Commun. Comput. Phys.
10.4208/cicp.2026.JLi.preface

Vol. **39**, No. 5, pp. i-ii
May 2026

Preface to the Special Issue in Memory of Prof. Jiequan Li

On May 14, 2023, the community of computational and applied mathematics lost an exceptional scholar and cherished friend, **Professor Jiequan Li**. His sudden passing left us with both a profound sense of loss and a deep appreciation of his intellectual legacy. To honor his memory and extraordinary contributions, this special issue of Communications in Computational Physics has been dedicated to him. The collection has been carefully assembled by his friends and collaborators, and it reflects both the breadth of his influence and the vitality of the field he helped shape.

Prof. Jiequan Li made pioneering contributions to the theory and computation of compressible fluid dynamics. In his early career, he carried out fundamental studies on hyperbolic partial differential equations. He developed measure-valued solutions for two-dimensional scalar conservation laws and the zero-pressure gas dynamics model, proposed entropy conditions for combustion and noncombustion waves, and undertook groundbreaking work on the two-dimensional Riemann problem of the Euler equations. His proof of global smoothness of a wedge flow expanding into vacuum was hailed by Prof. Barbara Keyfitz as "a tour de force." He also revealed new phenomena in multi-wave interactions and, together with collaborators, introduced the characteristic decomposition method for 2-D Euler equations. His coauthored monograph on the subject was internationally recognized and identified by P. G. LeFloch as part of a "Chinese School of Mathematics."

In the later stages of his career, Prof. Li turned his attention to the development of high-order accurate and structure-preserving numerical methods for compressible flows. He introduced the principle of discrete thermodynamic compatibility and emphasized the importance of spatiotemporal coupling in algorithm design. His two-stage fourth-order time discretization and related methodologies became a foundation for a new generation of high-fidelity numerical schemes, now applied to shallow water flows, multi-material systems, relativistic hydrodynamics, and kinetic models. With his collaborators, he further clarified the concepts of consistency, stability, and convergence for compact finite volume schemes, and developed the notion of "Godunov compatibility" as a rigorous alternative to entropy conditions. His work on convergence analysis has been widely acknowledged as a milestone in the theory of high-order numerical schemes.

The papers collected in this special issue continue the themes that were close to Prof. Li's heart:

1. *The Implicit Unified Gas Kinetic Scheme for Neutron Transport with Arbitrary Anisotropic Scattering Model* by Shuang Tan, Wenjun Sun, and Junxia Wei
2. *Role of Fluxes in High-Order Godunov Schemes* by Matania Ben-Artzi
3. *A Lagrangian GRP Algorithm for Axisymmetrical Problems of Compressible Fluids* by Zijin Zhu, Min Xiao, Jiwei Zhang, and Guoxi Ni
4. *Gas-Kinetic Unified Algorithm for Multi-Component Monatomic Gas Mixture* by Fan Li and Zhi-Hui Li
5. *Convergence Analysis for a Finite Volume Evolution Galerkin Method for Multidimensional Hyperbolic Systems* by Maria Lukáčová-Medvid'ová, Zhuyan Tang, and Yuhuan Yuan
6. *Kinetic Representation of the Unified Gas-Kinetic Wave-Particle Method and Beyond* by Zhaoli Guo, Yajun Zhu, and Kun Xu
7. *Multiscale Simulation of Rarefied Gas Flows in Simplified Divertor Tokamak Test Facility Particle Exhaust* by Wei Li, Yanbing Zhang, Jiannan Zeng, and Lei Wu
8. *Adaptive Reconstruction Method Using Discontinuity Feedback for High-Order Accuracy Schemes* by Hong Zhang, Yue Zhao, Xing Ji, and Kun Xu
9. *Stability Analysis and Structure Preserving Schemes for the Reactive Euler Equations with a New Equation of State* by Minghao Sun, Hujian Zuo, Weifeng Zhao, and Ping Lin
10. *A Two-Stage Fourth-Order Gas-Kinetic CPR Method for Subsonic Flows on Hexahedral Meshes* by Chao Zhang, Qibing Li, and Zhihui Li

We hope this collection will not only serve as a scientific tribute to Prof. Li, but also inspire the next generation of mathematicians and computational scientists who follow in his footsteps. His work, marked by rigor, creativity, and deep insight, will continue to influence the field for many years to come. We dedicate this special issue to honoring his remarkable life, his scholarship, and his enduring friendship.

Special Issue Editors:

Kun Xu

Gerald Warnecke

Matania Ben-Artzi