Research Paper Meteorology

Trends in Climate of West Bengal

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ABSTRACT

The climate of West Bengal is humid sub-tropical in the north and varies to tropical savannah in the south. The state is mainly marked for hot and humid climate (except the northern part of Sub-Himalayan West Bengal). The state has intimate dependence on climate with reference to agriculture and human comfort. It is said that the climate of the state is changing. An attempt is made herein to study the decadal trends in respect of summer maximum temperature and southwest monsoon rainfall.

Keywords : Pre – monsoon / summer, Southwest monsoon / rainy season, Decadal mean, Sun spot.

Introduction:-
The climate of West Bengal varies from north to south. It is humid sub-tropical in the north and tropical savannah in the southern part of the state. The state may be geographically divided as follows:- Sub-Himalayan West Bengal in the north and Gangetic West Bengal in the southern, Gangetic West Bengal may be further subdivided as follows: - Interior Gangetic West Bengal and Coastal Gangetic West Bengal (exhibited in the tables). West Bengal is marked mainly for hot and humid climate, excepting the northern part of Sub-Himalayan West Bengal. Hot and humid climate is appropriate for production of paddy and jute. Higher rain fall in the hills, i.e. northern part of Sub-Himalayan West Bengal is good for production of tea. Summer or pre-monsoon (March to May) is the principal hot season in the state and South west monsoon or rainy season (June to September) is the principal humid season. Consumption of electricity and water is highest in the Summer.

Aim of the study:-
This state has intimate dependence on climate with reference to agriculture and human comfort. It is said that the climate of West Bengal is changing, particularly summer maximum temperature and intra southwest monsoon temporal rainfall distribution, over decades. To understand such change, we relate thermal and precipitation phenomena to configuration of the Sun, specifically speaking, Sunspot number.

Data and methodology:-
Meteorological data have been collected from the following open access and free website: - IMD district wise monthly rainfall data from 2004-2010 for the whole --- (www.indiawaterportal.org > Articles > MET DATA Tool). Sun spot data have also been collected from open access and free website. Those districts have been selected for study wherein regular departmental observatories of the India Meteorological Department (IMD) are situated. Month wise decadal mean values of maximum temperatures of summer months have been computed for the thermal part of the study. Decadal mean values of half seasonal percentage of south west monsoon rainfall have been computed for the precipitation part of the study. If the mean maximum temperature in March 1971 be T1, March 1972 be T2, … , March 1980 be T10, decadal mean (1971 – 1980) of March is (T1+T2+…+T10)/10. If the percentage of south west monsoon rainfall (total rainfall during June to September) in June – July 1971 be P1, June – July 1972 be P2, … June – July 1980 be P10, decadal mean percentage (1971 – 1980) of June – July, i.e. first half season is (P1+P2+ … + P10)/10. Period of our study is 1971 – 2000 (three decades).

Conclusive trends:-
Sunspot is very important regarding total energy flux received on the earth. Decadal mean number of Sunspots are as follows:- 1971-1980 : 66.6, 1981-1990 : 83.0, 1991-2000 : 64.9.

Let us consider the thermal part (Summer) at first. It is seen from Table-I that decadal mean maximum temperature is negatively correlated to decadal mean Sunspot number. Decade 1981-1990 was the decade of maximum mean Sunspot number and lowest mean summer maximum temperature (any month), within probable observational error limit which is tolerable. April is hottest in Sub-Himalayan West Bengal and May in Gangetic West Bengal.

Let us now consider the precipitation part (Southwest Monsoon). It is clear from Table-II that decadal mean of first half seasonal percentage of southwest monsoon rain fall (June – July) is positively correlated (highest in 1981 -1990) to decadal mean Sunspot number and decadal mean for second half seasonal percentage of south west monsoon rainfall (August – September) is negatively correlated (lowest in 1981 – 1990) to decadal mean Sunspot number.

Proposal for further work: -
By regression analysis of decadal mean Sunspot data, a trend in respect of decadal mean Sunspot number may be found and respective correlation coefficients in respect of thermal and precipitation parts may be determined for forecasting purpose.

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Table - I
Month wise Decadal Average Maximum Temperature (°C)

Zone	Districts	March			April			May		
		1971-1980	1981-1990	1991-2000	1971-1980	1981-1990	1991-2000	1971-1980	1981-1990	1991-2000
Sub-Himalayan West Bengal	Coochbehar	31.1	31.0	31.4	33.4	32.4	33.6	32.3	32.3	32.8
	Jalpaiguri	30.5	30.5	30.9	32.6	31.9	32.9	31.8	31.8	32.4
	Malda	33.3	32.7	33.2	36.6	36.0	36.6	35.8	35.7	36.4
Interior Gangetic West Bengal	Bankura	34.3	33.6	34.2	37.6	37.5	37.8	38.2	37.9	38.7
	Birbhum	34.6	33.7	34.5	37.9	37.6	38.1	37.9	37.7	38.5
Coastal Gangetic West Bengal	Midnapore	33.2	32.6	33.2	35.6	35.4	35.9	35.9	35.8	36.4
	N-24 Parganas	31.0	30.6	31.0	32.6	32.5	32.9	32.7	32.8	33.3
	Kolkata	33.2	32.7	33.3	35.4	35.3	35.8	35.3	35.4	36.0

Table – II
Decadal mean of half seasonal % of southwest monsoon rainfall (%)

Zone	Districts	June & July			August & September		
		1971-1980	1981-1990	1991-2000	1971-1980	1981-1990	1991-2000
Sub-Himalayan West Bengal	Coochbehar	55	57	49	45	43	51
	Jalpaiguri	56	58	48	44	42	52
	Malda	47	49	46	53	51	54
Interior Gangetic West Bengal	Bankura	47	49	46	53	51	54
	Birbhum	47	50	43	53	50	57
Coastal Gangetic West Bengal	Midnapore	44	49	46	56	51	54
	N-24 Parganas	49	50	46	51	50	54
	Kolkata	44	50	45	56	50	55

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