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7th Groundwater Symposium of the
International Association for Hydro-Environment Engineering and Research (IAHR)

Preface

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Groundwater is the most abundant freshwater resource on Earth. Its use for domestic use and agriculture dates back thousands of years. In recent decades the over-exploitation and unabated use of this resource, combined with the effects of a changing climate, has led to severe environmental problems, including resource depletion, land subsidence and groundwater contamination. To mitigate these adverse impacts and protect this valuable resource, it is imperative that rational groundwater management practices and policies as well as robust modeling and analysis tools be developed. While groundwater has been traditionally treated as a ubiquitous part of the water cycle, modern understanding of groundwater related challenges involves a truly multidisciplinary approach to understanding the joint effects of geological, chemical and biological processes. The International Association for Hydro-Environment Engineering and Research (IAHR), founded in 1935, is a worldwide independent organization of engineers and water specialists working in fields related to hydro-environmental sciences and their practical Applications. IAHR promotes research and strives at contributing to sustainable development and optimization of water resources management.

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The Groundwater Hydraulics and Management Committee of IAHR organizes periodically symposia aimed at bringing together researchers that present their newest scientific results and exchange ideas and expertise with the community related to the latest developments in the field.

This volume includes 31 full papers, presented at the 7th International Groundwater Symposium that was held in Perugia (Italy) on September, 22-24, 2014. The Symposium was jointly organized by the Dipartimento di Ingegneria Civile ed Ambientale of the University of Perugia, and the IAHR Groundwater Hydraulics and Management Committee. The 7th edition is the first one where the papers have been published online – Procedia Environmental Sciences on the Elsevier site – with perpetual open access providing maximum impact.

During the Symposium (Fig.1), the following much appreciated keynotes lectures were given: *Transverse mixing in heterogeneous porous media* by Olaf A. Cirpka of the University of Tübingen, *On the characterization of breakthrough curves and implications in risk analysis* by Erica R. Siirila of the Universitat Politecnica de Catalunya, *About pumping tests interpretations* by Philippe Ackerer of the Centre National de la Recherche Scientifique of Strasbourg, *Characterization of sedimentary basins in the presence of mechanical and geochemical compaction* by Monica Riva of the Politecnico di Milano, *Interpretation of a multidisciplinary infiltration tank experiment with emphasis in bioclogging and related changes in soil properties* by Xavier Sanchez-Vila of the Universitat Politecnica de Catalunya, and *A multi-objective optimization concept for risk-based early-warning monitoring networks in well catchments*, by Wolfgang Nowak of the University of Stuttgart.

Fig. 1. Snapshots from the 7th IAHR International Groundwater Symposium: a) opening ceremony (from left: B. Brunone, X. Sanchez-Vila (XSV), and N. Copty); b) M. Riva and E. R. Siirila; c) P. Ackerer and M. Riva; d) E. R. Siirila and O. A. Cirpka; e) W. Nowak and XSV; f) XSV and P. Ackerer; and g) O. A. Cirpka and XSV.

This volume provides a discussion of modern and significant issues relating to sustainable groundwater management; groundwater flow and transport modeling; inverse modeling; density driven flow and

seawater intrusion; uncertainty analysis; subsurface heterogeneity; optimization problems; land use and vulnerability; groundwater in arid regions; unsaturated and hyporheic flows; climate change; risk, uncertainty analysis and optimization; laboratory and field tests; geothermal systems; and monitoring. The volume emphasizes the idea of bridging the gap between research, operational aspects associated with engineering practice and policy, aiming at becoming a reference to students, researchers, modelers as well as practitioners and policy makers. Finally we would like to express our gratitude to our colleagues Marco Ferrante and Silvia Meniconi – co-editors of these proceedings – and Caterina Capponi who contributed significantly to the event.