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Letters to the Editor

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STABILITY INDEX FOR THUNDERSTORM FORECASTING IN PRE-MONSOON SEASON OVER DUNDIGAL AIRFIELD

1. Forecasting the occurrence of thunderstorm depends upon the analysis of radiosonde ascent and assessing the instability of various layers of atmosphere. Showalter has developed an index for the quick check for the possibility of occurrence of thunderstorm. A negative value shows instability (rising air warmer than the surrounding) and a positive value indicates stability. The utility of stability index for thunderstorm forecasting has been investigated for Pune, Madras, Jodhpur and Nagpur by Tripathi (1956), Joseph (1957), Narayanan (1965) and Sharma (1966) respectively. In this study an attempt has been made first to study the utility of stability index for thunderstorm forecasting and subsequently combined with mean mixing ratio for 850 to 700 mb layer.

2. Data from March to May for 1973 to 1977 was used and the daily values of the stability index were calculated for 1200 GMT ascent taken at Begumpet. In order to decide whether a thunderstorm has occurred or not, following criteria was set up:

(*a*) Thunderstorm/thunder showers observed at Dundigal airfield.

(*b*) Cumulonimbus cells observed at Dundigal airfield, within next 24 hours of the time of ascent.

The days on which thunderstorm was observed occurring over Begumpet at the time of ascent were excluded from the study. This resulted in 175 occasions for occurrence of thunderstorm out of total number of 406 days. Data on 54 days was not available.

3. Table 1 gives the percentage occurrence of thunderstorm for various ranges of stability index. Thunderstorm are seen to occur for almost all ranges of stability index, but the percentage occurrence decreases as value increases from greater than and equal to — 6.0 to greater than and equal to +6.0. Majority of the occurrences are confined to a value of stability index of less than + 1.0.

4. Table 2 gives the percentage occurrence for different ranges of stability index combined with different values of mean mixing ratio for the whole season. There are no occurrences for the value of mean mixing ratio of less than 2.5 gm/kg and increases as the value of mean mixing ratio increases from 2.5 to 7.5 gm/kg in each range. For a negative value of stability index almost all the occurrences are confined to a value of mean mixing ratio greater than 5.0 gm/kg and for positive values of less than +6.0, the mean mixing ratio should be more than 7.5 gm/kg. As the stability increases the value of mean mixing ratio required for thunderstorm also increases. For a value of stability index of less than —2.0 there are no occurrences for mean mixing ratio of less than 5.0 gm/kg.

5. In general, occurrence of thunderstorm over Dundigal airfield does not depend upon any specific value or range of stability index but a value of less than —1.0 conforms to a percentage occurrence of greater than 50 per cent and the percentage occurrence fall sharply for values higher than —1.0.

6. It is apparent that only stability index is not a suitable predictor but when combined with mean mixing ratio of 850 to 700 mb layer the occurrences are confined to a range of stability index and mean mixing ratio. In which the occurrences are confined to a value of mean mixing ratio of more than 5.0 gm/kg for negative values of stability index and for a value of mean mixing ratio of greater than 7.5 gm/kg for a positive value of stability index of less than +6.0. This shows that as the value of stability index increases towards positive side higher

TABLE 1

Stability index for pre-monsoon season (March-May)

	Stability index													
	⩽—6.0	—5.9 to —5.0	—4.9 to —4.0	—3.9 to —3.0	—2.9 to —2.0	—1.9 to —1.0	—0.9 to 0.0	0.1 to 1.0	1.1 to 2.0	2.1 to 3.0	3.1 to 4.0	4.1 to 5.0	5.1 to 6.0	>6.0
Total No. of days	22	11	19	28	34	37	38	19	34	47	26	33	17	38
No. of days of thunderstorm	16	9	13	18	17	16	17	8	10	14	8	10	5	14
Percentage	73	82	68	64	50	49	45	42	27	39	31	30	20	36

TABLE 2

Stability index combined with mean-mixing ratio for pre-monsoon season (March-May)

	Mean mixing ratio														
	>7.5	7.5 to 5.0	4.9 to 2.5	<2.5	>7.5	7.5 to 5.0	4.9 to 2.5	<2.5	>7.5	7.5 to 5.0	4.9 to 2.5	<2.5	>7.5	7.5 to 5.0	4.9 to 2.5	<2.5
	S.I.⩽—6.0				**S.I.—5.9 to —4.0**				**S.I.—3.9 to —2.0**				**S.I. —1.9 to 0.0**			
Total No. of days	11	1	Nil	Nil	29	8	1	Nil	33	33	1	Nil	16	42	7	Nil
No. of thunder-storm days	9	1	Do.	Do.	23	5	Nil	Do.	22	20	Nil	Do.	11	19	3	Do.
Percentage (%)	81	100	Do.	Do.	79	63	Do.	Do.	67	60	Do.	Do.	69	45	43	Do.
	S.I.+0.1 to +2.0				**S.I. +2.1 to +4.0**				**S.I. +4.1 to +6.0**				**S.I.>+6.0**			
Total No. of days	11	9	15	Nil	6	46	18	Nil	2	27	22	Nil	11	18	9	Nil
No. of thunder-storm days	8	9	5	Do.	4	10	7	Do.	2	7	5	Do.	2	6	3	Do.
Percentage (%)	73	24	33	Do.	67	22	39	Do.	100	26	23	Do.	18	33	33	Do.

values of mean mixing ratio is required for the occurrence of thunderstorms.

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