

East Siberian and Chukchi Sea Region: Geology, Tectonic Development, and Petroleum Systems

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ABSTRACT

The eastern part of the East Siberian Sea and the Chukchi Sea shelves are characterized by immature exploration stage. Three major troughs are outlined here: North Chukchi, Dremkhedsky and North Wrangel. Nowadays two main concepts of this region geological setting exist. According to the first one, major structural feature North Chukchi Trough infill is composed of the same sedimentary sequences as in the North Slope of Alaska. Another concept proposes only Cretaceous-Cenozoic strata within its sedimentary cover. Study region geological setting and main evolution stages are similar to the North Slope of Alaska sedimentary basin. They are situated close to each other and in pre-Cretaceous time were the part of the same passive margin within the Eastern Arctic Platform. There are some differences though. The North Chukchi trough is a large depression and is likely to represent hydrocarbon kitchen. It is often considered to be analogous to Colville foreland basin where the main hydrocarbon generation took place. Colville basin resulted from Canada Basin opening accompanied by Brooks fault and thrust belt formation. Significant effect of these tectonic events is evident from seismic data analysis. The Colville basin, Dremkhedsky and North Wrangel troughs look alike. The North Chukchi trough can't be described by typical structural characteristics of foreland basins. Another crucial point is that two longitudinal depressions separated by structural high are outlined within the North Chukchi trough. That leaves analogy with Colville trough in serious doubt. Dremkhedsky, North Wrangel and Hanna troughs almost identical geological setting can be seen on seismic section of west-east direction. Development in a rift setting and the same order of sequences thickness point to similarity of these structural features whereas along the south-north direction differences can be noticed. North Wrangel and Dremkhedsky Troughs extend for several times smaller area comparing with Hanna Trough. Furthermore, these features resemble foreland basins occurred in front of Late Mesozoic compressional deformations. These differences in structural evolution with analogues may have affected petroleum systems development. Basin modeling based on results of seismic, gravity and magnetic, geological survey data integrated interpretation could give an answer to the question about the possibility of large oil and gas discoveries in the region.