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Stratigraphic Model of Vendian Terrigenous Deposits of Nepa Arch (Nepa-Botouba Anteclise, Eastern Siberia)

Nepa arch is located in the central part of Nepa-Botuoba anteclise, in the southeast part of Eastern Siberia (fig. 1). Nepa arch is the most studied oil and gas area of Eastern Siberia. Such oil and gas fields as Vakunay, Verhne-Chona, Timpuchikan, Talakan and others have already been discovered (fig. 1). Revealing of oil and gas field shows high petroleum potential of this area.

Despite this fact there are still some unsolved questions. One of them is a productive horizon V_{10} stratification in conjunction zone Nepa-Botuoba anteclise and Pre-Patoma regional trough. Here horizon V_{10} differs from horizon V_{10} of inside areas of Nepa-Botuoba anteclise in its structure, structural and textural features. Therefore two types of horizon V_{10} were distinguished in the Nepa arch on this ground.

The first type of horizon V_{10} is identified in inside area of anteclise (Verhne-Chona, Timpuchikan, Chaianda fields). Thickness of this type of horizon V_{10} reaches 10-12 m. It consists of quartz-fealdspathic sandstones with mudstone and siltstone interbeds with 1-2 m thickness.

Three parts can be selected in the first type of horizon V_{10} (fig. 2a).

The lower section consists of alternation of anisomerous sandstones (mainly gritstones) and thin, lenticular mudstone and siltstone interbeds.

The midsection consists of fine-grained (rare medium-grained) argillaceous sandstones. This part of horizon V_{10} is characterized by higher radioactivity because of high content of clay minerals.

The upper section consists of alternation of anisomerous sandstones (mainly fine- and medium-grained sandstones) with lenticular and horizontal mudstone and siltstone interbeds.

Porosity of the first type of horizon V_{10} is ranging from 2-5 % to 22 %, the permeability reaches $500*10^{-15}$ m^2.

The second type of horizon V_{10} was revealed in the southeast and the east slopes of anteclise (Talakan field and other).

The second type of horizon V_{10} embodies heterogeneous alternation of sandstones and clay rocks. However a number of beds can be indicated. Each bed has clear marked bottom, where coarse-grained, gravel sandstones gradually moved on to mudstones lie (fig. 2b). Sandstones are characterized by massive structure, rare lenticular, inclined bedding. Mudstones are characterized by horizontal bedding,

Porosity of the second type of horizon V_{10} is 10-15 %, the permeability reaches $200*10^{-15}$ m^2.

