

**PHANEROZOIC EAST EUROPE - SIBERIA INTERACTION and PETROLEUM
 HABITAT of NORTHERN EURASIA**

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The principal tectonic elements in Northern Eurasia are East European and Siberian cratons. A smaller continental block, the Neoproterozoic Brentsia plate, is situated in the Arctic shelf. The cratons are surrounded by Neoproterozoic-Paleozoic orogens (Sobornov, K and Yakubchuk, A, 2004, Yakubchuk, A.S., 2004). Basement of the prolific West Siberian basin includes amalgamated folded Paleozoic terrains. The Paleozoic orogenic collage is sinistrally offset along the Transeurasian strike-slip fault, which was active during late Paleozoic-Triassic times. This fault extends from South Siberia towards Pai-Khoy and Novaya Zemlya displacing all pre-Mesozoic structures for as much as 1,000 km (Fig. 1).

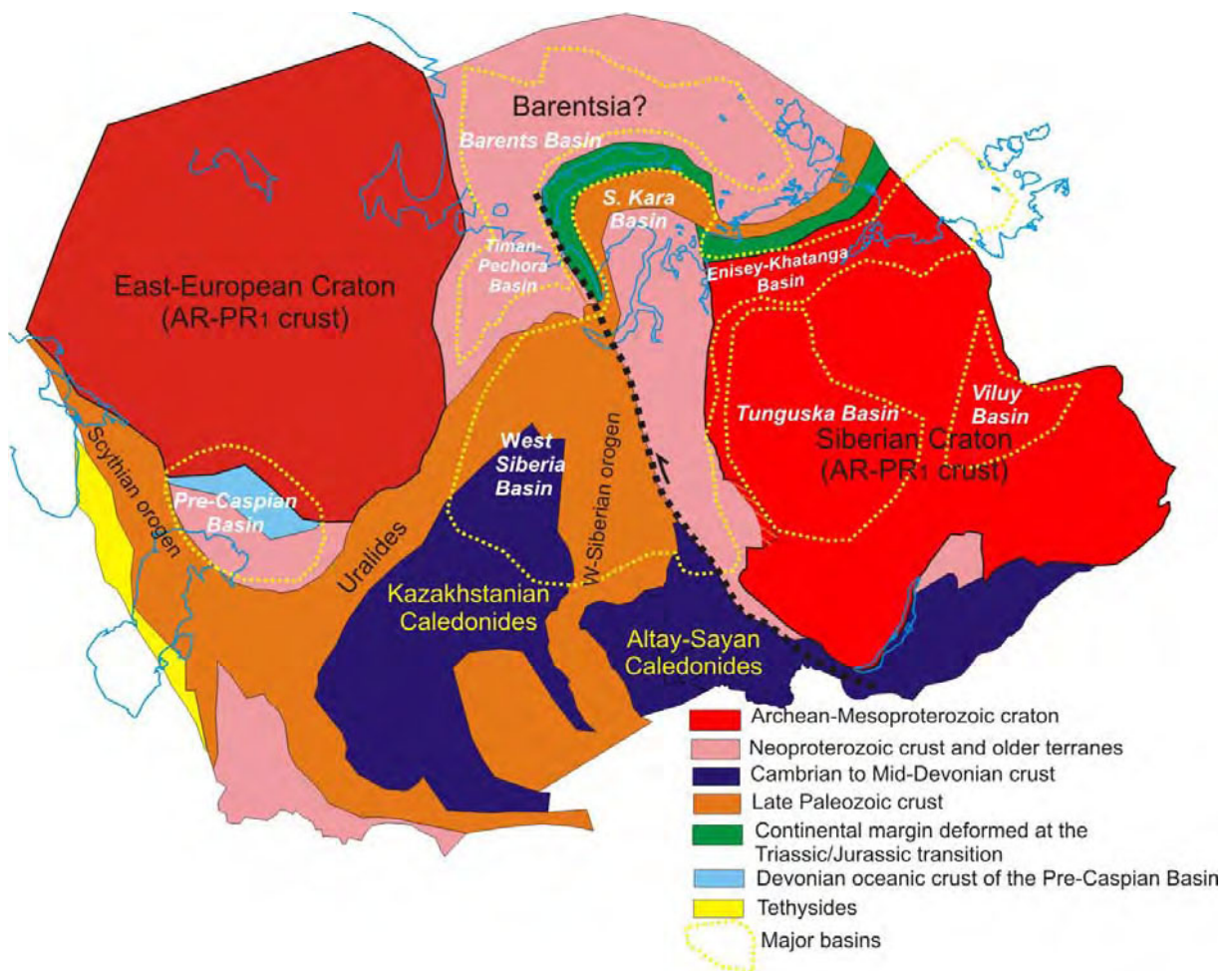


Figure 1. Structural scheme of Northern Eurasia and location of the major sedimentary basins. Dotted line is the Transeurasian fault.

Two major phases of sedimentary basin development in Northern Eurasia are recognized in the plate tectonic context.

The first one started in the Late Precambrian and finished in the Late Permian (circa 750-250 Ma). Much of the preserved sedimentary deposits of these times are in the Lena-Tunguska, Timan-Pechora and Volga-Ural basins. They developed as asymmetrical foreland-type basins influenced by evolution of flanking island arcs and fold belts. Their sedimentary sequences reflect successive rift-drift-collision tectonic regimes. Carbonates deposited in low-latitudes shelf conditions are abundant and spread over huge areas of the East European and Siberian platforms. Source rocks are represented by marine bituminous shales and marls deposited in anoxic conditions. Hydrocarbon traps are mainly provided by compressional and inversional 4-way dip closures, carbonate build-ups, truncations of reservoirs by stratigraphic unconformities. Locally, these basins include remnants of the Proterozoic basins filled with thick Riphean sediments. These rocks contain important oil accumulations in the western part of the Siberian platform where the Cambrian salt provides a regional seal.

