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The Research Grants Council of Hong Kong
NSFC/RGC Joint Research Scheme
Joint Completion Report

(Please attach a copy of the completion report submitted to the NSFC by the Mainland researcher)

Part A: The Project and Investigator(s)

1. Project Title

On Mathematical Theory of the Compressible Fluid-dynamical Equations

2. Investigator(s) and Academic Department/Units Involved

	Hong Kong Team	Mainland Team
Name of Principal Investigator *(with title)*	Professor Zhouping XIN	Professor Hai-liang LI
Post	William M. W. Mong Professor of Mathematics	Professor
Unit / Department / Institution	The Institute of Mathematical Sciences, CUHK	Capital Normal University, China
Contact Information	zpxin@ims.cuhk.edu.hk	hailiang_li@cnu.edu.cn
Co-investigator(s) *(with title and institution)*	/	Professor Chengchun HAO

3. Project Duration

	Original	Revised	Date of RGC/ Institution Approval *(must be quoted)*
Project Start date	1 January 2015	/	
Project Completion date	31 December 2018	/	
Duration *(in month)*	48	/	
Deadline for Submission of Completion Report	30 September 2019	/	

Part B: The Completion Report

5. Project Objectives

5.1 Objectives as per original application

1. Well-posedness and behaviors of the compressible Navier-Stokes system
2. Well-posedness and vacuum problem of the compressible Euler Equations
3. Asymptotical behaviors of the Vlasov-Poisson (Maxwell)-Boltzmann system

5.2 Revised Objectives

Date of approval from the RGC: _____

Reasons for the change: _____

_____

(N/A)

6. Research Outcome

Major findings and research outcome
(maximum 1 page; please make reference to Part C where necessary)

With the direct support of the joint research scheme, the PIs and their collaborators have achieved all the objectives of the project by establishing the following important results. First, we have obtained some important and surprising results on the both local and global (in time) well-posedness of strong solutions for the compressible Navier-Stokes systems. Indeed, through joint efforts, the PIs and their collaborators have discovered the surprising phenomena that there exists no finite energy classical solution with bounded entropy for the full compressible Navier-Stokes systems with compact initial density for any positive time. This implies that there is no even short time well-posedness theory in the inhomogeneous spaces for fast decaying initial density in general, which is in sharp

contrast to the case of non-vacuum initial data. Stronger results without boundness of entropy have been obtained in one-dimensional case. These results imply, in particular, that the local well-posedness of strong solutions can be obtained only in homogeneous spaces in general, and the behavior of strong solutions may be extremely complex compared with the non-vacuum case. These results have been published in [8]. Then the PI from Hong Kong and his collaborators have shown the finite-time blow-up of smooth solutions, established the blow-up criteria, and gain understanding on the possible blow-up mechanism, which solved the Nash's conjecture on finite-time singularity formation which must be due to either mass concentration or over-heating. Furthermore, we first identify the self-similar scaling and used it to show that there are first-type finite time singularity for isentropic compressible Navier-Stokes system. These results have been published in [1, 2, 14, 21]. The PI from Hong Kong and his collaborators have proved the nonlinear asymptotic stability for the Lane-Emden solution for the viscous gaseous star problem with degenerate density-dependent viscosity, which is a long standing difficult problem and the result is published in [3]. We also made important progress on the global in time well-posedness and large time behavior by establishing the global strong solution with small energy but large oscillations and vacuum for both 2D and 3D isentropic Navier-Stokes systems in [16, 20] which are based on our new discovery that the pressure behaves dispersively in the presence of far field vacuum, by showing the global smooth solutions for various models of compressible Navier-Stokes system with degenerate viscosity which are reported in [17, 12], and by showing the optimal decay of strong solutions without restrictions on the lower frequency parts [13]. We have also obtained important results on the asymptotic behavior of solutions to the compressible Navier-Stokes system for large Reynolds number in the presence of either physical boundaries or interfacial boundaries with stress free boundary conditions by establishing uniform regularity estimates and obtaining vanishing viscosity limits in the general case, which are published in [4, 19] and are generalized to the incompressible cases in [18, 23]. The PI from Hong Kong and Dr. C. P. Wang discovered and rigorously proved the existence of vacuum for 2-dimensional steady isentropic compressible flow in a general expanding nozzle, which is published in [11]. Furthermore, the PI from Hong Kong and his collaborators have also obtained substantial results on transonic flows with or without shocks in general nozzles with variable sections which solve some long standing open problems in this area in [5, 9, 10, 11, 22, 25], on well-posedness of weak solutions for liquid-crystals in 2-dimensional space in [6, 7], and on global entropy weak solutions to weakly nonlinear gas dynamics [24] and large time asymptotic stability of nonlinear waves under periodic perturbations in [15]. In summary, with the support of this joint scheme, the PI from Hong Kong side and his collaborators have produced 25 research papers, out of which 19 have been published in peer-reviewed journals and 2 chapters for research monographs.

