Streamflow prediction using machine learning techniques: application case in the Moroccan Atlas sub-basin

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Accurate forecasting of streamflow is essential for an efficient water management, but it remains challenging due to the complexity of hydrological systems. Several hydrological models have been employed for streamflow prediction. However, the need for a robust and parsimonious simulation technique remains. This study compares the performance of four data-driven models, namely Linear Regression (LR), Support Vector Regression (SVR), Random Forest (RF) and XG-boost for streamflow forecasting at a daily time step in the Rheraya sub-basin of Tensift, Morocco. A time series of 13 years of daily Precipitation (P_t), snow cover area (SCA_t) and streamflow (Q_t) data from 2003 to 2016 were used to develop and evaluate the models. Two groups were formed from the dataset for training and testing models. Three input scenarios were constructed based on P_t, SCA_t, Q_t, and their values in lag time. To evaluate and compare the accuracy of models, two performance criteria were considered including the Nash-Sutcliff Efficiency (NSE) and the Root mean squared error (RMSE). The results indicate that SVR outperformed the other models under all scenarios, with a NSE of 0.85 and a RMSE of 0.55 compared to ((NSE= 0.48, RMSE= 1.05), (NSE=0.27, RMSE= 1.25), (NSE=-0.11, RMSE= 1.55)) of LR, RF and XG-boost respectively. It can be concluded that the SVR model is a reliable tool to reproduce daily streamflow.