551.515.13 : 551.58 (541.9)

CLIMATOLOGY OF CYCLONIC DISTURBANCES OVER ANDAMAN AND NICOBAR ISLANDS

1. Andaman and Nicobar Islands (Bay Islands) is one of the Meteorological Subdivisions of India out of 35. The Islands lie between 6.5°-14°N and 92°-94°E covering land area of 8290 sq km and comprise 572 small islands.

Ganesan *et al.* (1994) found that the most probable area in the Bay of Bengal for the formation of tropical cyclonic disturbance is around Andaman Island, particularly in the pre-monsoon months of April and May. They have further shown that in the post monsoon months of October and November the probability of formation of storm is higher in an area lying between 6°-11°N and 80°-95°E. Cyclonic disturbance henceforth denoted by "Storm" includes depressions and tropical storms (all cyclonic disturbances with wind speed ≥17 kts). Since in the Bay of Bengal area formation of the storm is relatively higher near Andaman Islands, the probability of the system crossing Andaman & Nicobar (A & N) Islands is expected to be significant. Though considerable work has been done on the storms crossing different coasts of India, no systematic study has been made on systems crossing A & N Islands. In this paper, therefore, an attempt is made to present climatological details of the storms crossing A & N Islands during the period 1891-1997. Characteristic features of rainfall over A & N Islands in association with the storm are also discussed. The rainfall study is confined to the period 1941-97.

2. The data relating to the storm track was collected from the tracks of storms and depressions in the Bay of Bengal and the Arabian Sea for the period 1891-1970 published by the India Meteorological Deptt. and for the remaining period (1971-97) from the reports of Annual Cyclone Review meetings and the report on cyclonic disturbances over north Indian Ocean published by IMD. The rainfall data during the storm period (the week in which the storm affected the Islands) was collected from Pune weekly weather report of IMD (1941-97).

3. During the period of study (1891-1997) altogether 45 cyclonic disturbances crossed A & N Islands, out of which 30 were depressions and the remaining cyclonic storms / severe cyclonic storms. Figs. 1 (a-d) give the tracks of cyclonic disturbances that crossed A & N Islands in the pre-monsoon season and in

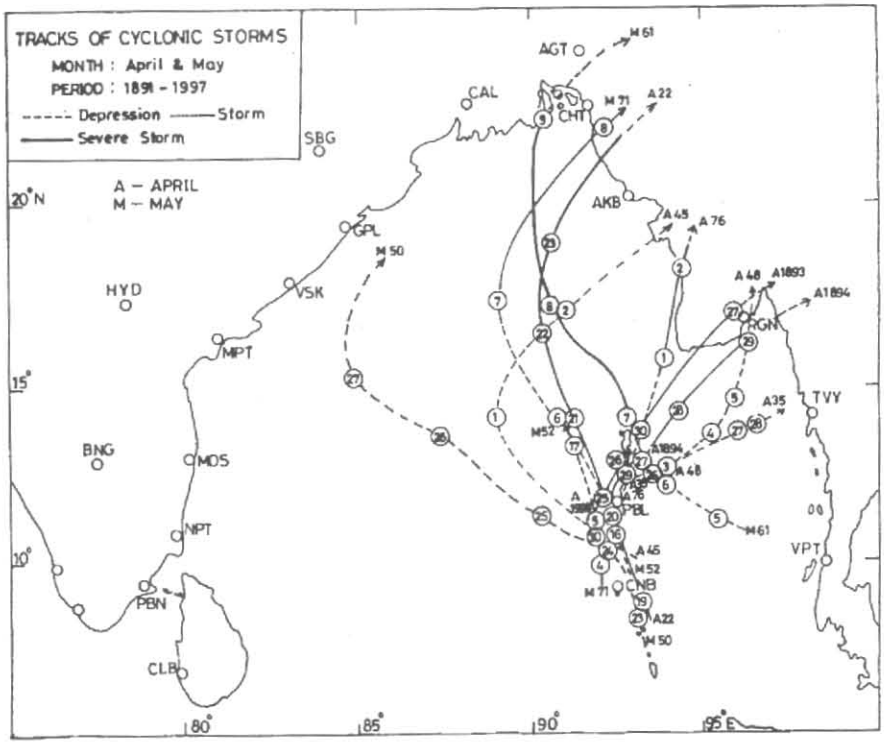

Fig. 1(a). : Tracks of cyclonic systems affecting A & N Islands

TABLE 1

Statistics of cyclonic disturbances which crossed Andaman and Nicobar Islands during the period 1891-1997

