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A CLIMATOLOGICAL STUDY OF PRE-MONSOON THUNDERSTORM OVER SRINIKETAN, ALIPORE AND KALAIKUNDA

1. Thunderstorm (TS) in Gangetic West Bengal during pre-monsoon season is one of the most important mesoscale weather phenomenon. Different statistical analysis of TS regarding frequency, periodicity, duration, diurnal variation, distribution monthwise and seasonwise *etc*. have been studied by Raman and Raghavan (1961), Rao *et al.* (1971), Prasad and Pawar (1985) and Sivaramkrishnan (1990) among others. Sahoni (1931), Vishvanathan and Faria (1962) analysed climatic characteristics of TS for Calcutta and Bombay airport respectively. In the present context we have studied different climatological aspects of TS during pre-monsoon season for three stations of Gangetic West Bengal, namely, Sriniketan (SKT) (23°39′N, 87°42′E), Alipore (ALP) (22°32′N, 88°20′E) and Kalaikunda (KLK) (22°20′N, 87°13′E). A total period of 30 years (1965-94) has been considered for the analysis, but for KLK, the period 1990-94 has been omitted due to non-availability of data.

2. Percentage frequency of TS has been calculated for every 15 days starting from 1 March upto 31 May and plotted in Fig.1 for drawing following facts:

(*i*) There exist overall increasing activities of TS during the season with only 2% decrease of TS in the first fortnight of May at KLK.

(*ii*) In the first fortnight, percentage of TS, *i.e.*, 8% for all stations reaches maximum during 6th fortnight with highest value of 26% (SKT) (Fig.1). Thus the total seasonal variation must be less than (26-8)% *i.e.* 18%. Again from Fig.1 it is seen that variation of TS percentage among all three stations during each fortnight never exceeds 4%. Thus, in general, the difference in TS percentage of the three stations during each fortnight in respect of total seasonal variation does not differ by 22% at the most.

3. Ratios of TS associated with squall and the total TS have been calculated. It is found that it is 48% for ALP and 32% for KLK, whereas it is only 3% in case of SKT. The biweekly representation of percentage of squall during pre-monsoon at ALP and KLK from Fig.2 suggests that the percentage occurrence of squall increases gradually upto last fortnight of April, *i.e.*, upto 4th fortnight of the season

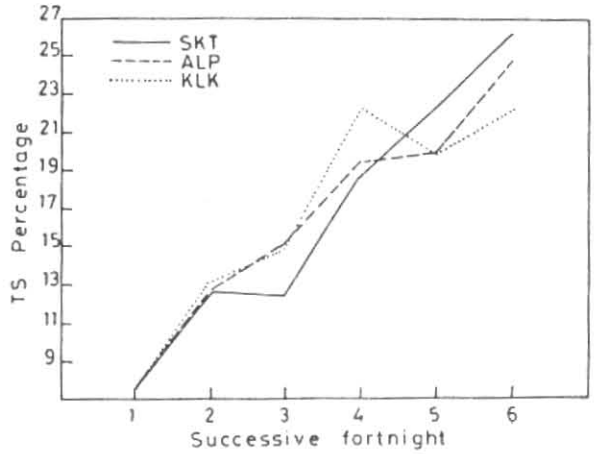

Fig.1. Percentage of bi-weekly representation of occurrence of thunderstorm (TS)

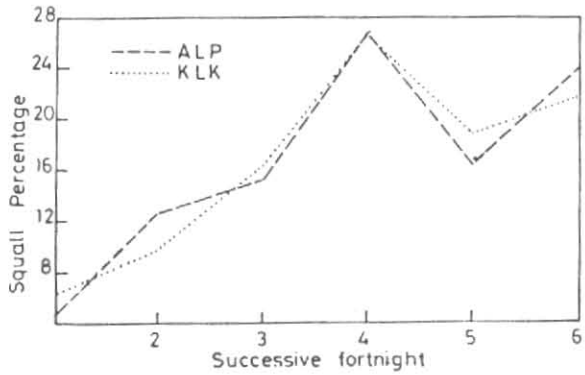

Fig.2. Bi-weekly representation of occurrence of squall

TABLE 1

Three hourly duration of thunderstorm

Duration (Hours)	Number of Occurrence of Thunderstorm														
	March			April			May			Total (Pre-monsoon)			Percentage		
	SKT	ALP	KLK	SKT	ALP	KLK	SKT	ALP	KLK	SKT	ALP	KLK	SKT	ALP	KLK
0000-0300	69	87	85	109	167	129	162	211	154	340	465	368	66.93	72.43	50.14
0300-0600	24	34	40	40	47	98	63	59	116	127	140	254	25.00	21.81	34.60
0600-0900	8	9	23	9	6	39	16	13	31	33	28	93	6.5	4.36	12.67
0900-1200	2	2	5	0	2	5	4	4	3	6	8	13	1.18	1.25	1.77
≥1200	1	0	0	0	1	2	1	0	4	2	1	6	.39	.16	.82
Total	104	132	153	158	223	273	246	287	308	508	642	734	100	100	100

