World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:12, No:12, 2018

Application of an Analytical Model to Obtain Daily Flow Duration Curves for Different Hydrological Regimes in Switzerland

Authors : Ana Clara Santos, Maria Manuela Portela, Bettina Schaefli

Abstract : This work assesses the performance of an analytical model framework to generate daily flow duration curves, FDCs, based on climatic characteristics of the catchments and on their streamflow recession coefficients. According to the analytical model framework, precipitation is considered to be a stochastic process, modeled as a marked Poisson process, and recession is considered to be deterministic, with parameters that can be computed based on different models. The analytical model framework was tested for three case studies with different hydrological regimes located in Switzerland: pluvial, snow-dominated and glacier. For that purpose, five time intervals were analyzed (the four meteorological seasons and the civil year) and two developments of the model were tested: one considering a linear recession model and the other adopting a nonlinear recession model. Those developments were combined with recession coefficients obtained from two different approaches: forward and inverse estimation. The performance of the analytical framework when considering forward parameter estimation is poor in comparison with the inverse estimation for both, linear and nonlinear models. For the pluvial catchment, the inverse estimation shows exceptional good results, especially for the nonlinear model, clearing suggesting that the model has the ability to describe FDCs. For the snow-dominated and glacier catchments the seasonal results are better than the annual ones suggesting that the model can describe streamflows in those conditions and that future efforts should focus on improving and combining seasonal curves instead of considering single annual ones.

Keywords : analytical streamflow distribution, stochastic process, linear and non-linear recession, hydrological modelling, daily discharges
Conference Title : ICHE 2018 : International Conference on Hydrology and Ecology
Conference Location : London, United Kingdom
Conference Dates : December 13-14, 2018

Open Science Index, Environmental and Ecological Engineering Vol:12, No:12, 2018 publications.waset.org/abstracts/98484/pdf