Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Laboratory of Hydraulics,
Hydrology and Glaciology

Master's Thesis
FS 2024

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Simulation of particle transport in rivers using a Lagrangian method

Lagrangian particle tracking approaches nowadays offer high potential for understanding the transport and deposition of floating particles in open channel flows, like sediments, pollutants, plastics, litter, plant seeds and dead wood. These types of models resolve the trajectory of single particles moving into a flow field and are usually paired with 2D flow solvers based on the shallow-water equations. However, Lagrangian approaches often result in high computational costs, especially in large domain.

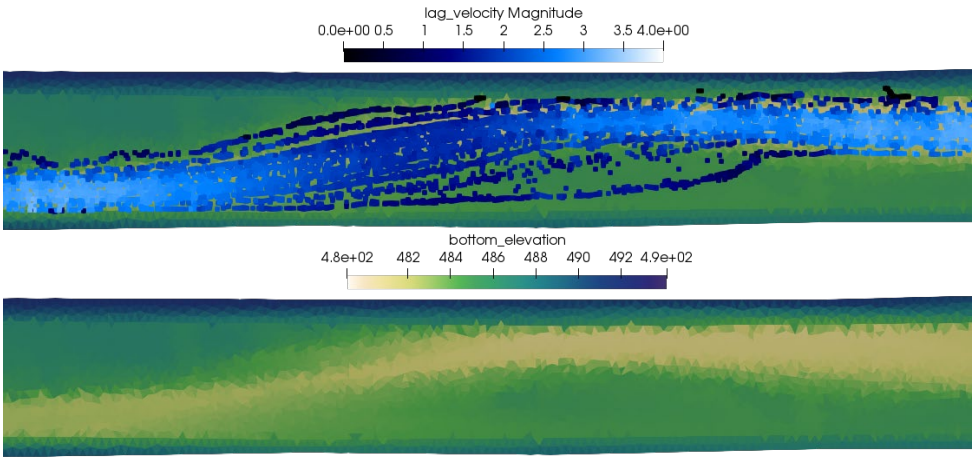

Fig. 1: Visualization of the particle model output in a straight channel with alternate bars simulated with BASEMENT

In this project, we aim at testing a newly developed Lagrangian model within the BASEMENT software considering the transport by advection-diffusion processes of massless, floating particles (example in Fig. 1). Features that will be tested may include (i) code efficiency depending on the number of particles and CPUs, (ii) particle deposition approaches, (iii) particle trajectories in complex flow fields, and (iv) the treatment of turbulence effect on particle dynamics. The end results of the project will greatly contribute to the model development and the future release of the code in BASEMENT, as well as to advance our knowledge of transport processes in rivers.

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Remarks: Research-based thesis, good modelling skills required.
Correspondence and thesis in English