551.543.3 : 551.553.21 : 551.515.1

LATITUDINAL VARIATIONS OF CENTRAL PRESSURE IN MONSOON DEPRESSIONS

That the central pressure of weather systems in the temperate zone tends to decrease with latitude is well established observational fact. However, not much information appear to be available on latitudinal variations of pressure in weather disturbances in the tropics.

In this study it is proposed to examine latitudinal variations of central pressures in monsoon depressions based on data for July and August months for the period 1961-1974. The position of the depression centre and the central pressure refer to 03 GMT and collected from reports published by the Department.

2. *Distribution of central pressure* — The frequency distribution in latitude was approximately normal (Fig. 1) with the mean latitude being 22°N and the standard deviation of 6.5°. Of all the depression in the normal population, 68 per cent should have the central pressure within the range $\overline{P_0} \pm \sigma$, about 93 per cent within $\overline{P_0} \pm 2\sigma$ while 99 per cent should lie within $\overline{P_0} \pm 3\sigma$ range where, $\overline{P_0}$ is the mean pressure at the depression centre and σ is the standard deviation. In the present analysis the criteria was generally fulfilled. In fact, the number of cases lying within the above three ranges were 70, 95 and 100 per cent respectively in nearly all the latitudinal belts. This test of normality, though necessary, may not be sufficient in itself and has to be supplemented for a rigorous analysis, which was beyond the scope of the present study. In this study, based on the above test together with the shape of distribution (Fig. 1) it may perhaps be inferred that the central pressure in the monsoon depression generally follow normal distribution.

Table 1 gives the mean central pressure of the depression with latitude frequency and σ^2. The mean pressure has been illustrated in Fig. 2. It may be seen that the central pressure first generally decreases upto 22°N and subsequently increases with latitude. No regular pattern is seen in the variance although variances between 18-19°N and 21-22° N were quite high.

TABLE 1

Frequency, mean central pressure and variance

Lat (°N)	Frequency (percentage)	$\overline{P_0}$ (mb)	σ^2 (mb)^2
18-19	4.4	993.2	31.4
19-20	8.0	993.5	5.8
20-21	13.3	993.8	8.4
21-22	24.8	992.5	15.2
22-23	18.6	993.4	10.8
23-24	12.4	993.6	5.3
24-25	12.3	994.9	0.8
25-26	6.2	995.4	2.0

TABLE 2

Analysis of variance

Terms	Sum of of squares	Degrees of freedom	Mean sum of squares	F-values
First term	3.067	1	3.067	18.568*
Second term	1.700	1	1.700	8.629*
Third term	0.191	1	0.191	1.000
Fourth term	0.532	1	0.532	2.700
Residual	0.590	3	0.197	

*Significant at 5% level

3. *Orthogonal fitting* — An orthogonal poly-nomial was fitted to the mean latitudinal pressure of the depression centre. The analysis of variance is shown in Table 2. Evidently the first and second terms are significant at 5 per cent level but the variance is not significant in the subsequent terms. A parabola was, therefore, assumed to adequately describe the set of pressure data and the following equation was established :

$$Y = 993.02 + 0.41X - 0.17X^2$$

where, Y = mean central pressure in mb, and $X = 1, 2$ etc for latitudinal zones 18-19°N, 19-20°N etc respectively.

The curve fitted to the above equation is shown in Fig. 2. The fit between the observed and the values comupted appear quite close. In fact in none of the latitude zones did the deviation exceed 1 mb.

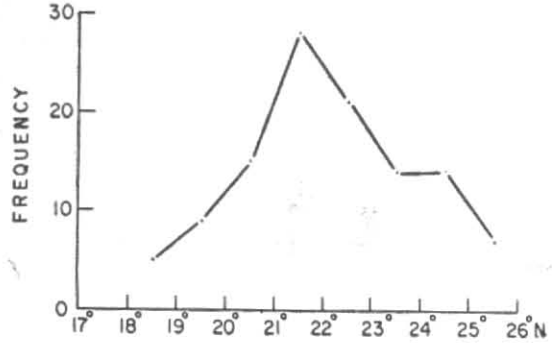

Fig. 1. Frequency distribution of depression latitudes

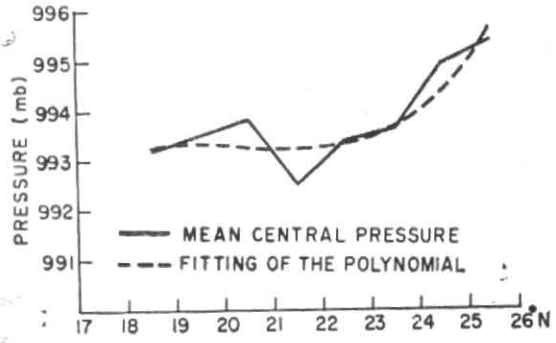

Fig. 2. Mean central pressure of depression & fitting of the polynomial

4. It thus appears that :

(*i*) The depressions in the Bay of Bengal, following westerly to westnorthwesterly track during July and August are normally distributed with a mean latitude of 22° N and standard deviation of $6\frac{1}{2}°$.

(*ii*) The central pressure in the depressions generally increases with latitude and a parabola adequately represents the pressure distribution in latitudes.

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