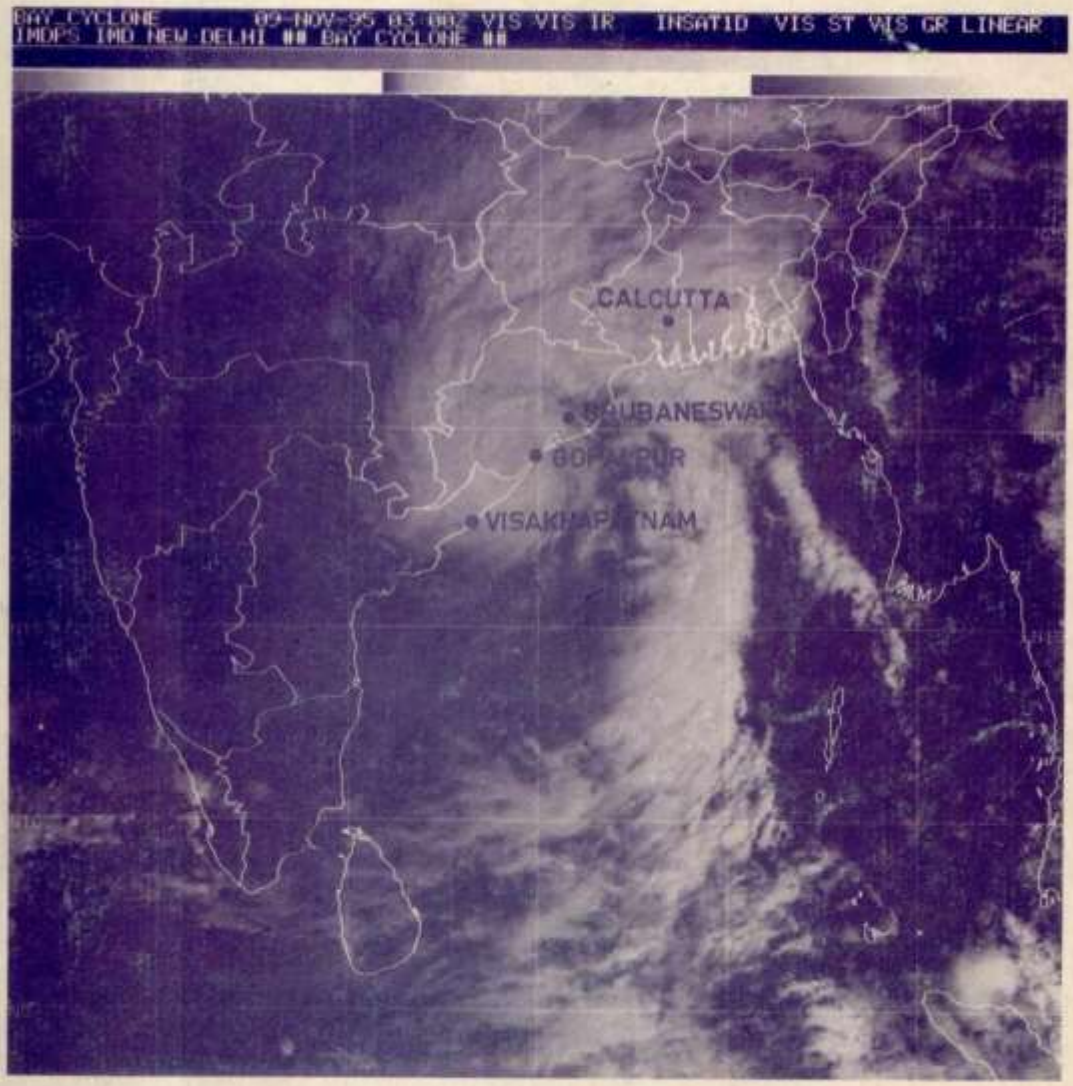
भारत मौसम विज्ञान विभाग

INDIA METEOROLOGICAL DEPARTMENT

REPORT ON CYCLONIC DISTURBANCES OVER NORTH INDIAN OCEAN DURING 1995



RSMC-TROPICAL CYCLONES, NEW DELHI
JANUARY 1996

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REPORT ON CYCLONIC DISTURBANCES OVER NORTH INDIAN OCEAN

(Abridged report for circulation during the annual meeting of WMO/ESCAP Panel on Tropical Cyclones)

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Introduction

This report consists of a review of the cyclonic disturbances and their associated features, that formed in the North Indian Ocean (The Bay of Bengal and the Arabian sea) during the year 1995. The classification of cyclonic disturbances followed in the report are given below:

	Weather System	Maximum Sustained Surface Wind Speed
1.	Low	Wind speed less than 17 kt. (31 kmph)
2.	Depression	Wind speed between 17 kt and 27 kt. (between 31 and 49 kmph)
3.	Deep Depression	Wind speed between 28 kt and 33kt. (between 50 and 61 kmph)
4.	Cyclonic Storm (CS)	Wind speed between 34 kt and 47 kt. (between 62 and 88 kmph)
5.	Severe Cyclonic Storm (SCS)	Wind speed between 48 kt and 63 kt (between 89 and 117 kmph)
6.	Severe Cyclonic Storm With A Core Of Hurricane Winds.SCS(H)	Wind speed 64 kt or more. (118 kmph or more)

The term **'Cyclone'** used at times in the text, is to indicate all the three categories of cyclonic disturbances given above under S.N0. (4) to (6).

Following are the important features of cyclonic disturbances in the North Indian Ocean during 1995.

a) This year, there were **eight** cyclonic disturbances against the normal frequency of 15 per year. Seven out of the eight disturbances formed over the Bay of Bengal and the one over Arabian sea. Only three of these systems attained the intensity of a cyclone.

(b) **Three** deep depressions formed one after another during the month of May in the pre-monsoon season of 1995.The long term average of formation (1891-1994) of such systems in May is 1.5 only.

(c) During south-west monsoon season only **two** depression formed against the normal frequency of 4 to 5. Each had a short life of less than two days and weakened close to the coast after 12 to 24 hrs of land fall.

(d) A depression that formed over East Central Arabian Sea in the month of October intensified in to a cyclonic storm and moved in a North Westerly to Northerly direction with average speed of 5kmph. It finally weakened over the sea off Oman Coast in west central Arabian sea.

