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Stability Index for Duststorm / Thunderstorm forecasting at Jodhpur

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ABSTRACT. The utility of stability index for forecasting local thunderstorms has been stressed by various workers. An attempt has been made to see how far this method could be used for dust/thunderstorm forecasting at Jodhpur during the premonsoon months. The data for the months March-June during the years 1961 and 1962 have been utilised in the study. It is observed as a result of this study that stability index alone has not been found suitable for predicting convective phenomena for Jodhpur.

1. The utility of stability index for forecasting of thunderstorms at Poona, Madras and Delhi has been studied by Tripathi (1956), Joseph (1957), Sesbadri (1962) and Basu (1962). In this study, a similar attempt has been made to see how far this method could be used for forecasting dust/thunderstorms and development of thundery conditions at Jodhpur during the premonsoon months of March, April, May and June.

2. The daily values of stability indices for Jodhpur (for 00 Z and 12 Z) have been calculated for the months March to June during 1961 and 1962. The indices could not be worked out on 35 occasions during the above period, due to want of data. From the current weather registers of Jodhpur for these months, the occasions when duststorms, thunderstorms and development of cumulonimbus clouds as well as associated squalls occurred at the station together with the date and time of occurrence of these phenomena were extracted. These were tabulated in the form of convenient tables, which are discussed in the following paragraphs.

3. Table 1 gives the number of occasions when stability index at 00 Z and 12 Z in the month of March had different values ranging from $\leqslant -4$ to $\geqslant +4$. The number of occasions when dust/thunderstorm or *Cb* development occurred during the next 24-hour period are shown in the same table against the corresponding values of stability indices. Percentage occurrences of these phenomena for different values of the indices have been worked out and are shown in the next row. The number of occasions when these phenomena were accompanied with squalls together with their percentages are also given in the same table.

4. It is significant that for 00 Z values of stability indices, the percentage occurrence of convective phenomena is more for positive values of the indices; whereas for 12 Z values, the percentage occurrence is more for negative values. Squall occurred only on one occasion when the stability index was —1 at 12 Z.

5. Tables 2, 3 and 4 have been similarly prepared, indicating stability indices at 00 Z and 12 Z in different ranges for the months of April, May and June respectively. The number of occasions when convective phenomena occurred during the next 24-hour period together with their percentages as well as the number of occasions of accompanying squalls with their percentages are also tabulated in the same way.

6. From Table 2, it is seen that in the month of April, the percentage occurrences are fairly evenly distributed between positive and negative values of stability index for both the hours 00 Z and 12 Z, although the

TABLE 1

	Stability Index for the month of March																	
	−4 or less		−3		−2		−1		0		+1		+2		+3		+4 or more	
GMT	00	12	00	12	00	12	00	12	00	12	00	12	00	12	00	12	00	12
No. of occasions	3	2	1	0	3	4	2	4	1	4	6	5	3	5	5	3	30	31
No. of dust/thunderstorms or *Cb* development (next 24 hrs)	0	1	1	0	0	2	0	1	0	0	1	0	1	2	1	0	3	2
Percentage	0	50	100	—	0	50	0	25	0	0	17	0	33	40	20	0	10	6
No. of occasions of squall	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Percentage	—	0	0	—	—	0	—	100	—	—	0	—	0	0	0	—	0	0

TABLE 2

	Stability Index for the month of April																	
	−4 or less		−3		−2		−1		0		+1		+2		+3		+4 or more	
GMT	00	12	00	12	00	12	00	12	00	12	00	12	00	12	00	12	00	12
No. of occasions	6	6	1	5	2	4	3	5	4	1	7	3	6	7	5	9	22	19
No. of dust/thunderstorms or *Cb* development (next 24 hrs)	1	1	0	2	0	2	2	0	1	0	1	0	0	2	2	0	2	3
Percentage	17	17	0	40	0	50	67	0	25	0	14	0	0	29	40	0	9	16
No. of occasions of squall	0	1	0	1	0	0	0	0	1	0	0	0	0	1	0	0	2	0
Percentage	0	100	—	50	—	0	0	—	100	—	0	—	—	50	0	—	100	0

TABLE 3

	Stability Index for the month of May																	
	—4 or less		—3		—2		—1		0		+1		+2		+3		+4 or more	
GMT	00	12	00	12	00	12	00	12	00	12	00	12	00	12	00	12	00	12
No. of occasions	11	17	6	4	6	7	7	13	6	3	8	6	5	3	3	4	5	5
No. of dust/thunderstorms or *Cb* development (next 24 hrs)	1	7	3	1	2	2	2	7	4	0	1	1	2	2	1	1	4	2
Percentage	9	41	50	25	33	29	29	54	67	0	12	17	40	67	33	25	80	40
No. of occasions of squall	0	2	1	0	0	0	0	1	2	0	0	0	1	0	0	1	0	0
Percentage	0	29	33	0	0	0	0	14	50	—	0	0	50	0	0	100	0	0

TABLE 4

	Stability Index for the month of June																	
	—4 or less		—3		—2		—1		0		+1		+2		+3		+4 or more	
GMT	00	12	00	12	00	12	00	12	00	12	00	12	00	12	00	12	00	12
No. of occasions	3	8	4	5	5	3	6	0	7	2	7	9	3	5	6	4	17	13
No. of dust/thunderstorms or *Cb* development (next 24 hrs)	0	2	1	1	1	1	1	0	3	0	2	2	0	1	3	0	3	3
Percentage	0	25	25	20	20	33	17	—	43	0	29	22	0	20	50	0	18	23
No. of occasions of squall	0	1	1	0	1	0	0	0	1	0	0	2	0	1	0	0	3	1
Percentage	—	50	100	0	100	0	0	—	33	—	0	100	—	100	0	—	100	33

maximum percentage for both hours correspond to negative values of the indices (67 per cent with index —1 at 00 Z and 50 per cent with index —2 at 12 Z). Percentage occurrences of squalls are quite erratic, squalls occurring with both the extreme values of stability index, *viz.*, $\leqslant -4$ and $\geqslant +4$.

7. In the month of May (Table 3), the percentage occurrences for positive and negative values of the indices for both the hours of observations are nearly alike as in April. It is significant that the maximum percentages for both the hours correspond to positive values of the index, 80 per cent corresponding to $\geqslant +4$ for 00 Z values and 67 per cent corresponding to $+3$ for 12 Z values of the index. During this month also, squalls have occurred with both positive and negative values of stability indices at both the hours.

8. In June also (Table 4), the percentage occurrences of convective phenomena do not show any preference for either positive or negative values of the stability index during both the hours. For 00 Z values, 50 per cent is the maximum percentage occurrence corresponding to stability index +3, whereas for 12 Z values, maximum percentage of 33 corresponds to index —2. Squalls too have occurred with both positive and negative values of the indices at both the hours.

9. An examination and study of the foregoing Tables 1 to 4 will show that occurrences of convective phenomena as well as accompanying squalls do not appear to correspond to any particular value of stability index, positive or negative for both the hours 00 Z and 12 Z. They occur with all values of stability indices ranging from the extreme positive to extreme negative. Thus we see that stability index alone has not been found suitable for predicting convective phenomena for Jodhpur.

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