RIVER BASINS

INTERNATIONAL CONFERENCE
ON MONITORING, MODELLING AND MANAGEMENT
OF RIVER BASINS

ABSTRACTS

Edited by
Máté Krisztián Kardos, Orsolya Szomolányi, Adrienne Clement,
Steffen Kittlaus, Karoline Morling and Stephan Fuchs

Budapest, Hungary
4-5 June 2024

RIVER BASINS 2024

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ON MONITORING, MODELLING AND MANAGEMENT
OF RIVER BASINS

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Budapest University of Technology and Economics
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Institute of Water Quality and Resource Management

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Environment Agency Austria

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Deltares

International Committee for Protection of the Danube River

Abstracts of the Conference

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Conference program

Welcome and opening – *Miklós Patziger, Head of Department, Department of Sanitary and Environmental Engineering, Budapest University of Technology and Economics*

Oral presentations

Monitoring (Tuesday, 4th June, 9:10 – 10:40)

Chair: Adrienne Clement, Budapest University of Technology and Economics, Hungary

Influence of sampling strategies on the assessment of concentrations and loads of trace contaminants in surface waters. *Ottavia Zoboli – TU Wien, Austria*

Particle-bound nutrients and trace substances in small streams: Implications for the aquatic environment and presentation of a novel sampling method. *Peter Flödl – BOKU Wien, Austria*

Trace substance monitoring at the intersection of urban drainage and an urban river in Karlsruhe, Germany. *Lukas Kopp – Karlsruhe Institute of Technology, Germany*

Monitoring and modelling I (Tuesday, 4th June, 11:10 – 12:40)

Chair: Ottavia Zoboli, TU Wien, Austria

Benchmarking the persistence of organic micropollutants in large European rivers. *Mark Honti – HUN-REN – BME Water Research Group, Hungary*

PFAS transport and retention during riverbank filtration and in saturated columns. *Thomas James Oudega – TU Wien, Austria*

Exploring human-vector dynamics using insect repellent concentrations in the river. *Enpei Li – Federal Institute of Hydrology, Germany*

Monitoring and modelling II. (Tuesday, 4th June 13:40 – 15:10)

Chair: Jos van Gils, Deltares

Assessment of diffuse heavy metal loadings by surface water and evaluation of their potential contamination. *Yassine Mimouni – University of Liège, Belgium*

Assessment of the share of sediments in the eutrophication of reservoirs: Case study from the Czech Republic. *Josef Krása – Czech Technical University in Prague, Czech Republic*

Transboundary contamination risk assessment and modelling in the Drava River floodplain. *Jasminka Alijagić – Geological Survey of Slovenia*

Modelling (Wednesday, 5th June 8:30 – 10:30)

Chair: Stephan Fuchs, Karlsruhe Institute of Technology, Germany

Calculating emissions to water – a simplified method implemented as a spatially and temporally distributed model. *Jos van Gils – Deltares, The Netherlands*

Modelling of nutrient emission in river systems (MONERIS): Presenting new perspectives and current developments of a widely used emission model. *Anna Oprei – Leibniz Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany*

Complex water quality simulations in Želivka River Basin and Švihov Water Reservoir (CZ). *Pavel Tachecí – DHI a.s., Prague, Czech Republic*

Developing nitrogen boundaries for surface water bodies on national and regional scale for Germany. *Karoline Morling – Karlsruhe Institute of Technology, Germany*

Modelling and Management (Wednesday, 5th June 11:00 – 12:30)

Chair: tbc.

The new Urban Wastewater Treatment Directive from the perspective of the receiving rivers. *Máté Krisztián Kardos – Budapest University of Technology and Economics, Hungary*

Nitrogen and phosphorous load reduction approach for catchments to reach the water quality targets set for the Water Framework Directive. *Peter Schipper – Wageningen University & Research, The Netherlands*

Efficiency of the buffer zones in nutrient load reduction under climate change conditions. *Damian Bojanowski – AGH University of Krakow, Poland*

Pitch presentation of posters

Session I. (Tuesday, 4th June 15:20 – 15:45)

Moderator: Martine Broer, Environment Agency Austria

A harmonized Danube Basin-wide multi-compartment concentration database to support inventories of micropollutant emissions to surface waters. *Steffen Kittlaus – TU Wien, Austria*

Mercury pollution in the Lom River Basin (East Cameroon): using PEGASE model to assess small scale gold mining pressures over surface water quality. *Marie Sorella Bella Atangana – University of Liège, Belgium/University of Yaoundé, Cameroon*

Seasonality in agricultural-associated river pollution: a global multi-pollutant modelling. *Mirjam Bak – Wageningen University, Netherlands*

Investment needs in water and wastewater infrastructure and inevitability of horizontal and vertical solidarity in fulfilling SDG 6. *Károly Kovács – BDL Ltd., Hungary*

Investigating eutrophication levels in the stream network of the Danube Basin. *Eszter D. Nagy – Budapest University of Technology and Economics, Hungary*

Event forecasting of rivers with soft computing methods. *Tamás Koncsos – Budapest University of Technology and Economics, Hungary*

Assessment of erosion phosphorus transport risk: Case study for the Elbe Basin. *Barbora Jachymová – Czech Technical University in Prague, Czech Republic*

Detecting pollutant sources and pathways: High-frequency automated online monitoring in a small rural French/German transborder catchment. *Angelika Meyer – Saarland University, Germany*

