TECTONIC ZONES OF OIL ACCUMULATION AND PROSPECTIVES OF SEARCH FOR THE OIL FIELDS

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In the article distinquished tectonic zones of oil accumulation in offshore of the Central Baltic and on the eastern coast of Baltic onshore. It explains peculiarities of prospectives of those zones and indicates authenticity of tectonic method when we discern such zones in this region.

Petroleum potential of the Baltic region is closely connected with the biggest negative tectonic structure – Baltic syneclise. Cambrian, Ordovician and Silurian strata are most petroliferous. Oil indications were obtained in the southern periferic part of this syneclise in the Upper Permian deposits. Moreover, oil shows are known in Devonian layers (Kaliningrad district). The cover bowels of the earth mainly consists of clayish and clayish-calcareous Silurian cover rocks. In the central – the deepest part of syneclise these deposits are represented by graptolithic facies and reach from several hundred up to several-thousands meters of thickness. The thickness increases in South-West direction and reaches its maximum in North-West Poland. Upper Silurian deposits by its occurrence contour limit Baltic-Lvov oil and gas bearing province. The Baltic region is compound part of this province.

In Lithuanian, Latvian and Russian (Kaliningrad district) economic zones of Baltic Sea the zones of NE faults into Caledonian peroliferous complexes are widespread.

In Polish economic offshore zone also near the Bornholm island of Danmark and in the SW corner of Swedish offshore, faults of diagonal direction in connection with its – tectonic scarps predominate.

