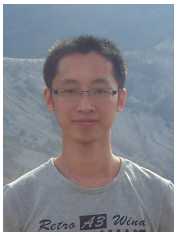
Zhicheng HU

胡 志成

Department of Computational Science
School of Mathematics
Nanjing University of Aeronautics and Astronautics
29 Jiangjun Avenue, Nanjing 211106, P.R. China
+86 159 5048 6380
huzhicheng@nuaa.edu.cn
faculty.nuaa.edu.cn/huzhicheng



Research Interests

Numerical Method for PDEs, Computational Fluid Dynamics, Multigrid Method, Adaptive Method

Education

2012 **Ph.D., Computational Mathematics**, *Zhejiang University*, Hangzhou, China

- Thesis: Moving Mesh Method and Its Applications Coupled with Dynamic Domain Decomposition
- Supervisors: Prof. Xinghua Wang and Associate Prof. Heyu Wang

2007 **Bachelor of Science, Information and Computing Science**, *Zhejiang University*, Hangzhou, China

Experience

Work and Visit

04/2022 - Present **Associate Professor**, *Department of Computational Science, School of Mathematics, Nanjing University of Aeronautics and Astronautics*, Nanjing, China

06/2021 - 04/2022 **Associate Professor**, *Department of Mathematics, College of Science, Nanjing University of Aeronautics and Astronautics*, Nanjing, China

06/2018 - 09/2018 **Visitor**, *Faculty of Science and Technology, University of Macau*, Macau, China, Collaborator: Guanghui Hu

07/2016 - 08/2016 **Visitor**, *Institute of Computational Mathematics and Scientific/Engineering Computing, Chinese Academy of Sciences*, Beijing, China, Collaborator: Ya-na Di

09/2015 - 06/2021 **Lecturer**, *Department of Mathematics, College of Science, Nanjing University of Aeronautics and Astronautics*, Nanjing, China

07/2015 - 09/2015 **Visitor**, *Institute of Computational Mathematics and Scientific/Engineering Computing, Chinese Academy of Sciences*, Beijing, China, Collaborator: Ya-na Di

07/2014 - 07/2015 **Postdoctoral fellow**, *Department of Applied Mathematics, The Hong Kong Polytechnic University*, Hong Kong, Co-supervisor: Dr. Zhonghua Qiao

- Topic: Adaptive numerical regularized moment method for Boltzmann equation; Steady-state multigrid solver

06/2012 - 06/2014 **Postdoctoral fellow**, *School of Mathematical Sciences, Peking University*, Beijing, China, Co-supervisor: Prof. Ruo Li

- Topic: Applications of numerical regularized moment method for Boltzmann equation; Efficient numerical methods such as multigrid method for steady-state problems

Teaching

- **Linear Algebra**, *Undergraduate Course*, NUAA, Fall 2017, Fall 2019, Fall 2020, Fall 2021, Fall 2022, Fall 2023
- **Mathematical Foundations of Information Systems**, *Undergraduate Course for International Students*, NUAA, Spring 2016, Spring 2017, Spring 2018, Spring 2019, Spring 2022, Spring 2023
- **Computational Methods**, *Undergraduate Course*, NUAA, Fall 2015, Fall 2016, Spring and Fall 2017, Spring and Fall 2018, Spring 2020, Spring 2021
- **Matrix Theory**, *Graduate Course*, NUAA, Fall 2020

- **Advance Mathematics Level III**, *Undergraduate Course*, NUAA, Fall 2016, Fall 2018, Spring 2019
- **Teaching Assistant**, *Mathematical Analysis*, School of Mathematical Sciences, Peking University, Beijing, China, Fall 2013
- **Teaching Assistant**, *Mathematical Analysis, Scientific Computing, Optimal Algorithm, etc.*, Department of Mathematics, Zhejiang University, Hangzhou, China, Sept. 2007 - June 2012

