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Application of Bayesian Approach to estimate rainfall in Sri Lanka

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Rainfall data are important to address many problems in agriculture, hydrology and ecology. This study aims to estimate the annual rainfall and average rainfall per month received during the four rainy seasons in the year 2011, using monthly rainfall data collected at 76 meteorological observatories of the Department of Meteorology during the year 2011. The four rainy seasons are first inter-monsoon, Southwest monsoon, second inter-monsoon and Northeast monsoon. It is assumed that the spatial continuity of rainfall of two neighbouring locations is exponentially correlated. The Bayesian spatial statistical technique along with its Markov Chain Monte Carlo (MCMC) implementation was used to estimate the rainfall at ungauged locations. Projected coordinates of longitude, latitude system and altitude were incorporated into the spatial prediction of rainfall to improve the accuracy of predictions. Cross validation was used to compare the prediction performance of the five models using 16 stations out of 76 stations.

According to the study, predictions obtained for the Northeast monsoon are better than the rainfall predictions of annual and other climatic seasons. Overall predictions at Kekenadura station in Matara District, Madulkele station in Kandy District and Homagama station in Colombo District were better than the predictions of other stations. The study also clearly identified the actual pattern of seasonal variation at most (more than 68%) of the locations.

Keywords: Bayesian, exponential, Markov Chain Monte Carlo, rainfall, spatial