

导师个人简介

计算数学教研室，李杰权，博士生导师

从事专业

计算流体力学，偏微分方程，数值分析

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教育经历

- 1991/09—1994/07：北京师范大学数学系攻读硕士学位
- 1994/09—1997/03：中国科学院数学所攻读博士学位

工作经历

（长期职位）

2015/08—：北京应用物理与计算数学研究所研究员，博士生导师
2010/12—2015/07：北京师范大学数学学院教授、博士生导师
2013/07—2014/06：美国宾州州立大学数学系，访问教授
2002/08—2010/12：北京市首都师范大学数学学院研究员（2003 年始博士生导师）
2004/03—2005/06：德国马格德堡大学数学系，洪堡学者
2001/08—2002/07：台北中央研究院数学所访问教授
1999/10—2001/08：以色列希伯莱大学爱因斯坦数学所 Lady Davis 和 Golda Meir 研究员（以色列总理基金资助）
1997/03—1998/12：中国科学院应用数学所博士后

（短期访问）

2017/07—08（1 个月）：香港科技大学数学系
2017 / 05：美国内华达大学（拉斯维加斯）数学系
2016 / 09 （10 天）：德国美因茨大学数学系
2016 / 04-05（1 个月）：香港科技大学数学系
2015 / 02：香港科技大学数学系
2014 / 06-09：德国美因茨(Mainz)大学数学系（洪堡学者）
2010 / 11—12（20 天）：新加坡国立大学
2010 / 10：香港科技大学理学院
2009 / 11-12：美国宾州州立大学数学系
2009 / 08-09：德国马格德堡大学数学系、汉堡科技大学
2008 / 06-07（3 周）：法国巴黎庞卡莱数学研究所
2007 / 06-07：美国斯坦福大学数学系
2007 / 01：以色列希伯莱大学爱因斯坦数学研究所，特拉维夫大学数学系
2006 / 09-11：美国宾州州立大学数学系

2006 / 01: 以色列希伯莱大学爱因斯坦数学研究所
2004 / 10-11: 德国汉堡科技大学数学系
2004 / 09: 法国 Metz 大学数学系
2003 / 06-07: 香港中文大学数学研究所
1999 / 01-1999 / 10: 德国马格德堡大学数学系 DFG 项目博士后
1998 / 01-1998 / 3: 以色列希伯莱大学爱因斯坦数学所博士后

研究方向简介

- 计算流体力学:

面向航天航空、武器物理以及其它工程应用领域, 致力发展三高(高置信度、高精度、高效)数值方法。涉及的背景问题有: 可压缩流体的普适性问题、爆轰、弹塑性材料、信号传输、多介质流体的界面不稳定性等。目前和成娟、田保林、于明、程军霞研究员等组成联合团队从事多介质大变形流体力学数值方法与应用研究, 感兴趣的问题有:

(1) 可压缩流体力学的高精度数值方法, 包括有限体积、有限差分、间断有限元方法等;

(2) 从介观到宏观的多介质流体力学数学建模;

(3) 可压缩湍流的形成机理以及大规模数值模拟;

团队成员与美国、德国、瑞士、法国、意大利、以色列、日本、香港等国家和地区有着密切的合作关系。每两年有定期的多介质流体力学国际会议以及每年有小规模的高精度数值方法国际会议, 推动着该领域内同行的合作与交流。

- 数值分析

数值分析是理解、评价数值方法的重要手段, 也是设计高置信度数值方法的基础。本方向致力于:

(1) 分析各种新型数值方法的稳定性;

(2) 针对复杂物理模型, 分析相应数值方法保物理性质;

- 偏微分方程

基于无粘欧拉方程组和 BGK 模型, 研究可压缩流体的流场结构及其各种非线性波(激波、滑移面、爆轰波、Delta 波等)的稳定性。具体有:

(1) 可压缩欧拉方程组的两维黎曼问题以及多维非线性波的相互作用;

(2) 从稀薄到连续流相关模型的适定性。

美国 Mathematical Reviews 评价其所在团队的成果为“中国数学学派”(Chinese School of Mathematics)的工作。

个人荣誉、所获奖项等

- 2008 国务院政府特殊津贴
- 2008 年北京市百千万工程人选
- 2006 年教育部新世纪优秀人才
- 2005 年第十届霍英东高等学校青年教师奖(研究类)
- 2004 年德国洪堡研究类奖学金
- 2003 年北京市科学技术一等奖
- 2001, 2002 年以色列 Golda Meir(总理)奖

代表性研究成果列表（请按照参考文献引用格式提供详细信息）

****专著:** The Two-dimensional Riemann Problem in Gas Dynamics (第一作者; 合作者: Tong Zhang, Shuli Yang), Pitman Monographs and Surveys in Pure and Applied Mathematics 98, 312 页, Longman Scientific & Technical, Harlow.

(美国数学会数学评论 MR1697999 (2000d:76106): More recently, the two-dimensional Riemann problem has attracted the attention of many researchers, particularly the *Chinese school of mathematics*: J. Li, D. Tan, S. Yang, T. Zhang, Y. Zheng, etc. A complete and rigorous study is presented for both the two-dimensional scalar conservation laws and the zero-pressure gas dynamics model. Many important properties of the structure and qualitative behavior of solutions are derived for the two-dimensional compressible Euler system. Precise conjectures are stated, which are carefully tested in numerical experiments.)