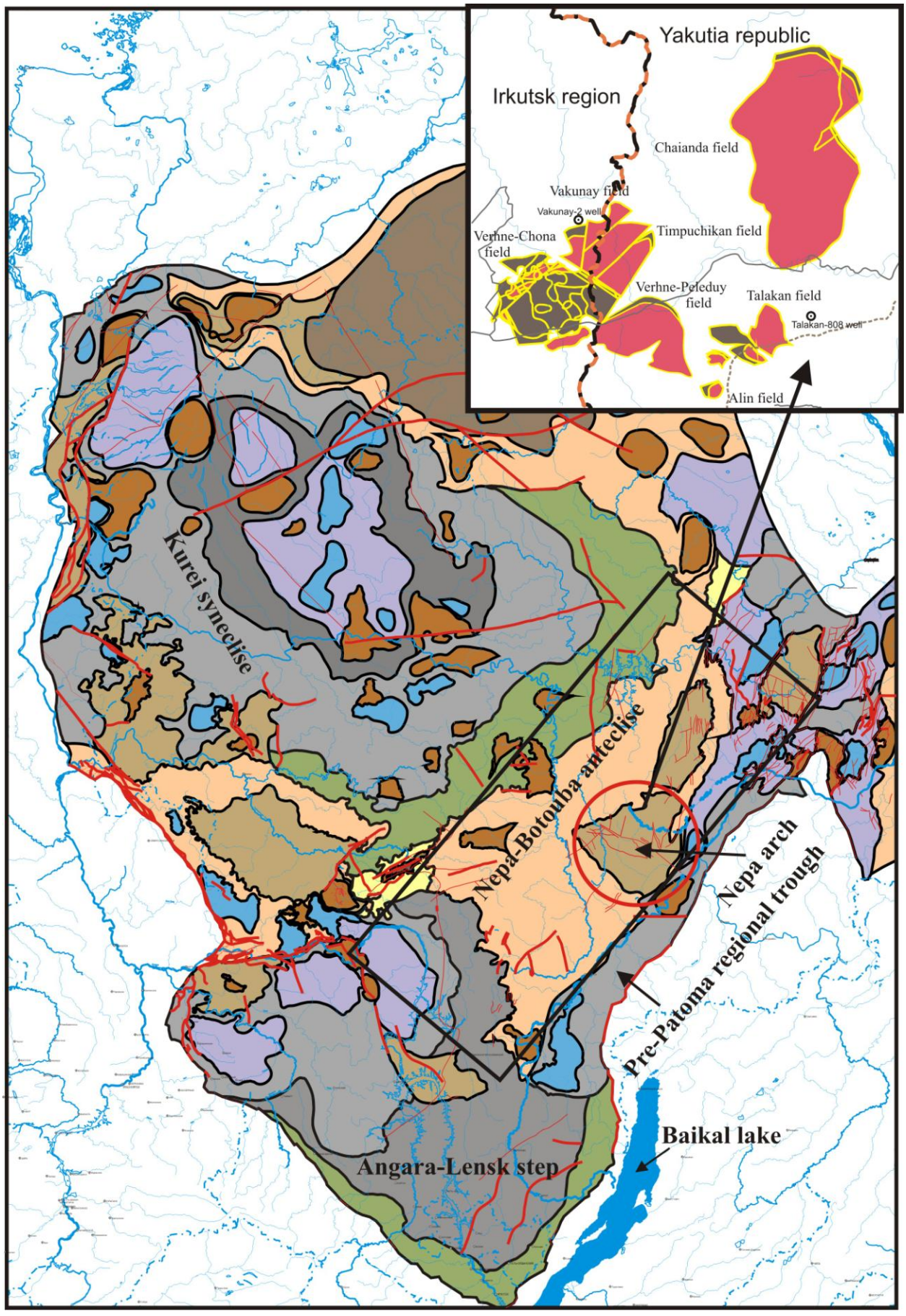
Yakutia republic
Irkutsk region
Chaianda field
Vakunay field
Vakunay-2 well
Verhne-Chona field
Timpuchikan field
Verhne-Peleduy field
Talakan field
Talakan-808 well
Alin field
Kurei syneclise
Nepa-Botouba anteclise
Nepa arch
Pre-Patoma regional trough
Baikal lake
Angara-Lensk step

Fig. 1 Location of research area (Nepa arch)

