

Modelling water quality in reservoirs to mitigate downstream water quality alterations

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23/5/2024 15:00-17:00 - room B1.6

24/5/2024 15:00-17:00 - room B1.7

Abstract

The ongoing growth of the hydropower sector at low latitudes calls for an examination of the environmental effects of tropical dams. Dams disrupt the continuum of rivers by altering their natural hydrological regimes and create new lentic systems by increasing water residence time. This has cascading effects on the morphology, biogeochemistry and ecology of downstream river environments. Concerning biogeochemistry, dams interrupt the flow of organic carbon, change the nutrient balance and alter water quality. Large reservoirs are also potential hotspots for mineralization processes. Eventually reservoirs, especially in the tropics, may be responsible for substantial amounts of greenhouse gas emissions.

In the first part of the seminar, the main physical and biogeochemical processes leading to water quality alterations in lakes and reservoirs will be introduced. Afterwards, an overview of the different tools that we can use to study lakes and their inner processes will be provided, to finally discuss about how to make choices among the existing tools when approaching a specific problem.

In the second part of the seminar, an assessment of the effects of damming on water quality at low latitudes considering the Zambezi River Basin (Africa) will be presented as a specific case study. The discussion will be focused on the transboundary Lake Kariba, the world's largest artificial lake by volume. Here, downstream water quality alterations depend directly on Kariba's stratification dynamics, its water level and the transboundary policies for water withdrawal from the reservoir. Rising questions in the context of lake research in a changing climate

Short Bio

Elisa Calamita is a Postdoctoral Researcher at the Swiss Federal Institute of Aquatic Science and Technology, Eawag. She received her MSc degree in Environmental Engineering from the University of Trento in 2015 and her PhD in Environmental Science at ETH Zürich in 2020.

During her PhD project, Elisa worked on "[Modelling the effects of large dams on water quality in tropical rivers](#)". She experienced water-quality field campaigns in the Zambezi River Basin and she used lake models to reproduce the internal dynamics of artificial reservoirs and to quantify the water quality alterations in the downstream river systems.

After the PhD, Elisa was awarded the ESA CCI (European Space Agency, Climate Change Initiative) Postdoctoral Research Fellowship, which presently supports her position as a Postdoc at Eawag. Her current research project focuses on the use of remotely sensed data to detect climate change-related ecosystem shifts in lakes. The aim of this project is to analyze the spatial patterns of remotely sensed lake water properties and link such patterns to documented anomalies or shifts in lake ecosystems.