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Chemical composition of sediments from White Sea, Russian Arctic

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The White Sea, the only Russian inland sea, is located on the north of outlying districts of the European part of Russia, belongs to Arctic Ocean. Area of water of sea occupies about 90 tousend square kilometers. The sea can be divided into some general parts: neck, funnel, basin and 4 Bays: Dvina Bay, Kandalaksha Bay, Mezen Bay and Onega Bay. The purpose of this work was geochemical mapping of the surface sediments of this area. The main tasks were: compilation data base of element composition of the surface sediments, geochemical mapping of each element, research of the anormal concentration of elements on the surface.

To detect the content of chemical elements several methods were used: atomic absorption spectrometry (P.P. Shirshov Institute of Oceanology); neutron activation analysis (Vernadsky Institute of Geochemistry and Analytical Chemistry), total and organic carbon analysis, photometric method to detection Si, Al, P (P.P. Shirshov Institute of Oceanology).

Bulk composition is one of the fundamental characteristics of sediments and bottom deposites of modern basins. Coarse-grained sediments with portion of pelitic component <50% is spread on the shallow area (Kandalaksha Bay), in areas with high hydrodynamic activity of near-bottom water. Under the conditions of their low activity, fine-grained facies are common(>80%). Character of elements distribution correlates with facial distribution of sediments from White Sea.

According to litologic description, bottom surface of Dvina Bay is practically everywhere covered by layer of fine-grained sand. In the border area between Dvina Bay and White Sea basin on terraced subwater slope aleurite politic silts are abundant. They tend to exhange down the slope to clay silts. In Onega Bay fractions of non-deposition are observed. They are characterized by wide spread of thin blanket poorgraded sediments, which are likely to be relic. Relief of Kandalakscha Bay bottom is presented as alternation of abyssal fosses (near 300 m) with silles and elevations (<20 m), and also numerous islands. Thus variety of sediment composition is observed here – from rules and gravels to fine-grained clay silts [1].

The map of distribution of chemical elements was created by using bulk composition data with the help of program ArcView.

Mn distribution in sedimentation mass is largely determed by influence of redox diagenesis. Reactive form of Mn dominates over less moving, litogenic form in sedimation mass of White Sea. Litogenic form remains in sediment, reactive form moves into silt near-bottom water, resulting Mn migration both in sediment and near-bottom layer of marine water. Mn oxidizes on the contact with oxygen of marine water and alters into insoluble form MnO2, causing Mn enrichment of surface layer of sediments. Highly movable silt deposit MnO2 and enriched by Mn suspension are moved by underflow and accumulate in bottom depressions and in central part of the sea, which is quite wide from both places of original sedimentation and run off sources [2].

Thus, the interrelation between granulometric composition of sediment and materials concentration can be shown by the example of Mn. Local conditions, leading to accumulation of clastic components, are:

1. Rise of content in sand owning to separation of heavy minerals
2. Rise of content in surface, mainly sandy clay sediments owning to presence of concretions
3. Rise of content in lower bunches roof owning to diagenetic contraction.

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