

The Structure of the Wrangel Arch (Russian Chukchi Sea), Based on Marine Seismic and Onshore Observations

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Wrangel Arch represents the extensive (more, than 500 km) ~ E-W trending offshore basement high, separating the well-known shelf depressions: North and South Chukchi (Hope) sedimentary basins, filled by more than 16-18 km of Late Paleozoic(?) -Tertiary and up to 5-6 km of Aptian(?) -Tertiary sequences respectively. The onshore exposures of the Arch are known on Cape Lisbourne (Alaska) and on Wrangel Island in Russian sector. Our study of the Arch is based on the TGS 2D seismic data of 2006 survey in Russian Chukchi Sea and onshore geological observations on the Central and Western parts of the Wrangel Island. It is likely that the Wrangel Arch represent the northwestern extension of the Herald Arch-Lisburne Hills fold belt. Wrangel Island is mostly composed of Neoproterozoic metamorphic rocks and uncomfortably overlying Paleozoic-Triassic sedimentary sequences, involved in the Late Kimmerian rather uniform North-vergent fold and thrust deformation. At the same time, seismic data revealed intensive development of the both North- and South-vergent thrust sheets of the Wrangel Arch. The geological complexes of the Island are the key units for investigating the structure, tectonics and hydrocarbon potential of Russian Eastern Arctic shelf, including the folded basement of the South Chukchi and lower (Ellesmerian) sequences of the North Chukchi basin. Undeformed Turonian(?) -Tertiary sandy-clayey strata, known for the Northernmost exposures of Wrangel Island are the age-equivalent of the Uppermost Lower and Upper Brookian sequences and thus correspond to the upper part of the sedimentary cover of the North-Chukchi Basin and the main sedimentary infill for the South Chukchi Basin, which is not older, than Aptian-Albian. The structural pattern of the Northern front of the Arch is heterogeneous. The series of North-vergent thrust faults, with the main detachment at the base of Brookian were detected. From the other hand, obvious double-vergent pop-up and positive flower (dextral? transpressional) structures of Early Paleocene age were also observed. We relate the latest N-S to NE-SW extensional stage to the formation of the South Chukchi basin and the series of the small half-grabens, superimposed on the Wrangel Arch. The intergrated approach to the research of the Wrangel Arch by marine seismic and onshore geological-analytical methods is crucial for the exploration of the offshore sedimentary basins of Chukchi and adjoining East Siberian Sea.