(e) Two out of three cyclones, of this year formed over the Bay of Bengal during the second and third week of November initially moved in a north-westerly direction and then moved along 85° E. The first cyclone, moving northward crossed north Andhra Pradesh coast and the other cyclone recurved towards northeast.Generally during the month of November, cyclones move in a west-north-west direction or recurve towards north or north-east and hit Bangladesh and Myanmar coast.In such cases generally recurvature occurs east of 87° E. The cases of cyclone recurvature west of 87° E are very few during the past 104 years.

(f) The coasts of Bangladesh and Myanmar have been hit by one cyclone of hurricane intensity in every year since 1990 except in the year 1993.

(g) This year, the coastal area north of 18° N in the Bay of Bengal in India was mostly affected by the depressions and cyclones.

(h) The movement of the first cyclone of November has been rather rapid while the second cyclone moved fast after recurvature.

(i) This year the systems had longer life period than those of 1994. Only one cyclone made the land fall over the Indian Coast like in the previous year.

This year **eight** cyclonic disturbances formed over the Bay of Bengal and the Arabian Sea against the normal frequency of 14 to 15 disturbances. Thus the year of 1995 also had below normal cyclonic activity over North Indian Ocean like in the year of 1993 and 1994.

The **first** system formed over the southwest Bay of Bengal on the early morning of 6 May 1995 and attained the intensity of a deep depression by the same afternoon. Moving in a west-north-westerly direction it crossed Tamilnadu Coast by the same evening and weakened gradually. The **second** disturbance formed over west central Bay of Bengal on the afternoon of 8 May and intensified into a deep depression by the afternoon of 9 May. Moving in a north-north- easterly direction it crossed Andhra Pradesh coast by the same night of 9 May and weakened later. The **third** system formed as a low pressure area

over northwest Bay of Bengal off Andhra-Orissa coast on 14 May and attained the intensity of deep depression by the morning of 15 May. Moving in a north-north-easterly direction, it crossed West Bengal coast, near Sagar Islands on the morning of 16 May. It later moved in a north- easterly direction and finally weakened over northeast India by the morning of 18 May.

The **fourth** system formed during the southwest monsoon season as a depression over north-east Bay of Bengal on the morning of 16 September 1995 and moved in a north-westerly direction. It crossed north Orissa-West Bengal coast near Balasore in the early morning (0100 UTC) of 17 September and weakened over Bihar Plateau by the morning of 18 September. The **fifth** system also formed as a depression over northwest Bay of Bengal on the morning of 26 September with center near Lat. 21.5° N and Long. 87.5° E. Moving in a north westerly direction it crossed north Orissa-West Bengal coast near Balasore by the same noon.Thereafter it moved in a north easterly direction and finally weakened over Sub-Himalayan West Bengal by the evening of 28 September. Under the influence of these two depressions southwest monsoon strengthened over the eastern States of India. Heavy to very heavy rain occurred in this region.

The **sixth** system formed over the east Arabian Sea in the month of October. It was located as a depression near Lat. 16.5° N and Long. 70.0° E on the evening of 12 October. Moving in a north westerly direction, it intensified into a cyclonic storm on the morning of 14 October near Lat. 17.5° N. and Long. 67.5° E. Later, the system weakened over west central Arabian Sea by the evening of 17 October. The **seventh** system formed over the Bay of Bengal on the morning of 7 November and moved north west wards. It intensified in to a severe cyclonic storm with core of hurricane winds around the midnight of 8 November when it was located near Lat. 17.0° N, and Long. 85.2° E. Moving thereafter in a northerly direction, it crossed north Andhra Pradesh-Orissa Coast south of Gopalpur near Ichchapuram in north Andhra Pradesh on the morning of 9 November and weakened gradually. The **eighth** system also formed as a depression in the Bay of Bengal on the evening of 21 November 1995 near Lat. 7.0° N and Long. 91.0° E. Moving initially in a north westerly direction, it intensified into a severe cyclonic storm with a core of hurricane winds near Lat. 12.0° N and Long. 85.0° E by the evening of 23 November. Thereafter it changed its course from north to north east and moved fast. It finally crossed Bangladesh coast south of" Cox's Bazar" by the noon of 25 November 1995 and weakened rapidly. The tracks of these system are given in fig. 1 (a), (b), (c), (d), (e) and (f) respectively.

Table 1A gives the monthly distribution of cyclonic disturbances over the north Indian Ocean. It may be seen from the table that the number of systems in the pre-monsoon (March-May), monsoon (June-September) and post monsoon (October-December) seasons of this year were 3,2,and 3 respectively. Only two depressions formed in the monsoon season against the normal frequency of 4 to 5 per year. The monthly distribution of cyclonic disturbances during the past 24 years (1971-1994) is given at the end of the Table 1A. The Table 1B gives the duration of each type of cyclonic disturbance along with the duration of peak intensity, place and date of crossing the coast, loss of lives, peak storm surge etc. Identification numbers are given in the systems of cyclone intensity only in accordance with the para 2.3 of the TCP-21.

Tables (2 to 9) give the best track positions at 00,03,06,12, and 18 UTC along with the other meteorological parameters for all the cyclones in the Bay of Bengal and the Arabian Sea. Detailed account of all the systems are given in the following paragraphs. The locations of various stations referred to in this report are shown in Fig 2.

2. DETAILED DESCRIPTION OF CYCLONIC DISTURBANCES.

2.1 PRE-MONSOON SEASON (MARCH - MAY).

During the pre-monsoon season, three disturbances formed during the month of May and attained the intensity of a deep depression. The first disturbance formed during the first week of May and affected Tamilnadu coast. It was followed by the second and third cyclonic disturbances during the next two weeks and have affected Andhra Pradesh Coast and West Bengal- Bangladesh Coast respectively. The formation of such three systems, one after another in the month of May is rare in the history of cyclones of this region. Under the influence of these systems, entire coastal belt of India and adjoining Bangladesh received widespread rainfall which provided much needed water for drinking and agriculture use.