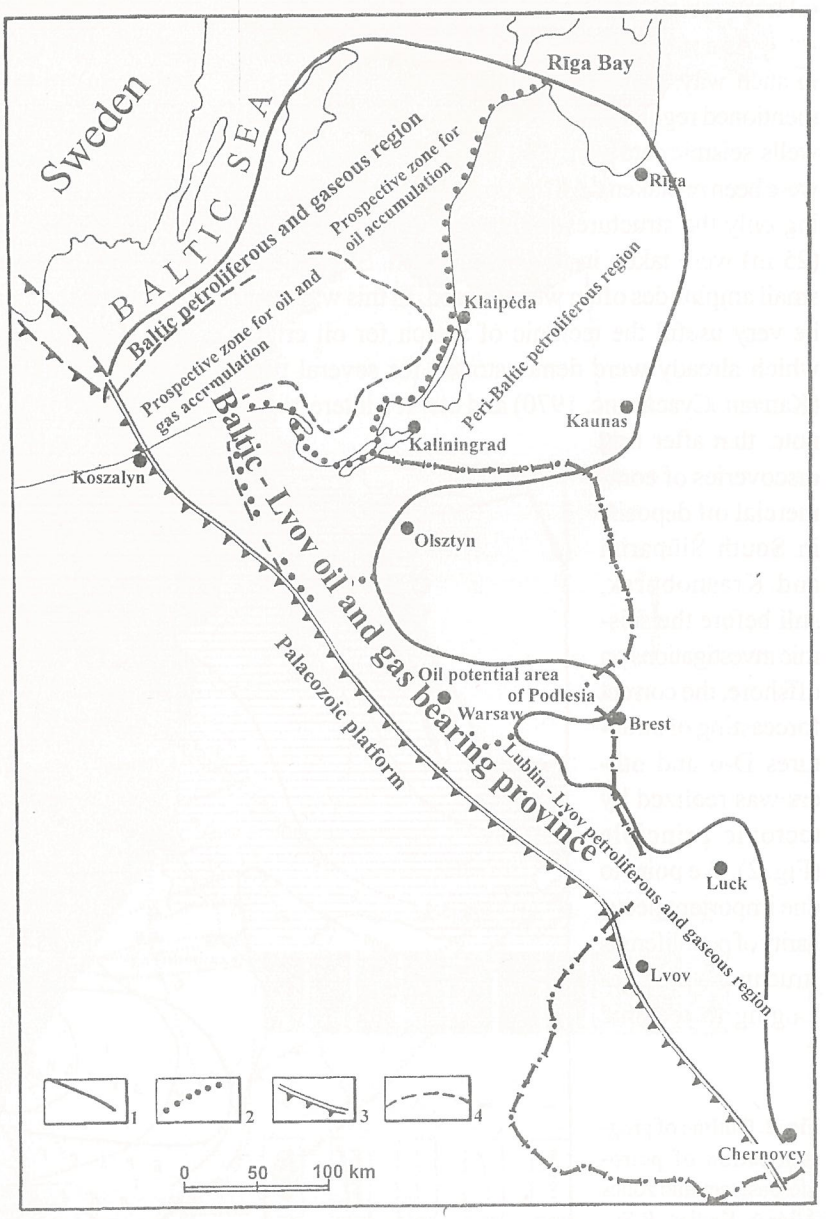

Fig. 1. Distribution of prospective oil and gas bearing territories of the Western part of the East-European Platform (after K. Sakalauskas, 1996).

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In a land two directions of faults and scarps predominate – NE – in western Latvia, western Lithuania, latitudinal – in western Lithuania, Kaliningrad district and North Poland (faults of Suvalki and Mazur region). Some faults of latitudinal direction from the land are extend into Baltic offshore (faults of Kaliningrad and Sambia peninsula).

In the petroliferous Lower Palaeozoic complexes large structures related with faults zones and circumscribed as assimetric cusps (Suveizdis, 1979). These structures often stretch to several hundred kilometres, sometimes they refer to tectonic scarps (Sakalauskas, 1996). That is why that narrow strips (3–5 km wide, rare more) at the cusps near the faults are rised considerably higher if to compare with other part of assimetric cusp, which is mainly circumscribed as slowly deeping limb of cusp. On the rised narrow strips near the faults chiefly chains of local structural oil traps (several km^2) are disposed.

As a rule, search for these traps was carried out in such way, that not enough attention was paid for mentioned regularities. For selection of places for deep wells seismic data were used (although sometimes they were been mistaken). All the time during seismic sounding only the structures higher than the level of error (25 m) were taken in to consideration. Structures of small amplitudes often were missed. In this way could be very useful the tectonic of search for oil criteria which already were demonstrated for several times (Каплан, Сувейздис, 1970) and etc. It's interesting to note, that after first discoveries of commercial oil deposits in South Šiūpariai and Krasnoborsk, still before the seismic investigations on offshore, the correct forecasting of structures D-6 and others was realized by tectonic principle (Fig. 2). We point to one important peculiarity of petroliferous structures – their belonging to tectonic covered corners of upthrows, but not to isolated plication structures – brachyanticlines. In due course on the "brachyanticlines" the large quantity of empty wells were drilled, hoping for optimum results in the centre of imaginary brachyanticline, but not in the corner of upthrows.

From point of oil potential the most consequential in the region there are already investigated latitudinal Kaliningrad tectonic fault zone and related with it fragmental tectonic scarp of non constant amplitude, also Telšiai fault zone, of the same direction, and Gargždai fault zone of NNE direction. These fault zones are related with scarps upthrusted and situated near the same faults. On each of mentioned scarps several oil fields were discover.

In the Baltic offshore the tectonic petroliferous Western Nida zone of NE direction is revealed. It traces from oil fields in the structures D6 and D5 to Kulikovo structure in peninsula Sambia (in the SW) and along fault Tūbausiai (in the NE) in the western Lithuania. To the West from the scarp Western Nida still several prospective petroliferous tectonic zones – Western Klaipėda and Central Baltic I, II are parallel by spatial distribution with it. Distribution of petroliferous zones in Lithuania are well seen on the map (Fig. 3).

As far as we could judge from results of wells drilling on the local structure E6, in the Liepaja-Saldus zone of uplifts, on its arch, where in Cambrian deposits oil was not found, but shows of oil pool destruction were detected higher in many-coloured deposits of