Potential for further development of the research and the proposed course of action *(maximum half a page)*

The main results and methods developed in this joint research scheme indicate great complexities of the motions of viscous compressible fluids in the presence of vacuum state. These give rises many important problems such as the analysis of the specific entropy, the necessities of investigating the vacuum interface problems compared with the non-vacuum case, the important of studying the degenerating viscosity and heat-conductivity coefficients. Such kinds of problems provide natural models for further mathematical theory of mixed and degenerate nonlinear partial differential equations. These important issues will be considered in the future researches.

7. The Layman's Summary

(describe in layman's language the nature, significance and value of the research project, in no more than 200 words)

This research project concerns the mathematical studies of the compressible Navier-Stokes equations and related systems which govern some of most important motions in continuum mechanics. It is found that in the presence of vacuum, the great complexities of the system give rise to many interesting new phenomena such as immediate gain of energy, finite time mass concentration and/or overheating, increasing of oscillations over vacuum, and dispersion of the pressure, etc.. By developing some new techniques and ideas, we have obtained substantial results which are not only important for physical problems such as motion of viscous gaseous stars, but also for theories on free boundary and fixed initial-boundary value problems for degenerate mixed-type systems of nonlinear partial differential equations. The ideas and methods developed here should share lights on other physical problems too.

Part C: Research Output

8. Peer-reviewed journal publication(s) arising directly from this research project

(Please attach a copy of each publication and/or the letter of acceptance if not yet submitted in the previous progress report(s). All listed publications must acknowledge RGC's funding support by quoting the specific grant reference.)

The Latest Status of Publications				Author(s) ***(bold** the authors belonging to the project teams and denote the corresponding author with an asterisk*)*	Title and Journal/ Book *(with the volume, pages and other necessary publishing details specified)*	Submitted to RGC *(indicate the year ending of the relevant progress report)*	Attached to this report *(Yes or No)*	Acknowledged the support of this Joint Research Scheme *(Yes or No)*	Accessible from the institutional repository *(Yes or No)*
Year of publication	Year of Acceptance *(For paper accepted but not yet published)*	Under Review	Under Preparation *(optional)*						
[1] 2015				Quansen Jiu, Yuexun Wang, **Zhouping Xin***	Remarks on blow-up of smooth solutions to the compressible fluid with constant and degenerate viscosities. J. Differential Equations 259(7), 2981-3003	2016	No	Yes	No
[2] 2016				Xiangdi Huang, **Zhouping Xin***	On formation of singularity for non-isentropic Navier-Stokes equations without heat-conductivity. Discrete Contin. Dyn. Syst. 36(8), 4477-4493	2016	No	Yes	No

