

## Editorial: River basin hydrology and natural hazards: monitoring, prediction and prevention

The 5th edition of the ‘Hydrology Days’ of the Italian Hydrological Society was held in Perugia, Italy, 6–8 October 2015, to provide a joint forum of hydrologists and a broad range of stakeholders for commenting and discussing on ‘River basin hydrology and natural hazards: monitoring, prediction and prevention’. A total of 58 abstracts were presented at the workshop. The 2½-day conference was organized by the ‘Hydrology Group’ of the Research Institute for Geo-Hydrological Protection (National Research Council of Italy) in collaboration with the Italian Hydrological Society, the Tiber River Basin Authority and the professional association of Engineers of Perugia. Specifically, the Italian Hydrological Society (SII-IHS) was founded in 2009 to foster progress, enhancement and dissemination of hydrological sciences in Italy, including all aspects related to water resources systems management and possible interaction with human activity. In this perspective, one of the main objectives of the Association is to stimulate interdisciplinary collaboration among academia, research institutes, institutional stakeholders and private operators.

This Special Issue of *Hydrology Research* contains a selection of 14 peer-reviewed papers that reflect the multi-disciplinary aim of the conference. The papers included in this Special Issue are organized into three main topics; the first topic addresses *Innovative techniques for hydrological monitoring*, the second topic includes studies focusing on *River basin hydrology*, the third topic comprises *River basin management and mitigation measures*.

The first theme *Innovative techniques for hydrological monitoring* is addressed by five papers and highlights various advances and innovative techniques or processing methods to characterize the morphological and hydrological features of river basins. The relevance and the problems related to discharge estimation in river cross-sections are discussed in [Farina et al. \(2017\)](#) and in [Termini & Moramarco \(2017\)](#). The first paper presents a procedure for estimating discharge in a river cross-section based on the combined use of dimensionless isovels and point velocity measurements. The second paper illustrates a validation of the entropy-based approach allowing the estimation of the

mean flow velocity in open channel flow by using the maximum flow velocity and explores the effectiveness of entropy-based formula in high curvature channels. Innovative measurement techniques based on image processing that has emerged as a promising tool for several monitoring applications, are addressed in [Tauro & Salvatori \(2017\)](#) and in [Vinci et al. \(2017\)](#). [Tauro & Salvatori \(2017\)](#) demonstrate the potential of non-contact flow methods for gauging flooding rivers analysing 10 days’ optics-based surface flow monitoring through a permanent gauge-cam station on the Tiber River, Rome, Italy. [Vinci et al. \(2017\)](#) evaluate the suitability of a smartphone camera for the Structure from Motion reconstruction for monitoring variations in soil surface characteristics and soil loss originated by a low intensity erosive event. Furthermore, the effectiveness of the combined use of new technologies for environmental monitoring, merging ground-observed data with Earth observations from space and unconventional information from crowdsourcing, and hydrological modelling to forecast soil moisture and crop water requirement in order to optimize irrigation scheduling is evaluated in [Ravazzani et al. \(2017\)](#).

The second theme deals with *River basin hydrology*, and is made up of five papers. These studies mainly consider the use of spatial data, rainfall-runoff modelling and a laboratory experimental system, in order to provide a better understanding of both meteorological and hydrological processes at the river basin scale. A statistical analysis of rainfall for detecting a possible trend in the historical series collected in the Marche region, Italy, was carried out in [Soldini & Darvini \(2017\)](#). Specifically, they analyse the climate extremes indices defined by Expert Team on Climate Change Detection and Indices (ETCCDI) and the annual maximum daily, hourly and sub-hourly rainfalls, mainly exhibiting absence of trend or the presence of negative trend. Methods for uncertainty quantification in the evaluation of hydrological variables are discussed in [Vergni et al. \(2017\)](#) and in [Biondi & De Luca \(2017\)](#), with reference to standardized indices (i.e., SPI and SPEI) and design flood estimation in ungauged catchments,

respectively. Masseroni *et al.* (2017) review the applications and results of a semi-distributed rainfall-runoff model (i.e., MISDc) developed for flood simulation in Mediterranean basins and analyse its performance on a basin in northern Italy, which is stressed by flooding events mainly caused by excessive urbanization. Morbidelli *et al.* (2017) present a broad spectrum of laboratory analyses carried out through a physical model consisting of a soil tank with slope angle adjustable from 1° to 15° that allows a few mechanisms of the infiltration process to be studied univocally. The validity of a local conceptual model for erratic rainfalls, the role of run-on and the effects of sloping soil surfaces were investigated by using different configurations of the system.

Four papers address the third theme, *River basin management and mitigation measures*. The studies focus on the development of water management tools for flood risk management and sustainable water management, dealing with problems ranging from the estimation of design variables for hydraulic structures to the vulnerability assessment of levee systems and the water demands for irrigation systems. Balistrocchi & Bacchi (2017), by applying copula functions, propose a criterion to derive flood frequency curves from rainfall volume and duration distribution with regard to urban catchment applications. Further, a method to estimate the return period of bivariate rainfall events based on a hydraulic works-targeted approach is developed. Barbetta *et al.* (2017) present the Italian levee database (DANTE), a dynamic geospatial tool for collecting all the available data/information on levee systems to usefully support authorities in charge of flood risk mitigation and management. Moreover, they propose a simple vulnerability index for a quick analysis of extended levee systems which is fundamental to identify critical points that can lead to levee system failures. Estimating water requirements of plants cultivated in greenhouse environments is crucial, for both the design of greenhouse irrigation systems and the improvement of irrigation scheduling. Bianchi *et al.* (2017) propose a water balance model simulating the daily irrigation need for greenhouse crops based on the FAO-56 'single crop coefficient' method that proved to improve irrigation management and planning in these environments. Finally, Barontini *et al.* (2017) present the activity performed at the University of Brescia by students and researchers to prepare a documentary exhibition

on irrigation techniques in water scarcity conditions, on the occasion of the International Year of Soils 2015.

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