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Mesozoic and Cenozoic plate tectonics in the High Arctic: new 2D seismic data and geodynamic models

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Our paper is mainly based on the interpretation of 2D seismic lines, obtained from Arctic-2001 and Arctic-2012 projects. We also analyzed all available open-source data concerning Arctic geology.
Three domains are distinguished in the abyssal part of Arctic Ocean: (1) Canada Basin, (2) Lomonosov-Podvodnikov-Alpha-Mendeleev-Nautilus-Chukchi Plateau (LPAMNCP) area, (3) Eurasia Basin.
Canada Basin has oceanic and transitional crust of different structure. The formation time of this oceanic basin is probably 134-117 Ma. New seismic data for LPAMNCP area shows numerous rift structures parallel to the Lomonosov Ridge and Mendeleev Ridge. These rift structures are also nearly orthogonal to the Canada Basin spreading axis, and this may indicate either a different mechanism for the formation of the LPAMNCP region and Canada Basin, or a very complicated basin architecture formed by processes we do not yet understand. We also observe at the base of the LPAMNCP area sedimentary cover packages of bright reflectors, they were interpreted as basalt flows probably related to the Cretaceous plume volcanism. Approximate time of the volcanism is about 125 Ma. After this event, the area experienced stretching and transtension as documented by large scale rifting structures.
The younger Eurasian Basin has oceanic crust of Eocene to Recent age, and our new seismic data confirms that Gakkel Ridge has typical ultraslow-spreading zone topography. Perhaps, Eurasia Basin crust was partly formed by exhumed and serpentinized mantle.
Lomonosov and Alpha-Mendeleev Ridges has typical present-day basin and range topography with Oligocene to Recent faults. It means, that all LPAMNCP area was subjected to regional intra-plate stretching during Neogene to Recent time. We assume, that this intra-plate stretching was related to the Gakkel Ridge extension.
We suppose, that the deep-water part of Arctic Ocean was formed during three main stages: (1) Valanginian – Early Aptian: formation of Canada Basin; (2) 125 Ma – Large-scale magmatism at Alpha-Mendeleev Ridge area, followed by large-scale rifting at LPAMNCP area; (3) Eocene to present: Eurasian Basin formation, ultraslow spreading. This process is accompanied by LPAMNCP area stretching.
These three stages are connected with main phases of the plate tectonic reorganization.