

Invariant domain preserving approximations for the Euler equations with a tabulated equation of state

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We will present a construction of a first order invariant domain preserving method for the compressible Euler equations supplemented with an equation of state that is either tabulated or is given by an expression which makes solving the local Riemann problems either impossible or computationally very expensive. That is the pressure is coming from an oracle providing us with point values when needed. Under the assumption that the oracle provides positive pressure values for positive input for density and internal energy, we will construct a numerical method that under a standard CFL condition preserves on discrete level the invariant domain of the system: positivity of density and internal energy. Moreover, if the oracle used is a simple ideal gas law we will recover the minimum principle on the specific entropy for that case.

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