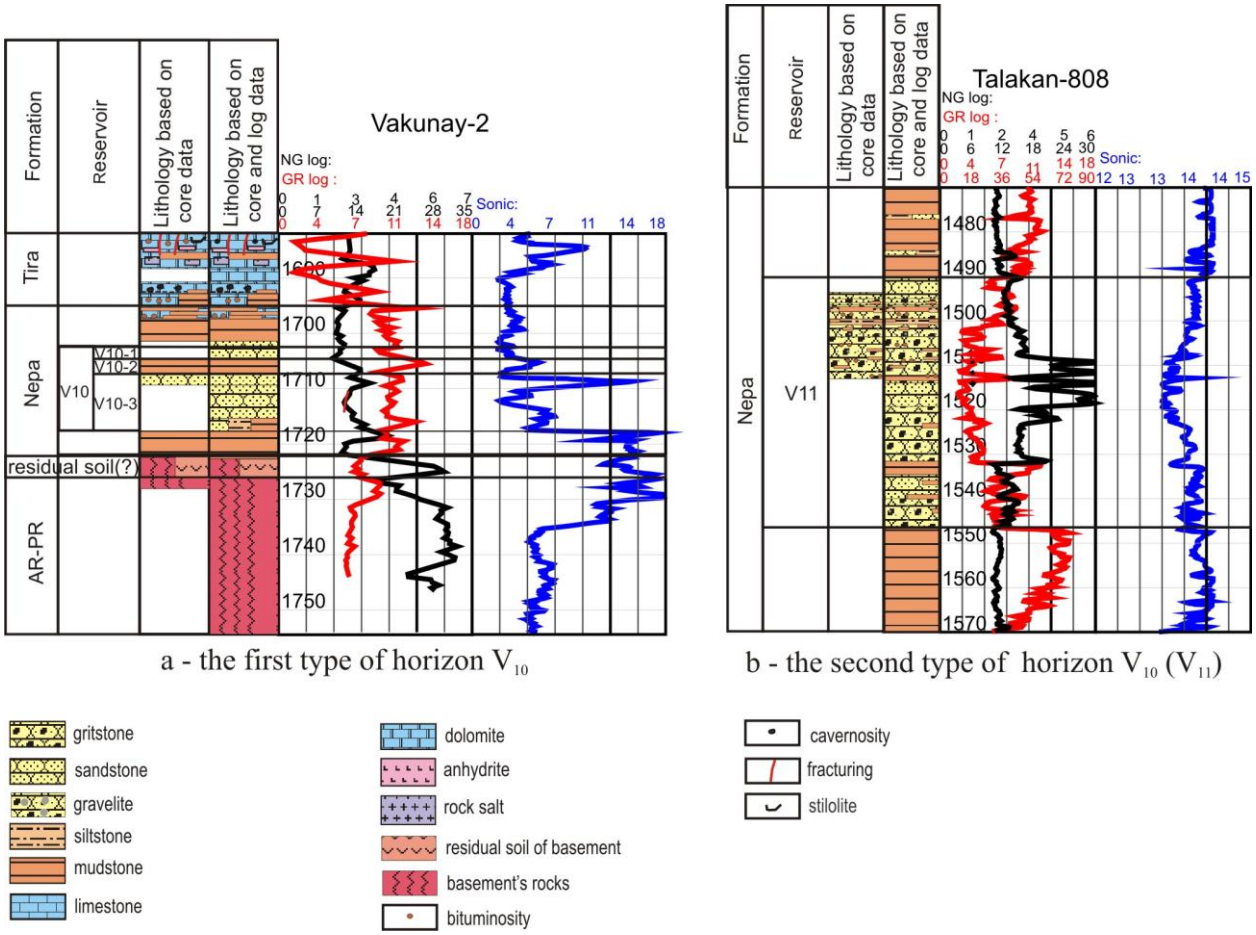

Fig. 2 Typical cross-sections of horizon V_{10} (a) and horizon V_{11} (b)

Taking into consideration difference of structure between the first and the second types of horizon V_{10} it was decided to name horizon V_{10} of the second type horizon V_{11}, as it is older.

On the fig. 3 correlative cross-section based on log and core data is shown. In case of this exact correlation a member of rocks with high radioactivity is marked out in the top of Vendian terrigenous deposits (between horizon V_5 and V_{11}). In the upper part of this member sandstone-siltstone unit is distinguished, which corresponded to horizon V_{10} of the first type in the Vakunay field. Sorting of this sandstone-siltstone unit allows to make a conclusion about an absence of per-tira depositional break, because thickness of member between bottom of horizon V_5 and top of horizon V_{10} is kept and reaches 20 m

Further analysis of this profile provides a conclusion about limited distribution of intra-nepa depositional break. It was made on the ground of changing of thickness of member between bottom of horizon V_{10} and top of horizon V_{13}. Thickness of this member changes from 50 m to 70 m in the wells, located to the south of Verhne-Nyuya-780 well, and is 0 m in the wells, located to the north of Verhne-Nyuya-780 well. Such observation gives an opportunity to suggest that intra-nepa depositional break is developed only in central part of Nepa-Botuoba anteclise.

Siltstone and shale member between bottom of horizon V_{11} and top of horizon V_{13} is replaced by sandstones and siltstones near the paleo-coast line. It was decided to name this horizon as horizon V_{12}.