[3] 2016				Tao Luo, **Zhouping Xin***, Huihui Zeng	Nonlinear asymptotic stability of the Lane-Emden solutions for the viscous gaseous star problem with degenerate density dependent viscosities. Comm. Math. Phys. 347(3), 657-702	2016	No	Yes	No
[4] 2015				Yong Wang, **Zhouping Xin***, Yan Yong	Uniform regularity and vanishing viscosity limit for the compressible Navier-Stokes with general Navier-slip boundary conditions in three-dimensional domains. SIAM J. Math. Anal. 47(6), 4123-4191	2016	No	Yes	No
[5] 2016				Chunpeng Wang, **Zhouping Xin***	On sonic curves of smooth subsonic-sonic and transonic flows. SIAM J. Math. Anal. 48(4), 2414-2453	2016	No	Yes	No
[6] 2016				Jinkai Li, Edriss S. Titi, **Zhouping Xin***	On the uniqueness of weak solutions to the Ericksen-Leslie liquid crystal model in R2. Math. Models Methods Appl. Sci., 26(4), 803-822	2016	No	Yes	No
[7] 2016				Jinkai Li, **Zhouping Xin***	Global existence of weak solutions to the non-isothermal nematic liquid crystals in 2D. Acta Math. Sci. Ser. B Engl. Ed. 36(4), 973-1014	2016	No	Yes	No

[8] 2019				Hailiang Li, Yuexun Wang, **Zhouping Xin***	Non-Existence of Classical Solutions with Finite Energy to the Cauchy Problem of the Compressible Navier-Stokes Equations, ARMA, 232(2), 557-590	2016	Yes	Yes	No
[9]			Y	Beixiang Fang, **Zhouping Xin***	On Admissible Locations of Transonic Shock Fronts for Steady Euler Flows in an Almost Flat Finite Nozzle with Prescribed Receiver Pressure	No	Yes	Yes	No
[10] 2019				Chunpeng Wang, **Zhouping Xin***	On an Elliptic Free Boundary Problem and Subsonic Jet Flows for a Given Surrounding Pressure, SIAM J. Math. Anal., 51 (2), 1014-1045	No	Yes	Yes	No
[11] 2019				Chunpeng Wang, **Zhouping Xin***	Smooth Transonic Flows of Meyer Type in De Laval Nozzles, Arch. Rat. Mech. Anal. 232, 1597-1647	No	Yes	Yes	No
[12]			Y	**Zhouping Xin***, Shengguo Zhu	Well-posedness of Three-Dimensional Isentropic Compressible Navier-Stokes Equations with Degenerate Viscosities and Far Field Vacuum	No	Yes	Yes	No
[13]			Y	**Zhouping Xin***, Jiang Xu	Optimal Decay for the Compressible Navier-Stokes Equations Without Additional Smallness Assumptions	No	Yes	Yes	No

[14] 2019				Zhen Lei, **Zhouping Xin***	On scaling invariance and type-I singularities for the compressible Navier-Stokes equations, Science China Mathematics, 62(11), 2271-2286	No	Yes	Yes	No
[15] 2019				**Zhouping Xin***, Qian Yuan, Yuan Yuan	Asymptotic Stability of Shock Waves and Rarefaction Waves Under Periodic Perturbations For 1-D Convex Scalar Conservation Laws, SIAM J. Math. Anal. 51(4), 2971-2994	No	Yes	Yes	No
[16] 2019				Jing Li, **Zhouping Xin***	Global Well-Posedness and Large Time Asymptotic Behavior of Classical Solutions to the Compressible Navier-Stokes Equations with Vacuum, Annals of PDE, 5(1):7, pp.37, https://doi.org/10.1007/s40818-019-0064-5	No	Yes	Yes	No
[17] 2018				Quansen Jiu, Yi Wang, **Zhouping Xin***	Global classical solutions to two-dimensional compressible Navier-Stokes equations with large data in R^2, Physica D: Nonlinear Phenomena, Vol. 376-377, 180-194	No	Yes	Yes	No
[18] 2018				Shijin Ding, Quanrong Li, **Zhouping Xin***	Stability analysis for the incompressi-ble Navier-Stokes equations with Navier boundary conditions, J. Math. Fluid Mech., 20(2), 603-629	No	Yes	Yes	No

