551.515.4(547.1)

FORECASTING THUNDERSTORM OVER BOMBAY AIRPORT

(1) Bombay Airport experiences thunderstorms in the premonsoon and postmonsoon periods. The thunderstorms are not generally accompanied by severe squalls except on rare occasions. The *Cb* clouds develop over the hills in the afternoon/evening to the northeast and east of the station and drift over the station. Some of them cause squalls. Radar studies have shown that the convective clouds which develop over the hills during late afternoon/evening move slowly and have a tendency to dissipate rapidly as they move from the favourable terrain and most of the thunderstorms do not affect the Airport.

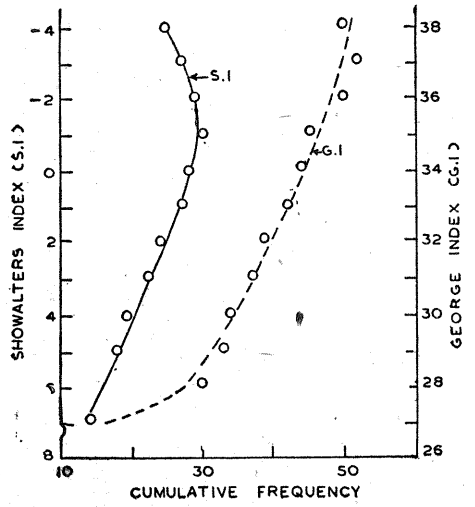
(2) In Showalter's method, the stability index is determined by lifting an air parcel at 850 mb dry adiabatically to saturation and then moist adiabatically to 500 mb. The temperature of the parcel so obtained at 500 mb is then algebraically subtracted from the observed 500 mb temperature. A positive value indicates stability and a negative value instability George (1960) instability value is given by the expression K = (850 mb temperature — 500 mb temperature) + (850 mb Dew point) — (700 mb Dew point depression). In this expression the lapse rate parameter is given by the first term, the moisture content in the lower levels by the second term and the vertical extent of the moist layer by the third term.

TABLE 1

George Index Analysis

(G. I.)

	G.I.	⩽27	28	29	30	31	32	33	34	35	36	37	⩾38
0000 Z	Freq. G.I.	363	29	15	21	23	25	32	29	23	22	17	45
	Freq. TS.	14	2	0	2	5	3	12	9	6	7	7	21
	Percentage Freq.	(4)	(7)	(0)	(10)	(22)	(12)	(38)	(31)	(26)	(32)	(41)	(47)
1200 Z	Freq. G.I.	372	27	15	14	16	22	9	17	18	15	12	25
	Freq. TS.	11	3	3	1	2	7	3	8	5	10	9	14
	Percentage Freq.	(3)	(11)	(20)	(7)	(13)	(32)	(33)	(47)	(30)	(67)	(75)	(56)
0000 Z+1200 Z	Freq. G.I.	735	56	30	35	39	47	41	46	41	37	29	70
	Freq. TS.	25	5	3	3	7	10	15	17	11	17	16	35
	Percentage Freq.	(3)	(9)	(10)	(9)	(18)	(22)	(37)	(37)	(27)	(49)	(55)	(50)
Cumulative	Freq. G.I.	1206	471	415	385	350	311	264	223	177	136	99	70
	Freq. TS.	164	139	134	131	128	121	111	96	79	68	51	35
	Percentage Freq.	(14)	(30)	(33)	(34)	(37)	(39)	(42)	(44)	(45)	(50)	(52)	(50)



(3) Data for this study confined to all the available tephigrams (both 0000 GMT and 1200 GMT). The study is limited to months March to June for premonsoon and September to November for the postmonsoon seasons. Care is taken to exclude the days of monsoon during the months of June and September. The occurrence of thunderstorm over the Bombay Airport during the next 24 hours subsequent to the RS/RW ascent is considered.

(4) The frequency distribution for George's instability index and Showalter's stability index are presented in Tables 1 and 2 respectively. The first and second rows correspond to 0000 GMT and 1200 GMT frequencies under various values of Showalters and George's index. The frequency of occurrence of thunderstorm along with the percentage in parenthesis is given. The third row corresponds to the total frequencies (0000 GMT and 1200 GMT combined) and the fourth row corresponds to the cumulative frequencies for the values 'greater than or equal to' in case of George's index and 'less than or equal to' for Showalter's index. It may be seen from the fourth row of the Table 1 that the possibility of occurrence of thunderstorm is 30 per cent whenever the George's instability index is 28 or more. It increases to 50 per cent for the values more than or equal to 36. Compared to this, Showalter's stability index could not reveal much about the occurrence of thunderstorm. It is just 30 per cent whenever the index is —1 or less and the accuracy/efficiency never reached 50 per cent in forecasting thunderstorm. Tables 1 and 2 are presented as frequency graph. It can be observed that George's instability index can be used as a better tool for forecasting thunderstorm over Bombay Airport. It is however to be mentioned that any index has to be used with the synoptic situation.

(5) The authors wish to express their sincere thanks to Shri S. Kumar, Director, Meteorological Office, Bombay Airport for his valuable suggestions.

TABLE 2

Showalter's Index (S. I.) Analysis

	S.I.	≥+7	+6	+5	+4	+3	+2	+1	0	—1	—2	—3	≤—4
0000Z	Freq. S.I.	123	40	45	52	48	73	60	58	58	47	35	26
	Freq. TS.	14	0	3	1	5	8	12	13	16	13	10	4
	Percentage Freq.	(3)	(0)	(7)	(2)	(10)	(11)	(20)	(22)	(23)	(28)	(29)	(15)
1200Z	Freq. S.I.	126	41	38	31	63	60	53	44	42	15	14	14
	Freq. TS.	0	0	3	0	5	7	16	11	18	5	4	6
	Percentage Freq.	(0)	(0)	(8)	(0)	(8)	(12)	(3)	(25)	(43)	(44)	(29)	(40)
0000Z+1200Z	Freq. S.I.	249	81	83	83	111	133	113	102	100	62	49	40
	Freq. TS.	4	0	6	1	10	15	28	24	34	18	14	10
	Percentage Freq.	(2)	(0)	(7)	(1)	(10)	(11)	(25)	(24)	(34)	(29)	(29)	(25)
Cumulative	Freq. S.I.	1206	957	876	793	710	599	466	353	251	151	89	40
	Freq. TS.	164	160	160	154	153	143	128	100	76	42	24	10
	Percentage Freq.	(14)	(16)	(18)	(19)	(22)	(24)	(27)	(28)	(30)	(29)	(27)	(25)

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Meteorological Office, Bombay
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K. B. PUNIAH
M. K. RAO