

Synthetic Stream-Flow Generation with Deseasonalized ARMA Model

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ABSTRACT

Time series models are used in river hydrology for synthetic generation. The development of such a model, namely deseasonalized Autoregressive Moving Average (ARMA), for generation of decadal (10-day) flows of the Brahmaputra River in Bangladesh is described. The model was fitted following systematic stages of identification, estimation and diagnostic checking of model building. A negative power transformation for the Brahmaputra flow was found to be necessary for model construction. The seasonality of the flow was removed by Fourier analysis using 5 harmonics for decadal means and 13 harmonics for standard deviations. The fitted model was ARMA (1, 3) having one autoregressive parameter and three moving average parameters. The validation forecasts made with the model indicated that the deseasonalized ARMA model could capture the decadal variability of the Brahmaputra flow reasonably well. Two hundred synthetic flow sequences, each with a length of 50 years, were generated using this model to further validate and verify the model. The fitted ARMA model was found to be capable of preserving both short-term statistics (variance and autocorrelation) and long-term statistics (Hurst coefficient and rescaled adjusted range) of the historic Brahmaputra flow.

Keywords: *ARMA model; synthetic flow; deseasonalization; Brahmaputra River*