

Different Models to solve Non-Hydrostatic Pressure Shallow Flows with Roe-type Riemann Solvers

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SUMMARY

Roe-type Riemann solvers are widely applied to solve the Shallow Water Equations (SWE) in hydrostatic systems. However, when extending these models to include non-hydrostatic effects, other simpler schemes has been frequently used in the past, entailing a big difference between hydrostatic and non-hydrostatic numerical models. This work extends a finite volume numerical scheme previously designed for hydrostatic SW formulation that has been applied with great success in large domains, to a Non Hydrostatic Pressure (NHP) depth averaged model. Additionally, the work explores the available options in the context of previous work in this field: Hyperbolic-Elliptic (HE-NHP) formulations solved with a Pressure-Corrected technique (PCM) [1] and Hyperbolic Relaxation formulations (HR-NHP) [2], in order to find the most suitable model to be solved with a Roe scheme. The performance of both models are compared. The extension of the scheme is assessed obtaining good results. The necessity of understanding the behaviour of the model and the numerical scheme is highlighted.

Keywords: Non-Hydrostatic Pressure, Hyperbolic-Elliptic, Hyperbolic relaxation, Roe Solver

AMS Classification: 35-04, 64-05, 76-04

References

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