Basins of the second type have developed since the Triassic. The major ones are the West Siberian, Enisei-Khatanga and East Barents basins. They formed as intracratonic basins within the large landmass of the North Eurasia superimposed on amalgamated older structures. Sedimentary fill of these basins is composed almost entirely of clastic deposits. There are two primary source rock intervals represented by locally developed Triassic lacustrine deposits and the bituminous shales of the Bazhenov Formation in the West Siberian basin. Typically hydrocarbons are trapped in low relief platform anticlines, sandstone pinch-out zones and lenses associated with clinoform complexes.

In addition to the understanding of the regional geodynamic context of Northern Eurasia that constrains chronostratigraphic models of individual basins and variations in structural styles, the proposed plate tectonic scenario explains some important peculiarities of distribution of oil and gas fields.

It is the Siberian craton that happened to be in low latitudes in the early Cambrian during the drift of the North Eurasia continental plates from the southern to the northern hemisphere. Combined with structural conditions, this factor facilitated deposition of evaporates over large areas of the Siberian platform. The evaporite series provided a regional seal for hydrocarbons generated in the Riphean section. The lack of such a seal on the East European platform most likely resulted in destruction of hydrocarbon accumulations produced by the thick pre-Cambrian deposits.

Analysis of oil and gas distribution across the West Siberian basin shows that the existing pattern where the northern part is dominated by gas fields and the south by oil fields, could be influenced by the plate tectonic evolution. Boundary between these two domains corresponds to the Transeurasian strike-slip fault, which divides the Siberian craton from the East European platform (Fig. 2).