2.1.1 BAY OF BENGAL DEEP DEPRESSION (5-6 MAY 1995).

A well marked low pressure area formed over South-West Bay of Bengal off north Sri-Lanka coast on the evening of 5 May and concentrated into a depression by the same night with centre at 2100 UTC near Lat. 11.0^{o} N and

Long. 80.5° E about 130 Kms south-east of Pondicherry. It intensified into a deep depression at 0900 UTC of 6th May and was located near Lat 11.5° N and Long. 80.0° E close to Tamilnadu coast. INSAT Imagery of 0900 UTC indicated dense circular cloud mass of about 4° diameter over south-west Bay of Bengal in association with this system. By **1100 UTC** of 6th May the system **crossed** Tamilnadu coast near **Cuddalore**,and was located near Lat. 12.0° N and Long. 79.5° E at 1200 UTC.Moving in a north-westerly direction, it weakened over northern parts of Tamilnadu and adjoining Karnataka by the morning of 7 May. Under the influence of this system, widespread rains with isolated heavy falls occurred over Tamilnadu and Kerala on 5, 6, and 7 May and over Andhra Pradesh on 6 and 7 May. The system was monitored with the help of INSAT-2B, cyclone detection Radars of Karaikal and Madras and by the synoptic and special surface observations from the coastal region. The maximum intensity attained by the system was estimated as T-2.0 on Dvorak's scale at 0900 UTC of 6 May 1995 (Fig.3).

2.1.2 BAY OF BENGAL DEEP DEPRESSION (8-10 MAY 1995)

A low pressure area formed over west central Bay of Bengal and neighbourhood on the morning of 8 May and concentrated into a depression over the west central Bay and adjoining south west Bay by 0900 UTC of 8 May. It was centered about 120 kms south east of Machilipatnam near Lat. 15.0° N/ Long. 81.5° E on the evening of 8 May. The system gradually moved in a north easterly direction and intensified into a deep depression at 0900 UTC of 9 May and lay centered near Lat. 16.5° N/ Long. 82.5° E at 1200 UTC.It then moved in a northerly direction and **crossed** the Andhra Pradesh coast near **"Tuni"** around **1700 UTC** of 9 May. Later the deep depression weakened into a depression on 10th morning and further weakened into a low pressure area by 10th evening over Orissa and adjoining north coastal Andhra Pradesh. The system caused heavy rainfall on 8,9,10, and 11 May in Andhra Pradesh.

The system was monitored continuously with the help of coastal surface observations, cyclone detection radar (CDR) Of Vishakhapatnam and Machilipatnam and with the cloud imageries of INSAT- 2B. The highest intensity of the system was estimated as T-2.0 on Dvorak's scale at 0900 UTC of 9 May. (Fig.4) CDR at Vishakhapatnam reported a set of broken curved lines associated with the system from 0200 UTC of 9 May.

2.1.3 BAY OF BENGAL DEEP DEPRESSION (14-18 MAY 1995).

2.1.3.1 Brief History.

A depression formed off Orissa Coast in the west central and adjoining north west Bay of Bengal on the night of 14 May 1995.and lay centered

at 1800 UTC near Lat. 19.5° N and Long. 86.5° E about 100 kms south of Paradip in Orissa. Moving in a north northeasterly direction and skirting the coast, it intensified further into a deep depression with center near Lat. 20.5° N and Long. 87.0° E (about 60 km south east of Chandbali) by the morning of 15 May Moving in a north northeasterly direction it was centered near Lat. 21.5° N and Long. 87.5° E at 1200 UTC and by the morning of 16 May it **crossed** the West Bengal coast near **Sagar Island** and was located at 0600 UTC near Lat. 22.5°N and Long. 89.5° E. It then changed its course to north-easterly direction andmaintaining its intensity as a deep depression it entered into Tripura through Bangladesh by the morning of 17 May and was located near Lat. 24.5° N and Long. 91.5° E about 100 km north of Agartala. It weakened into a depression by the same evening and further weakened into a low pressure over north Assam and neighbourhood by the morning of 18 May.

2.1.3.2 Monitoring.

The system was kept under constant surveillance of coastal cyclone detection radars at Paradip and Calcutta from its origin over West Central Bay of Bengal on 14 May 1995 to its crossing stage on 16 May. It was also tracked with the help of conventional synoptic observations, hourly special observations and satellite (INSAT-2B).

The maximum intensity as estimated with the help of Dvorak's method was T-2.0 at 0300 UTC of 15 May.(Fig 5)

2.1.3.3 Weather Occurred

During 14 to 16 May 1995, widespread rainfall with scattered heavy to very heavy falls occurred in Orissa. During the period 15 to 17 May fairly widespread rainfall with isolated heavy falls occurred over coastal areas of West Bengal Very heavy falls were recorded at Sand heads on 17 May.

2.1.3.4 Winds Recorded.

On 15 May 1995, at 1000 UTC to 1100 UTC Paradip (Orissa) recorded westerly winds of 28-30 kts.

A ship ATKD positioned at Lat 20.8° N / Long 88.1° E reported wind direction south-westerly and speed 50 kts at 0300 UTC and 0600 UTC of 16 May.

2.1.3.5 Damages.

Under the influence of the three deep depressions in May, widespread rainfall occurred all along the east coast of India leading to floods in some areas of north Tamilnadu & south Andhra Pradesh and coastal areas of West Bengal. Damage to crops due to heavy rain was also reported from these region. The death toll due to the first two deep-depressions which crossed Tamilnadu and Andhra Pradesh was **12** persons in Tamilnadu and **22** in Andhra Pradesh and **5** in Kerala. Due to third deep depression, rains claimed **35** lives in Orissa and **12** in West Bengal. Heavy rains and Tidal waves also claimed **60** lives in Bangladesh and rendered more than **60,000** people homeless.

2.2 SOUTH WEST MONSOON SEASON (JUNE-SEPTEMBER)

During the monsoon season, two depressions formed over the Bay of Bengal in the month of September 1995, against the average frequency of 4 to 5 depressions during this season.

During the past five years, there were, four depressions in 1990, three depressions in 1991; one cyclonic storm and one depression in 1992; one depression in 1993; one cyclonic storm and one depression in 1994. Thus there has been below normal cyclonic activity in each monsoon season,since 1990. This year, no system formed during the month of June, July and August,in which the frequency of formation of cyclonic disturbances is 1 to 2 depressions per month.In general, a depression during monsoon season has a life period of 2 to 4 days and traverses a large part of land over Central India, but this year both the systems had a short life of less than 2 days. They weakened close to the coastal area 12 to 24 hrs after their land fall. The **first** system formed over Bay of Bengal on 16 September 1995. Moving in north westerly direction it **crossed** north Orissa coast near **Balasore** by the morning of 17 September. The **second** system formed over north west Bay of Bengal during the last week of September and **crossed** almost at the same place near **Balasore.**

2.2.1 BAY OF BENGAL DEPRESSION(16-17 SEPTEMBER 1995)

A well marked low pressure area formed over East Central Bay of Bengal on the afternoon of 14 September 1995. INSAT imageries of 14 and 15 September indicated little change in the organization and intensity of the system. At 0300 UTC of 16 September it concentrated into a depression with centre near Lat. 19.0° N / Long. 90.0° E. Associated upper air circulation extended up to 400 hpa. Moving in a north westerly direction, it **crossed** North Orissa coast near

Balasore on the morning of 17 September. It weakened over Bihar Plateau near Ranchi by the same evening. The peak intensity of the system was inferred as T-1.5 on Dvorak's scale.(Fig. 6). Under its influence widespread rainfall with scattered heavy falls occurred over Orissa and Bihar Plateau during this period.

