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# Tectonic structure, seismic stratigraphy and hydrocarbon potential of the North Kara Basin (Russian Arctic)

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North Kara shelf represents one of the remote and still poorly studied sedimentary megabasins of Russian West Arctic. North Kara area lacks any offshore wells so the understanding of its structure is based on the geology of adjacent East Barents Basin, as well as surrounding land areas (Taimyr, Severnaya and Novaya Zemlya fold belts) and stratigraphic columns of the scattered Arctic Islands. It is widely believed that North Kara shelf is mostly composed of Riphean-Paleozoic sedimentary units, underlain by Precambrian basement (North Kara massif), and represents one of the most promising areas of the Russian Arctic for hydrocarbon (mostly oil) discoveries.

Our study is based on the reinterpretation of several regional seismic lines acquired by Sevmorgeo. We used the main Paleozoic and Mesozoic tectonic events known for Severnaya Zemlya Archipelago and Taimyr Peninsula for interpretation of the age of main seismic complexes/boundaries within the North Kara sedimentary cover (first of all within the Priseverozemelsky Trough). We correlated the sharp angular unconformity in the lower part of sedimentary succession with Cambrian/Ordovician unconformity described earlier on the nearby Severnaya Zemlya onshore domain. It is likely that the pre-Ordovician tectonic event corresponds to the Late Baikalian (Timanian) orogeny, which took place on Timan-Pechora and Novaya Zemlya areas. Above the unconformity we proposed the occurrence of Ordovician-Silurian shelfal sedimentary sequence of $\sim$ 2 km thickness. This strata are overlain by thick ($\sim$3-4 km) progradational unit. It is likely that this sequence should correspond to molassic deposits of old red sandstones, related to the regional Caledonian orogeny. We believe that general structural pattern of the North Kara region was formed in Late Carboniferous-Early Permian time as a result of Kara massif/Siberian Craton collision-related Hercynian orogeny of Taimyr-Severnaya Zemlya domain. This event led to gentle folding of the main sedimentary infill of the basin, including Carboniferous and Permian strata of 2-4 km of thickness. The deformed Paleozoic strata of the North Kara basin are unconformably overlain by thin post-orogenic Upper Permian(?)-Mesozoic beds. It is notable that we found almost no evidence for the Mesozoic contractional deformation events known for adjacent Taimyr fold belt. From the other hand we proposed the existence of small transtensional pull-apart basins, superimposed on the Hercynian unconformity. We believe that these structures are coeval with Triassic dextral strike-slip faulting, previously described for Taimyr fold belt.

It is also notable that we did not find any evidence of the existence of deep rift-related troughs filled by Riphean-Cambrian rocks, which were proposed by previous researchers. Nevertheless the occurrence of the Ordovician regional post-orogenic extensional basins is not excluded.

Based on the results of seismic data re-interpretation and tectonostratigraphic model the regional forward stratigraphic (sedimentatological) simulation was carried out to predict the stratigraphic architecture and spatial distribution of facies. The subsequent basin modeling results showed that North Kara region may represent highly prospective, but mostly gas-bearing basin due to the high maturity of Lower Paleozoic source rocks.