[19] 2018				Yu Mei, Yong Wang, **Zhouping Xin***	Uniform regularity for the free surface compressible NavierStokes equations with or without surface tension, Math. Models Methods Appl. Sci., 28(2), 259-336, https://doi.org/10.1142/S0218202518500082	No	Yes	Yes	No
[20] 2018				J. Li, **Zhouping Xin***	Global existence of regular solutions with large oscillations and vacuum for compressible flows, Springer, Handbook of Math. Analysis in Mechanics of Viscous Fluids, 38, 2037-2083	No	Yes	No	No
[21] 2018				X. D. Huang, **Zhouping Xin***	Finite time blow-up of regular solutions for compressible flows, Handbook of math. analysis in mechanics of viscous fluids, Springer, 40, 2183-2261	No	Yes	No	No
[22]		2019		C. P. Wang, **Zhouping Xin***	Regular Subsonic-sonic Flows in General Nozzles	No	Yes	Yes	No
[23] 2017				Shu Wang, **Zhouping Xin***	Boundary layer problems in the vanishing viscosity-diffusion limits for the incompressi-ble MHD system (in Chinese), Sci Sin Math, 47(10), 1303-1326, doi: 10.1360/N012016-00211	No	Yes	Yes	No

[24] 2017				Peng Qu, **Zhouping Xin***	Global entropy solutions to weakly nonlinear gas dynamics, Adv. Math. 316, 292-355	No	Yes	Yes	No

9. Recognized international conference(s) in which paper(s) related to this research project was/were delivered

(Please attach a copy of each delivered paper. All listed papers must acknowledge RGC's funding support by quoting the specific grant reference.)

Month/Year/ Place	Title	Conference Name	Submitted to RGC *(indicate the year ending of the relevant progress report)*	Attached to this report *(Yes or No)*	Acknowledged the support of this Joint Research Scheme *(Yes or No)*	Accessible from the institutional repository *(Yes or No)*
Dec, 2018, Taipei, Taiwan	Degenerate Potential Equation and Subsonic-Sonic Flows	The 2nd annual meeting of International Consortium of Chinese Mathematicians (ICCM) 2018	No	Yes	Yes	No
Dec, 2018, Shanghai, China	Some Results on The Prandtl Boundary Layer Equations	The Workshop on Theory of Boundary Layers and Related Topics	No	Yes	Yes	No
Sept, 2018, Chengdu, China	跨音速激波和混合型方程	The 16th CSIAM Annual Meeting 2018	No	Yes	Yes	No
Aug, 2018, Xiamen, China	Riemann and Shock Waves Theory	Summer School on Mathematics for Graduate Students	No	Yes	Yes	No
Aug, 2018, Heilongjiang, China	Compressible Navier-Stokes Equations and Vacuum Dynamics	International Conference on Nonlinear Partial Differential Equations	No	Yes	Yes	No
Jul, 2018, Dalian, China	Riemann and Shock Waves Theory	Tianyuan Summer School	No	Yes	Yes	No
Jul, 2018, Harbin, China	Incompressible inviscid resistive MHD surface waves in 2D	16th Summer School on Nonlinear PDEs	No	Yes	Yes	No
Jul, 2018, Sichuan, China	Entropy-bounded solutions in inhomogeneous spaces to the compressible Navier-Stokes equations with vacuum	Mini-Workshop on Differential Equations	No	Yes	Yes	No
Jun, 2018, Shanghai, China	Incompressible inviscid resistive MHD surface waves in 2D	Approximately 60: An international conference on nonlinear PDEs	No	Yes	Yes	No
Jun, 2018, L'Aquila, Italy	Transonic Shocks and Mixed Type PDEs	Workshop on Mathematical Fine Structures in Fluid Dynamics	No	Yes	Yes	No
May, 2018, Hubei, China	Transonic Shocks and Mixed Type PDEs	The 3rd Workshop on Partial Differential Equations and Their Applications	No	Yes	Yes	No