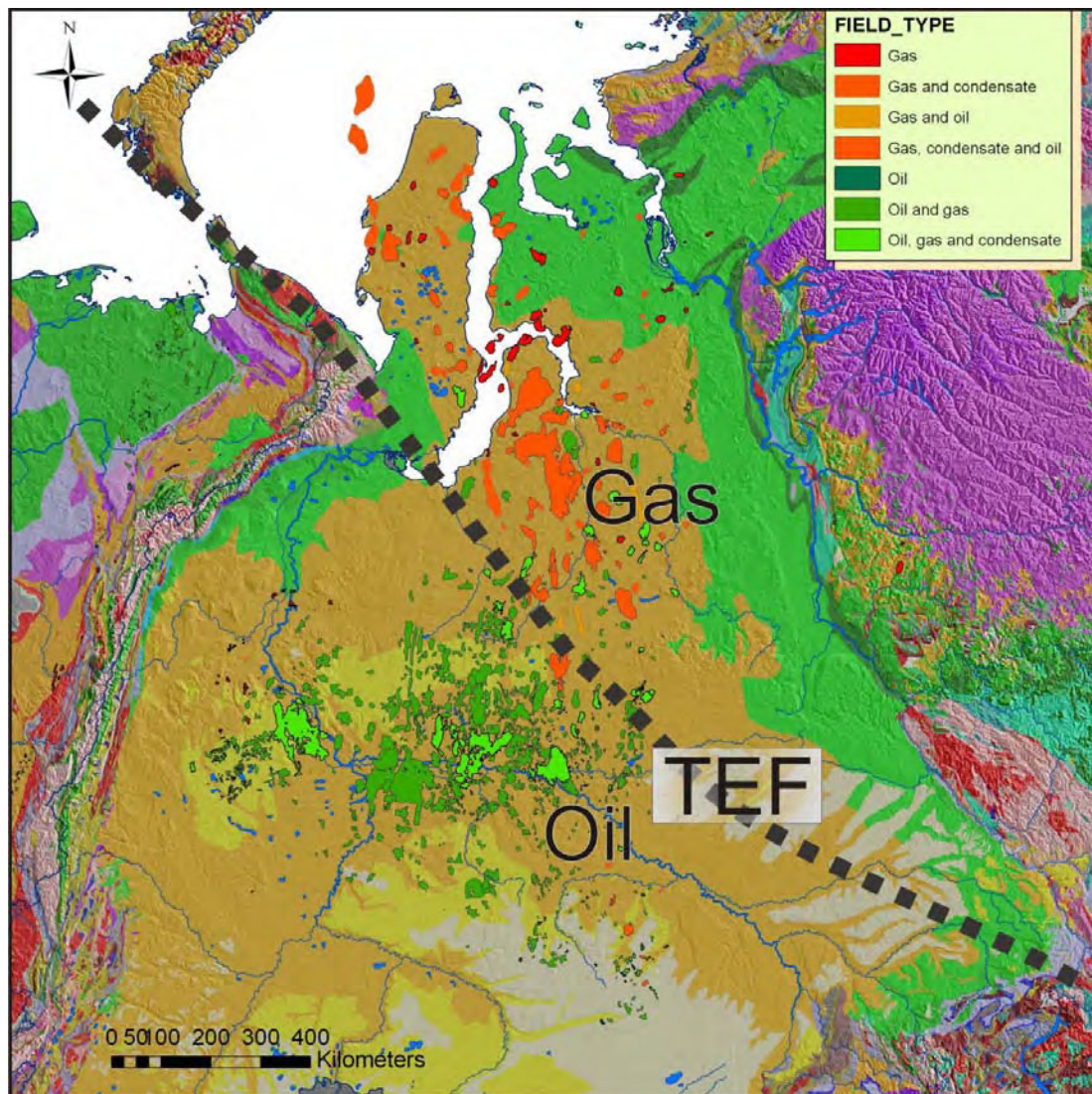


Fig.2. Distribution of oil and gas field in the West Siberian basin. FEF – TransEurasia fault.

In the Triassic, the clock-wise rotation of the Siberian plate resulted in rifting in the northern part of the basin. It created highly structured relief with deep troughs. The subsequent rapid thermal subsidence pushed the lower part of the sedimentary section well below the oil window and prompted generation of gas. The Tertiary uplift and reactivation associated with opening of the Arctic Ocean led to the release of large volumes of gas from formation fluids, thus accelerating accumulation of gas. In the meantime the southern oil-bearing part of the basin overlapped the Paleozoic collage jammed between the continental plates. From the Jurassic till early Tertiary time it had been experienced broad and subtle deposition that brought the major source rock of the Bazhenov Formation into the oil window over a large area facilitating generation of massive volumes of oil.

Reference

- Sobornov, K and Yakubchuk, A, 2004. Phanerozoic East Europe – Siberia Interaction and Petroleum Habitat of Northern Eurasia. CD-ROM. AAPG/GSA European Region Conference, Prague.
- Yakubchuk, A.S., 2004, Architecture and mineral deposit settings of the Altaid orogenic collage: a revised model. *Journal of Asian Earth Sciences* 23, p. 761-779.