

## Preface

This book is a collection of lecture notes mainly from the short courses given in the 2007 Shanghai Summer School on Nonlinear Conservation Laws, Fluid Systems and Related Topics at Fudan University, July 5–August 4, 2007. There were more than 130 participants, including graduate students, postdoctors and junior faculty members from more than 30 universities in China and USA.

This summer school provided an occasion for a series of courses (25–26 hours each) by four distinguished contributors of this volume, Denis Serre (ENS-Lyon, France), Xiaoming Wang (Florida State University, USA), Tong Yang (CUHK, Hong Kong), and Yuxi Zheng (Penn State, USA), and a series of invited lectures by distinguished speakers including Jerry Bona (UIC, USA), Hongqiu Chen (The University of Memphis, USA), Emmanuele DiBenedetto (Vanderbilt University, USA), Willi Jäger (University of Heidelberg, Germany), Fanghua Lin (NYU, USA), Tai-Ping Liu (Stanford University, USA), Yuejun Peng (Université Blaise Pascal, France), WeiKe Wang (Shanghai Jiao Tong University, PRC), and Ping Zhang (Chinese Academy of Sciences, PRC), besides the editors of this volume.

This volume comprises five chapters, ranging from the mathematical theory and numerical approximation of both incompressible and compressible fluid flows, kinetic theory and conservation laws, to statistical theories for fluid systems, with expectation to lead the readers from the basics to the frontiers of the current research in these areas.

Chapter 1 is an introduction to the theory of incompressible inviscid flows with emphasis on classical results and recent developments. Chapter 2 is an introduction to one-dimensional hyperbolic systems of conservation laws with emphasis on theory, numerical approximation, and discrete shock profiles. Chapter 3 is an introduction to the kinetic theory, conservation laws and their intrinsic connections. Chapter 4 is an introduction to elementary statistical theories with applications to various fluid systems. Chapter 5 is an introduction to the Euler equations for compressible fluids in two space dimensions with emphasis on the self-similar isentropic irrotational case. These topics are naturally interrelated and represent a cross-section of the most significant recent

advances and current trends in nonlinear conservation laws, fluid systems and related topics.

The editors would like to express their sincere thanks to all the authors in this volume for their contributions and to all the participants in the Summer School. Zhiqiang Wang and Chunlian Zhou deserve our special thanks for their prompt and effective assistance to make the Summer School run smoothly. The editors are grateful to Fudan University, the Mathematical Center of Ministry of Education of China, the National Natural Science Foundation of China (NSFC) and the Institut Sino-Francais de Mathématiques Appliquées (ISFMA) for their help and support. Finally, the editors wish to thank Tianfu Zhao (Senior Editor, Higher Education Press) for his patience and professional assistance.

Gui-Qiang Chen, Ta-Tsien Li, Chun Liu

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