2.2.2 BAY OF BENGAL DEPRESSION(26-28 SEPTEMBER 1995)

A well marked low pressuré area formed over north West Bay of Bengal in the early morning of 26 September. INSAT imagery of 0300 UTC indicated further organization, suggesting the formation of a depression near Lat. 21.5° N /Long. 87.5° E (close to north Orissa coast). It **crossed** north Orissa coast near **Balasore** around noon of the same day. Moving in north westerly direction, it was centered at 0300 UTC of 27 September near Lat. 23.0° N/ Long. 86.0° E. Thereafter it recurved in a north easterly direction under the influence of an upper air anticyclone at 200 hpa. It weakened over Gangetic West Bengal and neighbourhood by the evening of 28 Sept.

The highest intensity attained by the system was T-1.5 (Fig.7) on Dvorak's scale from 0300 UTC of26 Sept. to 0300 UTC of 28 September. It caused **heavy to very heavy rainfall** over Bihar Plateau and Gangetic West Bengal. **Malda** in West Bengal recorded **57cm**. **Nimapara** in **Orissa** recorded **44cm**. **Colgong** in **Bihar Plains** recorded **34cm** during 24 hrs on 28 September.

2.3 POST MONSOON SEASON (OCTOBER-DECEMBER 1995)

During this season one system formed over the Arabian Sea in October and two formed over the Bay of Bengal in November. The first system formed on 12 October over the Arabian Sea and attained the intensity of a cyclonic storm on 14 October during its northwest ward movement. It weakened over west central Arabian Sea by the evening of 17 October 1995. The second system formed over the central Bay of Bengal on 7 November and attained the intensity of a severe cyclonic storm with a core of hurricane winds. Moving in a northerly direction, it crossed north Andhra Pradesh Coast on 9 November and finally weakened over Bihar by the evening of 10 November. The third system formed over south east Bay of Bengal in the third week of November and moving initially in a north westerly direction and later towards north, it intensified into a severe cyclonic storm with a core of hurricane winds by the evening of 23 November. Thereafter, it changed its track from north to north east and moved fast. It finally crossed South east Bangladesh Coast by the end of the week.

This year, both the systems of November had a recurvature from northwesterly direction to northerly direction along 85.0° E and attained the intensity of hurricane. In general the recurvature of the systems in the month of November occurs near Long. of 88° E

2.3.1 ARABIAN SEA CYCLONIC STORM12-17 OCTOBER 1995. (ARB 95 01 1014)

2.3.1.1 The Life History of the cyclone.

A well marked low pressure area which moved across central peninsula on 11 October, emerged into east central Arabian Sea on 12 October and intensified into a depression by the same evening with center near Lat. 16.5° N/ Long. 70.0° E. Moving initially in a west north westerly direction, it intensified into a deep depression with its center near Lat. 17.0° N/ Long. 68.0° E by 1200 UTC of 13 October. Later it moved in a north- westerly direction and concentrated in to a cyclonic storm at 0000 UTC of 14 October near Lat. 17.5° N/ Long. 67.5° E. The system remained almost stationary up to 0600UTC of 15 October 1995 and then moved slowly in a north westerly direction up to 00 UTC of 16 October near Lat. 19.0° N /Long. 66.0° E. It remained stationary again up to 0600 UTC of 16 October and thereafter, moving in a north- westerly direction it weakened in to a deep depression by 1200 UTC with center near Lat. 19.5° N/ Long. 65.0° E. It weakened further in to a depression and was centered at 0300 UTC of 17 October near Lat. 19.5° N and Long. 64.5° E. Moving west wards it weakened further and became unimportant over west - central Arabian Sea by the same evening.

2.3.1.2 MONITORING AND TRACKING

As the system was beyond the range of cyclone detection radars (CDR) located at Goa, Bombay and Bhuj, it was tracked and monitored continuously with the help of INSAT- 2B cloud imageries. Some ship observations from storm field, though received late helped in fixing the center of the system.

The INSAT imagery of 0900 UTC of 12 October indicated well organized cloud cluster with the center of circulation near Lat. 16.5° N/ Long. 70.5° E. Its intensity was estimated as T-1.5 on Dvorak's scale. The important feature of the cloud structure associated with this system is that the system had sheared type structure with clouds located mostly to the west of center of the system (Fig 8). With slow intensification, it acquired the maximum intensity of T-3.0 at 0900 UTC of 14 October. Subsequent imageries of 1200 UTC,1800 UTC, 0000 UTC showed considerable weakening of the curvature structure associated

with the system (Fig 9). At 0000 UTC of 15 October, its intensity was estimated as T-2.5. Thereafter the system continued to weaken slowly over the sea and became unimportant by 17 October.

2.3.1.3 MOVEMENT.

The system initially was located in the south west sector of the upper air anti-cyclone at 200hpa and accordingly it moved in a north-westerly direction. Gradually the system came under the influence of weak winds between the two upper air anticyclones and as such showed erratic movement. It appears that the strong vertical wind shear between 850 and 200 hpa (Fig 10) over the storm field and unfavourable environment prevailing over the north-west Arabian sea caused the gradual weakening of the system over the sea.

2.3.1.4 METEOROLOGICAL FEATURES AND WEATHER CAUSED.

Pressure and Wind.

As the system attained the maximum intensity of T-3.0 on Dvorak's scale, the corresponding maximum sustained surface winds and lowest surface pressure are estimated as 45kt, and 994 hpa respectively. As the system did not make land fall and weakened over the Arabian sea, no damage was caused.

