

Editorial

Natural Hazards: Links between Science and Practice

Natural hazards are the subject of permanent interest of the society, bringing a constant need for sharing information and knowledge related to research, education and management in mitigation of natural disasters. Although the causes and origins of natural hazards can be different, ranging from atmospheric and hydrologic, to volcanologic and seismic, the environmental impacts are equally catastrophic. Furthermore, rapid urbanization in regions prone to natural hazards places more people at risk than ever before. Therefore, close interaction between different scientific and operational disciplines, aimed at enhancing the mitigation of natural hazards, is very important. Consequently, developments in the research methodologies for natural hazards characterisation and modelling have become popular research topics.

In recent decades, knowledge and understanding of the natural hazards have progressed thanks to model developments, supplemented by in-situ and remotely sensed data. Moreover, these data are particularly important and useful for research scientists, practitioners and decision makers concerned with detection of natural hazards, vulnerability and risk assessment, and the design and implementation of mitigation and adaptation strategies.

Regarding the natural hazards addressed, this special issue has a narrower focus, dealing with the application of information technology, methods and tools for the detection, monitoring, modelling and forecasting of natural hazards.

The paper by [Stanić *et al.* \(2018\)](#) presents GIS-oriented hydro-informatics platform 3DNET and the associated hydrologic model, with the focus on the platform and model features that are relevant for flood simulations. The platform is used to develop a semi-distributed model, based on hydrologic response units for reconstruction of the devastating flood in the Kolubara catchment, Serbia, in May 2014. The authors describe in detail the Catch module of the platform, intended for data pre-processing for hydrological simulations, and focus on the development of catchment computational structure and preparation of meteorological forcing. Then, the 3DNet-Catch hydrologic

model structure, inputs and outputs are briefly described, followed by the section on model application for reconstructing the extreme flood in May 2014, and the sections with the results, discussion and conclusions on development of hydrologic models and tools for flood flow simulations. Most model parameters are physically based and can be inferred from topography, land use and soil types data, thereby facilitating model calibration. In this paper, the authors attempted to present some features of the platform and the hydrologic model that lead to improvements in flood simulations and could be implemented in other tools/models. They find the presented features of the platform and the model, their application and the results interesting not only to scientific circles, but also to people dealing with such simulations in practice.

The paper by [Alabyan & Lebedeva \(2018\)](#) deals with the modelling of the Northern Dvina River, a river with a large anastomosed delta subject to tidal effects. The proposed approach uses the horizontal 2D numerical model based on the shallow-water equations. In this very interesting case study, the authors go through the classical steps of modelling, calibration and validation. They present a sensitivity analysis and then apply the model to a storm surge event. They conclude that 2D numerical modelling of the Northern Dvina mouth area simulates water level fluctuations quite accurately. The developed model calculates accurately the flow distribution between the delta branches in the case of high river runoff and non-tidal conditions. However, the errors increase significantly for the periods of low flow in tidal conditions. In any case, the influence of the roughness and the bathymetry of delta arms seems to be less important than the water level regime along the marine boundary.

The paper by [Ivković *et al.* \(2018\)](#) examines the possibility to include daily rainfall data from a dense observation network in the flood forecasting system with sub-daily data. The method is to the extreme flood event in the Kolubara catchment in May 2014. Daily rainfall from the dense observation network is disaggregated to hourly time scale using the MuDRain multivariate disaggregation software. The disaggregation procedure results in well

reproduced rainfall dynamics and adjusts rainfall volume to the values from non-recording gauges. In this paper, the authors describe the `wflow_hbv` model, which is comprised of the precipitation, soil moisture and runoff response routines. The model is under development as a forecasting tool and used for flood simulations with two alternative hourly rainfall data. The results of hydrologic simulations show a moderate improvement when the disaggregated rainfall from the denser network is used, thus indicating the significance of better representation of rainfall temporal and spatial variability for flood forecasting.

The paper by Yamashkin *et al.* (2018) describes a methodology for decoding of remotely sensed multispectral space images based on the Ensemble Learning concept, which allows for solving effectively important problems of mapping geosystems. The approach includes diagnostics of the structure and condition of the catchment basins, inventory of water bodies and assessment of their ecological state, study of channel processes, and monitoring and forecasting of functioning, dynamics and development of geotechnical systems. The methodology is based on an ensemble learning using a fundamentally new organization of the metaclassifier that allows making a weighted decision based on the efficiency matrix, which is characterized by an increase in accuracy of decoding of space images and resistance to errors. The metaclassification training algorithm is proposed, which is based on the method of weighted voting of monoclifiers where the weights are calculated on the basis of error matrix metrics. The methodology was tested at the test site 'Inerka' (Republic of Mordovia). The performed experiments confirmed that

the use of ensemble-systems allows good accuracy and reliability of the analysis.

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