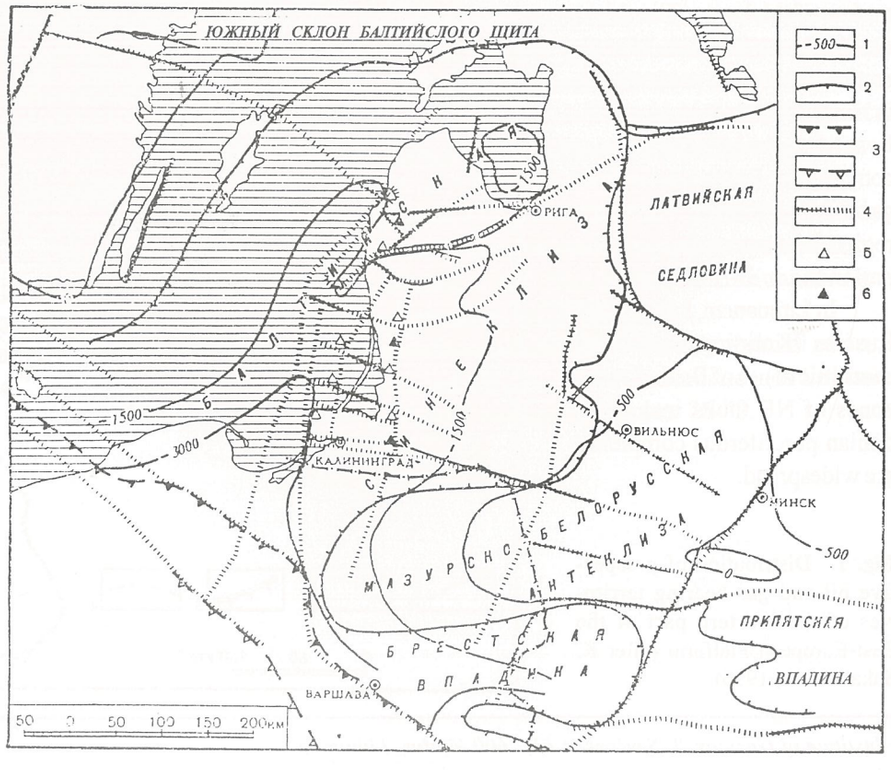
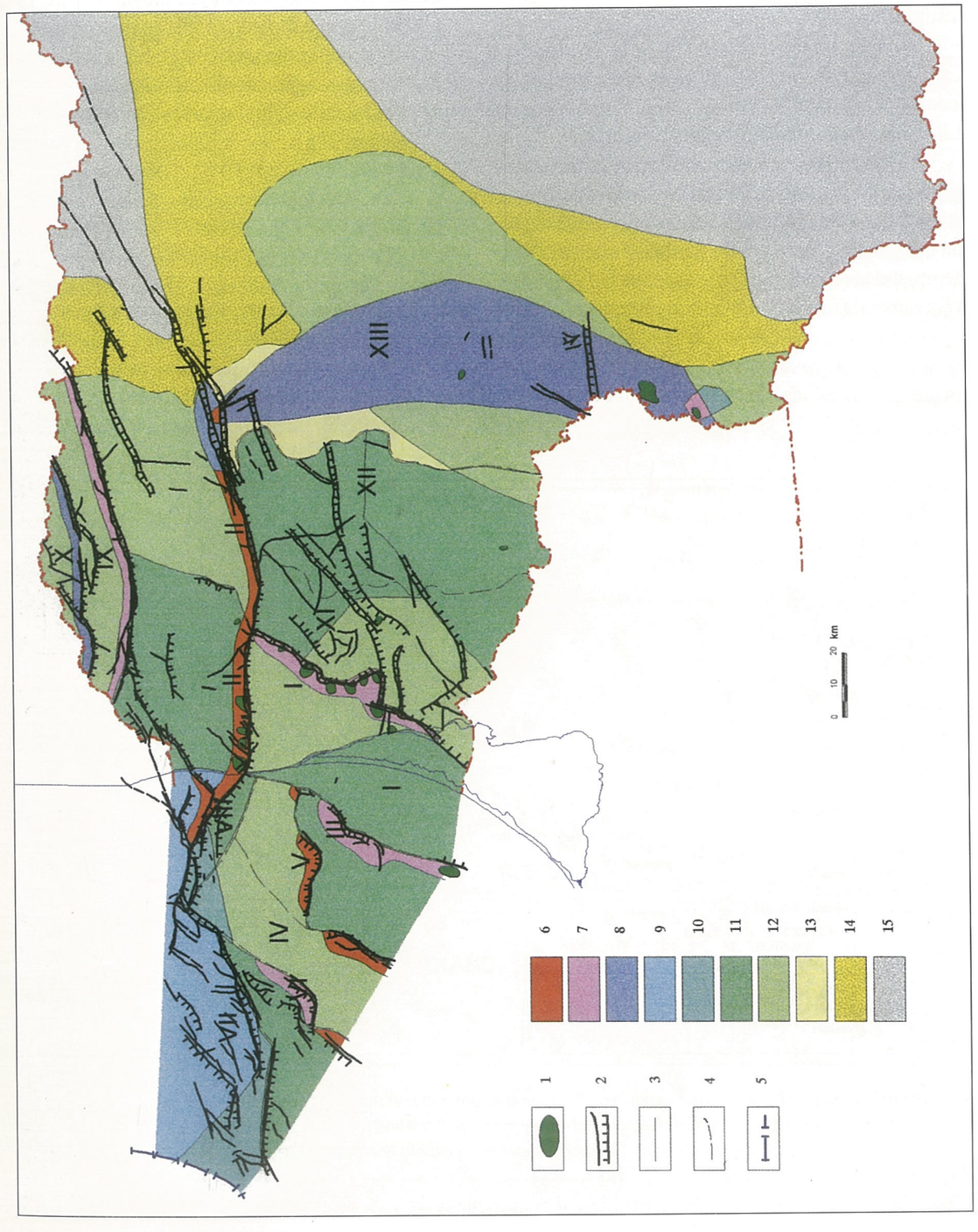