2.3.2 BAY OF BENGAL SEVERE CYCLONIC STORM WITH A CORE OF HURRICANE WINDS 7-10 NOVEMBER 1995. (BOB 95 02 1108).

2.3.2.1 Brief History.

Cloud configuration in the Insat Imagery of 0900 UTC of 6 November indicated the formation of a low pressure area over south-east Bay of Bengal and adjoining Andaman Sea. It concentrated into a depression by the morning of 7 November and was centered near Lat. 11.0° N/ Long. 91.5° E (Fig. 11).Moving north- westwards with average speed of 21kmph it intensified into a deep depression and was located at 1200 UTC near Lat. 12.5° N/ Long. 89.5° E. (about 380 kms north west of Portblair). It intensified into a cyclonic storm by the same midnight and lay centered at 0000 UTC of 8 November near Lat. 13.0° N/ Long. 88.5° E. Thereafter it moved almost in a northerly direction with an average speed 30 kmph and attained the intensity of a severe cyclonic storm by 0900 UTC of 8 November and hurricane intensity by 1500 UTC(Fig 12) with center near Lat. 16.0° N/ Long. 85.4° E.(about 300 kms south east of Vishakhapatnam in Andhra Pradesh). Moving with the same speed and in the

same direction, it crossed north Andhra Pradesh- Orissa coast between Kalingapatnam and Gopalpur (close to **Ichhapuram** in **Andhra Pradesh**) around **0500 UTC** of 9 November (Fig 13). After land fall,it continued to move in a northerly direction and weakened into a cyclonic storm by the same evening and was located at 1200 UTC near Lat. 21.0° N/Long. 85.0° E (about 120 kms northwest of Bhubaneswar). It weakened further into a deep- depression on the morning of 10 November and was located close to Gaya and became a depression by the after- noon near Muzaffarpur in Bihar. It slowly weakened further and became unimportant on the morning of 11 November.

2.3.2.2 MONITORING AND TRACKING

The system was tracked with the help of hourly INSAT-2B imageries from its origin over north east Bay of Bengal till dissipation over Bihar. Cyclone Detection Radar (CDR) of Machilipatnam, Vishakhapatnam and Paradip also monitored from 8 November. As the system was at the fringe of CDR's range, full details of the eye and the eyewall of the cyclone could not be received. CDR Vishakhapatnam reported estimated position of eye of the storm at 0300 UTC of 9 November. Radar diagram of 1904, 2004,2104,and 2333 UTC of 8 November (Fig 14), showed curved lines and their orientation was fast changing due to the rapid movement of the system.

2.3.2.3 SIGNIFICANT FEATURES OF THE CYCLONE.

1. The movement of the cyclone has been rather rapid with an average speed of about 30kms /hr after attaining the intensity of a cyclonic storm in the morning of 8 November.

2. The cloud bands were seen to originate both from the south as well as from the north. Inverted comma structure was seen clearly at 0300 UTC of 7 November.

3. At 1500 UTC of 8 November, INSAT imageries showed a cloud canopy with sharp edges of about 5° diameter (Fig 12).

4. The highest T- number of 4.5 on Dvorak's scale was estimated for the cyclone just before its crossing the coast. At this time 'Banding Type Eye' was seen in the associated CDO at 0300 UTC of 9 November (Fig on. front cover).

5. High wind speed recorder (HWSR) at Vishakhapatnam recorded maximum winds of 40kts at 1818 UTC of 8 November.

MOVEMENT. The system was initially located in the south-west sector of upper air anticyclone at 200 hpa, and was steered by the prevailing easterly to south-easterlies in this region. Later it came under the influence of western flank of upper air anticyclone which was shifted north-ward as the cyclone moved northward along 85° E.(Fig.14 & 15).

2.3.2.5 METEOROLOGICAL FEATURES AND WEATHER CAUSED. (Based on post cyclone survey report)

2.3.2.5.1 PRESSURE.

The system attained a peak intensity of T-4.5 on Dvorak's scale at 0300 UTC of 9 November. The estimated central pressure corresponding to this intensity works out to be 976 hpa. The **lowest pressure** of **982.1 hpa** was recorded at 0002 UTC of 9 November by Kalingapatnam which is close to land fall point.

2.3.2.5.2 WIND.

The **maximum surface wind** associated with the highest intensity of the storm T-4.5 was estimated as **77 kt**. From the observations of damaged electric poles and uprooted big trees at various places the wind strength is estimated to be of the order of 150 kmph. Maximum speed in gust at Visakhapatnam air port was recorded as N/59kt at 1655 UTC while that at Waltair was recorded as 53kt at 1548 UTC which are separated about by a 15km distance.At Gopalpur the maximum winds were estimated to be southerly 70kts at 0500 UTC of 9 November. It appears from Fig16. that the eyewall of the storm passed through the area south of Gopalpur, where the maximum damage to trees, electric poles and crops was caused by the strong winds.

The RT mast installed at Gopalpur observatory also fell on this day. Ship ATKA (Position near 15.5° N/85.3° E.) reported winds at 0900 UTC north east/ 40 kt, at 1200 UTC north- west/ 40 kt.

2.3.2.5.3 RAINFALL.

The system caused widespread rains with heavy to very heavy fall over south Orissa and north Andhra Pradesh. Isohyetal analysis of 9 November(Fig 17) indicates that the western sector of the storm received the highest rainfall.

2.3.2.5.4 *TIDE WAVES /STORM SURGES.*

The *storm surge height* was estimated of about **1.5 metre** above normal tide level at Gopalpur and Chilka Lake in north east sector of the storm. Saline inundation was noticed upto a few hundred feet from the coast in the low lying areas near Gopalpur and Chilka Lake.

The area affected by the storm surge is shown in fig.18.

2.3.2.5.5 *DAMAGES.*

a) *Damage reports in* **Andhra Pradesh** *coast.*

1.	**Districts affected**	Srikakulam, Vizianagaram, Visakhapatnam.
2.	**Total no of lives lost**	one (1) in Srikakulam, (Due wall collapse), **48** fishermen in Visakhapatnam.
3.	**No of persons missing**	**153** fishermen in Visakhapatnam.
4.	**No of person injured**	**93** in Visakhapatnam.
5.	**No of boats affected**	**81.**
6.	**No of houses damaged**	**2,631.**
7.	**Damage to crops**	**1,73,653** Hectares.
8	**a). No of electrical units affected.**	**12,733.**
	b). Length of conductors affected	**21** km.

a) *Damages in* **South Orissa** *as reported from the local Govt.Authorities are.*

1.	**No of districts affected**	**20**
2.	**No of villages affected**	**21826**

3.	a). Human casualties b). Missing	20 117
4.	No of boats damaged	2681
5.	Cropped area affected	108.7 Lakh hect.
6.	No of private houses damaged	25014
7.	Value of damaged public properties	Rs.112.75 Crores

c) *Damage reports in* West Bengal.