May, 2018, Henan, China	Incompressible inviscid resistive MHD surface waves in 2D	2018 Conference on Mathematical Fluid Mechanics Equations	No	Yes	Yes	No
May, 2018, Guangzhou, China	Free Boundaries and Subsonic Jet Flows	2018 Conference on Nonlinear Partial Differential Equations	No	Yes	Yes	No
May, 2018, Bad Boll, Germany	Incompressible inviscid resistive MHD surface waves in 2D	Mathematical Fluid Dynamics Workshop 2018	No	Yes	Yes	No
Apr, 2018 Taipei, Taiwan	Incompressible inviscid resistive MHD surface waves in 2D	NCTS Workshop on Computational Mathematics and Applied Analysis	No	Yes	Yes	No
Mar, 2018, Kunming, China	Transonic Shocks in General Nozzles	Workshop on Dynamical System, Nonlinear PDEs and Their Imaging Processing Applications	No	Yes	Yes	No
Mar, 2018, Guangzhou, China	Incompressible inviscid resistive MHD surface waves in 2D	Workshop on 2018 Medical Imaging Analysis and Nonlinear PDEs	No	Yes	Yes	No
Jan, 2018, Sichuan, China	On subsonic and sonic jets	The 6th International Conference of Western Nonlinear PDEs	No	Yes	Yes	No
Jan, 2018, Sanya, China	Transonic Shocks in Nozzles	Nonlinear PDEs in Continuum Mechanics and Related Topics Workshop	No	Yes	Yes	No
Jan, 2018, Beijing, China	Incompressible inviscid resistive MHD surface waves in 2D	Workshop on Mathematical Problems in Fluid Mechanics	No	Yes	Yes	No
Jan, 2018, Jinan, China	Transonic Shocks in Nozzles	Conference on applied Analysis	No	Yes	Yes	No
Dec, 2017, Xiamen, China	Transonic Shocks and Mixed-Type Equations	Workshop on Transonic Flows and PDEs	No	Yes	Yes	No
Dec, 2017, Sanya, China	Incompressible inviscid resistive MHD surface waves in 2D	PDE Model and Nonlinear Waves for Fluids and Plasma Workshop	No	Yes	Yes	No
Dec, 2017, Guangzhou, China	Riemann and Shock Waves Theory	The Workshop on Partial Differential Equations for Young Scholars	No	Yes	Yes	No
Dec, 2017, Jilin, China	跨音速激波和混合型方程	Workshop on Partial Differential Equations	No	Yes	Yes	No
Dec, 2017, Hong Kong	Incompressible inviscid resistive MHD surface waves in 2D	Frontier of Theory and Applications of Nonlinear PDEs	No	Yes	Yes	No
Nov, 2017 Shanghai, China	On Global Well-Posedness of the 2D Prandtl's Boundary Layers Equations	International Conference on Analysis of Complex Fluids	No	Yes	Yes	No
Nov, 2017, Nanjing, China	On Global Well-Posedness of the 2D Prandtl's Boundary Layers Equations	Workshop on Nonlinear Partial Differential Equations and Their Applications	No	Yes	Yes	No
Nov, 2017, Xiamen, China	Incompressible inviscid resistive MHD surface waves in 2D	Conference on Analysis of Complex Fluids	No	Yes	Yes	No
Sept, 2017, Shanghai, China	Compressible Navier-Stokes Equations and Vacuum Dynamics	Workshop on compressible Navier-Stokes Equations	No	Yes	Yes	No

