

Preface

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The present Special Issue contains selected papers issuing from the first edition of the Workshop on *Numerical approximations of hyperbolic systems with source terms and applications*. This event held on September 7–11, 2009 in the International Centre for Mathematical meetings (CIEM), Castro Urdiales (Spain). This Centre is a joint initiative of the University of Cantabria and the City Council of Castro Urdiales.

The aim of the workshop was to provide an opportunity for researchers and PhD students coming from academia, industry and government agencies to discuss recent developments and techniques about theoretical and numerical studies for hyperbolic systems with source term. Such P.D.E. systems govern a broad spectrum of physical phenomena related to gas dynamics, shallow water systems, multiphase flows, radiative transfer, aerodynamics, etc. In most cases the models can be written as a system of conservations laws that may include some non-conservative terms and/or source terms. These terms turn out to be crucial since

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they modify the nature of the system under consideration. For instance, stiff source terms are assumed to model two distinct regimes with a single set of partial differential equations. On the other hand, the source terms modify drastically the steady states of the system. Therefore, in order to obtain a good understanding of the phenomena under study as well as some good predictions of their behavior, the numerical schemes have to correctly handle these terms, otherwise the approximated solutions may not capture the physics of the problem. During the last ten years, the numerical treatment of source terms and non-conservative products has evolved from basic discrete forms to very sophisticated methods that ensure accurate and robust simulations. The development of new methods makes possible, in turn, the application to more and more complex physical applications.

More than 60 participants coming from 13 different countries attended the event and 56 contributions were presented. Besides the invited lectures and contributed talks, a poster session and a round-table concerning some open problems related to free surface Navier-Stokes and multi-layer shallow water system (chaired by F. Bouchut) were scheduled. About 10 young researchers received a grant to attend the workshop.

The program and the presentations can be found at the conference website <http://www.math.sciences.univ-nantes.fr/NumHyp2009>

This Special Issue contains 22 articles selected from the invited lectures and contributed talks covering several state-of-the-art numerical techniques and/or applications of hyperbolic systems with source terms.

The organization of the Workshop was a joint effort of the Universities of Málaga (Spain), Bordeaux and Nantes (France). The meeting was financially supported by the *CIEM*, the Spanish Project *CONSOLIDER i-Math*, the *Ministerio de Ciencia e Innovación*, the *Spanish Society of Applied Mathematics (SEMA)*, the *Institut de Mathématiques de Bordeaux*, the *Laboratoire de Mathématiques Jean Leray*, and *IFP Energies Nouvelles*. The *French Society of Applied and Industrial Mathematics (SMAI)*, via its group *GAMNI* which is devoted to the improvement of numerical methods in industry oriented mathematical problems, also collaborated in the diffusion of the event.