



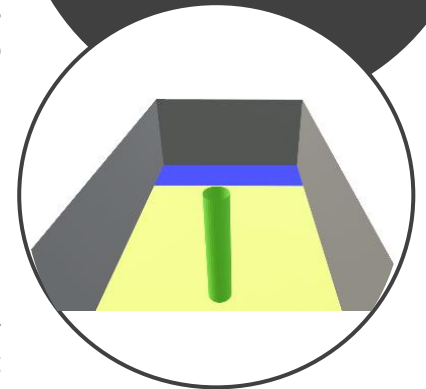
M.Sc. Topic

Numerical modeling of turbulence around a cylinder in 2d and pseudo-3d

Background

In hydraulic engineering, structures placed in free-surface flows like rivers are considered obstacles that disturb the hydrodynamic flow continuum. These disturbances generate turbulence, which can cause erosion, typically occurring around bridge piers. As a part of an inter-model comparison, this Master's thesis project uses multi-dimensional numerical modeling to systematically investigate solver parameters affecting turbulence patterns and turbulent kinetic energy (TKE). This project involves building a 2d and 3d numerical model of a rectangular flume using the open-source software TELEMAC. A wall-mounted vertical cylinder is placed in the flume to study turbulent patterns and TKE in near- and far-wake regions. The systematic comparison of different turbulence solver parameters constitutes the main study objective. Ultimately, the simplicity of the study aims at testing quasi-direct numerical simulation of free-surface hydrodynamics, which is yet unachieved in hydraulic engineering. The required data are available from existing models.

**Numerical modeling of
turbulence around a
cylinder in 2d and
pseudo-3d**



Thesis Overview

1. Review literature on hydrodynamic turbulence modeling.
2. Familiarize with QGIS and TELEMAC.
3. Set up the numerical model of the flume with cylinder.
4. Explore the influence of solver parameters related to turbulence (e.g., detached eddy or large eddy simulations).
5. Systematically interpret the simulation results.

Required Skills

Course work in numerical modeling or accomplish a prior numerical modeling challenge.



Apply now!

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The thesis can be written in German or English.

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