

TABLE 1  
Net radiation on nights with sky overcast with different kinds of cloud

Name of Station		Kinds of cloud covering the whole sky						Clear sky	Author and Reference		
		Low Clouds				Medium Clouds	High Clouds				
		Nimbostratus	Nimbus	Stratus or Strato-cumulus	Cumulus or Cumulonimbus		Alto-cumulus or Alto-stratus			Cirro-stratus	Cirro-cumulus
Bassour	R	0.01 to 0.04 (mean 0.025)				0.04 to 0.08 (Mean 0.060)	0.080 to 0.16 (mean 0.120)		0.14 to 0.20 (mean 0.170)	Angstrom (1915). <i>Smiths Misc. Coll.</i> , 65, 3, p. 56.	
Upsala	R n	0.023 (10)				0.039 (2)	0.135 (5)		0.169 (28)	Asklof (1920). <i>Geogr. Ann.</i> , 2, p. 253.	
Helsingfors	R n	0.046 (13)				0.097 (6)	0.123 (1)		0.190 (31)	Meinander, <i>R. Soc. Sci. Fenn-comm. Phys. Math.</i> , 16.	
Mount Weather	R n	0.047 (21)				—	0.091 (1)		0.159 (120)	Kimball (1918). <i>Mon. Weath. Rev.</i> , 46, pp. 57-70.	
Polar Regions	R n	0.008 (73)				—	—		0.075— 0.194 (269)	Mosby, H. "Maud" Expedition to North Pole, 1, 7.	
Stolsalpe	R n	0.029 (54)				—	—		0.144 (85)	Lauscher, F. (1928). <i>Met. Z.</i> , 45, p. 371.	
Kanzelhobe	R n	0.040 (20)				—	—		0.186 (47)	Eckel, O. (1934). <i>Met. Z.</i> , 51, p. 234.	
Mt. Norden-sköld (Sweden)	R n	0.041 (21)				0.047 (29)	0.124 (20)		0.147 (130)	Olsson, H. (1936). <i>Geogr. Ann.</i> , 18.	
Poona	R n	0.026 (10)	0.039 (7)	0.049 (9)	0.075 (3)	0.075 (20)	0.097 (6)	0.122 (2)	0.130 (10)	0.174 (345)	The present writer

R—Net radiation

n—No. of observations

551·515·2

### VARIATION OF CYCLONIC CIRCULATION WITH HEIGHT IN SEPTEMBER 1951 DEEP DEPRESSION

It is of interest to know the height upto which the circulation that is noticed in lower levels round tropical depressions extends. However, pilot-balloon winds do not provide complete information on this matter, since, within the depression field, the pilot-balloon ascents do not reach sufficient heights on account of cloud cover. James (1951) has attempted to study the vertical structure of tropical cyclones by plotting 'contour anomaly' against height. The contour anomaly is the difference in the height of any constant pressure surface between a point at periphery of the depression and at its centre. James has discussed this information for the typhoon, *Kitty* which passed over Japan and another over Florida. For plotting the contour anomaly James utilised the radiosonde data of one station only at different times, at one of the times the station being near the centre of the typhoon and at other times at the periphery of the typhoon. In the case of typhoon *Kitty* the contour anomaly was found to be practically constant during first eight kilometres, decreasing rapidly thereafter upto thirteen kilometres. In the Florida hurricane the contour anomaly was constant only upto 3 km and decreased higher up.

Cases where a depression centre passed close to a radiosonde station with an ascent at that time have been rare; one instance could be found in September 1951. A low pressure wave coming from the east across central Burma concentrated into a depression about 120 miles southeast of Chittagong at 0300 GMT of 9th. By 0300 GMT of 10th it was deep and centred near Burdwan, the pressure departure from normal at this station being 9·8 mb. Thereafter the depression moved in a westnorthwesterly direction and weakened rapidly on 13th, on which morning it was near Agra.

A sketch showing the position of Allahabad in relation to the depression centre at the

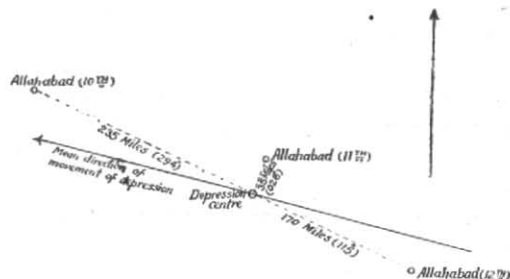


Fig. 1

times (1400 GMT) of the radiosonde ascents on 10, 11 and 12 September 1951 is shown in Fig. 1. On 10th, Allahabad was 235 miles westnorthwest, on 11th 35 miles north-northeast and on 12th 170 miles east-southeast of the depression centre.

It is taken that the ascent of 11th is representative of the conditions at the centre, of the 10th evening at the western periphery of the depression and of the 12th at the eastern periphery of the depression. From 10th to 12th the depression has slightly weakened.

In Fig. 2, the contour anomaly of different pressure surface is plotted. Unfortunately the ascent of 10th evening did not reach higher than 500 mb.

It will be seen that the contour anomaly between 10th and 11th is more or less constant upto about 2 km, slightly increasing with height thereafter upto 6 km. The contour anomaly between 11th and 12th also shows a constant value upto 1 km, slight rise from 1 to 5 km, and a very rapid increase thereafter right upto 12 km.

As in the case of *Kitty* typhoon and Florida hurricane, the contour anomaly is more or less constant in the lower layers but higher up the contour anomaly instead of decreasing seems to increase with height, very rapidly so above 5 km. It would appear that the intensity of the cyclonic circulation was increasing with height upto 12 km.

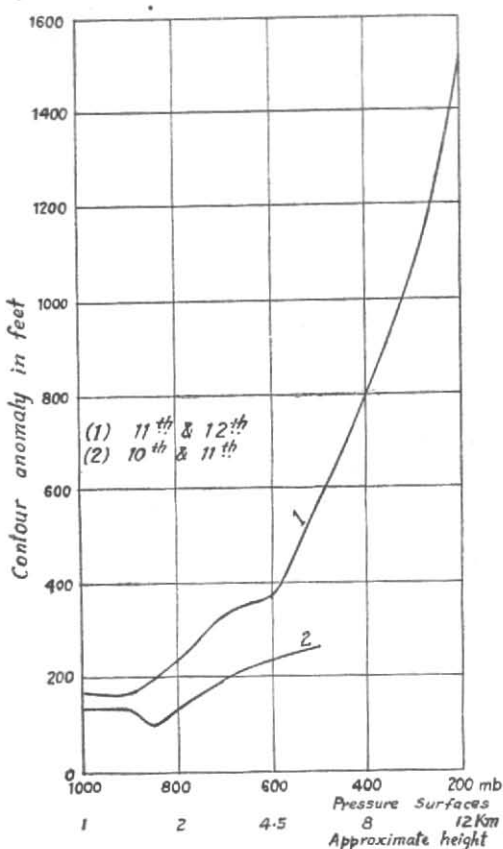


Fig. 2. Variation of contour anomaly with height

It will also be seen that the contour anomaly in the rear of the depression is greater than in front, though the distance of Allahabad from the centre was greater on the 10th than on the 12th. This may be either due to the pressure gradient being greater in the rear portion of the depression or due to the depression centre shifting at upper levels in the direction of movement, if the pressure gradient is uniform.

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#### REFERENCE

- James, R.W. (1951). *Mon. Weath. Rev.*, **79**, 11, pp. 205-207.