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Inorganic Chemistry of Surface Waters in the Palsa Mires Region of Northern Finland

Joanna JÓŹWIK[1,✉], Krystyna KOZIOŁ[2], Danuta SZUMIŃSKA[2], Marcin FRANKOWSKI[3], Marta JAKUBIAK[4], Kamil NOWIŃSKI[5], Mieszko WOŁYŃSKI[1], and Żaneta POLKOWSKA[1]

[1]Gdańsk University of Technology, Chemical Faculty, Gdańsk, Poland

[2]Kazimierz Wielki University in Bydgoszcz, Faculty of Geographical Sciences, Bydgoszcz, Poland

[3]Adam Mickiewicz University, Faculty of Chemistry, Poznań, Poland

[4]University of Wrocław, Institute of Geological Sciences, Wrocław, Poland

[5]University of Gdańsk, Faculty of Oceanography and Geography, Gdańsk, Poland

✉ joanna.jozwik@pg.edu.pl

1. INTRODUCTION

Climate warming in the Northern Hemisphere accelerated permafrost degradation (Streletskiy 2021), leading to physical and chemical changes in Arctic and sub-Arctic watersheds (Tananaev and Lotsari 2022; Verdonen et al. 2023). Palsa mires are a feature of sporadic and patchy permafrost landscapes in Northern Finland. We analysed inorganic chemistry (ions, metals and metalloid concentrations) of freshwater (rivers and lakes) collected from this region in the summer 2022 to detect their characteristic features.

2. MATERIALS AND METHODS

We have collected 54 water samples between Aug 17th and 25th 2022 in the Tana river watershed, from the tributaries connected to a various extent to palsa mires, and ten lakes both inside and outside of the palsa mire, for comparison. We have analysed acidified (high-purity HNO_3, Suprapur, Merck Life Science) filtrate for elemental concentrations of Be, P, S and Ti with inductively coupled plasma optical emission spectrometry (ICP-OES 9820, Shimadzu, Japan) and of Ag, Al, As, Ba, Bi, Cd, Co, Cr, Cu, Fe, Li, Mn, Mo, Ni, Pb, Sb, Se, Si, Sr, V and Zn with inductively coupled plasma mass spectrometry (ICP-MS 2030, Shimadzu, Japan).

3. RESULTS

The water were well buffered (pH range 5.93 – 8.23) and poor in dissolved solute (SpC 16.5 – 44.3 μS/cm). The concentrations of metals and metalloids were generally in the low range, never exceeding the drinking water guideline levels. However, the geochemical background was exceeded for some samples in the case of Ni and Zn concentrations. Multiple correlations were found between the elemental concentrations determined, and clear differences occurred between various study areas.

4. CONCLUSIONS

The hydrochemistry of palsa mire waters has showed distinct features from the surrounding waters.

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