

Theoretical and numerical analysis of a simple turbulent compressible model.

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Abstract

Turbulent compressible flows are encountered in many industrial applications, for instance when dealing with combustion or aerodynamics. This paper is dedicated to the study of a simple turbulent model for compressible flows. It is based on the Euler system with an energy equation and turbulence is accounted for with the help of an algebraic closure that impacts the thermodynamical behavior. Thereby, no additional PDE is introduced in the Euler system. First, a detailed study of the model is proposed : hyperbolicity, structure of the waves, nature of the fields, existence and uniqueness of the Riemann problems. Then, numerical simulations are proposed on the basis of existing finite-volumes schemes. These simulations allow to perform verification test cases and more realistic explosion-like test cases with regards to the turbulence level.

We refer the reader to [1, 2] for details.

- [1] S. L. Gavriljuk, J.-M. Hérard, O. Hurisse, A. Toufaili. *Theoretical and numerical analysis of a simple turbulent compressible model*, 2020. Working paper or preprint.
- [2] J.-M. Hérard, H. Lochon. *A simple turbulent two-fluid model*. *Comptes Rendus Mécanique*, **344**(11-12), 776–783, 2016.