Colloquium

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Research Interest: Partial Differential Equations, Fluid Mechanics

108年03月27日(三) 14:30~15:30 應用數學系多媒體教室 (408)

Composite Hyperbolic Waves in Resonant Hyperbolic Systems of Balance Laws

Abstract: The global in time existence and behaviour of composite hyperbolic waves to the resonant hyperbolic systems of balance laws are studied. The resonant hyperbolic systems we study have the property that all the eigenvalues of Jacobian matrix of the flux are coincided in the whole phase domain. We give an example of a weak solution with vacuum for the classical Riemann problem of some entirely resonant system to indicate that the self-similar Riemann solution is not an appropriate building block of Glimm scheme to Cauchy problem of such systems. Instead, we invent a regularised Riemann problem with perturbed Riemann data. The weak solutions of such Riemann problem consists of constant states separated by the composite hyperbolic waves, which are the combination of nonlinear hyperbolic waves and contact discontinuities. Such composite waves have finite total variations so that the generalised Glimm scheme can be applied to establish the global existence of weak solutions for the entirely resonant systems. The results indicate that the resonance provides an effect of singularity which cannot be coupled with the singularity of Riemann data. It means that the generalised Riemann solutions with composite hyperbolic waves can be a more appropriate building block of generalised Glimm scheme for hyperbolic resonant system.

This is a joint work with Hsin-Yi Lee (NCU), Jia-Chieh Chu (NTHU) and Shi-Wei Chou (Soochow University).