Month	No. of CDs (Wind speed 17 kts or more)	No. of tropical cyclones (TCs) (Wind speed 34 kts or more)	No. of CDs crossing from the east	No. of CDs crossing from the west	No. of CDs crossing north of 10°N	No. of CDs crossing south of 10°N	No. of CDs which struck Indian coast	No. of CDs which struck other than Indian coast	No. of CDs which weakened over the ocean
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Jan	1	0	0	1	0	1	0	1	0
Feb	1	0	0	1	1	0	0	0	1
Mar	0	0	0	0	0	0	0	0	0
Apr	7	2	2	5	7	0	0	6	1
May	4	1	4	0	2	2	0	2	2
Oct	10	4	10	0	9	1	6	4	0
Nov	16	4	15	1	8	8	9	3	4
Dec	6	4	2	5	4	3	0	2	4
Total	45	15	33	13	31	.15	15	18	12

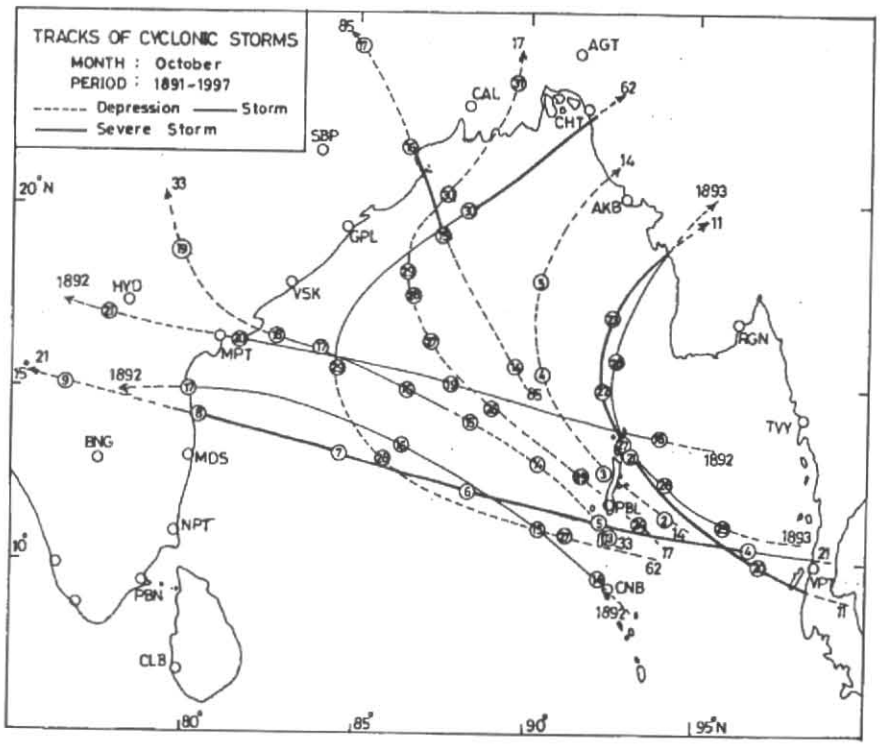

Fig. 1(b). : Tracks of cyclonic systems affecting A & N Islands

the months of October, November and December respectively during the period 1891 to 1997.

3.1 Table 1 gives monthly frequency of storms that crossed A &N Islands. It is seen that storms affect A & N Islands in winter, pre-monsoon and post-monsoon seasons. Since, during monsoon season, systems generally form over north Bay, A & N Islands is free from storms. It is further seen that the highest number of systems occur in the month of November (36%) and the