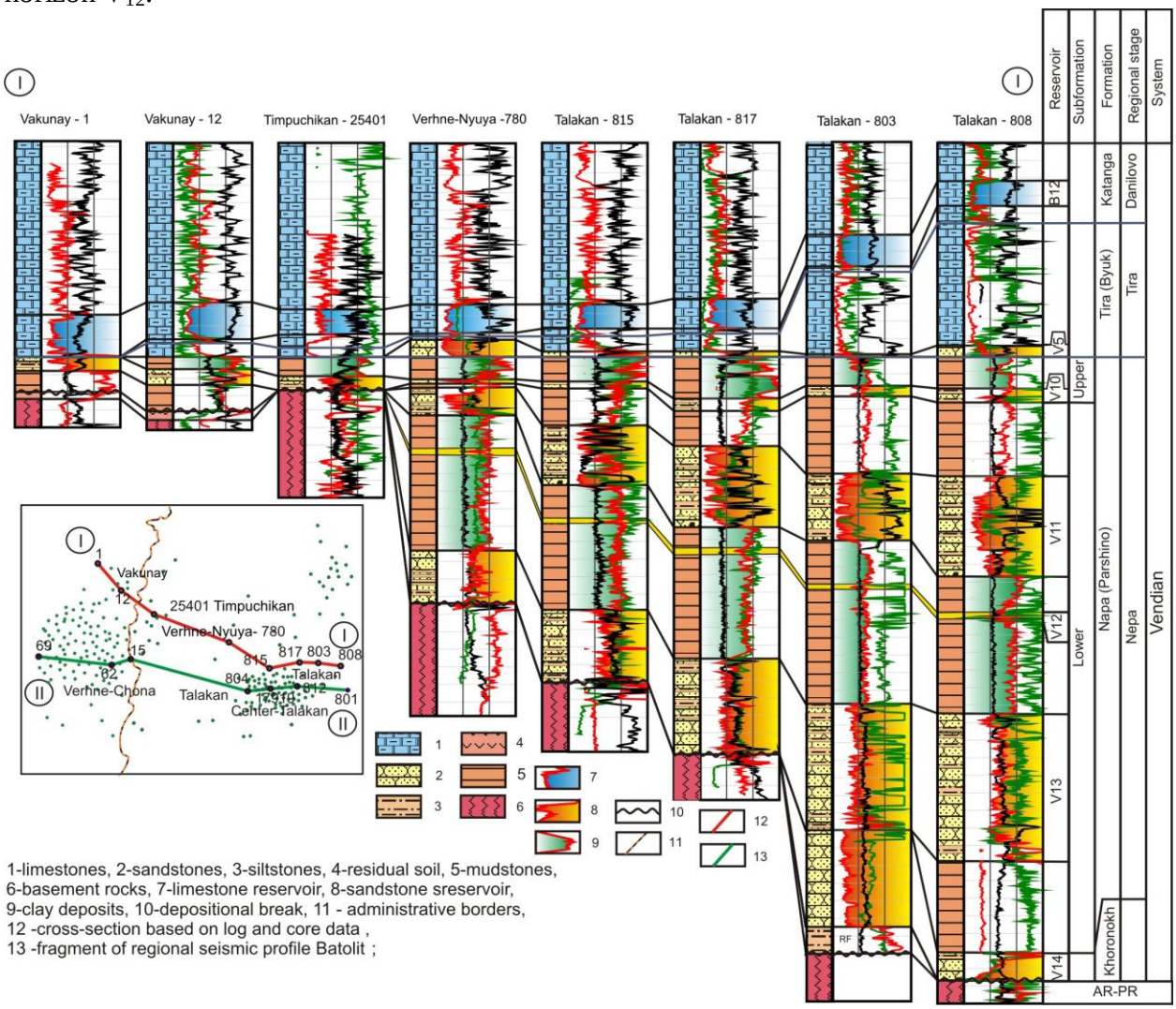

Fig. 3 Cross-section based on log and core data (Vakunay-1 – Talakan-808)

