



Assessing the Transferability of a Conceptual Rainfall Runoff Model within the Medjerda catchment (Tunisia)

Ahlem Gara^{a,b}, Khoulood Gader^b, Slaheddine Khelifi^a, Christophe Bouvier^c, Marnik Vanclooster^d

^aUnité de recherche en Gestion Durable des Ressources en Eau et en Sol (GDRES), High School of Engineering of Medjez el Bab (ESIM), University of Jendouba (ahlem_gara@yahoo.fr)

^bNational Agronomic Institute of Tunisia (INAT), University of Carthage

^cInstitut de Recherche pour le Développement (IRD), HydroSciences Montpellier, France

^dEarth and Life Institute, Université Catholique de Louvain, Belgium

Abstract: Predicting climate change impacts on hydrological fluxes in ungauged basins remains a challenging task. In this study, we investigated the transferability of a modified version of a simple conceptual and spatially distributed hydrological model available within the ATHYS platform to simulate hydrological behaviour within catchments of a large South Mediterranean transboundary basin :ie the Medjerda bordering between Tunisia and Algeria, and characterized by contrasting climatic and physiographic conditions. The model was initially calibrated for two donor catchments situated within the Medjerda basin using input data from 1990-1994. The model performance was evaluated through multiple accuracy criteria and on the basis of the Best Linear Unbiased Estimator (BLUE) for the automatic calibration to quantify the model simulation, proving its good performance. The temporal transferability of the calibrated model was demonstrated by evaluating model performance for 3 year periods outside the calibration domain to test the robustness of the model through a diachronic analysis, i.e. for the periods 1994-1997, 2001-2004 and 2014-2017 respectively. The spatial transferability was assessed by using the parameters calibrated on the donor catchments to be applied in the receptor catchments based on similarity and data availability. The model was upgraded to a greater catchment for data from 1994-2016 for the right bank and to the nearest catchment with a similar area for the data from 2008-2017 for the left bank of the Medjerda basin. The compared model results with the observed data proved that the adopted transferability approach produced well the volumes and timing of the flood events, but underestimate exceptional flash floods and overestimate the summer base flow. The used methodology proved to be a successful way to predict hydrological functions in ungauged catchments.

Keywords: Model transferability; Conceptual distributed hydrological model; ATHYS; Medjerda basin