



The impact of photodestruction of metal-organic complexes on transport of metals from terrestrial to aquatic ecosystems

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Biological cycles of terrestrial ecosystems involve large amounts of different metal ions from minerals composing soil and from the pools of anthropogenic origin. They are an inherent part of different energetic pathways, and constitute reactive centers of different enzymes complexes. In different cases they can play role of toxins and inhibitors and perform danger while distributing across the trophic networks. The high activity of metal ion turnover devoted to plant litter, where the autotrophic biomass is extensively decomposed by microbes. Diverse rearrangements lead to the saturated flux of intact biomolecules and complexes of metals with organic ligands (e.g. humic substances) from the plant litter to the surface waters, streams, bogs and result in their deposition and distribution in the aquatic area.

In the aquatic ecosystems metal-organic complexes are involved in a new broad spectrum of biotic and abiotic pathways and interactions. Our preliminary studies have shown remarkable variation in the ferrum isotopes composition in the size fractions obtained with cascade filtration, which testifies about intensive turnover of this substances.

Our study aims to study the processes occurring in the euphotic zone of the aquatic systems, predominantly the processes of photodestruction and rearrangements of metal-organic complexes under the impact of solar radiation. According to our working hypothesis, in the cascade of sequential reactions of complexe rearrangements and organic molecules degradation the metal distributes between different pools: free ions, which are available for the autotrophic and heterotrophic biota metabolism (they are highly significant for regulating the biogeochemical activity and bioproductivity of aquatic ecosystems); thermodynamically stable metal-organic complexes; precipitation and sedimentation from the solution in form of indissoluble newborn fractions.

The research design is based on the laboratory-scale studies of photodestruction of metal-organic complexes with and without influence of photoactivated oxygen and the large scale experiments for testing the developed models on the bog-lake ecosystems of Karelia and Kolsky Peninsula.