

**MODELLING MONSOONAL RAINFALLS  
WITH SUNSPOT NUMBERS  
USING TRANSFER FUNCTION NOISE MODEL**

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Monsoonal rainfalls in Sri Lanka have a complex variation which can not be simply predicted. It's believe that the variation of the solar cycle have an impact on climatic patterns. The variation of solar cycle is measured by the sunspot numbers.

The study concentrated on monsoonal rainfalls of three locations in Sri Lanka, (Colombo:79°51'E, 06°52'N, Kandy:80°38'E, 07°07'N, Plonnaruwa:81°00'E, 07°54'N). Previous rainfalls records of 142, 136 and 108 years in Colombo, Kandy and Polonnaruwa considered for the analysis. The study, firstly examined the possibility of modelling monsoonal rainfall as univariate time series models and found that univariate modelling approach fails to track the true variation of monsoonal rainfalls. The study explored the connection between rainfalls with the sunspot numbers and constructed Box Jenkins(1976)Transfer function noise models(TFN) for Box-Cox transformed monsoonal rainfall and sunspot number series, such that, rainfalls is the dependent variable and sunspot numbers series is the predictor. The yearly mean wolf's sunspot numbers series modeled as an auto regressive model, so that it can provide input for the TFN model to make forecasts. The auto regressive model explains nearly 87% of the actual sunspot variation. This model used to predict 40 years ahead sunspot numbers and predictions matched well with observed values. During the study, Separate TFN models constructed for South West and North East monsoons in each district. TFN functions identified according to Box Jenkins(1976) residual cross correlation function(RCCF) method. By using TFN models, monsoonal rainfalls foretasted for 40 years for Colombo, Kandy locations and 30 years for Polonnaruwa. These models generated the basic pattern of monsoonal rainfalls series. Constructed TFN models have  $R^2$  values nearly 54%, 49%, 47%, 45%, 48%, 52% for Colombo-

South West, Colombo-North East, Kandy-South West, Kandy-North East, Polonnaruwa-South West, Polonnaruwa-North East respectively. TFN models could be used to make long term predictions for each location.

**Key Words:** TFN, ARIMA, Monsoonal Rainfall, Sunspot Numbers, Kandy, Colombo, Polonnaruwa