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Statistical seasonal forecasting of hydrological drought in the Limpopo basin

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The Limpopo basin in southern Africa is prone to drought and seasonal forecasting can be one important step in improving drought early warning systems in the region. Seasonal forecasts models are based on sea surface temperatures with 3 to 12 months lead time. Southern Africa rainfall is affected by atmospheric anomalies like El Nino and varying Monsoon activity. These are propagated by sea surface temperature to Southern Africa. Predictability of Southern African rainfall has been experiencing difficulties due to nonstationary atmospheric processes. These are further complicated by the sometimes non-linear relationships between precipitation and teleconnected regions. Forecasting models have to be enabled to account for these challenges. We employ wavelet empirical orthogonal function analysis in order to deal with the nonstationarity in the sea surface temperature and the runoff signals. The forecasting model consists of an artificial neural network with the genetic algorithm as parameter calibration approach which is able to represent nonlinear relationships.