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Latitudinal gradient of carbon, macro- and microelements in components of thermokarst lake ecosystems, western Siberia

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Thermokarst lakes in the permafrost zone have an important biospheric climate regulation function and simultaneously serve as indicators of current climate changes and possible increased anthropogenic load. Therefore, a detailed and comprehensive assessment of the biogeochemical status of the components (bottom sediments–lake water–macrophytes) of the thermokarst lake ecosystems of Western Siberia, and their response to current environmental changes and anthropogenic impacts, as well as interpretation of the role of macrophytes as markers of these processes are an important scientific goal. In this study, the model dominant macrophytes were taken (Menyanthes trifoliata L., Carex aquatilis Wahlenb s. str.) for a study of their element composition. Samples were treated in a four-step chemical digestion procedure (full dissolution via acid attack) for major and trace element analysis. Element concentrations were determined by inductively coupled plasma-mass spectrometry (ICP-MS). Our results show that the total concentrations of chemical elements in macrophytes growing in the continuous permafrost zone (northern part) are higher than in the discontinuous permafrost zone (middle part) and increasing in the isolated permafrost zone (southern part). This can be due to two factors: 1) the proximity of the Kara Sea, the influence of marine aerosols; 2) the difference in substrates, namely, the decrease in the thickness of the peat deposit from the south to the north of Western Siberia. The mineral horizon in the tundra zone lies closer to the surface and to the seasonal-thawed layer, whereby more elements can be absorbed by plant roots.
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