Sept, 2017, Shanghai, China	On Global Well-Posedness of the 2D Prandtl's Boundary Layers Equations	2017Workshop on Mathematical Study of Boundary Layers and Related Topics	No	Yes	Yes	No
Sept, 2017, Taipei, Taiwan	On Multi-Dimensional Compressible Navier-Stokes Systems	The 2017 NCTS Applied Mathematics Workshop	No	Yes	Yes	No
Jul, 2017, Zurich	On Transonic Shocks in Curved Nozzles	Conference on Mathematics, Physics and their Interaction	No	Yes	Yes	No
Jul, 2017, Xian, China	Transonic Shocks and Mixed PDEs	The 15th Summer School on Nonlinear PDEs	No	Yes	Yes	No
Jul, 2017, Sichuan, China	N-S方程：进展和挑战	西部高校数学教师暑期学校	No	Yes	Yes	No
Jun, 2017, Henan, China	Free Boundaries and Subsonic Jet Flows	Workshop on Fluid Mechanics Equations	No	Yes	Yes	No
Jun, 2017, Guangzhou, China	Multi-Dimensional Shock Wave Theory: Progress and Challenges	Workshop on Partial Differential Equations	No	Yes	Yes	No
Jun, 2017, Shanghai, China	Free Boundaries and Subsonic Jet Flows	Workshop on Multi-Dimensional Conservation Laws	No	Yes	Yes	No
May, 2017, Xiamen, China	Multi-Dimensional Shock Wave Theory: Progress and Challenges	Workshop on Transonic Flow and Mixed Type Equations	No	Yes	Yes	No
Apr, 2017, Queensland, Australia	Free Boundaries and Subsonic Jet Flows	China-Australia Joint Conference on Nonlinear PDE and Related Topics	No	Yes	Yes	No
Apr, 2017, Beijing, China	Free Boundaries and Subsonic Jet Flows	Perspectives of Mathematics in the 21st Century: Conference in Celebration of the 90th Anniversary of the Department of Mathematics of Tsinghua University	No	Yes	Yes	No
Apr, 2017, Beijing, China	Free Boundaries and Subsonic Jet Flows	International Conference on PDEs - Silkroad Mathematics Center Series International Conference	No	Yes	Yes	No
Mar, 2017, Guangzhou, China	Free Boundaries and Subsonic Jet Flows	The 4th PDEs Youth Forum	No	Yes	Yes	No
Feb, 2017, Jinan, China	Periodic Motions for One-Dimensional Nonlinear Gas Dynamics Systems	Conference on Applied Analysis	No	Yes	Yes	No
Dec, 2016, Wuhan, China	Periodic Motions for One-Dimensional Nonlinear Gas Dynamics Systems	Workshop on Partial Differential Equations and their Applications	No	Yes	Yes	No
Dec, 2016 Nanjing, China	Global Existence of Weak Solutions to the Barotropic Compressible Navier-Stokes Flows with Degenerate Viscosities	Workshop on PDEs	2016	No	Yes	No

Nov, 2016 Xian, China	Nonlinear Asymptotic Stability of the Lane-Emden Solution for the Viscous Gaseous Star Problem	The Mathematical Problem on the Fluid Dynamics and Related Topics	2016	No	Yes	No
Oct, 2016 Dalian, China	Global Existence of Weak Solutions to the Barotropic Compressible Navier-Stokes Flows with Degenerate Viscosities	Dalian Workshop on Partial Differential Equations and Mathematical Physics	2016	No	Yes	No
Sept, 2016 Obihiro, Japan	Entropis and Uniqueness of Weak Solutions to The Multi-Dimensional Compressible Euler Systems	International Workshop on Mathematical Science for Nonlinear Phenomena	2016	No	Yes	No
Aug, 2016 Taipei, Taiwan	Nonlinear Asymptotic Stability of the Lane-Emden Solution for the Viscous Gaseous Star Problem	2016 NCTS Workshop on Dynamical Systems	2016	No	Yes	No
Aug, 2016 Beijing, China	On Multi-Dimensional Compressible Navier-Stokes Systems	ICCM 2016	2016	No	Yes	No
Aug, 2016 Beijing, China	Global Existence of Weak Solutions to the Barotropic Compressible Navier-Stokes Flows with Degenerate Viscosities	International Conference on PDEs and Applications	2016	No	Yes	No
Jul, 2016 Beijing, China	Nonlinear Asymptotic Stability of the Lane-Emden Solution for the Viscous Gaseous Star Problem	International Workshop on Nonlinear Partial Differential Equations and Scientific Computating	2016	No	Yes	No
Jul 2016 Harbin, China	Riemann and Shock Waves Theory	第十四屆偏微分方程暑期學校	2016	No	Yes	No
Jul 2016 Guangzhou China	On Smooth Transonic Flows And Mixed Type Equations	2016 現代數學與統計學術論壇二	2016	No	Yes	No
Jun, 2016 Daejeon, Korea	Global Existence of Weak Solutions to the Barotropic Compressible Navier-Stokes Flows with Degenerate Viscosities	International Conference on Navier-Stokes equations and related PDEs	2016	No	Yes	No

