirmed in 9 cases (success coefficient – 91,96%). For non-production wells – forecast confirmed in 30 cases, non-confirmed in 4 cases (success coefficient – 88,23%).

Statistics of successful application of DNME on offshore:

DNME works conducted:	producing wells **confirmed**/non-confirmed forecast	non-production wells **confirmed**/non-confirmed forecast
Caspian Sea		
before drilling exploration wells	**12**/1	**4**/0
after drilling	5/0	1/0
Ob and Taz bay of Kara Sea		
before drilling exploration wells	**13**/1	**2**/0
after drilling	-	-
Sea of Azov		
before drilling exploration wells	**2**/0	-
after drilling	1/0	3/0
Baltic Sea		
before drilling exploration wells	**1**/0	-
after drilling	2/0	2/0
Barents Sea		
before drilling exploration wells	-	-
after drilling	1/0	-

For production wells – forecast confirmed in 28 cases, not confirmed in 2 cases (success coefficient – 93,33%). For non-production wells – forecast confirmed in 6 cases, non-confirmed in zero cases (success coefficient – 100%).

Cost of 1 running km on land makes, depending on conditions, 2 500 - 4 500 $, productivity - from 2 up to 4 kms day. Five units of car (are used depending on conditions of passableness - wheel or cross-country; besides during the winter period it is required bore holing device for the device of grounding).

Manufacture of sea works needs a vessel with powerful diesel engine - power station (up to 200 Kw).

Duration the period of processing - from 2 till 4 months.