

Preface

Hydroinformatics defined as management of information related to the water sector using ICT tools is a large domain of engineering technology and sciences. Modelling and simulation are historically the points of departure for hydroinformatics and are one of the most important part of it. Neither the SimHydro cycle of international conferences nor the present book has the purpose or ambition to cover thematically the whole extent of the subjects. The purpose is to concentrate on a limited number of specific areas and subjects which are not usually considered as such during most global international conferences.

Modelling in fluid mechanics, hydraulics and hydrology, whether using digital tools or scale models, has reached sufficient maturity to be in daily use by engineers for analysis, design and for communication. Increasingly, complex cases can be handled thanks to ever-more sophisticated tools and increasingly abundant computing power. The emerging environment populated with new generation of sensors, using cloud-computing resources, is challenging the current practices of modelling and request innovation in methodology and concepts for a real integration into the decision-makings processes. At the same time, the request to integrate vulnerability and resilience dimension in the various engineering approaches is becoming more and more frequent.

With respect to these issues, however, a number of questions still remain open: coupling of models, data acquisition and management, uncertainties (both epistemic and random) of results supplied by models, use of 3D CFD models for complex phenomena and for large-scale problems.... All these points are continuously explored and investigated by researchers, scientists and engineers. Like in all scientific domains, most recent and advanced developments have to be discussed and shared regularly in a growing community. The SimHydro 2014 conference, following the two previous editions, has contributed to this objective by providing a platform for exchanges and discussion for the different actors in the water domain.

SimHydro is a permanent cycle of conferences held every 2 years, hosted by Polytech Nice Sophia and organised by the Société Hydrotechnique de France and its European partners. It aims, as the subject, at recent advances in modelling and hydroinformatics and at the participation and exchanges at European scale (it is

open to all other researchers and participants but the purpose is to maintain a specific platform for the region that was a birthplace of both domains). That is why the SimHydro language is English.

The latest SimHydro conference was held in Sophia Antipolis, France, from 11 to 13 June 2014. The conference was jointly organized by the Société Hydrotechnique de France (SHF), the Association Française de Mécanique (AFM) and the University of Nice Sophia Antipolis/Polytech Nice Sophia with the support of IAHR, the Environmental & Water Resources Institute (EWRI) of the American Society of Civil Engineers (ASCE) as well as Eau and DREAM clusters. The conference attracted 172 delegates from 42 (although most of them European) countries who participated in 16 sessions where 76 papers were presented. The programme was organised around four main themes:

- Theme 1: Modelling of fast hydraulic transients (dam and dyke breaking waves, storm waves, tsunamis, flash floods)
- Theme 2: Uncertainty in simulation, uncertainty of results of models
- Theme 3: Simulation and modelling of 3D near field phenomena in free surface flows (rivers, lakes and coastal areas)
- Theme 4: Simulation and modelling of multiphase flows: cavitation, bubbly flows, flows with particles

Within these general themes, topics like coupling of models, data assimilation and uncertainties, urban flooding, data and uncertainties in hydraulic modelling, model efficiency and real situations, new methods for numerical models, hydraulic machinery, 3D flows in the near field of structure, models for complex phenomena have been covered. The conference, by attracting researchers, engineers and decision makers, has promoted and facilitated the dialogue between communities with round tables where needs and expectations were discussed. Exchanges have been very fruitful on crucial questions related to sources of uncertainty in modelling, the state of the art in research and development in the domain of numerical fluid mechanics, the stakeholder's capacity to understand results, the means for dialogue directly or indirectly between the stakeholders and the model developers, the information's exchange between stakeholders and developers.

In order to contribute to this dialogue and to provide useful references, following the successful experience of 2012, the organisers of SimHydro 2014 have decided to elaborate this book. This volume gathers a selection of the most significant contributions received and presented during the conference. The objective is to provide the reader with an overview of the ongoing developments and the state of the art taking place in three major themes that are:

- Modelling: Floods and Inundations;
- Uncertainties, 3D Modelling and Models Coupling;
- Two-phase Flows and Cavitation.

Obviously, all dimensions of these themes cannot be covered in a single book. However, the editors are convinced that the contents may contribute to provide to

the reader essential references for understanding the actual challenges and developments in these areas of the hydroinformatics field.

This volume represents the sum of the efforts invested by the authors, members of the scientific committee and members of the organising committee. The editors are also grateful for the dedicated assistance of the reviewers who worked tirelessly behind the scene to ensure the quality of the papers. We hope this book will serve as a reference source on hydroinformatics for researchers, scientists, engineers and managers alike.

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