

# STUDY OF RIEMANN SOLVERS FOR EULER EQUATION WITH GENERAL EQUATION OF STATE

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ABSTRACT. In this work we compare novel Riemann solvers designed to solve the Euler equation when considering general Equation Of State (gEOS). In [1] an adaptive Osher-type Riemann solver was presented that can handle highly nonlinear equations of state together with an exact(iterative) algorithm for the Euler+gEOS Riemann problem. In [2] a Roe-type numerical algorithm was presented for general hyperbolic partial differential equations which can solve gEOS problems. Recently in [3] a flux splitting approach shows the numerical solution of the Euler+gEOS problems in three dimensions.

In this presentation we show numerical results comparing computational time needed to solve several typical benchmark problems including high-order implementation in the context of ADER finite volume schemes. We plan to extract some conclusion on the efficiency of these solvers depending on the character of the different test problems.

**Keywords:** Euler system, general equation of state, high-order finite volume, ADER

**Mathematics Subject Classifications (2010):** 65N08

## REFERENCES

- [1] Bok Jik Lee, Eleuterio F. Toro, Cristóbal E. Castro and Nikolaos Nikiforakis. Adaptive Osher-type scheme for the Euler equations with highly nonlinear equations of state. *Journal of Computational Physics*, 246:165-183, 2013.
- [2] Cristóbal E. Castro and Eleuterio F. Toro. Roe-type Riemann solvers for general hyperbolic systems. *Int. J. Numer. Meth. Fluids*, 75:467-486, 2014.
- [3] Eleuterio F. Toro, Cristóbal E. Castro and Bok Jik Lee. A novel numerical flux for the 3D Euler equations with general equation of state. *Journal of Computational Physics*, 303:80-94, 2015.

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