

Workshop on Analysis and Applications of PDEs

7 – 8 April 2017

Sponsors:

The AMSS-PolyU Joint Research Institute
The Hong Kong Polytechnic University

Organizers:

Renjun Duan
Zhian Wang
Tong Yang

The Chinese University of Hong Kong
The Hong Kong Polytechnic University
City University of Hong Kong

Schedule – 7th April 2017 (Friday)

Venue: Room TU801, 8/F, Core T, Yip Kit Chuen Building, PolyU

Time	Speaker / Title
09:25-09:30	Opening remark
<i>Session Chair</i>	<i>Tong Yang</i>
09:30-10:10	Mario Pulvirenti , Università di Roma La Sapienza From N-Body Schrödinger to Hartree: Uniformity in \hbar
10:10-10:30	Coffee & Tea Break
<i>Session Chair</i>	<i>Zhian Wang</i>
10:30-11:10	Yong Jung Kim , KAIST Advection and cross-diffusion models customized by population dynamics
11:10-11:50	Hongjun Yu , South China Normal University Global solution to the inhomogeneous non-cutoff Kac equation
12:00-14:30	Lunch
<i>Session Chair</i>	<i>Renjun Duan</i>
14:30-15:10	Yoshinori Morimoto , Kyoto University Generalized Toscani metric and the spatially homogeneous Boltzmann Equation
15:10-15:50	Huanyao Wen , South China University of Technology Global well-posedness of solutions to a drift-flux model
15:50-16:10	Coffee & Tea Break
<i>Session Chair</i>	<i>Huanyao Wen</i>
16:10-16:50	Shuangqian Liu , Jinan University The Boltzmann equation with weakly inhomogeneous data in bounded domain
16:50-17:30	Yong Wang , Chinese Academy of Sciences The Boltzmann equation with large-amplitude initial data in bounded domains
18:00-20:30	Banquet

Schedule – 8th April 2017 (Saturday)

Venue: Room TU801, 8/F, Core T, Yip Kit Chuen Building, PolyU

Time	Speaker / Title
<i>Session Chair</i>	<i>Wei Xiang</i>
09:30-10:10	Myoungjean Bae , POSTECH Subsonic flow of Euler-Poisson system with nonzero vorticity
10:10-10:50	Weiran Sun , Simon Fraser University Radiative transfer equation with the Heney-Greenstein kernel
10:50-11:00	Break
<i>Session Chair</i>	<i>Xianpeng Hu</i>
11:00-11:50	Haiyang Jin , South China University of Technology Direct chemotaxis vs. indirect chemotaxis
12:00-14:00	Lunch
14:00-16:00	Free Discussion

Subsonic flow of Euler-Poisson system with nonzero vorticity

Myoungjean Bae
POSTECH, Korea

Abstract: Steady compressible Euler-Poisson system

$$\begin{cases} \operatorname{div}(\rho \mathbf{u}) = 0 \\ \operatorname{div}(\rho \mathbf{u} \otimes \mathbf{u}) + \nabla p = \rho \nabla \Phi \\ \operatorname{div}(\rho(\mathbf{e}(p, \rho) + \frac{p}{\rho}) \mathbf{u}) = \rho \mathbf{u} \cdot \nabla \Phi \\ \Delta \Phi = \rho - b \end{cases}$$

models various physical phenomena, including the propagation of electrons in sub-micron semiconductor devices and plasmas. Similarly to compressible Euler system, Euler-Poisson system changes its mathematical feature depending on the Mach number $M = \frac{|\mathbf{u}|}{c(p, \rho)}$. But, due to a nonlocal and nonlinear effect of electric potential Φ , one needs a new approach to study subsonic, supersonic or transonic flows of Euler-Poisson system. In this talk, I will discuss on the following subjects:

1. 1-d flows of Euler-Poisson system;
2. transonic shock problem;
3. multidimensional subsonic solutions: potential flow, flow with nonzero vorticity.

This talk is based on several joint works with Ben Duan, M. Feldman, Yong Park, Shangkun Weng and Chunjing Xie.

Direct chemotaxis vs. indirect chemotaxis

Haiyang Jin
South China University of Technology

Abstract: In this talk, we will consider some chemotaxis models with indirect signal production. We show that in contrast to the classical Keller-Segel chemotaxis model reflecting immediate signal secretion by the cells themselves, the indirect mechanism of signal production in chemotaxis model has drastic influence on the solution behavior.

Advection and cross-diffusion models customized by population dynamics*Yong Jung Kim*

KAIST, Korea

Abstract: Migration is a survival strategy of a biological species and usually modeled by advection or diffusion. In this paper we derive a few biological advection and diffusion models which are customized by population dynamics. The population dynamics in logistic, Lotka-Volterra type competition and predator-prey equations are considered and the resulting advection and cross-diffusion models turn out to be logarithmic ones. These derivations provide meaningful coefficients regimes.

The Boltzmann equation with weakly inhomogeneous data in bounded domain*Shuanqian Liu*

Jinan University

Abstract: This talk is concerned with the Boltzmann equation with specular reflection boundary condition. We will show how to construct a unique global solution for the Boltzmann equation in bounded domain and obtain its large time asymptotic behavior in the case that the initial data is close enough to a radially symmetric homogeneous datum. This is a joint work with Prof. Y. Guo.

