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		On the stability and instability of the Rayleigh-Taylor problem in capillary fluids
	In this talk, I will report the mathematical studies on the Rayleigh-Taylor (RT) problem in viscous incompressible capillary fluids driven by gravity in a smooth bounded domain. We find that the capillarity have the stabilizing effect on the RT instability. It is shown that if the equilibrium density $\overline{\rho}$ is a RT type and $\overline{\rho}'$ is strictly positive, there exists a finite critical capillary coefficient κ_c, such that when the capillary coefficient $\kappa < \kappa_c$, the RT steady state is linear instability and, for the case $\kappa > \kappa_c$, the RT steady state is linear stability. However, when κ is small enough, the RT steady state is also nonlinear instability. This work is jointed with Prof. Fucai Li.	
		Low Mach number limit of the non-isentropic ideal magnetohydrodynamic equations
	Abstract Low Mach number limit of the non-isentropic ideal magnetohydrodynamic (MHD) equations with large variation of entropy and general initial data in R3 was investigated by Jiang, Ju and Li [SIAM J. Math. Anal. 48 (2016), 302{319]. To obtain the uniform estimates of solutions in Hs with respect to the Mach number, one of the key assumptions is that the Sobolev index s 4 is even. In this talk, for well-prepared initial data, we revisit the low Mach number limit of the non-isentropic ideal compressible MHD equations with large variation of entropy in the torus T3 and the whole space R3 under lower regularity assumptions by dierent approaches. First, the uniform estimates of div and curloperators are established by energy methods. Next, by estimating the gradient of vector elds via div and curl operators, we obtain the uniform existence of classical solution on a time interval independent of the Mach number when the initial data are bounded in H3. Based on the above uniform estimates, the low Mach number limit is established. More precisely, it is rigorously justied that the solution of original equations converges to that of incompressible inhomogeneous MHD equations as the Mach number tends to zero.	

		DISSIPATIVE SOLUTIONS TO THE COMPRESSIBLE ISENTROPIC NAVIER-STOKES EQUATIONS
	Abstract: In this talk, we will study the dissipative solutions to the compressible isentropic Navier-Stokes equations. The notion was inspired by the concept of dissipative solutions to the incompressible Euler equations of Lions (book-1996, Section 4.4). We prove the existence of the dissipative solutions to the compressible isentropic Navier-Stokes equations. Moreover, we present the relation between the weak solution and the dissipative solution to the compressible isentropic Navier-Stokes equations.	
		The Cauchy problem for the fermion equation in weighted Sobolev spaces
	Abstract : In this talk, we will deal with the global well-posedness and the asymptotic behavior of the solution of the fermion equation in the Sobolev spaces with a polynomial weight in the torus. We first investigate the linearized equation and obtain the optimal exponential decay rate for the associated semigroup. Our strategy is taking advantage of quantitative spectral gap estimates in smaller reference Hilbert space, the factorization method and the enlargement of the functional space. We then turn to the nonlinear equation and prove the global existence and uniqueness of solutions in a close-to-equilibrium regime. Moreover, we prove an exponential stability for such a solution with the optimal decay rate given by the semigroup decay of the linearized equation. This work is joint with Professor Kung-Chien Wu.	
		Global weak solutions for a kinetic-fluid model with local alignment force in a bounded domain
	Abstract We study a kinetic-flfluid model in a 3D bounded domain. More precisely, this model is a coupling of the Vlasov-Fokker-Planck equation with	

	the local alignment force and the compressible Navier-Stokes equations with nonhomogeneous Dirichlet boundary condition. We prove the global existence ! 3/2) and hence extend the existence result of Choi and Jung [Asymptotic analysis for a Vlasov-Fokker-Planck/Navier-Stokes system in a bounded domain, arXiv: 1912.13134v2], where the velocity of the flfluid is supplemented with homogeneous Dirichlet boundary condition.	

	the existence and regularity of solutions to the VPB system with soft potential in a bounded convex domain in the case of in-flow boundary condition. We establish the existence of strong solutions in the time interval $[0,T]$ for an arbitrary given $T>0$ when the initial distribution function is near an absolute Maxwellian. Our contribution is based on a new weighted energy estimate in some $W^{1,p}$ space and $L_x^3 L_v^{1+}$ space for soft potential. By using the classical L^2--L^∞ method and bootstrap argument, we extend the local solutions from small time scale to large time scale.
	SHARP DECAY ESTIMATES FOR THE VLASOV-POISSON SYSTEM WITH AN EXTERNAL MAGNETIC FIELD
	Abstract: In this talk, we establish sharp decay estimates for the Vlasov-Poisson system with an external magnetic field on R^3 R^3. Our arguments are based on the modified vector field method developed in [33] for the classical Vlasov-Poisson system in 3-D case, and hence we extend some results in [33] to the Vlasov-Poisson system with an external magnetic field.

Global well-posedness to three-dimensional full compressible magnetohydrodynamic equations with

	full compressible Navier Stokes equations was obtained under the condition viewed as the first one on the global existence of strong solutions to 3D Cauchy problem for compressible non-isothermal nematic liquid crystal flows with vacuum.	
		Global well-posedness and optimal large-time behavior of strong solutions to the non-isentropic particle-fluid flows
	In this talk, we consider the large-time decay near equilibrium of a non-isentropic particle-fluid flow system. The energy balance equation of the fluid part of the system is given by $$ \partial_t (nE) + \nabla \cdot ((nE + p) u) - \kappa \Delta \widetilde \theta = \Cal F, $$ where the viscous flux term $\nabla \cdot (\nabla u u)$ is omitted, in contract to the classical compressible Navier-Stokes equations [E. Feireisl, Dynamics of viscous compressible fluids, Oxford Lecture Ser. Math. Appl., 26, Oxford Univ. Press, Oxford, 2004; MR2040667]. The global existence of smooth solutions near equilibrium is established both $\Bbb R^3$ and $\Bbb T^3$. Optimal algebraic exponential decays are obtained in $\Bbb R^3$ and $\Bbb T^3$, respectively. The proofs are based on a new macro-micro decomposition, and careful estimates of the momentum functionals. Compared to previous results, the appearance of temperature and the interaction of temperature with the particle-fluid flows increase the complexity of the analysis.	
		Stability and instability of the 3D homogeneous incompressible viscous flow in a smooth bounded domain
	Abstract: In this talk we discuss the stability and instability of the steady state $(0,p_s)$ for the 3D homogeneous incompressible viscous flow in a smooth bounded simply connected domain with Navier boundary condition. It is shown	

	that there exists a critical slip friction coefficient $C_r \mu$ such that if the slip friction coefficient ζ is less than $C_r \mu$, then the steady state $({0,p_s)$ is linearly and nonlinearly unstable and conversely, for the case $\zeta>-C_r \mu$, the steady state $(0,p_s)$ is linearly and nonlinearly stable. This talk is based on the joint work with Ronghua Pan and Zhipeng Zhang.

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