A dynamic Bayesian ARMA model for hydrological drought forecasting

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Abstract

A time series analysis is proposed for an adaptive design framework in nonstationary conditions. In this study, a dynamic Bayesian autoregressive moving average model (t-ARMA) is developed for modelling a standardized runoff index (SRI) time series. The t-ARMA model takes into account the possible change points in the SRI series, and the structure of the model changes with time. Bayesian theory is carried out to estimate the t-ARMA model parameters and locations of change points using a strategy of Markov chain Monte Carlo (MCMC) methods. The results demonstrate that using the Bayesian method to estimate the parameters of the ARMA and t-ARMA models could capture the SRI series characteristics, and the performances of the t-ARMA model are compared with those of the traditional autoregressive moving average (ARMA) model, showing that the t-ARMA model capable of taking the change point of the time series into account is more robust than the traditional ARMA model.

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