Letter To The Editor

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GROUND INVERSIONS OVER POONA DURING THE MONTHS OCTOBER TO DECEMBER

It is well known that Poona experiences strong 'ground inversions' or counter-lapse rates during the winter months. These inversions have been studied by Roy and Mahalingam (1941), Ramdas and Atmanathan (1932) and Ramdas (1943-45). Although the radiosonde ascents are available for Poona, for nearly eight years, morning ascents were made regularly for only about one year. There were also a few morning ascents over Poona during October and December during other years. This note describes a few facts that have emerged out of an analysis of 112 morning ascents during the months October to December, the majority of which were made in the year 1948.

2. Table 1 gives the frequencies of inversion and of isothermal layers for the three months.

TABLE 1

Month and hour (GMT) of observation	Total No. of ascents	Frequency of occurrence of inversion (%)	Frequency of isothermal stratification in the lower layers (%)
Oct (0030)	41	51·2	7·3
Nov (0130)	30	43·3	3·3
Dec (0130)	41	100	Nil

It is seen from Table 1 that the chances of ground inversions in October and November are about 50 per cent while in December ground inversion is a daily phenomenon. Days of isothermal stratification in the lower layers are very few in October and November and none in December, though in all the three months we do have occasionally, a thin isothermal transition layer separating the inversion layer from the free atmosphere where temperature decreases with height.

3. Table 2 gives details about the thickness of the inversion layer.

Inversions of Poona during October to December start from the ground layer itself. From Table 2 it is noticed that the thickness of the inversions are usually greater during October and December than during November; the average height of ground inversion works out to be about 0·45 km during October and December and about 0·3 km during November. Apparently, the decrease in the frequency and the thickness of inversion in November is associated with the post monsoon depressions which move across the south Peninsula and have a tendency to recurve towards the northeast from the east central Arabian Sea and increase the cloudiness and moisture content of the Poona atmosphere. This state of affairs prevailed in 1948, to which all the November ascents belong. If this feature was to be absent in any particular November, the frequency and thickness of inversions during November may be high in that year.

4. Table 3 gives the details about the counter-lapse rates expressed in increase of degrees centigrade per kilometre.

It is noticed from Table 3 that the mean counter-lapse rate or negative lapse rate is highest in December, 12°C per km and lowest in November 3·5°C per km. The low counter-lapse rate in November is probably due to the depressions in the east Arabian Sea and associated moisture content of the Poona atmosphere.

Roy and Mahalingam (1941), referring to ground inversions above Poona based on a

TABLE 2

Month and hour (GMT) of observation	No. of observations	Mean thickness of layer (mb)	Extremes of thickness of layer (mb)	Median value (mb)	Standard deviation (mb)
October (0030)	21	41	6 and 90	50	20·2
November (0130)	13	33	15 and 50	30	11·4
December (0130)	41	47	15 and 133	45	21·5

TABLE 3

Month and hour (GMT) of observation	No. of observations	Mean value of counter-lapse (°C/km)	Extreme values (°C/km)	Median value	Standard deviation
October (0030)	21	8·1	0·3–41·1	4·3	9·4
November (0130)	13	3·5	0·4–10·0	3·1	2·4
December (0130)	41	12·1	1·4–33·6	9·3	7·0

TABLE 4

Month and hour (GMT) of observation	Mean fall in specific humidity between base and top of inversion (gm per kg)	Mean rate of fall of sp. humidity (gm kg^{-1} per km)	Extremes of values (gm kg^{-1} per km)	Median value (gm kg^{-1} per km)	Standard deviation (gm kg^{-1} per km)
October (0030)	2·5	9·2	1·0—41·1	5·8	9·2
November (0130)	1·7	6·6	1·4—28·1	3·8	7·4
December (0130)	0·8	2·2	0·8— 8·5	2·0	2·2

study of the records for one year of two thermographs one at 4 ft and another at 120 ft above ground, have calculated the mean magnitude of temperature reversal at the time of strongest inversions as 8°F in December. The present analysis, suggests that, in the early morning deep layers of the atmosphere, of the order of 1000 ft, do not exhibit such steep lapse rates.

5. Table 4 gives the mean fall in specific humidity in grams per kilogram per kilometre.

It is noticed that the fall of specific humidity through the inversion layer is greatest in October and least in December.

6. It is known (Amer. met. Soc., 1951) that lapse rates of humidity of the order of about $\frac{1}{2}g$ kg^{-1} per 100 ft and inversions of temperature of the order of about 5°F per 100 ft are of great importance in radio meteorology as they cause downward bending of radio rays as great as the curvature of the earth, thereby making radio vision possible round the curved surface of the earth. The meteorological factors prevailing in the Poona inversions, may be of significance in the propagation of short radio waves of centimetre and metre wavelengths.

I wish to take this opportunity of expressing my grateful thanks to Dr. P. R. Pisharoty for the suggestion of the problem and his guidance during this study.

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