9th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMA2024)
June 3-7, 2024, Lisbon, Portugal

ADVANCES IN NUMERICAL METHODS FOR SHALLOW WATER EQUATIONS AND ITS APPLICATIONS

TRACK NUMBER 1700

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Keywords: Shallow Water Equations, Free Surface Models, Computational Fluid Dynamics

ABSTRACT

The last decades were characterized by a rapid growth of natural hazards involving not only large mass movements on complex terrain such as landslides, debris flows, and mud flows, but also floods and tsunamis. In this scenario, the modeling and simulation of these physical phenomena have become essential in many areas of applied and industrial sciences. Shallow Water Equations represent a fundamental mathematical tool for comprehending and modeling this kind of phenomena. The simulation of the above events still represents a big challenge for different reasons: the need to deal with large strain regimes, the intrinsic multiphysics nature of such events, and the difficulties induced by the geometric complexity of the terrain under consideration. These complexities necessitate the development of advanced numerical methods to be able to obtain an accurate and reliable numerical solution. Classical finite element methods are well established and widely used in many engineering fields both in academia and industry, but they can show some limitations. This is particularly true when dealing with problems where large deformation occurs, like, e.g., hypervelocity impact, crack propagation, multi-phase interactions, and free surface simulations. In recent years, possible alternatives have been proposed and developed to overcome this drawback.

In this Minisymposium, we will delve into the connection between the SWE model and its numerical solution, with a focus on the recent advances in the available numerical methods. This Minisymposium aims at covering the state-of-the-art in the mathematical and computational framework for solving the shallow water model to stimulate interdisciplinary research in applied mathematics and to foster interactions among the scientific community.