Research Funds

- **Research on efficient numerical methods and applications of solving Boltzmann equation with moment expansion**, Supported by *The National Natural Science Foundation of China, No. 12171240*, ¥510, 000, Jan. 01, 2022 - Dec. 31, 2025, **Sole Principal Investigator**
- **Research on efficient numerical moment method of multi-dimensional Boltzmann equation**, Supported by *The Fundamental Research Funds for the Central Universities, China, No. NS2021054*, ¥100, 000, Jan. 01, 2021 - Dec. 31, 2022, **Sole Principal Investigator**
- **Research on properties of solutions of axially symmetric Navier-Stokes equations**, Supported by *The National Natural Science Foundation of China, No. 11801268*, ¥240, 000, Jan. 01, 2019 - Dec. 31, 2021, Co-principal Investigator
- **Theoretical study and numerical simulation of thermal convection of viscoelastic fluid in multilayer systems**, Supported by *The National Natural Science Foundation of China, No. 11702135*, ¥294, 000, Jan. 01, 2018 - Dec. 31, 2020, Co-principal Investigator
- **Multilayer model and heat transfer characteristics of viscoelastic fluid in sparse porous media**, Supported by *The Natural Science Foundation of Jiangsu Province of China, No. BK20170775*, ¥200, 000, July 01, 2017 - June 30, 2020, Co-principal Investigator
- **High-performance numerical moment method and applications of steady-state Boltzmann equation**, Supported by *The National Natural Science Foundation of China, No. 11601229*, ¥205, 200, Jan. 01, 2017 - Dec. 31, 2019, **Sole Principal Investigator**
- **Moment model and its numerical method of semiconductor device simulation**, Supported by *The Natural Science Foundation of Jiangsu Province of China, No. BK20160784*, ¥200, 000, July 01, 2016 - June 30, 2019, **Sole Principal Investigator**
- **NRxx method and its applications in semiconductor device simulation**, Supported by *China Postdoctoral Science Foundation, The 54th General Financial Grant, No. 2013M540807*, ¥50, 000, Sept. 2013 - June 2014, **Sole Principal Investigator**

Publications

Journal Papers

19. **Zhicheng Hu** and Guanghan Li. An efficient nonlinear multigrid solver for the simulation of rarefied gas cavity flow. *Communications in Computational Physics*, 2023. accepted. (Corresponding author. T1, 2022 IF: 3.7).
18. Xiaohua Zhang, **Zhicheng Hu**, and Min Wang. An adaptive interpolation element free Galerkin method based on a posteriori error estimation of FEM for Poisson equation. *Engineering Analysis with Boundary Elements*, 130:186–195, SEP 2021. (T3, 2019 IF: 2.884).
17. Lei Yang, Yedan Shen, **Zhicheng Hu**, and Guanghui Hu. An implicit solver for the time-dependent Kohn-Sham equation. *Numerical Mathematics: Theory, Methods and Applications*, 14(1):261–284, FEB 2021. (Corresponding author. T2, 2019 IF: 1.659).
16. **Zhicheng Hu**, Siyao Yang, and Zhenning Cai. Flows between parallel plates: Analytical solutions of regularized 13-moment equations for inverse-power-law models. *Physics of Fluids*, 32:122007, DEC 2020. (2019 IF: 3.514).
15. **Zhicheng Hu** and Zhenning Cai. Burnett spectral method for high-speed rarefied gas flows. *SIAM Journal on Scientific Computing*, 42(5):B1193–B1226, OCT 2020. (T1, 2018 IF: 2.31).
14. **Zhicheng Hu** and Zhihui Liu. Heat conduction simulation of 2D moving heat source problems using a moving mesh method. *Advances in Mathematical Physics*, 2020:Article ID 6067854, FEB 2020. (Corresponding author. 2018 IF: 0.936).