In the 2000 year regional seismic profile Batolit was made. It allows for the first time to consider stratigraphic model of Nepa arch described above from the point of seismic data. On the ground of complex analysis if seismic data and log and core data next conclusions were made:

1) Using log and seismic data reflections connected with different productive horizons can be indicated.
2) Reflections presumably connected with horizons V_{10} and V_{13} join in the area of Verhne-Chona-69 well, forming an united reservoir (fig. 4-I).
3) Reflection presumably connected with horizon $V_{11\text{-}2}$ (it corresponded to horizon V_{11} on the fig. 3) shims to horizon V_{10} (fig. 4-II).
4) In deep pressure sinks on the basement surface one reflection can be indicated (under reflection presumably connected with horizon V_{13}). Admittedly this reflection can be associated with horizon V_{14}.
5) In Talakan-812 well area horizon $V_{11\text{-}1}$ shims to horizon V_{10} (fig. 4-III). Horizon $V_{11\text{-}1}$ wasn't penetrated by drilling before.
6) On the ground of displacement of reflections fractures are marked out.

Analysis of results of correlation of reflections fragment of regional seismic profile Batolit confirmed stratigraphic model of Nepa arch based on log and core data.

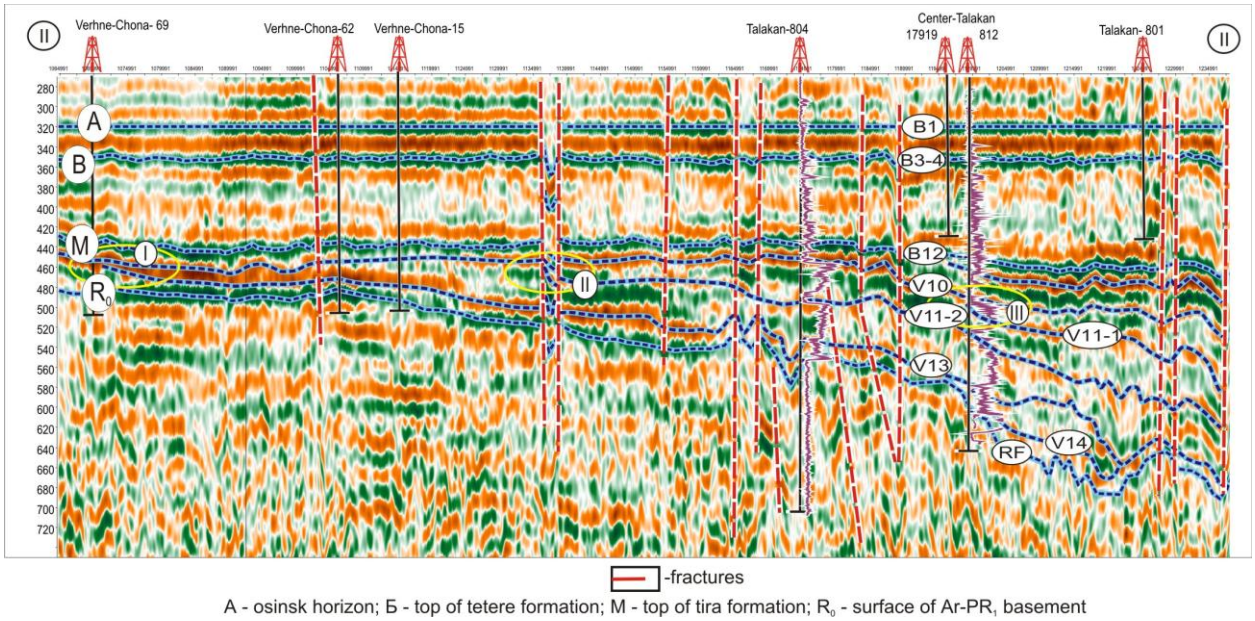

Fig. 4 Fragment of regional seismic profile Batolit osinsk horizon levelled

Conclusions made in presented research are very important for prediction of oil-and-gas content of Nepa arch.