Fig. 2. Outline of prognostication of petroliferous, tectonic zones (after A. Kaplan. P. Suveizdis, 1970).

Fig. 3. Schematic map of occurrence of petroliferous tectonic zones in Lithuania (after K. Sakalauskas, P. Lapinskas, J. Laškovas, G. Vosylius, J. Jacyna, 1996): 1 – oil fields; 2 – tectonic faults; 3 – borders of territories with different density of oil resources; 4 – borders of geological zonation of different petroliferous lands; 5 – fixed border of offshore economic zone; 6– 15 – convergence of initial, prospective oil resources – density thousands t/km^2 (6 – >50, 7 – 30–50, 8 – 20–30, 9 – 10–20, 10 – 5–10, 11 – 3–5, 12 – 1–3, 13 – <1, 14 – territory of small prospectives [density of resources is not calculated], 15 – non-prospective oil land). Zones of oil accumulation and prospective zones for oil accumulation: I – Gargždai zone of oil accumulation; II – Telšiai zone of oil accumulation; III – West Nida zone of oil accumulation; IV – West Klaipėda prospective zone for oil accumulation; V – Klaipėda prospective zone for oil accumulation; VI – Central Baltic prospective zone for oil accumulation; VII – Liepaja-Saldus prospective zone for oil accumulation; VIII – Faulting prospective zone for oil accumulation; IX – Akmenė prospective zone for oil accumulation; X – Mažeikiai prospective zone for oil accumulation; XI – prospective zone for oil accumulation in the Eastern outskirts of Kuršian depression; XII – prospective zone for oil accumulation in the Eastern preslope of Baltic Syneclise; XIII – zone of oil accumulation in the Eastern slope of syneclise and scarps of syneclise margins.



Middle Devonian. Therefore the oil pool in Cambrian deposits there, seems, was destructed. In the Liepaja-Saldus uplift zone the perspective local structures for preservation oil pools could be only on the periferical parts of this tectonic zone, especially in those, which are distributed on the scarps of NE direction to SE and SW from axial line of uplift zone, not with the exception of Swedish economic zone.

In the Polish offshore economic zone, in the NE Swedish economic zone part oil fields mainly may be discovered on the upthrow parts of scarps near the submeridional faults, detected during investigations of B block structures.

Nearer to the Russian economic zone of Kaliningrad onshore the oil traps must be located near the latitudinal Kaliningrad and Sambia peninsula faults on the upthrow parts of scarps.

In the Lithuanian economic zone of the Baltic Sea the continuation of Telšiai zone of oil accumulation from the land to offshore is very prospective for oil search. There on the upthrow part of scarp the most density of initial prospective oil resources is forecasted (Fig. 3).

As our expierence for oil search and exploration in Lithuania and Kaliningrad region shows, mostly effective finding of oil traps, usually, is in the narrow belts (3–5 km) of upthrow parts of the scarps. In these places they are primary concentrated, casped to the fault chains of local structures or homoclines in which tectonically covered oil pools can be.

References

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