Workshop on Nonlinear Partial Differential Equations

November 30th, 2016, 14:00-17:30

Venue: 110 Chinese Classics Building (国学馆 110 教室),

Renmin University of China

Organized by: Yuan Lou, Yaobin Ou

Sponsors: Renmin University of China,

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Program

14:00 - 14:45 黄飞敏 教授 (Feimin Huang)

Isentropic compressible Euler system with source terms

14:45 - 15:30 李海梁 教授 (Hailiang Li)

Non-existence of finite energy solution to Compressible Navier-Stokes equations

15:30 - 16:00 茶歇 (Tea Break)

16:00 - 16:45 王术 教授 (Shu Wang)

Boundary Layer Problem and Zero Viscosity-Diffusion Vanishing Limit of the Incompressible Magnetohydrodynamic System with Dirichlet Boundary Conditions

16:45 - 17:30 江松 教授 (Song Jiang)

Steady viscous compressible channel flows

Title and Abstract

Isentropic compressible Euler system with source terms

Feimin Huang
Chinese Academy of Sciences
fhuang@amt.ac.cn

Abstract. In this talk, we develop a new technique to prove the global existene of entropy solutions to an inhomogeneous isentropic compressible Euler equations through the compensated compactness and vanishing viscosity method.

Steady viscous compressible channel flows

Song Jiang
Institute of Applied Physics and Computational Mathematics, Beijing
jiang@iapcm.ac.cn

Abstract. We prove the existence and uniqueness of strong solutions to the steady isentropic compressible Navier-Stokes equations with inflow boundary condition in a 2-D finite channel near a uniform flow. The proof is based on the delicate a priori estimates and exploitation of the elliptic theory. For our result, we do not require the velocity, density, the Reynolds number and the Mach number to be small. (joint work with Y. Guo and C. Zhou)

Non-existence of finite energy solution to Compressible Navier-Stokes equations

Hailiang Li
Capital Normal University
hailiang_li@cnu.edu.cn

Abstract. It is an open problem to show the well-posedness of classical solution to compressible Navier-Stokes equations with the density possibly containing vacuum, although the same problem has been proved by Nash and Serrin in energy space in 1960s when the vaccum is excluded. In this talk, we shall prove that there does not exit any classical solution with density being compact supported to the Cauchy problem for one-dimensional compressible Navier-Stokes equaions in energy space so long as the initial data satisfy some properties.

Boundary Layer Problem and Zero Viscosity-Diffusion Vanishing Limit of the Incompressible Magnetohydrodynamic System with Dirichlet Boundary Conditions

Shu Wang
Beijing University of Technology
wangshu@bjut.edu.cn

Abstract. In this paper, we study the boundary layer problem, zero viscosity-diffusion vanishing limit and zero magnetic diffusion vanishing limit of the initial boundary value problem for the incompressible viscous and diffusive magnetohydrodynamic(MHD) system with Dirichlet boundary conditions and general viscosity and diffusion coefficient. The main difficulties overcome here are to deal with the effects of the the difference between the viscosity and diffusion coefficient on the error estimates and to control the boundary layer resulted by the Dirichlet boundary condition for the velocity and magnetic field. Firstly, we establish the result on the stability of the Prandtl boundary layer of MHD system with a class of special initial data and prove rigorously the solution of incompressible viscous and diffusive MHD system converges to the sum of the solution to the ideal inviscid MHD system and the approximating solution to Prandtl boundary layer equation by using the elaborate energy methods and the special structure of the solution to inviscid MHD system, which yields that there exists the cancelation between the boundary layer of the velocity and the one of the magnetic field. Next, we obtain the stability result on the boundary layer for the magnetic field and zero magnetic diffusion limit of viscous and diffusive MHD system with the general initial data when the magnetic diffusion coefficient goes to zero. Finally, for general initial data, we consider the boundary layer problem of the incompressible viscous and diffusive MHD system with the different horizontal and vertical viscosities and magnetic diffusions, when they go to zero with the different speeds. We prove rigorously the convergence to the ideal inviscid MHD system and the anisotropic inviscid MHD system from the incompressible viscous and diffusion MHD system by constructing the exact boundary layers and using the elaborate energy methods. We also mention that these results obtained here should be the first rigorous ones on the stability of Prandtl boundary layer for the incompressible viscous and diffusion MHD system with no-slip characteristic boundary condition.

Location of Lecture Hall