Modelling of PFAS emissions into the Upper Danube. *Meiqi Liu – TU Wien, Austria*

Quality management in river basins starts at the micro level: Filtration systems for storm water treatment – Appropriate filter substrates. *Claus Huwe – Hauraton Ltd., Germany*

Can machine learning tools support biological quality status assessment? *Orsolya Szomolányi – Budapest University of Technology and Economics, Hungary*

Session II. (Tuesday, 4th June 16:30 – 17:00)

Moderator: Steffen Kittlaus, TU Wien, Austria

Application of different types of catchment models to support understanding the hydrological and transport processes, emission patterns and model limitations related to these in a meso-scale catchment. *Zsolt Jolánkai – Budapest University of Technology and Economics, Hungary*

Updating input data and expanding the range of substances by a harmonized approach for modelling emissions from Urban Systems and Municipal Wastewater Treatment Plants in MoRE. *Julia Nowak – Karlsruhe Institute of Technology, Germany*

Heated rivers: learning from climate change and energy scenarios along a 700 km stretch of the Rhine. *Tanja Bergfeld-Wiedemann – Federal Institute of Hydrology, Germany*

Studying the effects of water temperature, phytoplankton and discharge variations on dissolved oxygen in the German reach of free-flowing Rhine. *Manoj Sanyasee Thapa – Federal Institute of Hydrology, Germany*

Exploring carbon dioxide dynamics and anthropogenic influences in the Ganga River: Implications for riverine management. *Pooja Upadhyay – Indian Institute of Technology Roorkee, India*

Identification of drained areas for enhanced precision in regionalized emission modelling. *Michelle Wild – Karlsruhe Institute of Technology, Germany*

Estimation of hazardous substance loads in a small catchment based on composite sampling. *Tímea Lajkó – Budapest University of Technology and Economics, Hungary*

Lesson learned from the application of a catchment-specific continuous surface water quality monitoring system. *Zsófia Kovács – University of Pannonia, Hungary*

Horizontal and vertical mass fluxes between aquifer and river during river floods. *Gadadhara Ferraz de Figueiredo – Budapest University of Technology and Economics, Hungary*

Assessment of pollutant emissions to support river basin management in Albania according to the EU, AMORE-AL. *Xhuljo Sema – Agricultural University of Tirana, Albania*

Spatial variability of meander characteristics within a distributive fluvial system experiencing an avulsion. *Neve Norris – University of Glasgow, United Kingdom*

Comparative isotope hydrological characterization of the elements of the water cycle in two continental catchments: Koppány (Hungary) and Ledava (Slovenia) streams. *István Gábor Hatvani – HUN-REN Research Centre for Astronomy and Earth Sciences, Hungary*

A model-based case study for wetland restoration effects on the hydrological conditions at a Hungarian lowland catchment. *Zsolt Kozma – Budapest University of Technology and Economics, Hungary*

Abstracts of oral presentations

PFAS transport and retention during riverbank filtration and in saturated columns

Ali Aa Obeid[1,2], Thomas James Oudega[1,2], Nikola Krlovic[3], Meiqi Liu[3], Ernis Saracevic[3], Nicolas Devau[5], Margaret E. Stevenson[1,2], Regina Sommer[2,6], Alfred Paul Blaschke[1,2], Claudia Gundacker[4], Ottavia Zoboli[3], Matthias Zessner[2,3], Julia Derx[1,2]

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Per- and Polyfluoroalkyl Substances (PFAS) are widely used chemicals valued for their desirable physicochemical properties. Despite increasing efforts to restrict their use, they pose a threat to drinking water production due to their persistence and mobility in the environment, as well as their toxicity to humans. Riverbank filtration (RBF) represents one of the primary pathways for PFAS transport to drinking water. While RBF systems effectively remove many organic compounds and microbial pathogens, their efficiency regarding PFAS remains poorly understood. This study seeks to investigate the subsurface transport behavior of various PFAS groups through field monitoring and sorption experiments in columns.

Over a one-year period, bi-monthly samples were collected from river water and groundwater. Liquid Chromatography Mass Spectrometry was employed to analyze 32 PFAS compounds. Results indicated that most detected PFAS compounds had concentrations lower than 10 ng/l. For the majority of compounds, no concentration reduction was observed between the river and groundwater, suggesting limited removal processes. However, two sites exhibited higher concentrations of PFOA, PFOS, and GenX in the background water compared to the river, hinting at an inland source of these compounds. Presently, there are no concerns regarding drinking water, as measured concentrations fall below the legal limit established by the EU Drinking Water Directive. Nevertheless, potential future legal or industrial changes could pose challenges, as the

results suggest that these compounds are not effectively removed during riverbank filtration.

To examine transport behavior under laboratory conditions, a 50 cm glass column filled with soil was injected with a 2.5 μg/l solution of 10 PFAS, and effluent samples were collected to assess transport parameters. Findings revealed that different PFAS exhibited varying degrees of sorption, with some behaving conservatively while others were entirely retained. Different sorption modules in Hydrus were tested to simulate these behaviors. Substances with higher sorption levels necessitated more complex sorption terms and could not be accurately represented by assuming equilibrium sorption.

Ongoing efforts aim to reconcile these seemingly contradictory results by developing models that simulate transport and fate at RBF sites, where sorption parameters derived from column experiments can be evaluated. Additionally, further column experiments are planned using natural soil from the monitoring sites.