

Title: Hybrid of arima-garch modeling in rainfall time series

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Abstract: The dependence structure of rainfall is usually very complex both in time and space. It is shown in this paper that the daily rainfall series of Ipoh and Alorsetar are affected by nonlinear characteristics of the variance often referred to as variance clustering or volatility, where large changes tend to follow large changes and small changes tend to follow small changes. In most empirical modeling of hydrological time series, the focus was on modeling and predicting the mean behavior of the time series through conventional methods of an Autoregressive Moving Average (ARMA) modeling proposed by the Box Jenkins methodology. The conventional models operate under the assumption that the series is stationary that is: constant mean and either constant variance or season-dependent variances, however, does not take into account the second order moment or conditional variance, but they form a good starting point for time series analysis. The residuals from preliminary ARIMA models derived from the daily rainfall time series were tested for ARCH behavior. The autocorrelation structure of the residuals and the squared residuals were inspected, the residuals are uncorrelated but the squared residuals show autocorrelation, the Ljung-Box test confirmed the results. McLeod-Li test and a test based on the Lagrange multiplier (LM) principle were applied to the squared residuals from ARIMA models. The results of these auxiliary tests show clear evidence to reject the null hypothesis of no ARCH effect. Hence indicates that GARCH modeling is necessary. Therefore the composite ARIMA-GARCH model captures the dynamics of the daily rainfall series in study areas more precisely. On the other hand, Seasonal ARIMA model became a suitable model for the monthly average rainfall series of the same locations treated.