1.	Districts affected	Midnapore, South 24 Paraganas
2.	Total no of lives lost	Three(3) in Midnapore and one in South 24 paraganas.
3.	No of kutcha houses damaged	Three hundred (300)
4.	No of trawlers capsized	Five(5) in Midnapore, two(2)in South 24 paraganas.
5.	No of persons missing	One hundred thirty two (132) (110 from South 24 parganas and rest from Midnapore).
6.	Damage to crops	Large areas of paddy crops, potato, mustard and negetsiah in Midnapore.

A few photographs of damage caused by the cyclone are given in Fig,19.

2.3.3 BAY OF BENGAL SEVERE CYCLONIC STORM WITH A CORE OF HURRICANE WINDS. 21-25 NOVEMBER1995. (BOB 95 03 11 22).

2.3.3.1 BRIEF HISTORY.

A well marked low pressure area formed over south-east Bay of Bengal on the morning of 21 November. Its intensity was estimated as T-1.0 with

center around Lat. 6.5° N and Long 92.0° E. By the same evening, it concentrated into a depression with center close to Lat 7.0° N AND Long 91.0° E. Moving north-westwards it further intensified into a deep depression on the morning of 22 November and was centered near Lat 7.5° N and Long 90.0° E. By the afternoon it attained the intensity of a cyclonic storm with center near Lat 8.5° N and Long 88.5° E. At this time the cloud structure in the central area became well organised. It continued to move in a north-westerly direction and intensified into a severe cyclonic storm by the morning of 23 November and was located at 1200 UTC near Lat. 10.0° N and Long. 86.0° E. Thereafter it took a northerly course and further intensified into a severe cyclonic storm with a core of hurricane winds by the night of 23 November and lay centered at Lat. 12.0° N and Long. 85.0° E. It moved in a northerly direction upto the morning of 24 November and then recurved to north-east and moved very fast. It **crossed** south-east coast of Bangladesh near **Cox's Bazar** around **noon of 25 November** and weakened rapidly over Manipur and adjoining Myanmar by the same night.

2.3.3.2 MONITORING AND TRACKING

The system was continuously tracked and monitored mainly with the help of INSAT-2B imageries. As the system came within the range of Cyclone Detection Radars (CDR) located at Vishakhapatnam and Paradip along the east coast of India, the Radar observations helped in fixing the center and estimating the intensity of the system.

The INSAT imagery of 0300 UTC of 23 November (Fig 20) indicated well formed curved bands and increase in the cloud cluster of the core region. At this time its intensity was estimated as T-3.5 on Dvorak's scale. Formation of eye was first noticed in the imagery of 0000 UTC of 24 November and became very clear at 0500 UTC. Its intensity at 0300 UTC of 24 November was estimated as T-5.0 and T-5.5 at 0900 UTC (Fig.21). Warming in the eye region was continued from 0300 UTC to 0700 UTC of 24 November and the highest eye temperature of -8.7°C. was observed at 0700 UTC. As the system moved in a north-easterly direction with an average speed of 30 kmph, its intensity was reduced to T-4.0 /C.I. - 4.5 at 0600 UTC of 25 November, due to strong vertical wind shear just before crossing the Bangladesh coast. CDR Vishakhapatnam reported a very faint eyewall with height of the wall clouds about 10-11 kms at 0900 UTC of 24 November (Fig 22). It was not possible to estimate the diameter of the eye due to very small curved portion of eye wall and very small eye wall thickness. However, a rough estimate of eye-diameter was about 20-25 km. CDR Paradip also reported 'open eye' with RMR of about 25 km at 2100 UTC of 24 November (Fig 23).

A few radar observations were also received on real time basis from Cox's Bazar, Dhaka.It appears that the system weakened rapidly after crossing the coast on the evening of 25 November.

2.3.3.3 MOVEMENT.

Initially, as the system, was located in the south west sector of upper tropospheric anticyclone, it moved in a north-westerly direction. Later it came under the steering current of western flank of the upper air anticyclone at 200hpa (Fig 24). This resulted in its first north-ward movement on 23 evening and then north-eastwards movement by the morning of 24 November. Strong horizontal and vertical wind shear, Fig.25(a) in the upper levels decreased the intensity of the system on 25 November.

2.3.3.4 METEOROLOGICAL FEATURES.

2.3.3.4.1 PRESSURE.

The cyclone attained its peak intensity of T-5.5 AT 0900 UTC of 24 November. The estimated lowest central pressure corresponding to this intensity comes out to be 956 hpa. No crucial ship observation was available from the storm field. Surface observations at the time of crossing the coast from Cox's Bazar are not readily available and are still awaited.

2.3.3.4.2 WIND.

The **maximum sustained surface wind** corresponding to the peak intensity of T-5.5 is **102 kt**. As the system weakened before crossing the coast, the available reported wind speed by Chittagong at 0600 UTC was NE/30KT.

2.3.3.4.3 DAMAGES.

Damage report and storm surge height recorded or estimated along the Bangladesh Coast are awaited.

3. DYNAMICAL ASPECTS.

3.1 VERTICAL SHEAR.

It is known that the development of a disturbance is favoured when the vertical wind shear is small over the disturbance. In order to see the contribution of this parameter for the development of cyclonic disturbances in the north Indian Ocean in 1995, vertical shear of the zonal winds between 200 and 850 hPa were computed in the case cyclones. Computations were made by utilizing the winds at 850 and 200 hPa from the land stations and 2.0^{o} Lat/Long grid point forecast winds available over the ocean areas from the Limited Area Model of RSMC, New Delhi.

The analysis of the vertical wind shear charts for the cyclones of 1995 shows the prevalence of minimum vertical wind shear over the area of disturbance. The shear charts for the case of Bay of Bengal Cyclones in November 1995 are shown in Fig.25 (a) and (b).

3.2 TRACK PREDICTION MODELS.

Storm track prediction is made operationally by RSMC New Delhi by utilizing several models based on climatology, persistence and the combination of climatology and persistence (CLIPER). These models were run for all the cyclonic disturbances (depression onward). The track prediction was also made based on Analogue Techniques. Such forecasts were made for cyclonic disturbances of tropical storm intensity and above. Mean forecast position errors on the basis of climatology, persistence and CLIPER models for cyclones are given in Table 10. Mean forecast position errors for the depression and cyclones based on Analogue are given in Table 11. The forecast skill relative to CLIPER model for cyclones is given in Table 12.

