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Stratigraphic Model of Vendian Terrigenous Deposits of Nepa Arch (Nepa-Botuoba Anticline,
Eastern Siberia)

Nepa arch is located in the central part of Nepa-Botuoba anticline, 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 anticline and Pre-Patoma regional trough. Here
horizon V_{10} differs from horizon V_{10} of inside areas of Nepa-Botuoba anticline 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 anticline (Verhne-Chona,
Timpuchikan, Chaianda fields). Thickness of this type of horizon V_{10} reaches 10-12 m. It
consists of quartz-feldspathic 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 anisomeric 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 anisomeric 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
 $500 \cdot 10^{-15} \text{ m}^2$.

The second type of horizon V_{10} was revealed in the southeast and the east slopes of anticline
(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 $200 \cdot 10^{-15} \text{ m}^2$.

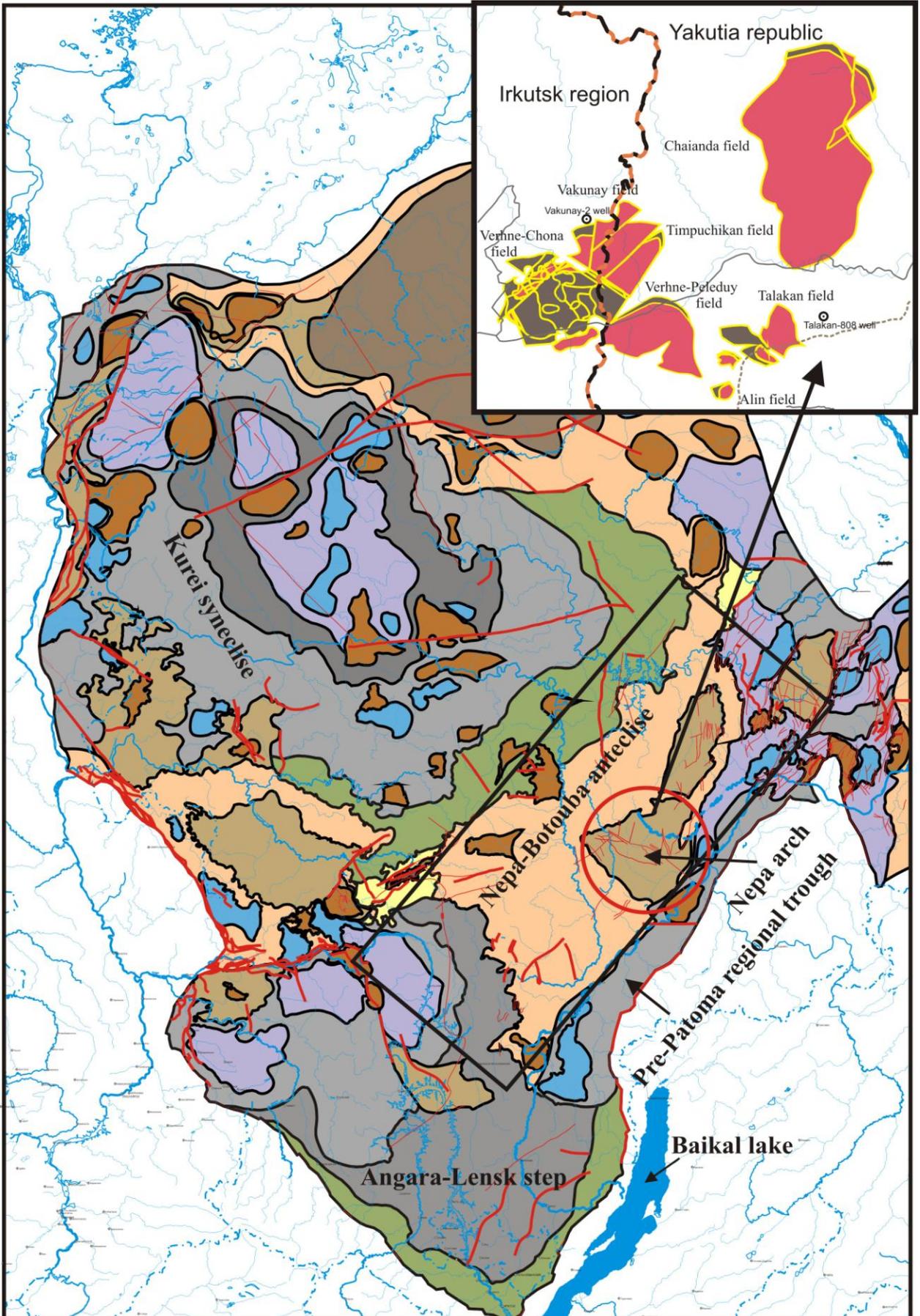


Fig. 1 Location of research area (Nepa arch)