13. **Zhicheng Hu**, Zhenning Cai, and Yanli Wang. Numerical simulation of microflows using Hermite spectral methods. *SIAM Journal on Scientific Computing*, 42(1):B105–B134, JAN 2020. (T1, 2018 IF: 2.31).
12. **Zhicheng Hu** and Guanghui Hu. An efficient steady-state solver for microflows with high-order moment model. *Journal of Computational Physics*, 392:462–482, SEP 2019. (T1, 2018 IF: 2.845).
11. **Zhicheng Hu**. Numerical investigation of heat conduction with multiple moving heat sources. *Symmetry*, 10(12):673, DEC 2018. (2017 IF: 1.256).
10. **Zhicheng Hu**, Ruo Li, and Zhonghua Qiao. Acceleration for microflow simulations of high-order moment models by using lower-order model correction. *Journal of Computational Physics*, 327:225–244, DEC 2016. (T1, 2015 IF: 2.556).
9. Zhenning Cai, Yuwei Fan, **Zhicheng Hu**, Ruo Li, and Heyu Wang. The development and application of the moment method in the gas kinetic theory. *SCIENTIA SINICA Informationis*, 46(10):1465–1488, OCT 2016. (In Chinese).
8. **Zhicheng Hu**, Ruo Li, and Zhonghua Qiao. Extended hydrodynamic models and multigrid solver of a silicon diode simulation. *Communications in Computational Physics*, 20(3):551–582, SEP 2016. (T1, 2015 IF: 1.778).
7. **Zhicheng Hu** and Ruo Li. A nonlinear multigrid steady-state solver for 1D microflow. *Computers & Fluids*, 103:193–203, NOV 2014. (Corresponding author. T2, 2013 IF: 1.532).
6. **Zhicheng Hu**, Ruo Li, Tiao Lu, Yanli Wang, and Wenqi Yao. Simulation of an n^+-n-n^+ diode by using globally-hyperbolically-closed high-order moment models. *Journal of Scientific Computing*, 59(3):761–774, JUN 2014. (T2, 2013 IF: 1.698).
5. **Zhicheng Hu** and Heyu Wang. A moving mesh method for heat equation with traveling singular sources. *Applied Mathematics. A Journal of Chinese Universities. Ser. A*, 28(1):115–126, MAR 2013. (in Chinese. T3).
4. **Zhicheng Hu** and Heyu Wang. A moving mesh method for kinetic/hydrodynamic coupling. *Advances in Applied Mathematics and Mechanics*, 4(6):685–702, DEC 2012. (T2, 2013 IF: 0.645).
3. Hua Qiang and **Zhicheng Hu**. Generalizations of Hölder's and some related inequalities. *Computers & Mathematics with Applications*, 61(2):392–396, JAN 2011. (Corresponding author. 2013 IF: 1.996).
2. **Zhicheng Hu** and Aimin Xu. Refinements of Aczél and Bellman's inequalities. *Computers & Mathematics with Applications*, 59(9):3078–3083, MAY 2010. (Corresponding author. 2013 IF: 1.996).
1. Aimin Xu, Feng Cui, and **Zhicheng Hu**. Asymptotic behavior of intermediate points in the differential mean value theorem of divided differences with repetitions. *Journal of Mathematical Analysis and Applications*, 365(1):358–362, MAY 2010. (T3, 2013 IF: 1.119).

Conference Papers

1. Guanghan Li and **Zhicheng Hu**. A multigrid method for solving Boltzmann equation based on moment expansion. In *The 19th National Conference on Computational Fluid Dynamics, China*, Nanjing, June 27-30, 2021. (In Chinese).

Submitted

1. Guanghui Hu, **Zhicheng Hu**, and Feng Yang. An h-adaptive finite volume solver for reactive Euler equations on complex domain. submitted.

Conferences and Workshops

Selected Talks

Mar. 2023 **Invited talk: "On efficient simulation of high-order moment model for the Boltzmann-BGK equation"**, *Workshop on Modeling and Simulations for Complex System*, Beijing Computational Science Research Center, Beijing, China

Nov. 2020 **Invited talk: "An efficient multigrid framework for steady-state Boltzmann equation based on Hermite/Burnett spectral method"**, China Three Gorges University, Online

Oct. 2020 **Minisymposium talk: "An efficient moment-based multigrid framework for steady-state Boltzmann equation"**, *The 18th Annual Meeting of the China Society for industrial and Applied Mathematics (CSIAM 2020)*, Changsha, China

Aug. 2019 **Minisymposium talk: "Burnett spectral method for Boltzmann equation in high-speed rarefied gas flows"**, *The 12th General Assembly of Computational Mathematics of China*, Harbin, China

May 2019 **Invited talk: "Steady-state solvers for Boltzmann equation with moment method"**, *2019 Young Scholars Seminar for Some Issues on Computational Fluid Dynamics (CFD)*, Xuchang University, Xuchang, China

July 2018 **Minisymposium talk: "An efficient steady-state solver for Boltzmann equation with applications to microflow simulation"**, *2018 Joint Annual Conference of Physical Societies in Guangdong-Hong Kong-Macao Greater Bay Area (YGA2018)*, University of Macau, Macau, China

