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The impact of a multi-criteria calibration on the performances of the DREAM model

Silvano Fortunato Dal Sasso[1], Alonso Pizarro[2], Ruodan Zhuang[1], Yijian Zeng[3], Paolo Nasta[4], Nunzio Romano[4,5], José Gomis Cebolla[6], Felix Frances[6], Brigitta Toth[7,8], Zhongbo Su[3,9], and Salvatore Manfreda[10]

[1]Department of European and Mediterranean Cultures: Architecture, Environment and Cultural Heritage (DICEM), University of Basilicata, 75100 Matera, Italy. silvano.dalsasso@unibas.it

[2]Escuela de Ingeniería en Obras Civiles, Universidad Diego Portales, 8370109 Santiago, Chile

[3]Faculty of Geo-Information Science and Earth Observation, University of Twente, Enschede, The Netherlands

[4]Department of Agricultural Sciences, AFBE Division, University of Naples Federico II, Portici, Italy

[5]Interdepartmental Center for Environmental Research (C.I.R.AM.), University of Naples Federico II, Napoli, Italy

[6]Research Group of Hydrological and Environmental Modelling (GIHMA), Research Institute of Water and Environmental Engineering, Universidad Politecnica de Valencia, 46022 València, Spain

[7]Institute for Soil Sciences and Agricultural Chemistry, Centre for Agricultural Research, Hungarian Academy of Sciences, H-1022 Budapest, Hungary

[8]Department of Crop Production and Soil Science, University of Pannonia, 8360 Keszthely, Hungary

[9]Key Laboratory of Subsurface Hydrology and Ecological Effect in Arid Region of Ministry of Education, School of Water and Environment, Chang'an University, Xi'an, China

[10]Department of Civil, Architectural and Environmental Engineering, University of Naples Federico II, 80125 Naples, Italy

Water resources observation and modelling are essential to better understand hydrological processes and improve water resource management. However, the reliability of hydrological simulation is strongly controlled by the quality and type of field observations used for the calibration and validation processes. Therefore, it is critical to develop proper strategies for model calibration and validation in order to reduce prediction uncertainties. Standard hydrological calibration relies mainly on the time series of total streamflow at the catchment outlet; nevertheless, this leads to a limited insight into the spatial behaviour of a river basin. In this work, we use simulations from the physically-based distributed DREAM model to discuss the importance of multi-criteria calibration to obtain consistent parameter sets. The calibration methodology exploits a physical based filter to decompose the streamflow times series in two time series referring to the surface component and the baseflow. Therefore, we adopted a multi-criteria calibration procedures which optimizes: (a) the total streamflow measured at the basin outlet (used as a reference study case); b) both the surface runoff and baseflow measured at the basin outlet; and (c) the combination the time series of the two components along with the annual water balance components. In addition, we also explored the use of a lumped parametrization against a spatial parametrization derived from the soil type characteristics of the river basin. In all cases, parameter optimization was carried out using an automatic calibration performed by a genetic algorithm (GA) tool. The study was carried out for two experimental catchments located in

Basilicata and Campania regions (Southern Italy). The performed experiments showed that the inclusion of physical information during the calibration process results in a general improvement of model reliability.

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