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Abstract

A hydrological modeling approach was used to detect changes in the hydrological regime of 5 rivers in the Blue Nile Basin of Ethiopia between 1960 and 2005. Daily meteorological and hydrological data were used. The whole time series classified into three periods based on major land management changes in the country; from 1960 to 1975, from 1976 to 1990 and from 1991 to 2004. Generalized Likelihood Uncertainty Estimation (GLUE) was used to calibrate the best parameter sets for each river in each period. The tests for detecting change were based on the 50 best model calibration for each river to each of three 15 year periods in the time series. Distribution of model parameter sets between different times-steps was compared. Model residuals from the different periods were also compared. Finally the predicted outputs of the model when the same time series of input data for a very dry or very wet year is used as input to the parameterized model for each of the 3 periods was examined. The modeling showed that soil moisture parameters were decreased significantly over the half decade of record, while subsurface flow parameters increased. These results implied that water is flowing faster from the catchments in recent years, leaving them to dry out more in the dry season. This increases the possibility of water shortage problems in the basin. These findings are contrasted with those of a more traditional statistical analysis of flow records which did not detect consistent changes in the flow regime, such as those found using model-based change detection.

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