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The Precambrian age of the Arctic shelf basement and plate tectonic reconstructions based on the first paleomagnetic data

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It was assumed that the Arctic terranes, composing shelf and continental slopes, represent the actual fragments of the ancient Arctida paleocontinent that broke up during rifting and the separated plates and terranes accreted to the periphery of the Arctic Ocean at a later stage [1]. Favoring this assumption, parts of the Arctic shelf, including Svalbard, Novaya Zemlya and Taimyr Peninsula, demonstrated Grenvillian and Mesoproterozoic basement. In addition, structures from the basement of Severnaya Zemlya archipelago showed Neoproterozoic ages or older. Basement from the eastern part of the Russian Arctic shelf was poorly studied previously.

The New Siberian Islands archipelago is one of key structures for understanding geology and evolution of the Arctic region. Moreover, within the Arctic Ocean and adjacent to the New Siberian Islands archipelago, there are several submerged structures containing fragments of continental crust, including the Lomonosov Ridge and the Mendeleev Rise. A number of pieces of geochronological evidence support the Late Precambrian and Paleozoic ages of the volcanogenic-sedimentary and intrusive rocks that overly Precambrian basements of the New Siberian Islands and De Long archipelago (Henrietta, Zhokhov and Jeannette islands) [2, 3]. For the first time, an Early Paleozoic age, more specifically Ordovician (471-467 Ma), was obtained by the Ar/Ar dating for dolerites and basalts of the submerged Mendeleev Rise [4]. Performed Ar/Ar isotopic data, combined with available results from detrital zircons, petromagnetic and paleomagnetic data, indicate that the magnetization in dolerite dykes from Jeannette Island occurred in the Early Ordovician (~480 Ma), whereas the basalt flows and the underlying volcanogenic-sedimentary series from the Henrietta Island formed and acquired magnetization in the first half of the Cambrian (540–520 Ma) [5]. Calculated Cambrian-Ordovician poles form a common apparent polar wander path (APWP) with Ordovician-Silurian poles, obtained for the De Long and Anjou archipelagos. Recently published paleotectonic reconstructions for the Arctic structures indicate on the emplacement of the Jeannette Island dike complex approximately 550-540 Ma, when the New Siberian terrane was drifting towards the Siberian paleocontinent [6]. Paleomagnetic data indicate that the New Siberian Islands terrane could not be part of Laurentia, Baltica, or Kara, but together with the Omulevka, Prikolyma and probably Omolon terranes was involved into tectonic evolution of the Kolyma-Omolon superterrane near the Siberian craton.

Exclusive paleomagnetic data were obtained for the Precambrian-Paleozoic age interval of the Novaya Zemlya archipelago. These poles show the coordinated apparent drift with paleomagnetic poles for Baltica, indicating the sedimentary basins of Svalbard and Baltica were close and within the same paleocontinent and their mutual configuration was similar to todays.

References:

[1] Zonenshain L and Natapov L (1987) In: *Tectonic history of the Arctic*. Nauka, Moscow

[2] Korago E et al. (2014) Doklady Earth Sciences 457(3): 315-322

[3] Matushkin N et al. (2016) Doklady Earth Sciences, in press
[4] Vernikovsky V et al. (2014) Doklady Earth Sciences 454(2): 97-101
[5] Zhdanova A et al. (2016) Doklady Earth Sciences, in press
[6] Metelkin D et al. (2016) Gondwana Res http://dx.doi.org/10.1016/j.gr.2015.08.008