Kalman filter technique for multisite modeling and streamflow prediction

K. Boukharouba and A. Kettab

Research Laboratory of Water Science, LRS-EAU National Polytechnic School, Algeria b_malikadz@yahoo.com
kettab@yahoo.fr

Multisite modeling and streamflow prediction are mostly required in water resources design and management. This paper aims at investigating the extent of applicability of Kalman filter (KF) for modeling and predicting streamflow records in northern Algeria, which has never been done before. KF method is based upon the recursive least squares concept and has the important property of sequential optimization, which means that the model is adaptively updated as soon as the output of the system is obtained. One of the advantages of the KF technique is that the property of stationarity is not a prerequisite. This allows for changes in model parameters and variances, which is a manner that accomodates the non-linear response of hydrologic systems. Another advantage of KF is that its application is elaborated in the time-domain. This characteristic plays an important role in real time forecasting of hydrologic time series. Besides, the KF algorithm may be initiated with minimum objective information and adjusts itself subsequently whenever more data become available. The main purpose of this paper is to apply the KF approach to the modeling and prediction of multi-site streamflow in northern Algeria. The data used are the annual streamflow records at 10 hydrometric stations located in the above region. The obtained result is an online prediction operation where the streamflow predictor is not bound to time or space, but rather adapts itself recursively to evolving conditions related to meteorology or other physical systems in the study area. It is observed that the obtained results are satisfactory and the associated errors are quite acceptable.