AN ABSTRACT OF A THESIS

ERROR BUDGET ANALYSIS OF HYDROLOGIC MODELS: UNDERSTANDING APPLICATIONS FOR SATELLITE RAINFALL DATA

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When the absence of an adequate ground-based rainfall network hinders the operative use of hydrologic models, satellite-based rainfall estimates become the natural alternative. However, the rainfall data obtained from space-borne platforms are prone to errors. The analysis of progression of error was conducted from the input stage (rainfall) to various components of hydrologic cycle that was simulated by four models. Error budget analyses were conducted for four hydrologic models of increasing level of complexity – (1) Statistical (ABC) model; (2) Linear Storage-Discharge Model; (3) Nonlinear Storage-Discharge Model; (4) BROOK90. The following can be concluded from the error budget analysis of hydrologic models using corrupted data.

(1) Change in systematic error, additive random error, and multiplicative random error in the precipitation input do not show any relative effect on the simulated output variables of streamflow and ET for the statistical ABC model.
(2) Output variables (streamflow and ET) simulated using a linear storage-discharge model show a linear increase in percentage of error in streamflow volume and a decrease in ET as the magnitude of systematic error increases in input.
(3) With additive random error in the precipitation, the accumulation of error in stream flow exhibits more sensitive trend appearing very exponential.
(4) Generally, additive random error penalizes more than the multiplicative nature of random error in model's streamflow simulation. Hence, the assumption of error variance being independent of the mean is an important issue in the understanding of the progression of error from input to output.
(5) Inclusion of nonlinearity in the storage-discharge relationship plays an insignificant role in altering the overall pattern of error accumulation for a linear model.
(6) BROOK90 penalizes most the streamflow simulation when input error propagates. The magnification of rainfall error to runoff error was found to be maximum among the four models studied.