

3-D Finite Element modelling of environmental flows with TELEMAC-3D: an extension to beds comprising vertical sections

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ABSTRACT

The TELEMAC-MASCARET open source suite of solvers is dedicated to the numerical simulation of environmental flows [2]. It includes a module for 3-D simulation, named TELEMAC-3D. This module is based on a Finite Element Method, and uses layered 3-D meshes with prismatic elements. TELEMAC-3D can account for the meteorological conditions, tidal boundary conditions, sediment transport, heat exchanges with the atmosphere, the presence of active or passive tracers in the flows, etc.[1]. It can be run on many processors with a good scalability [3]. It is thus a powerful tool for environmental simulations.

In this work, the focus will be laid on the representation of beds comprising vertical sections. Indeed, the layered structure of the mesh makes the data access and neighbour search very efficient, but it also limits the modelling of submerged bodies in the flows, or beds with vertical sections. In particular, the simulation of flows on vertical weirs or steps is not possible with this approach. We thus propose a solution to enable TELEMAC-3D to represent beds comprising vertical sections, while keeping the layered structure of the mesh. This approach will be tested on several cases in order to check the quality of the results (one of them is represented in the Figure below).

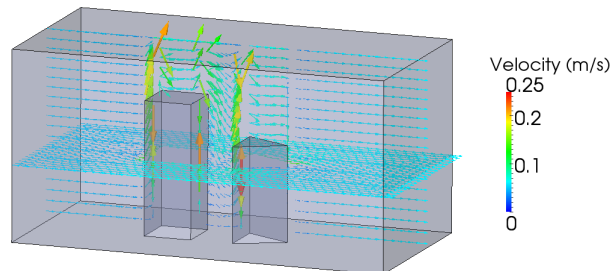


Figure 1: An example of a TELEMAC-3D simulation comprising vertical structures on the bed.

REFERENCES

- [1] J.-M. Hervouet, *Hydrodynamics of free-surface flows: modelling with the Finite Element method*. Wiley, 2007.
- [2] Open TELEMAC-MASCARET, [online] Available at: <http://www.opentelemac.org/> [Accessed 16 Nov. 2016], 2016.
- [3] C. Moulinec, HPC evolution of the TELEMAC system, *E-proceedings of the 36th IAHR World Congress*, 28 June – 3 July, 2015, The Hague, the Netherlands.