Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19723

Occurrence of PFAS in groundwater and surface water of an urban watershed (River Vantaa, southern Finland)

HARRI TURTIAINEN[1], MARIE-AMÉLIE PÉTRÉ[2] AND KIRSTI KORKKA-NIEMI[2]

[1]Water protection association of River Vantaa and Helsinki region

[2]The geological survey of Finland

Presenting Author: harri.turtiainen@helsinki.fi

Per- and polyfluoroalkyl substances (PFAS) are ubiquitous in the Finnish aquatic environment, but little is known about the occurrence of PFAS in groundwater and their transport via surface water-groundwater interactions. To fill this gap, we conducted a field study in an urban watershed (River Vantaa), where the highest PFAS concentrations and yield have been observed of all the major Finnish rivers [1]. River Vantaa is a reserve water source for water supply in the Helsinki Metropolitan area (1 million people), and previous studies showed that it has a substantial groundwater component, with 300 groundwater discharge locations. Twenty-three river water samples and 55 groundwater samples were collected in two areas of the watershed (Rekolanoja and Herajoki), where aquifers and surface water bodies are hydraulically connected. Samples were collected during May-October 2022 and were analysed for 50 PFAS. Up to 20 PFAS were detected in 91% of the samples. Total quantified PFAS (ΣPFAS) in river water was 0,9-59 ng/L (mean= 22 ng/L), the range for groundwater was 0-3959 ng/L (mean= 150 ng/L). The highest PFAS concentrations were found in two groundwater samples downstream from a landfill. Other potential point sources were identified across the watershed. Excluding this highest values, surface water samples generally showed higher average PFAS concentrations than groundwater in both study sites. In surface water, ΣPFAS consisted of 60% perfluoroalkylcarboxylic acids (PFCAs), 28% perfluoroalkylsulfonic acids (PFSAs), and 12% fluorotelomer sulfonates (FTS), while in groundwater ΣPFAS consisted of 45,4% perfluoroalkylcarboxylic acids (PFCAs), 48,3% perfluoroalkylsulfonic acids (PFSAs), and 3,1% fluorotelomer sulfonates (FTS) and 3,3% sulfonamides and PFECHS.

Perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) were the most frequently detected (in 86% and 74% of the samples, respectively). Results suggest a widespread PFAS occurrence in groundwater, which might contribute to the River Vantaa PFAS through discharge processes. Further studies are needed to fully characterize PFAS contamination in groundwaters and the role of surface water-groundwater interactions in PFAS transport, to ensure safe drinking water supply and efficient water treatment.

[1] Junttila V et al (2019) PFASs in Finnish Rivers and Fish and the Loading of PFASs to the Baltic Sea. Water 11:870.

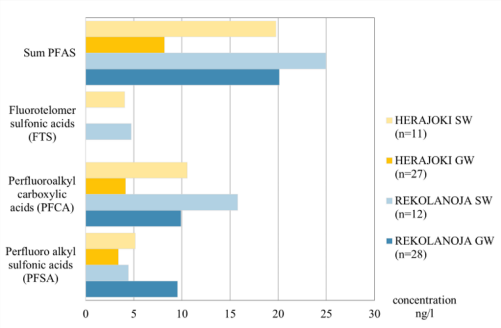

Figure 1. The distribution of different PFAS groups in groundwater samples and surface water samples from the two study areas. Two data points are excluded from this figure (ΣPFAS 3959 ng/l and 3582 ng/l in Rekolanoja groundwater).