

ESR Project 1

A new generation of coupled watershed-lake water quality models operating at multiple scales

Host institution: Aarhus University (AU), Department of Bioscience, Aarhus, Denmark.

Supervisor: Prof. Dennis Trolle, Aarhus University (AU), Department of Bioscience, Aarhus, Denmark.

Co-Supervisor: Prof. Ann van Griensven, Vrije Universiteit Brussel (VUB), Brussels, Belgium.

The ESR will be enrolled in the 3-year PhD program of Aarhus University, Faculty of Technical Sciences, Aarhus, Denmark.

Project description

On a global scale, lakes and reservoirs are important instruments in flood mitigation and for water supply and recreation. These surface water systems can be highly dynamic and respond quickly to watershed runoff and weather forcing, meaning that water quantity and quality can change rapidly in response to extreme events. Despite the close connection between lakes and their watersheds, only few model projection systems address both entities in an integrated solution. This project will integrate state-of-the-art watershed modelling with state-of-the-art lake and reservoir ecosystem modelling, and enable integrative projections that can aid water managers with adaptation to climate change. The project will take advantage of open source models, including the new SWAT+ watershed model, and the GOTM-WET hydrodynamic-ecosystem model, which are generic in the sense that these may be applied to any location in the world based on open access data (e.g. the globally available Harmonized World Soil Database by FAO, and the GlobCover land use maps from the European Space Agency). The project will be supported by AU and VUB, thereby utilizing great expertise in the open source model cores (SWAT+ and GOTM-WET), which are to be integrated into a new innovation solution.

Expected Results:

1. Innovative watershed-lake modelling system for integrated projections (building further on the already existing models).
2. Development of a software solution that enables climate projections, for any given location, to be downscaled (and bias-corrected) and formatted as input to the integrated watershed-lake modelling system.

3. Demonstration of how long term projections run through the watershed-lake modelling system may aid decision making and adaptation strategies in the water management sector.

Host laboratory

Aarhus University is a high ranking university with approx. 45,000 students. The Department of Bioscience at AU has approximately 275 staff. The candidate will be based in the Modelling Group of the Department of Bioscience, which is currently located in Silkeborg, but will relocate to the main campus in Aarhus in summer 2022. The modelling group is world leading in modelling of eutrophication processes, and has great experience with holistic and cross-disciplinary approaches to science, combining biology with, i.e. computer science, hydrology, geoscience and also molecular biology and genetics. Aarhus is a lively city, with a population of around 260,000. Aarhus is also referred to as the "City of Smiles", and has become a cultural centre where youths flock to study, innovate and start businesses. Aarhus, which is located on the eastern coastline, provides a good blend of modern city life and traditional Danish values.

Secondments

This project is carried out in collaboration with Vrije Universiteit Brussel (VUB) in Belgium. A willingness to travel and spend time abroad is therefore essential:

- Prof. Ann van Griensven, Vrije Universiteit Brussel (VUB), Brussels, Belgium. 4 months visit.

Specific requirements

- The candidate must hold a Master's degree from or equivalent to a Master degree awarded in the European Higher Education Area.
- Master's degree must be in Environmental Engineering, Environmental Sciences, Hydrology, Ecology, or similar.
- Technical Skills required: Good programming skills in typical scientific programming languages (e.g., Python). Willingness to face complex data and modelling problems. Ability with mathematics and statistics are essential. Basic knowledge about climate projections, and ideally also ecological processes affecting water quality in lakes and rivers.

- Proficiency in the English language is required, as well as good communication skills, both oral and written. Applicants from non-Anglophone countries or for those that have not completed their higher education with English as the language of instruction must include an English certificate in the application package (e.g. IELTS, TOEFL, Cambridge English).

HOW TO APPLY

Download the application form from this link: <http://u.pc.cd/LP8ctaIK> and fill it. The application form, together with an official copy of degree(s) (if applicable, an official English translation), course transcripts (if applicable, an official English translation), and English proficiency test results cited in the form, must be sent as a **SINGLE** pdf in a **SINGLE** email to *inventWater-jobs@icra.cat*.

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For additional information on this project, please contact Prof. Dennis Trolle (trolle@bios.au.dk)



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