Geophysical Research Abstracts
Vol. 21, EGU2019-1441, 2019
EGU General Assembly 2019

The flux of the nutrients through the boundary water – sediments in Arctic seas (72 cruise RV “Akademik Mstislav Kedish”)

Gennadii Borisenko

Shirshov Institute of Oceanology RAS, Biohydrochemistry, Moscow, Russian Federation (gennady.val.borisenko@gmail.com)

Without studying the border zones of the oceans, it is impossible to create a theory of ocean bioproductivity formation (modern and past), climate theory, find out the migration routes of pollutants and their influence on the cycles of chemical elements in the biosphere. Despite the fact that the border zones occupy only 2% of the volume of the World Ocean, their biochemical and geological role is enormous. Evaluation of the exchange of chemical elements is necessary to understand the biogeochemical cycles of nutrients. The boundary between the water and the bottom is poorly understood due to its inaccessibility for researchers [1].

In this research, we study the diffusion fluxes of nutrients in the system “silty (interpore) water - bottom water horizon”, the topic is rather new, therefore there are currently no universal approaches to the study of this issue, while the Arctic is an economically valuable region of the World Ocean and environmentally vulnerable. Work on the study of diffusion flows from the sediment are at the very beginning of development, but this important and subtle direction of oceanological research is capable of shedding light on the problems of climate and pollution of the ocean.

The studies were conducted during the 72nd cruise of the vessel “Akademik Mstislav Keldysh”, the region of study were the Arctic seas (Kara, Laptev Sea) and the Bay of Blagopolychia, Novaya Zemlya archipelago. Sampling was carried out using Niemisto tubes, from which samples of bottom water were taken and analyzed. The sediment containing interpore water was squeezed out and the water were also analysed.

Evaluation of diffusion fluxes (J) at the water-bottom interface was carried out on the basis of Fick’s formula [2]:

J = $-\phi \cdot Ds \cdot \frac{\partial C}{\partial x}$

C is the concentration of the component in the interpore solution, x is the distance from the surface to the depth of the sediment. Ds is the diffusion coefficient of the components in the pore sediment medium. The porosity coefficient (f) was taken equal to 0.95, and the diffusion coefficients of the components in the pore sediment medium for PO4 = 2.15E-05, Si = 3.97E-05, N total = 7.8E-05 [3].

Incoming intensity of chemical elements from the upper layer ranges for phosphorus from 1.03E-05 to 1.93E-06 mol / m2 •day, for silicon in the range from 1.56E-03 to 3.41E-04 mol / m2 •day for total nitrogen from 1.89E-03 to 1.77E-04 μmol / m2 •day.

Interesting trends in diffusion fluxes within the Vilkitsky canyon were noticed: silicon fluxes in absolute terms are quite high at the edges of the canyon and low at the bottom. Perhaps this is due to the best conditions for the flow of turbulent processes at the edge of the canyon due to shallow depth, which greatly increases the level of exchange of nutrients in this area.