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Structure and seismic stratigraphy of sedimentary cover in the Amerasian Basin of the Arctic Ocean

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The proposed seismic stratigraphy model was successively determined for the Cenozoic and pre-Cenozoic parts of the sedimentary section. The model based on correlation of the newest Russian multichannel seismic reflection (MCS) lines were obtained by High Arctic expeditions “Arctica-2011”, “Acrtica-2012”, “Arctica-2014” and seismic data documented by boreholes.

Cenozoic part of the sedimentary cover is based on correlation of the Russian MCS data and AWI91090 section calibrated by ACEX-2004 boreholes on the Lomonosov Ridge. Two major unconformities are traced. The upper regional unconformity (RU) is associated with a major pre-Miocene hiatus. Another major hiatus is recorded in the borehole section between the Campanian and the Upper Paleocene units. It is recognized as the post-Campanian unconformity (pCU) in the seismic sections. Neogene unit (above RU) consists of hemipelagic deposits; Paleogene unit (between pCU and RU) consists of neritic deposits. Cenozoic sedimentary units are continuously traced from the East Siberian Sea and the Chukchi Sea shelves across the transit zone to the Amerasian Basin.

Pre-Cenozoic part of the sedimentary cover is based on tracing major unconformities from boreholes on the Chukchi shelf (Crackerjack, Klondike, Popcorn) to the North-Chuckchi Trough and further to the Mendeleev Rise as well as to the Vilkitsky Basin and the adjacent Podvodnikov Basin. Three regional unconformities were correlated: Jurassic (JU – top of the Upper Ellesmerian unit), Lower Cretaceous (LCU) and Brookian (BU – base of the Lower Brookian unit). Above the acoustic basement the pre-Cenozoic section is mainly represented by terrigenous units.

The East Siberian outer shelf, the Podvodnikov Basin, the Mendeleev Rise, the Chukchi Basin and the Chukchi Plateau are the structures of rifting extension. The MCS sections show it cogently (Figure 1). The entire area of the Central Arctic Elevations Complex is controlled by normal faults, grabens, semi-grabens and other tectonic structures of rifting, extension and expansion of the Earth's crust (tilted blocks, listric faults, growth faults, drag folds, etc.). Sedimentary sequence between pCU and JU which underlies deposits of the Upper Ellesmerian unit is recorded as a synrift unit of the Podvodnikov Basin. Bathymetric and seismic data indicate an approximate N-S orientation of the structures formed along the extension stretching in the E-W direction. It is similar to the directions mapped on the adjacent shallow shelves in the Russian Arctic. In our opinion, rifting extension is the major factor in relation to the origin and tectonic evolution of the Amerasia Basin.

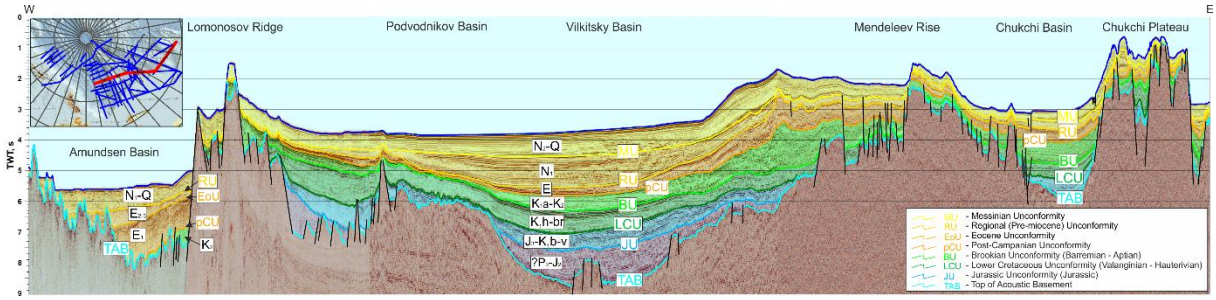

Figure 1: Continuity of sedimentary cover units from Lomonosov Ridge to Chukchi Plateau

The sedimentary cover thickness map is constructed. The map and seismic data (Figure 1) show a structural prolongation of the sedimentary cover from the East Siberian Sea and the Chukchi Sea shelves to the Amerasian Basin without any breaks and tectonic movements. Thereby the Lomonosov Ridge, the Podvodnikov Basin, the Mendeleev Rise, the Chukchi Basin and the Chukchi Plateau have general geological characteristics and/or origin similar to those of the land mass.