May 2016 Hong Kong	Global Existence of Weak Solutions to the Barotropic Compressible Navier-Stokes Flows with Degenerate Viscosities	Nonlinear PDEs: Theories, Numerics and Applications	2016	No	Yes	No
May 2016 Dalian, China	Global Existence of Weak Solutions to the Barotropic Compressible Navier-Stokes Flows with Degenerate Viscosities	Workshop on PDEs and Applications	2016	No	Yes	No
May 2016 Wuhan, China	Open problems for CNS *(blackboard talk, only cover page is available)*	The Third Youth's Academic Forum on PDEs	2016	No	Yes	No
May 2016 Macau, China	Shock Wave Theory	Joint Workshop and Strategic meeting	2016	No	Yes	No
Apr, 2016 Daejeon, Korea	Some Results on Uniqueness of Weak Solutions to Systems of Balance Laws	Workshop on Solid and Liquid Crystals	2016	No	Yes	No
Mar, 2016 Hunan, China	Entropis and Uniqueness of Weak Solutions to The Multi-Dimensional Compressible Euler Systems	Workshop on PDEs and Geometry Analysis	2016	No	Yes	No
Jan, 2016 Harbin, China	Global Existence of Weak Solutions to the Barotropic Compressible Navier-Stokes Flows with Degenerate Viscosities	2016 Winter PDEs Forum	2016	No	Yes	No
Jan, 2016 Hong Kong	Uniform Estimates On Incompressible Surface Waves	IAS Focused Program on Computation and Mathematical Problems in Materials Sciences	2016	No	Yes	No
Dec, 2015 Sanya, China	Riemann Problem and Shock Waves	The legacy of Bernhard Riemann after one hundred and fifty years	2016	No	Yes	No
Dec, 2015 Shanghai, China	Entropis and Uniqueness of Weak Solutions to The Multi-Dimensional Compressible Euler Systems	Changjiang PDEs Conference	2016	No	Yes	No
Dec, 2015 TSIMF, China	Entropis and Uniqueness of Weak Solutions to The Multi-Dimensional Compressible Euler Systems	International Conference on Nonlinear Systems of Fluid Dynamic Equations and Applications	2016	No	Yes	No

Dec, 2015, Beijing, China	Global Existence of Weak Solutions to the Barotropic Compressible Navier-Stokes Flows with Degenerate Viscosities	International Conference in Mathematics and its Applications	2016	No	Yes	No
Nov, 2015 Florida, USA	On Multi-dimensional Compressible Navier-Stokes Systems	One day workshop on Mathematical Theory of Fluid Dynamics	2016	No	Yes	No
Sept, 2015 Wuhan, China	Global Existence of Weak Solutions to the Barotropic Compressible Navier-Stokes Flows with Degenerate Viscosities	International Conference on Kinetic Equations and Related Topics	2016	No	Yes	No
Sept, 2015 Ravello, Italy	1. On Multi-Dimensional Compressible Navier-Stokes System with Vacuum And Related Topics 2. On Gases Expanding Into Vacuum 3. Global Existence of Weak Solutions to the Barotropic Compressible Navier-Stokes Flows with Degenerate Viscosities	XL Summer School on Mathematical Physics	2016	No	Yes	No
Aug, 2015 Fudan, China	Uniform Estimates On Incompressible Surface Waves	International Workshop on Mathematics of Geophysical Flows and Turbulence	2016	No	Yes	No
Aug 2015, Yunnan, China	On Uniqueness of Admissible Weak Solutions to Compressible Euler Systems	The Third West China PDE Conference	2016	No	Yes	No
Aug 2015 Xiamen, China	N-S方程：进展和问题	**2015**年全国基础数学研究生暑期学校	2016	No	Yes	No
Jul 2015 Wuhan, China	N-S方程：进展和问题	The 13rd Summer School and Workshop on PDEs	2016	No	Yes	No
Jun 2015 Dalian, China	Uniform Estimates On Incompressible Surface Wave	Workshop on Incompressible Fluids And Applications	2016	No	Yes	No
May 2015 Rizhao, China	On Uniqueness of Admissible Weak Solutions to Compressible Euler Systems	International Conference on Nonlinear PDEs and its Applications	2016	No	Yes	No
May 2015 Beijing, China	On Uniqueness of Admissible Weak Solutions to Compressible Euler Systems	Workshop on Nonlinear Partial Differential Equations	2016	No	Yes	No