The forecast skill relative to CLIPER model is expressed as percentage and calculated by using the formula given below :

$$\textbf{FORECAST SKILL} = \frac{\text{CLIPER (PE) - OM (PE)}}{\text{CLIPER (PE)}} \times 100$$

CLIPER (PE) = Position errors based on CLIPER Model

OM (PE) = Position errors based on other models such as persistence, climatology, Analogue etc.

The data revealed the following facts:

a. In general the forecast position errors were more with time, particularly beyond 24 hours.

b. The forecast errors based on persistence model were less than the errors based on climatological model. Due to this fact Forecast errors based on CLIPER were poor this year.

c. The forecast errors were very high at the time of recurvature of the cyclone during November 1995.

d. The forecast position errors upto 24 hours based on Analogue model were better than those based on CLIPER.

3.3. THE LIMITED AREA FORECAST MODEL OF RSMC, NEW DELHI.

The limited area forecast model adapted from Florida State University U.S.A. is also being run by R.S.M.C. New Delhi on an experimental basis. The details of the models are given in R.S.M.C. report of the year 1993.

3.3.1. RESULTS FROM MODEL FOR CYCLONES - 1995

The model could only be run for the two out of three cyclones of 1995 due to the non availability of necessary data input for the model. The first one was the Bay of Bengal severe cyclonic storm with a core of hurricane winds which formed on 7 November and crossed north Andhra Pradesh coast on 9 November. The other cyclone was the Bay of Bengal severe cyclonic storm of 21 - 25 November which crossed Bangladesh coast south of Cox's Bazar on 25 November. Initial and predicted vorticity fields of 850 hPa for the cyclone of 21-25 November 1995 are given in Fig.26 and 27 respectively. The 24 hour forecast position errors on 22,23,and 24 November were 50,50,and 250 Kms respectively in the case of 21-25 November cyclone. 48 hour forecast errors for 22 & 23 November were 100 and 250 km. Fig.28 shows the observed and predicted tracks of severe cyclonic storm,21-25 November,1995. In the case of 7-9 November cyclone 24 hours forecast errors for 9 November were 160 Kms and 220 kms for 48 hour. Results show slower than actual movements with a poleward bias in many forecasts. The forecast skill of this model relative to CLIPER is 64 percent for 24 hour and 76 percent for 48 hour forecast for the cyclones of November 1995. Fig.29 shows comparative forecast skill relative to CLIPER for all the models.

So far the prediction experiments show that the forecasts of tropical cyclone movement by incorporating a model vortex are quite reasonable and the results are comparable. This model is found to predict well the change in the intensity and direction of the system.

4. DISSEMINATION OF WARNINGS

Cyclone warnings were issued and disseminated to the general public, central and state government officials and other user organizations in India through high priority telegrams, T/P, Telephone and Telex. The electronic and print media were also used extensively for this purpose. Particularly, timely cyclone warnings issued to the public and the State governments of Andhra Pradesh and Orissa in connection with the severe cyclone of 7-9 November 1995 were helpful in minimizing the loss of life and public property to a great extent. Cyclone warnings in different local languages were communicated directly by India Meteorological Department (IMD)'s Cyclone Warning Centers to the affected coastal populations through the satellite based communication system known as the **Cyclone Warning Dissemination System (CWDS).**

5. COOPERATION AMONG PANEL COUNTRIES

As in the previous years, Tropical Cyclone advisories were issued by the Regional Specialized Meteorological Center (RSMC) New Delhi to all the member countries of WMO/ESCAP Panel on Tropical Cyclones during the cyclone period at the six hourly interval. Besides this, Tropical Weather

Outlooks for the north Indian Ocean were issued daily at 0600 UTC as a routine to the member countries of the Panel.

Cloud Motion Vectors based on 0000 UTC and 1200 UTC observations are regularly disseminated over GTS for the area covering the Bay of Bengal, the Arabian Sea and the Indian Ocean upto 30^{o} S. 0000 UTC IR full frame satellite picture is transmitted on Radio Facsimile for international use.

Bangladesh Meteorological Department has been requested to provide some valuable information, upper wind data and radar observations from the coastal cyclone detection radars (CDR) in connection with the cyclone of 21-25 November 1995 which may be very useful in finalizing the track and the intensity

of the system at the time of crossing the Bangladesh coast on November 25. The report is awaited.

This year,six special tropical cyclone advisories for the cyclone in Arabian Sea were issued to U.A.E. Saudi Arabia on their request.

6 CONCLUDING REMARKS.

Like the previous year (1994), this year also experienced eight cyclonic disturbances that formed over the Bay of Bengal and the Arabian Sea. Out of the eight one attained the intensity of a cyclone and weakened over the sea, and the two reached the stage of a hurricane. Both the hurricanes formed in the month of November and the first one crossed the Indian Coast and the other one crossed the Bangladesh Coast. Both the systems moved along 85.0^{o} upto $16\text{-}17^{o}$ N and then one made land fall over north Andhra Pradesh-Orissa coast and the other recurved toward northeast. Both of the systems had fast development and high speed of movement ranging between 26 to 35 kmph. Their rate of intensity and speed are shown in Fig.30 and Fig.31 respectively. This year, no cyclone has affected the Indian Coast south of 15^{o} N. Even the systems those formed during November moved northward and had a little effect on south peninsula of India.

Thus the year of 1995 was also a year with below normal cyclonic activity over north Indian Ocean. They have not caused any severe damage to property or loss of life in the region of their land fall.