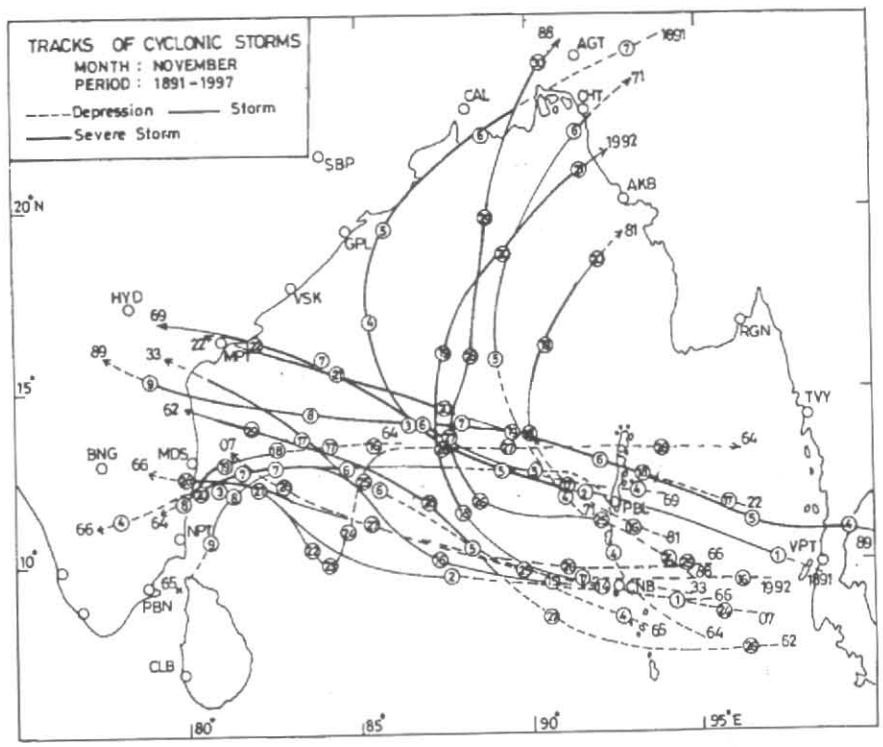

Fig. 1(c). : Tracks of cyclonic systems affecting A & N Islands

least is in the month of January and February (2% each) other than March, which is free from storms. The maximum probability of occurrence is in the post-monsoon months (71%) and the pre-monsoon months of April and May account for 24%.

It is interesting to note that these percentage probabilities are similar to the formation of cyclonic disturbances over the Bay of Bengal where 75% of the storms occur in the post-monsoon season and 22% in the pre-monsoon season (excluding monsoon season).

Since, the occurrence of the storm over A & N Islands in any given month is small, Poisson distribution holds good for the analysis of data. It is seen that the probability is negligible in January and February. The probability of A & N Islands being affected by a storm in any given year is 0.056 in April, 0.036 in May, 0.085 in October, 0.129 in November and 0.053 in December.

Percentage frequency of depressions and cyclonic storms including severe cyclonic storms (CS/SCS) that crossed A & N Islands in different months is also shown in Table 1. The contribution of CS/SCS to total disturbances in different months is 29% in April, 25% in May, 40% in October, 25% in November, and 67% in December. If we take post-monsoon season as a whole, 38% of the storms attained CS/SCS intensity, the contribution of SCS being 16%. In October and November, 50% of cyclonic storms attained severe cyclonic storm intensity whereas in December only 25% of them reached severe cyclonic storm intensity even though the percentage of occurrence of CS/SCS is the highest in December.

3.2. Table 1 also gives the direction from which the storms approach the coast of A & N Islands. It is seen that the majority of systems affecting A & N Islands approach from the east. If we examine individual months, it is seen that most of the storms affecting A & N Islands in October and November approach from the east, whereas in April and December the systems approach from the west.

3.3. Table 2 gives the significant rainfall amount at the time of storm crossing A & N Islands (≥20 cm). It is seen that the highest rainfall recorded in A & N Islands is 41 cm on 25 November 1'988 at Hut Bay. But during the storm situation rainfall recorded sometimes is as low as 1 cm in A & N Islands. For example, in November 1964, when the storm crossed A & N Islands on 27, the rainfall recorded at Port Blair was 3 cm and 2 cm on 26 and 27 respectively and Maya Bandar recorded 2 cm on 28. No rainfall was reported from the remaining stations. In the

