

Monitoring and numerical modelling of an urban river Hydrodynamics and microbiological contamination of a reach of the River Marne

Context

Monitoring and forecasting the microbiological quality of aquatic environments is necessary to reduce the risk of contamination by pathogens in water resources. European regulation requires a sanitary control based on faecal indicator bacteria (FIB). In rivers, monitoring can be carried out upstream of the region of interest. Due to the transfer time from the measurement point, information on water quality will be available in due time. However, hydro-meteorological conditions can significantly alter the transfer time of a detected contamination upstream. For example, thermal stratification, which occurs during heat waves, leads to differences in flow velocity at different depths. The transfer time between the upstream monitoring site and the area of interest can be accurately calculated with a hydrodynamic model. In order to take into account the spatial and temporal heterogeneity of the distribution of contaminants, the use of two-dimensional or three-dimensional modelling may be necessary.

Within the framework of a project funded by the European Union's Eurostars programme, LEESU offers an internship in collaboration with the Syndicat Marne Vive, which is responsible for the objective of restoring bathing in the River Marne.

Objective of the internship

The main objective of the internship is the physico-chemical monitoring of a reach of the River Marne (approximately 1km) where a bathing site is planned. Two continuous measurement systems are installed, upstream and downstream of the reach studied. A three-dimensional hydrodynamic model is being implemented on this reach of the river. The model variables are flow velocity, water temperature and faecal indicator bacteria (FIB) concentration. The collected field data will be used to calibrate the model parameters and validate the simulation results.

Organisation of the internship

The following steps are planned:

- Participation in field campaigns;
- Processing and analysis of continuous station data and field data;
- Participation in the calibration of the main model parameters. This part will be carried out in close collaboration with the LHSV (Laboratoire d'Hydraulique Saint Venant, EdF/Ecole des Ponts).
- Simulation of a few characteristic periods and comparison of the results with field data.

Used softwares

- Telemac-Mascaret open source code (www.opentelemac.org)
- Matlab for processing field data, preparing model forcing data and analysing simulation results.

Candidate profile

- Final year of engineering school; Master 1 or Master 2.
- fieldwork and data analysis skills
- Experience of coding softwares such as Python, R or Matlab will be very useful. A valid driving licence will be appreciated.

Duration 4 to 6 months from March 2023

Conditions The internship will take place at LEESU, Ecole des Ponts ParisTech, Marne-la-Vallée. Exchanges with the Syndicat Marne Vive (Saint-Maur-des-Fossés) are planned.

Internship grant, access to the restaurant of the Ecole des Ponts.

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