Sept. 2017 **Invited talk: "Accelerated computation of steady-state solutions for high-order moment models"**, *Workshop on Moment Methods in Kinetic Theory III*, Peking University, Beijing

Jan. 2017 **Minisymposium talk: "An efficient multilevel method for high-order moment models with applications to microflow simulation"**, *The 10th International Conference on Computational Physics (ICCP10)*, Macau, China

Aug. 2016 **Invited talk: "Improved high-order moment models and multigrid solver for silicon device simulation"**, Peking Univeristy, Beijing

Dec. 2015 **Invited talk: "Acceleration for microflow simulations of high-order moment models by using lower-order model correction"**, *Workshop on Numerical Simulations and Theoretical Analysis for Computational Physics*, Peking University, Beijing

Aug. 2015 **Minisymposium talk: "Multigrid acceleration for steady-state Boltzmann equation based on moment method"**, *The 8th International Congress on Industrial and Applied Mathematics (ICIAM 2015)*, Beijing, China

Jan. 2015 **Contributed talk: "A nonlinear multigrid solver for the steady-state Boltzmann equation"**, *The 9th International Conference on Computational Physics (ICCP9)*, National University of Singapore, Singapore

June 2014 **Invited talk: "A nonlinear multigrid steady-state solver for microflow"**, *The 2nd CAS SIAM Student Chapter Annual Meeting*, Chinese Academy of Sciences, Beijing, China

Oct. 2013 **Contributed talk: "An robust NRxx method for the steady-state Boltzmann equation"**, *The 12th General Assembly of Computational Mathematics of Chinese Universities*, Changsha, China

June 2013 **Contributed talk: "Efficient NRxx method for the steady BTE"**, *The 9th East Asia Section of SIAM Conference, The 2nd Conference on Industrial and Applied Mathematics (EASIAM - CIAM 2013)*, Institute Teknologi Bandung, Bandung, Indonesia

Organizer

- **Co-organizer**, *Workshop on Numerical Methods for Inverse Problems and Media Imaging*, NUAA, Nanjing, China, Dec. 06 - 08, 2019
- **Organizer**, *Workshop on Computational Methods for Complex Physics Problems*, NUAA, Nanjing, China, Aug. 28 - 30, 2019
- **Minisymposium Co-organizer**, *"High Efficiently Numerical Method and Its Applications for Boltzmann Equation", The 12th General Assembly of Computational Mathematics of China*, Harbin, China, July 31, 2019 - Aug. 03, 2019
- **Co-organizer**, *Workshop on Scientific Computing*, NUAA, Nanjing, China, Nov. 02 - 03, 2017

Other Activities Involved

Apr. 2023 **The 20th National Symposium on Numerical Methods in Fluids**, Nanjing, China

Oct. 2017 **Workshop on Multi-Component Drift-Diffusion Model and Simulation of Cross-Scale Semiconductor Device Damage**, Chengdu, China

May 2016 **The Annual Meeting of Computational Mathematics of Jiangsu Province**, *Jiangsu University*, Zhenjiang, China

Aug. 2013 **The 16th National Symposium on Numerical Methods in Fluids**, Fenghuang, China

Dec. 2011 **The Fifth Winter School on Applied Mathematics**, *City University of Hong Kong*, Hong Kong

Nov. 2007 **Computational Mathematics Conference of China and Germany**, *Zhejiang University*, Hangzhou, China

July 2007 **Graduate Summer School of Applied Mathematics**, *Zhejiang University*, Hangzhou, China

Honors and Awards

- **Changkong Star**, *NUAA*
- **Second Prize for Excellent Teaching**, *NUAA*, Academic Year 2021-2022

Graduate Students

- **Xiaoxu GAO**, *Master Student*, Sept. 2023 - Present
- **Longkun FAN**, *Master Student*, Sept. 2022 - Present

- **Kaiyuan CHEN**, *Master Student*, Sept. 2021 - Present
- **Chenfeng DENG**, *Master Student*, Sept. 2020 - Apr. 2023
- **Guanghan LI**, *Master Student*, Sept. 2019 - Apr. 2022
- **Qiong WANG**, *Master Student*, Sept. 2018 - Apr. 2021
- **Zhihui LIU**, *Master Student*, Sept. 2017 - Apr. 2020

Social Affiliations

- **Reviewer**, *Mathematical Reviews*, American Mathematical Society, Apr. 2020 - Present