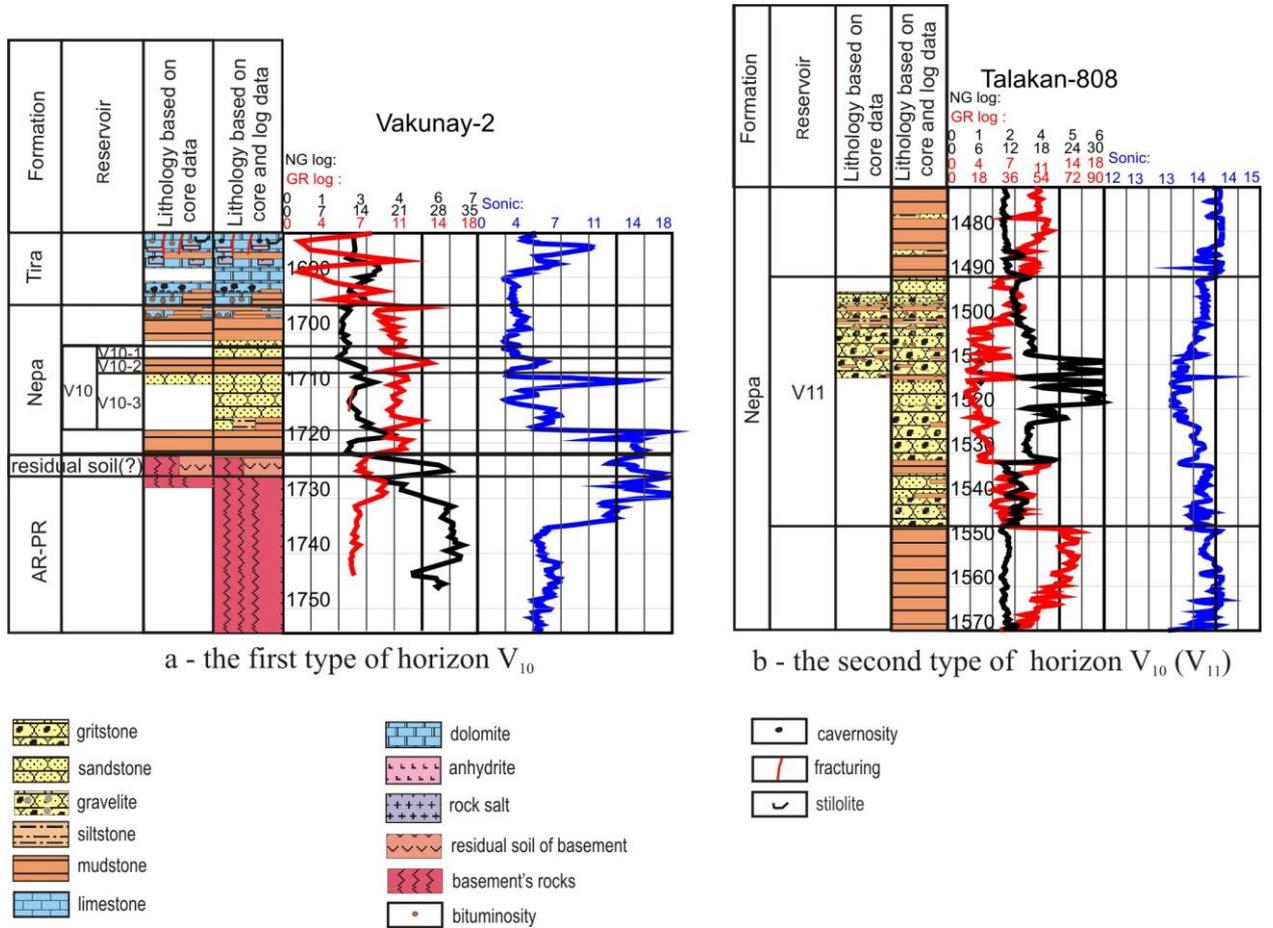


Fig. 2 Typical cross-sections of horizon V₁₀ (a) and horizon V₁₁ (b)

