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## **Interaction of ions of heavy metals and organic toxicants with humic substances in system 'atmospheric precipitation - lysimetric waters - lake waters' of the Reserve of the European Territory of Russia: climatic, technogenic, geochemical factors**

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The reactions of toxicants with organic substances of a humic nature are complex and depend on many geochemical factors. Differences in the mechanisms of the selected toxicants binding with organic natural substances of various natural waters - atmospheric precipitation, lake waters (acidic and alkaline), lysimetric waters are especially interesting. Due to significant concentration differences, features of functional groups and size distribution of components, the inactivation features of humic substances are selective and highly variable. We studied the waters of an acid lake near the city of Valday (Valday National Park, conditionally a background lake) and alkaline lake Valday (city of Valday, local technogenic influence). Near each lake there was a sediment collector (a container for collecting atmospheric precipitation) and a lysimeter (a container under the soil for collecting soil moisture) under the humus horizon (about 20 cm). Particular attention was paid to soil (lysimetric) waters with varying degrees of anthropogenic impact. We considered the behavior of a large group of heavy metals, as well as benzopyrene. To assess the composition and qualitative features of organic substances, gas chromatography-mass spectrometric methods of analysis were used. Chromatographic methods were used to assess the molecular weight distribution of the components. Possible reaction mechanisms were studied by IR spectral methods. Evaluation of the reactivity of organic substances was carried out by the methods of dynamic light scattering (zeta potential, MM, size) using the "Zeta-sizer nano". In addition to humic substances in the waters, the contents of autochthonous organic matter were estimated, especially in an alkaline lake, which in some periods prevailed over humic ones. In addition to humic substances in the waters, the contents of autochthonous organic matter were estimated, especially in an alkaline lake, which in some periods prevailed over humic ones. For separation, exchange technique and fluorometric evaluations were used. We conducted research in the period 2015-2020, sampling was carried out in spring, summer, autumn. Thus, we studied the circulation (in miniature) of changes in the protective properties of humic substances, depending on a large number of factors.