

MLS-BASED SELECTIVE LIMITING FOR SHALLOW WATERS EQUATIONS: APPLICATION TO THE DAM-BREAK PROBLEM

Jesús Cernadas¹, Xesús Nogueira¹ and Ignasi Colominas¹

¹ Group of Numerical Methods in Engineering, Dept. of Applied Mathematics, Universidade da Coruña, Campus de Elviña, 15071, A Coruña, Spain,
jesus.cernadas@udc.es, xnogueira@udc.es, icolominas@udc.es

Key Words: *Shallow Waters, High-order, Finite Volume Method, Shock Detection.*

Finite Volume Methods were successfully used in the last years to solve differential hyperbolic problems [1]. Our research is focused here on the use of the Moving Least Squares (MLS) approximations for the development of a selective limiting technique to keep the accuracy of high-order methods in non-smooth flows. Following [2] we use the multiresolution properties of the MLS methodology and we define a shock-detection technique to act as a smoothness indicator. This sensor is used to detect shock waves present in the flow problem. The use of this technique combined with slope limiters improves the accuracy of the resulting TVD scheme.

In this work we present the first results obtained with this technique applied to the resolution of the shallow waters equations with a high-order FV-MLS scheme [3]. We present several 1D results and we compare them with those obtained with other high-order schemes such as the WAF Method [4].

REFERENCES

- [1] Randall J. Leveque, *Finite-Volume Methods for Hyperbolic Problems*. Cambridge, 2005
- [2] X. Nogueira, L. Cueto-Felgueroso, I. Colominas, F. Navarrina, M. Casteleiro, *A new shock-capturing technique based on Moving Least Squares for higher-order numerical schemes on unstructured grids*, Computer Methods in Applied Mechanics and Engineering, 199, 2544-2558, 2010.
- [3] L. Cueto-Felgueroso, I. Colominas, X. Nogueira, F. Navarrina, M. Casteleiro, *Finite volume solvers and Moving Least-Squares approximations for the compressible Navier-Stokes equations on unstructured grids*, Computer Methods in Applied Mechanics and Engineering, 196, 4712-4736, 2007.
- [4] Eleuterio F. Toro, *Shock-Capturing Methods for Free-Surface Shallow Flows*, Manchester Metropolitan University, UK, 2001.