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The Hong Kong University of Science and Technology

Department of Mathematics

Seminar on Applied Mathematics

(1) On Hyperbolic Moment Models for Kinetic Equation
(2) Viscos Regularization for Moment System of Boltzmann Equation
(3) Viscos Regularization for Moment System of Boltzmann Equation

by

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Abstract

(1) In this talk, I will introduce the theory of the moment model reduction of Boltzmann equation we developed in recent years, together with the latest progress. By our exploration, it was found that the hyperbolicity of the reduced moment model for generic kinetic equation can always be achieved, and the method provides us a symmetric hyperbolic system that the local wellposedness of the reduced model is not a problem any more.

(2) In the last years, we systematically developed the method and the theory of the model reduction theory for kinetic equation without collision terms, to derive a symmetric hyperbolic system as the low dimensional model. The reduced model is formally an extension of the Euler equation. For the moment system for Boltzmann equation, we may derive a reduced model as NS system with the present of collision term using techniques as Chapman-Enskog expansion. The tool for the high order moment system is the so called Maxwell iteration and the analysis of moment order of magnitude. By some detailed calculation and approximation, we obtain a second order elliptic term as the viscos regularization term, formally as the viscos term in NS system. For simplicity in calculation, I will only consider the BGK collision model.

(3) In this talk, I will give a short review the new framework to the model reduction of kinetic equation. Based on this framework, it is guranteed to derive a symmetric hyperbolic system as the reduced model, using any ansatz to the solution of the kinetic equation and any closure. Therefore, the local wellposedness of the reduced model is automatically attained. As the focus of the talk, I will introduce some possible new applications, which include some problem we have or are to be tried, such as refined boundary condition of NSF, model reduction of radiative tranfer, and new numerical approach for density functional theory.

Date: ***Monday, 21 Aug 2017***

Time: ***2:00p.m. – 5:00p.m.***

Venue: ***Room 4475, Academic Building***
(near Lifts 25 & 26), HKUST

All are welcome!