Taking into consideration difference of structure between the first and the second types of horizon V₁₀ it was decided to name horizon V₁₀ of the second type horizon V₁₁, 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 V₅ and V₁₁). In the upper part of this member sandstone-siltstone unit is distinguished, which corresponded to horizon V₁₀ 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 V₅ and top of horizon V₁₀ 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 V₁₀ and top of horizon V₁₃. 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 antecline.

Siltstone and shale member between bottom of horizon V₁₁ and top of horizon V₁₃ is replaced by sandstones and siltstones near the paleo-coast line. It was decided to name this horizon as horizon V₁₂.

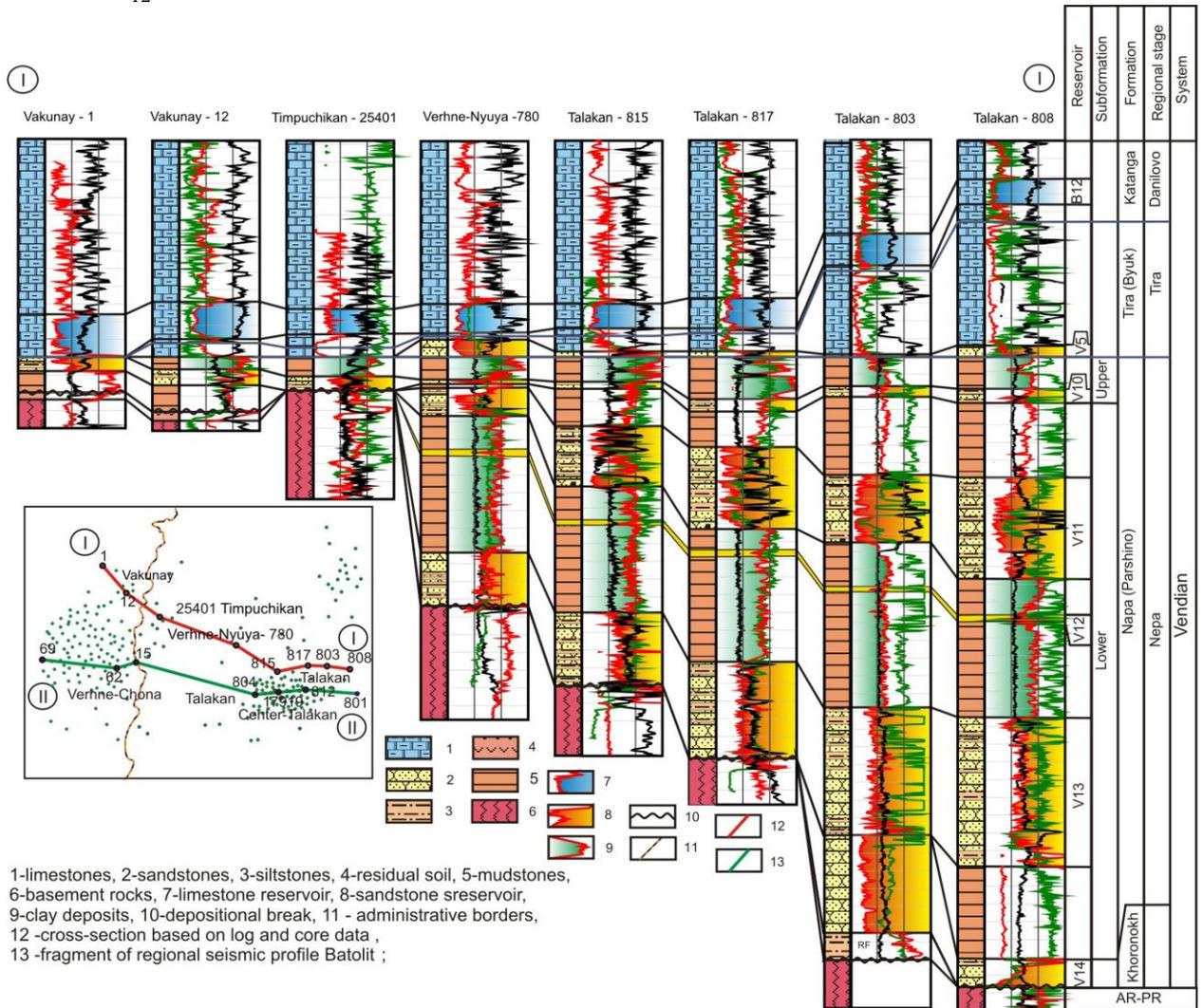
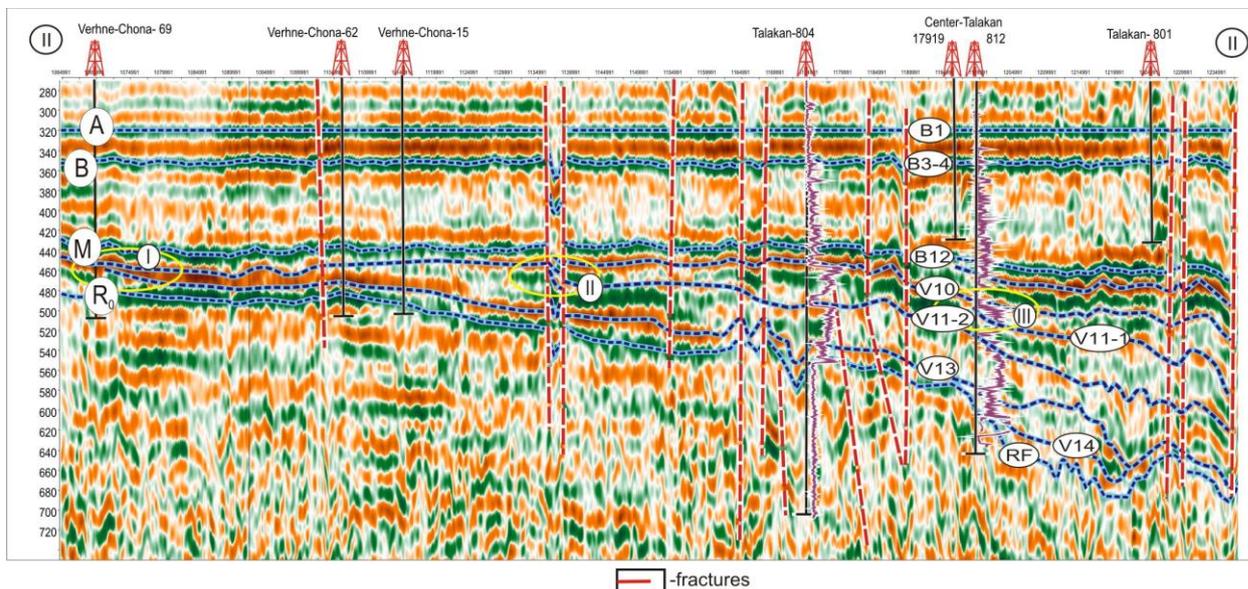


Fig. 3 Cross-section based on log and core data (Vakunay-1 – Talakan-808)

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 V₁₀ and V₁₃ join in the area of Verhne-Chona-69 well, forming an united reservoir (fig. 4-I).
- 3) Reflection presumably connected with horizon V₁₁₋₂ (it corresponded to horizon V₁₁ on the fig. 3) shims to horizon V₁₀ (fig. 4-II).
- 4) In deep pressure sinks on the basement surface one reflection can be indicated (under reflection presumably connected with horizon V₁₃). Admittedly this reflection can be associated with horizon V₁₄.
- 5) In Talakan-812 well area horizon V₁₁₋₁ shims to horizon V₁₀ (fig. 4-III). Horizon V₁₁₋₁ 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.



A - osinsk horizon; B - top of tetere formation; M - top of tira formation; R₀ - surface of Ar-PR₁ basement

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.