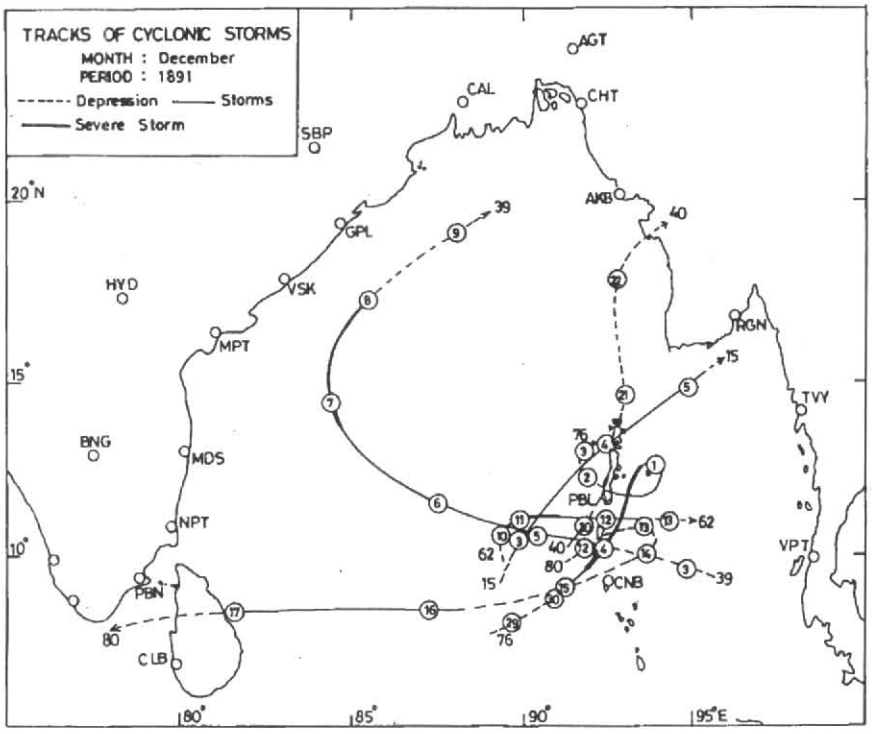

Fig. 1(d). : Tracks of cyclonic systems affecting A & N Islands

year 1985 also, when a storm crossed the Islands on 13 October, the rainfall recorded was 2 cm at Port Blair on 14, 1 cm at Long Island on 15 and 3 cm at Port Blair on 16. No rainfall was reported elsewhere. It may be concluded that the rainfall distribution over A & N Island stations during the storm situation is not uniform and as discussed above, there is significant variation in rainfall amount.

3.4. From Table 1, it is further seen that all the storms forming in April crossed north of 10°N. On the contrary in May, only 50% of the storms crossed north of 10°N. In the post-monsoon month of October, 90% of the storms crossed north of 10°N, whereas in November and December taken together more than 50% of storms crossed north of 10°N. On the whole 67% of the storms crossed north of 10°N and the remaining south of 10°N.

A looping storm affected A & N Islands in December 1976, when a severe cyclonic storm crossed A & N Islands on 30 December near Car Nicobar from the west and moved away towards northeast. It then made a clockwise loop, weakened into a depression, moved west and crossed the Islands near Port Blair on 1 Jan 1977. As a consequence of this looping slow-moving storm, Port Blair recorded 37 cm rainfall on 31 December 1976 and

TABLE 2

Significant rainfall recorded at the time of storm crossing A&N Islands (≥ 20 cm)

Year	Date of Crossing	Date	Place	Amount of rainfall (cm)
1962	12 Dec	12	PBL	26
1966	26 Nov	25	CNB	31
		25	NNC	20
1971	05 May	04	CNB	20
1976	30 Dec	31	PBL	37
1'980	12 Dec	13	PBL	22
1'988	25 Nov	25	HUB	41

the rainfall departure from normal over A & N Islands in the week ending 5 January 1977 was 215 mm. This storm caused widespread damage in A & N Islands due to very heavy rain and gale winds. A large number of trees were uprooted and roofs of houses were blown off in the little Andaman and the south Andaman and a few lives were lost. The property damage due to this storm was estimated to be Rs.23 lakhs.

3.5. It is evident from Table 1 that in April, 86% of the disturbances crossed Myanmar, Bangladesh coasts and the remaining weakened in the sea itself, whereas in May

only half of the total disturbances crossed Myanmar and Bangladesh coast and the remaining died in the sea itself.

It can further be seen that in the post-monsoon months of October and November taken together more than 50% of the systems after crossing A & N Islands crossed Indian coast. In October no storm weakened over the Bay after crossing A & N Islands whereas in December majority of the systems weakened in the sea.

The study has indicated that on an average, storm takes about 3.5 days with a coefficient of variation (C.V.) of 43% to reach Indian coast after crossing A & N Islands in October, whereas in November, it is 3 days with C.V. of 25%. It is seen that the storm travelled about a mean distance of 1040 km before crossing the Indian coast after crossing A & N Islands with a C.V. of 5% in October and in November, it travelled a mean distance of 1120 km with C.V. of 10%.

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