代表性研究论文

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- [2] **Jiequan Li** and Zhifang Du, A two-stage fourth order time-accurate discretization for Lax-Wendroff type flow solvers, I. Hyperbolic conservation laws, *SIAM J. Sci. Comput.* 38 (2016), 3045-3069.
- [3] Yue Wang and **Jiequan Li**, Numerical Defects of the HLL Scheme and Dissipation Matrices for the Euler equations, *SIAM J. Numerical Analysis*, No. 52, Vol. 1(2014), 207-219.
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- [5] **Jiequan Li** and Yongjin Zhang, The adaptive GRP scheme for compressible fluid flows over unstructured meshes, *Journal of Computational Physics*, 242 (2013), 367--386.
- [6] **Jiequan Li** and Zhicheng Yang, Heuristic modified equation analysis on oscillations in numerical solutions of conservation laws, *SIAM Journal on Numerical Analysis*, 49, 2386-2406, 2011.
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- [9] Ee Han, **Jiequan Li** and Huazhong Tang, An adaptive GRP scheme for compressible fluid flows, *Journal of Computational Physics*, 229,

1448–1466, 2010.

[10] **Jiequan Li** and YuxiZheng, Interaction of rarefaction waves of the two-dimensional self-similar Euler equations, *Archive Rational Mechanics and Analysis*, 193, 623–657, 2009.

[11] **Jiequan Li**, Huazhong Tang, Gerald Warnecke and Lumei Zhang, Local oscillations in finite difference solutions of hyperbolic conservation laws, *Mathematics of Computation*, 78, 1997–2018, 2009.

[12] **Jiequan Li**, Tiegang Liu and Zhongfeng Sun, Implementation of the GRP scheme for computing spherical compressible fluid flows, *Journal of Computational Physics*, 228, 5867–5887, 2009.

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[21] **Jiequan Li**, On the two-dimensional gas expansion for compressible Euler equations, *SIAM Journal on Applied Mathematics*, Vol. 62, No. 3, 831–852, 2001/2002.

[22] **Jiequan Li**, On the uniqueness and existence problem for a multidimensional reacting and convection system, *Journal of the London Mathematical Society*, Vol. 62, No. 2, 473–488, 2000.

其他期刊论文

- [1] Liang Pan, **Jiequan Li** and Kun Xu, A Few Benchmark Test Cases for Higher-order Euler Solvers, *Numerical Mathematics: Theory, Methods and Applications*, Vol. 10 (2017), 489–514.
- [2] Liang Pan, Kun Xu, QibingLi and **Jiequan Li**, An efficient and accurate two-stage fourth-order gas-kinetic scheme for the Euler and Navier–Stokes equations, *Journal of Computational Physics*, Vol 326 (2016), 197–221.
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- [5] Jin Qi and **Jiequan Li**, A fully discrete high order ALE method over untwisted time-space control volumes, *International Journal of Numerical Methods in Fluids*, 83 (2017), 625–641.
- [6] **Jiequan Li**, BaolinTian and Shuanghu Wang, Dissipation Matrix and Artificial Heat Conduction for Godunov-type Schemes of Compressible Fluid Flows, *International Journal of Numerical Methods in Fluids*, 84 (2017), 57–75.
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- [8] Jin Qi, Yue Wang and **Jiequan Li**, Remapping-free Adaptive GRP Method for Multi-Fluid Flows I: One Dimensional Euler Equations, *Communications in Computational Physics*, Vol 15(2014), 1029–1044.
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- [12] Matania Ben-Artzi, Joseph Falcovitz and **Jiequan Li**, The convergence of the GRP scheme, *Discrete and Continuous Dynamical Systems*, Vol. 23, 1&2, 1–27, 2009.
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- numerical approximation for two-dimensional scalar conservation laws, *Computational Fluid Dynamics Journal*, 14(4): 46, 401–418, 2006.
- [15] **Jiequan Li** and Gerald Warnecke, Generalized characteristics and the uniqueness of entropy solutions to zero-pressure gas dynamics, *Advances in Differential Equations*, Vol. 8, No. 8, 961–1004, 2003.
- [16] **Jiequan Li**, Maria Lukacova—Medvidova and Gerald Warnecke, Evolution Galerkin schemes applied to the two-dimensional Riemann problem for the wave equation system, *Discrete and Continuous Dynamical Systems*, Vol. 9, No. 3, 559–573, 2003.
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Numerical Mathematics, Edited by M. Fey and R. Jeltsch, Birhauser, Vol. 130, 629--641, 1999.

[5] Jiequan Li and Tong Zhang, Generalized Rankine-Hugoniot relations of delta-shocks in solutions of transportation equations, Nonlinear PDE and Related Areas, Edited by Guiqiang Chen, Yanyan Li, Xiping Zhu and Daomin Cao, World Scientific, Singapore, 219--232, 1998.