

國立交通大學應用數學系

學術演講公告

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講題：The Multiscale Flows of Compressible Euler Equations
near-vacuum states

時間：109年6月9日(星期二) 下午 14:00 –15:00

地點：(光復校區) 科學一館 223 室

茶會：當天下午 13:30 (科學一館 205 室)

Abstract

In this work, we use multiscale expansions to study the compressible Euler equations near-vacuum states. The vacuum states of the compressible Euler equations have been investigated for decades by many researchers. In our work, we propose a different model to simulate the situation when initial density is very close to 0 and velocity is $O(1)$. We expand the density and the velocity according to the amplitudes and derive the leading-order system for the leading-order term in the expansion. We explore the properties of the solutions of the leading-order system and prove the existence of vacuum states in the multiscale gas flows governed by the Cauchy problem of compressible Euler equations. We briefly summarize the significance and novelty of this work as follows.

1. We formulate the leading-order system and find the analytical expression of the solutions. The system is reduced to a hyperbolic resonant system and therefore the Riemann problem is no longer suitable for the Glimm Scheme. We further introduce the regularized Riemann problem to control the total variation of the solutions.
2. We prove the proposed regularized Riemann problems are stable under the perturbation coming from initial conditions.
3. The stability and consistency of the leading-order system have been demonstrated and used to establish the existence for the Cauchy problem of the compressible Euler equations.
4. Our numerical results confirm the behaviours of the solutions near-vacuum states, and verify the estimates for the stability of the leading-order equations. The results also suggest the L^1 convergence of the solutions of the compressible Euler equations to the solutions of the leading-order system. The actual proof is under progress.
5. We discuss some issues about the higher-order approximation and possible solutions. These are topics for future works.

敬請公告 歡迎參加

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