EXPOLRING THE SPATIAL AND TEMPORAL VARIATIONS OF RAINFALL IN SRI LANKA

By

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ABSTRACT

Exploring the Spatial and Temporal Variations of Rainfall in Sri Lanka

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A detailed study on the spatial and temporal characteristics of rainfall in Sri Lanka was carried out using the rainfall records maintained by the Department of Meteorology, Sri Lanka. The analysis was carried out as three separate studies, namely the temporal variations of rainfall, regionalization and spatial interpolation of rainfall and short term forecasting of rainfall occurrences.

The analysis of the temporal variations of rainfall revealed that a few stations namely, Kandy, Diyatalawa, Galle and Batticaloa have significant decreasing trends in the period 1948 to 1998. Decreasing long-term trends (1869-1998) could be observed at Nuwara Eliya, Kandy, and Badulla while a long-term increasing trend exists for Colombo. The spectral analysis by multi-taper and the maximum entropy method confirmed the existence of a 2-3 year band in the rainfall time series, which could be associated with a quasi-biennial oscillation and the Indian Ocean dipole moment. The connection with the ENSO (El-Nino Southern oscillation) effect could be observed through the bands 3-6 years and 6-7 years. Cross spectrum analysis reflects the influence of sunspot activity on most stations but it was hardly evident on a single spectrum analysis except Galle. A few stations indicated long-range oscillations with low significance while Colombo showed a 43.3-year cycle with significance greater than 95%.

The Regionalization analysis separated clearly the stations in the wet and dry zones. Spatial interpolation indicated that both the Inverse distance weighting method and kriging could successfully estimate weekly average rainfall in the northern central dry zone. The inverse distance weighting method with a single power factor produced estimates which were the most representative of the original data set. Although the results from the two methods are very similar, kriging allowed the quantification of the quality of predictions via the kriging variance. This work also showed that the strength of the predictions depends on the rainfall season.

The results of the Markov chain model approach show that the models can forecast the status of a given day at an average accuracy of 73%. Higher agreement in observed and forecasted values could be seen for stations in the dry zone when compared with those in the wet zone. No significant difference was observed between the results obtained by using the 1st order Markov process and the 2nd order Markov process.