



Dissolved methane transport in the Arctic water: observed data and simulation

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As part of the global carbon cycle, enormous quantities of methane occur in marine sediments. The extensive Arctic shelves may play an important role in methane cycling because of their large area. Based on observed data, an attempt was made to identify the main sources of dissolved methane in the Arctic Ocean. One of the mechanisms to release methane to the ocean is through submarine mud volcanism, hydrocarbon seeps and vents. Other sources of methane include methane gas hydrates. Siberian rivers are also a strong source of dissolved surface methane that comes from the wetlands.

A 3D mathematical model of the dissolved gas transport by the ocean currents is used to assess the amount of a possible methane flux from the submarine sources. The ocean model has been constructed at the Institute of Computational Mathematics and Mathematical Geophysics SB RAS, for the North Atlantic and Arctic basins. For modeling Arctic methane fluxes, the three above-mentioned methane sources were taken into account.

The results of the numerical simulation show that the propagation of dissolved methane into the Arctic basin is realized by two ways according to the atmospheric regimes and is associated with the North Atlantic/Arctic Oscillations. In the cyclonic circulation mode a high concentration of methane is formed in the region of Taimyr. In the anticyclonic mode, the dissolved methane is concentrated in the central Arctic.