TABLE 2

Three hourly diurnal variation of time of commencement of thunderstorm

Time of commencement of TS(IST)	Number of Occurrence of Thunderstorm														
	March			April			May			Total (Pre-monsoon)			Percentage		
	SKT	ALP	KLK	SKT	ALP	KLK	SKT	ALP	KLK	SKT	ALP	KLK	SKT	ALP	KLK
0000-0300	9	18	32	7	25	41	12	16	45	28	59	118	5.51	9.19	16.08
0300-0600	2	5	6	3	3	8	5	14	8	10	23	22	1.97	3.58	3.00
0600-0900	11	7	7	6	8	3	10	13	7	27	28	17	5.31	4.36	2.32
0900-1200	7	7	1	7	10	2	5	21	3	19	38	6	3.74	5.92	.81
1200-1500	15	11	11	22	22	40	41	49	33	78	82	84	15.35	12.77	11.44
1500-1800	39	39	56	84	84	126	136	81	154	259	204	336	50.98	31.78	45.78
1800-2100	15	33	30	25	51	40	33	72	44	73	156	114	14.37	24.30	15.53
2100-2400	6	12	10	4	19	12	4	21	12	14	52	34	2.76	8.10	4.63

and then decreases in the first fortnight of May for both the stations unlike TS. Squall, in both KLK and ALP, become maximum in the month of April (42%); though the occurrence in May (41%) is very close to that of April.

3.1. Fig.3 represents number of gap days (d_{gap}) *versus* frequency of TS (Ω_{TS}). The following observations have emerged:

(*i*) Ω_{TS} decreases with the increase of d_{gap} and this inverse relation is quite prominent for $d_{gap} \leq 4$.

(*ii*) for a gap of 3 days or more, $\Omega_{TS} < 10\%$ for all the stations.

(*iii*) Ω_{TS} is maximum for $d_{gap} = 1$, *i.e.*, on every alternate day the chance of TS is maximum for all three stations (KLK = 55.23%; ALP = 44.64% and SKT = 35.83%).

3.2. The duration of TS in the range 0-3 hour, 3-6 hour,... etc. for the stations ALP, SKT and KLK can be found in Table 1. Monthwise breakup and seasonal percentage have also been shown there. It is seen from Table 1 that maximum frequency of TS occurs with duration 0-3 hours for all the three stations during each month. This frequency is greater than 50% of total observations for all the three stations during the season [ALP = 72%, SKT = 67% and KLK = 50%]. Frequency of TS starting with duration 0-3 hour decreases drastically with the increase of three hourly duration at all stations for all the three months.

4. Three hourly diurnal variation of time of commencement of TS have been studied monthwise as well as seasonwise vide Table 2. In Fig.4, time of commencement in IST *versus* percentage occurrence of TS during the season have

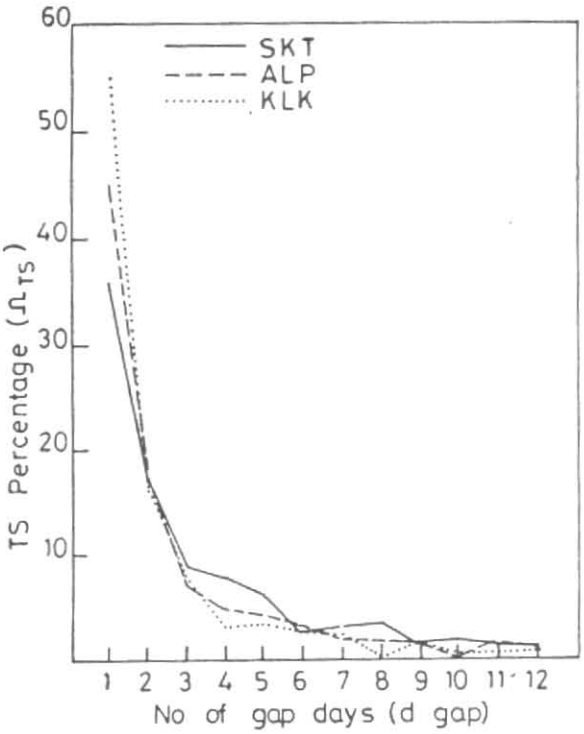

Fig.3. Thunderstorm (TS) percentage *Vs.* number of gap days

been plotted. It is seen there that the time during 1500-1800 IST is maximum prone to starting of TS for all three stations. More specifically for SKT and KLK the occurrence of TS during the said time interval is 51% and 46%, which is more than 3 times the occurrence of TS than any other intervals. In general, the percentage occurrence of TS takes considerable value during the intervals 1200-1500 IST and 1800-2100 IST for all three stations. However, for ALP the TS frequency in the time interval 1500-1800 IST is 32% which is in turn, only 1.3 times the frequency in time interval 1800-2100 IST and 2.5 times the frequency in time interval 1200-1500 IST. It is interesting to note that the distribution of TS frequency in ALP during 1200-2100 IST is more flat than that in SKT and KLK.

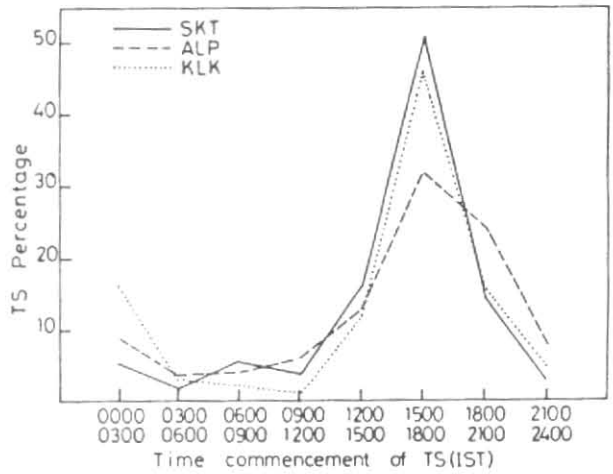

Fig.4. Percentage of thunderstorm (TS) at different time of occurrence

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