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Periodic occurrences of annual rainfalls in Eastern India [UPH No. 9 (theme: Variability of extremes) and UPH No.19 (theme: Modelling methods)]

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Long period annual rainfall data series from nine raingauge stations throughout eastern India were analysed. Those data series were for the years 1901 to 1965 for Aijal (Mizoram); 1901 to 1984 for Imphal (Manipur); 1901 to 1986 for Guwahati (Assam), Shillong, Cherrapunji (Meghalaya); 1901 to 1987 for Cuttack (Odisha), Patna (Bihar), Agartala (Tripura), Krishnanagar (West Bengal). Incomplete annual rainfall data were found out by taking average of data of preceding and following years. Each annual rainfall series was divided into modelled period (1901 to 1980 for eight stations except Aijal with 1901 to 1960) and predicted period (data for years left in the series after modelled period for evaluation of the model for prediction of future rainfalls). Each annual rainfall series in the modelled period was first converted into percentage values of the mean annual rainfall and then plotted against year, which showed the oscillations of the historigram about the mean line (Tomlinson, 1987 for New Zealand rainfalls). Such type of characteristic historigrams for all stations showed periodic nature of annual rainfalls throughout eastern India. So, autoregressive integrated moving average (ARIMA) model (Clarke, 1973) was used to evolve a useful model for prediction of future rainfalls. As the ARIMA model was biased for periodicity due to inclusion of both the ‘sin’ and ‘cos’ functions and period length as 12, modelled data series were analysed for polynomial regression. The accepted degrees of polynomials were decided on the basis of analysis of variance (ANOVA). Acceptance of either ARIMA model or polynomial regression was done on the basis of -test. In most of the cases in the observed historigrams the lengths of periods were less than eight years and in some cases those were eight to 12 years and from polynomial regressions in most cases the period lengths varied in between 8 to 12 years, 13 to 22 years and 23 to 37 years; and in rare cases those lengths were 38 years and more. Considering all the limitations in the observed data and 95% confidence interval for ARIMA model, a particular amount of annual rainfall occurred at about 12 years (i.e. almost resembling a Solar Cycle) and that might be concluded after minute analysis of more observed data. Recurrence of flood and drought years can be predicted from such analysis and also by following probability analysis of excess and deficit runs of annual rainfalls (Panda *et al*., 1996).

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