May 2015 Xian, China	Some Basic Problems for N-S System	2nd Workshop on Nonlinear PDEs for Young Mathematicians	2016	No	Yes	No
April 2015 Fujian, China	Nonlinear Asymptotic Stability of the Lane-Emden Solution for the Viscous Gaseous Star Problem	Workshop on Mathematical Physics and Nonlinear PDEs (On the occasion of Professor Boling GUO's 80th Birthday)	2016	No	Yes	No
March 2015 Tokyo, Japan	Uniform Estimates On Incompressible Surface Wave	11th Japanese-German International Workshop on Mathematical Fluid Dynamics	2016	No	Yes	No
January 2015 Tokyo, Japan	Periodic Motions for the One-Dimensional Non-isentropic Euler Equations	Fourth Workshop on Mathematical Analysis on Fluid Mechanics and Conservation Laws	2016	No	Yes	No
January 2015 Jinan, China	Periodic Motions for the One-Dimensional Non-isentropic Euler Equations	International Conference on Applied Analysis	2016	No	Yes	No

10. Student(s) trained *(Please attach a copy of the title page of the thesis.)*

Name	Degree registered for	Date of registration	Date of thesis submission/ graduation
YU Rongfeng *(submitted in 2016)*	PHD	2011-09-01	2015-06-30
LUO Tianwen *(submitted in 2016)*	PHD	2012-08-01	2015-07-31
YUAN Yuan *(submitted in 2016)*	MPHIL	2013-08-01	2015-07-31
YUAN Yuan *(attached)*	PHD	2015-08-01	2018-07-31
MEI Yu *(submitted in 2016)*	PHD	2013-08-01	2016-07-31
ZHANG Rong *(submitted in 2016)*	MPHIL	2014-08-01	2016-07-31
ZHANG Rong *(attached)*	PHD	2016-08-01	2019-07-31
LYU Wenqi *(submitted in 2016)*	MPHIL	2014-08-04	2016-07-31
LYU Wenqi *(attached)*	PHD	2016-08-01	2019-07-31
LIU Xin *(attached)*	PHD	2014-09-01	2017-08-31
XIAO Yao *(attached)*	PHD	2014-09-01	2017-08-31
YUAN Hongwei *(attached)*	MPHIL	2015-08-01	2017-07-31
YUAN Hongwei *(not yet graduated)*	PHD	2017-08-01	2020-07-31
YUAN Qian *(attached)*	PHD	2016-08-01	2019-07-31
XIN Jing *(attached)*	MPHIL	2017-08-01	2019-07-31
YEUNG Chin Ching *(attached)*	MPHIL	2017-08-01	2019-07-31
CHEN Zhendong *(not yet graduated)*	MPHIL	2018-08-01	2020-07-31

11. Other impact *(e.g. award of patents or prizes, collaboration with other research institutions, technology transfer, etc.)*

N/A