



Geological and geomorphological conditions for the construction of seaports in the Arctic in the first half of the twentieth century

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In 1874, English captain J. Wiggins brought a cargo vessel to the mouth of the Yenisei for the first time, proving the transport capabilities of the Northern Sea Route. The need for transportation has been steadily increasing, but on the entire highway along the northern coast of Russia there was only one equipped port, Arkhangelsk. Therefore, the Russian government and private capital have begun to explore areas for future ports, primarily in the mouths of rivers. The first Arctic port appeared on a much nearer and more accessible Murmansk coast. The place for its construction was chosen by the Minister S. Witte in 1894 on the rocky shore formed by the Precambrian rocks of the Baltic Shield. The Ekaterininsky island reliably sheltered the new port, founded in 1896, from the ocean waves. The increasing activity of the construction of the ports was connected to World War I. In the years 1914-16 in the depths of the Kola Bay on the dry shore and in the depths of the Kandalaksha Bay, with the adjoining of the Kandalaksha Mountains to the sea terraces and the moraine plain, the construction of the berthing facilities of the Romanov-Murman and Kandalaksha ports began. But the main construction of the Arctic ports began in the 1930s., after the Main Directorate of the Northern Sea Route (GUSMP) had been organized. Construction was carried out mainly on the rocky sites (Belomorsk, Kem, Amderma, Dikson, Tiksi, Pevek, Provideniya). Material for construction – gneisses, granites and granite gneisses (Belomorsk, Pevek, Provideniya), diabase (Dixon), Paleozoic sedimentary rocks (Tiksi). Most of the port facilities of that time are moles or breakwaters built of ryazhey (cages of logs of a cubic shape with a side of 2-4 m filled with stone blocks) or of a rough draft. Material for construction was usually taken nearby, and the quarries are still preserved. The length of the moles reached several kilometers depending on the depth of the sea, the width did not exceed 5-6 m. Sometimes we had to choose areas on loose Quaternary sediments (Novy Port, Salekhard, Khatanga, Ambarchik). Here wooden quay walls, several hundred meters long, were usually built, or moles put into the sea were made of the rough draft same breakwaters built of crib pier or ryazhey (cages of logs of a cubic shape with a side of 2-4 m filled with stone blocks) or, which, in the absence of stone material, were filled with sandbags. Later, some ports expanded significantly (Murmansk, Arkhangelsk, Provideniya), others built before the war were retained and partially used, others are gradually being destroyed by waves and fast ice. Over the decades, the sediment flow has stabilized and the port facilities have become part of the natural environment, incorporated into the coastline. They can also be considered historical monuments. The report analyzes the specific features of the geomorphological location of the ports listed. The works are supported by the Russian Foundation for Basic Research (project № 18-05-60200) under the theme of the Department of Geomorphology and Paleogeography.