Generalized Toscani metric and the spatially homogeneous Boltzmann Equation*Yoshinori Morimoto*

Kyoto University, Japan

Abstract: From the middle of 1990s, Toscani and his coauthors, analytically, studied the existence, the uniqueness and the asymptotic behavior of solutions to the Cauchy problem for the non-cutoff spatially homogeneous Boltzmann equation of Maxwellian molecules, introducing the so-called Toscani metric defined in the space of the Fourier image of probability measures, motivated by an earlier work of Hiroshi Tanaka ('78) by means of the probabilistic method. By using the Toscani metric on probability measures with moments less than 2, Cannone-Karch ('10) studied infinite energy solutions to the above Cauchy problem, which include self-similar solutions given by Bobylev-Cercignani('02). In order to establish the existence theory and smoothing effect of measure valued solutions for the non-cutoff homogeneous Boltzmann equation, the Toscani metric was generalized on probability measures with moments less than 2 in a series of joint works with S. Wang and T. Yang. Furthermore, in a recent paper (SIAM J.M.A. '16) by Y.-K. Cho and us, the class of probability measures possessing finite moments of an arbitrary positive order is characterized in terms of the symmetric difference operators of their Fourier transforms. In this talk, I state this generalized Toscani metric which is equivalent to the Monge-Kantorovich-Wasserstein metric, and moreover review the existence and smoothing effect of measure valued solutions, including the non Maxwellian molecules case.

From N-Body Schrödinger to Hartree: Uniformity in \hbar *Mario Pulvirenti*

Università di Roma La Sapienza, Italy

Abstract: It is well known that, under the mean-field scaling, the solution of the N-Body Schrödinger equation converge to the solution of the nonlinear Hartree equation. However the rate of convergence is strongly diverging when \hbar is vanishing. Since the same result is also valid for classical system (in this case the limiting equation is the Vlasov equation) it is natural to look for estimates independent of \hbar . In this talk I review recent progresses in this direction obtained by the author in collaboration with F. Golse and T. Paul.

Radiative transfer equation with the Heney-Greenstein kernel*Weiran Sun*

Simon Fraser University, Canada

Abstract: Radiative transfer equation with the Heney-Greenstein kernel are often used to model the light scattering in a media such as animal tissues. In such models the forward-peakedness of the scattering kernel is measured by an anisotropic factor g . It is known in the physics literature that asymptotic behaviour when g goes to 1 is not the classical Fokker-Planck operator. Instead in this talk we show that the limit should be a fractional Laplace operator on the sphere. Based on this analytical result, we design numerical schemes for approximating the scattering operator with the Heney-Greenstein kernel. Unlike previous results when the mesh size depends on g and have to be refined as g approaches 1, our method is uniform in g . This reduces the computational cost when g is close to 1 and can provide an efficient scheme for solving RTE over the region where g varies in different parts.

The Boltzmann equation with large-amplitude initial data in bounded domains*Yong Wang*

Chinese Academy of Sciences, China

Abstract: The paper is devoted to studying the global dynamics of the Boltzmann equation on bounded domains. We allow a class of non-negative initial data which have arbitrary large amplitude and even contain vacuum. The result shows that the oscillation of solutions away from global Maxwellians becomes small after some positive time provided that they are initially close to each other in L^2 . This yields the disappearance of any initial vacuum and the exponential convergence of large-amplitude solutions to equilibrium in large time. The most key ingredients in our strategy of the proof include: (i) $L^2_{x,v}$ to $L^\infty_x L^1_v$ to $L^\infty_{x,v}$ estimates along a bootstrap argument; (ii) Pointwise estimates on the upper bound of the gain term by the product of L^∞ norm and L^2 norm; (iii) An iterative procedure on the nonlinear term.

Global well-posedness of solutions to a drift-flux model

Huanyao Wen

South China University of Technology, China

Abstract: We shall talk about the global well-posedness of Dirichlet problem for a one-velocity viscous drift-flux model in one dimension. By relying on weak compactness tools we obtain an existence result within the class of weak solutions. An essential novel aspect of this analysis, compared to previous works on the same model, is that the solution space is large enough to allow for transition to single-phase flow without any constraints. This work is joint with Professors Steinar Evje and Changjiang Zhu.

Global solution to the inhomogeneous non-cutoff Kac equation

Hongjun Yu

South China Normal University, China

Abstract: In this talk, we make use of macro-microscopic decomposition and the energy methods to obtain global solution to the inhomogeneous one-dimension non-cutoff Kac equation. And we analyze the spectrum structure of the linearized Kac equation by using the semi-group theory and the linear operator perturbation theory. Then we employ the spectrum structure of the linearized Kac equation and the semigroup methods to obtain the time decay rate of the nonlinear equation.

Campus Map

校園地圖



KEY TO CAMPUS MAP 校園索引

- Core 樓
- Wing 翼
- Block 大樓
- University Health Service 大學醫療保健處
- University Health Service 康樂中心
- Convenience Store 便利店
- Toilet 洗手間
- Toilet for Disabled 傷殘人士洗手間
- Bank/ATM 銀行/自動櫃員機
- Canteen / Restaurant / Cafe 餐廳 / 酒樓 / 咖啡室
- Convenience Store 便利店

Location Map of Off-Campus Venues 校外場所位置圖

1. Multiple Campus 多校區
2. Student halls of residence (Hong Kong) 學生宿舍 (香港)
3. Student halls of residence (Kowloon) 學生宿舍 (九龍)
4. Yau Tung (near the campus) 楊屋 (近校園)
5. Yau Tong (near the campus) 楊屋 (近校園)
6. Yau Tong (near the campus) 楊屋 (近校園)
7. Yau Tong (near the campus) 楊屋 (近校園)
8. Yau Tong (near the campus) 楊屋 (近校園)
9. Off-campus housing (OCH) (Wai Chau Street) 校外宿舍 (柴洲街)

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