TABLES

TABLE 1A

Monthly Distribution of Cyclonic Disturbances (Depressions and Cyclones)
Over
North Indian Ocean (The Bay of Bengal and The Arabian Sea) During 1995

System	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Bay of Bengal													
Depression	-	-	-	-	3	-	-	-	2	-	-	-	5
Cyclonic storm	-	-	-	-	-	-	-	-	-	-	-	-	0
Severe cyclonic storm	-	-	-	-	-	-	-	-	-	-	-	-	0
Severe cyclonic storm with a core of hurricane winds	-	-	-	-	-	-	-	-	-	-	2	-	2
Arabian Sea													
Depression		-	-	-	-	-	-	-	-	-	-	-	0
Cyclonic storm	-	-	-	-	-	-	-	-	-	1	-	-	1
Severe cyclonic storm	-	-	-	-	-	-	-	-	-	-	-	-	0
Severe cyclonic storm with a core of hurricane winds	-	-	-	-	-	-	-	-	-	-	-	-	0
Total (North Indian Ocean)	-	-	-	-	3	-	-	-	2	1	2	0	8
NO. OF CYCLONIC-SYSTEM DURING 1971-1994	3	0	1	5	21	34	25	47	34	50	56	22	298

TABLE 1B

S.No.	Cyclonic Disturbance	Peak T.No.	Intensity MSSW (Kt)	Duration Time(UTC) /Date	Place and time of crossing the coast	Loss of human life	Peak storm surge height (m)
1	Bay of Bengal **Deep Depression 5-6 May, 1995**	2.0	30	21 UTC of 5 May TO 18 UTC of 6 May	Near Cuddalore around 11 UTC of 6 May	> 39	
2	Bay of Bengal **Deep Depression 8-10 May, 1995**	2.0	30	09 UTC of 8 May TO 09 UTC of 10 May	Near Tuni around 17 UTC of 9 MAY		
3	Bay of Bengal **Deep Depression 14-18 May,' 1995**	2.0	30	18 UTC of 14 May TO 00 UTC of 18 May	Near Sagar Island Around 5 UTC of 16 May 1995	47 (India) 60 (Bangladesh)	
4	Bay of Bengal **Depression 16-17 Sept, 1995**	1.5	25	03 UTC of 16 Sept TO 12 UTC of 17 Sept	Near Balasore around 01 UTC of 17 Sept		
5	Bay of Bengal **Depression 26-28 Sept, 1995**	1.5	25	03 UTC of 26 Sept TO 03 UTC of 28 Sept	Near Balasore around 05 UTC of 26 Sept		
6	Arabian Sea **Cyclonic Storm 12-17 Oct, 1995**	3.0	45	12 UTC of 12 Oct TO 12 UTC of 17 OCT	Weakened over West Central Arabian Sea		
7	Bay of Bengal **Severe Cyclonic Storm with a core of Hurricane winds 7-10 Nov 1995**	4.5	77	03 UTC of 7 Nov TO 09 UTC of 10 Nov	Crossed North Andhra Coast South of Ichchapuram around 05 UTC of 09 Nov.	73	1.5
8	Bay of Bengal **Severe Cyclonic Storm with a core of Hurricane winds 21-25 Nov 1995**	5.5	102	12UTC of 21 Nov TO 09 UTC of 25 Nov	Crossed Bangladesh Coast South of Cox's Bazar around noon of 25 Nov	N.A.	

TABLE - 2

Best Track Positions Alongwith Other Parameters for Bay of Bengal

Deep Depression of 5 - 6 May, 1995

Date	Time (UTC)	Centre Lat. (^{O}N)	Centre Long. (^{O}E)	T.No.	Minimum Surface Pressure (hPa)	Maximum Estimated Sustained Surface Wind(kts)	Outermost Closed Isobar(hPa)	ΔP (hPa)	Diameter Size of the Outermost Closed Isobar (^{O}Lat.xLong.)
May									
5	2100	11.0	80.5	1.5	998	25	1002	4	3 x 3
6	0000	11.5	80.5	1.5	998	25	1002	4	3 x 3
	0300	11.5	80.5	1.5	998	25	1002	4	3 x 3
	0600	11.5	80.5	1.5	997	25	1002	5	3 x 4
	0900	11.5	80.0	2.0	996	30	1002	6	3 x 4
		Deep Depression Crossed Near Cuddalore At 1100 UTC							
	1200	12.0	79.5	Depression Over Land					
	1800	12.5	78.5	Depression Over Land					
7	0000	Weakened Into Low Pressure Area Over North Tamilnadu							

TABLE - 3

Best Track Positions Alongwith Other Parameters for Bay of Bengal

Deep Depression of 8-10 MAY, 1995

Date	Time (UTC)	Centre Lat. (^{O}N)	Centre Long. (^{O}E)	T.No.	Minimum Surface Pressure (hPa)	Maximum Estimated Sustained Surface Wind(kts)	Outermost Closed Isobar(hPa)	ΔP (hPa)	Diameter Size of the Outermost Closed Isobar (^{O}Lat.xLong.)
MAY									
8	0900	14.5	81.5	1.5	998	25	1002	4	3 x 2
	1200	15.0	81.5	1.5	998	25	1002	4	3 x 3
	1800	15.5	81.5	1.5	998	25	1002	4	3 x 3
9	0000	15.5	81.5	1.5	998	25	1002	4	3 x 3
	0300	16.0	82.5	1.5	998	25	1002	4	4 x 3
	0600	16.5	82.5	1.5	997	25	1002	5	4 x 3
	0900	16.5	82.5	2.0	996	30	1002	6	4 x 3
	1200	16.5	82.5	2.0	996	30	1002	6	4 x 4
		Crossed Andhra Pradesh Coast Near Tuni Around 1700 UTC							
	1800	17.5	82.5	Deep Depression Over Land					
10	0000	18.0	82.5	Depression Over Land					
	0300	18.5	82.5	Depression Over Land					
	0600	19.0	82.5	Depression Over Land					
	0900	19.0	83.5	Depression Over Land					
	1200	Weakened Into a WML Over North Andhra Pradesh & Adjoining South Orissa.							

TABLE - 4

Best Track Positions Alongwith Other Parameters for Bay of Bengal Deep Depression of 14-18 MAY, 1995

Date	Time (UTC)	Centre Lat. (^{O}N)	Centre Long. (^{O}E)	T.No.	Minimum Surface Pressure (hPa)	Maximum Estimated Sustained Surface Wind(kts)	Outermost Closed Isobar(hPa)	ΔP (hPa)	Diameter Size of the Outermost Closed Isobar (^{O}Lat.xLong.)
May									
14	1800	19.5	86.5	1.5	998	25	1002	4	3 x 3
15	0000	20.0	86.8	1.5	997	25	1002	5	3 x 3
	0300	20.5	87.0	2.0	996	30	1002	6	4 x 3
	0600	21.0	87.3	2.0	996	30	1002	6	4 x 3
	1200	21.5	87.5	2.0	996	30	1002	6	4 x 4
	1800	21.5	88.0	2.0	996	30	1002	6	4 x 4
16	0000	22.0	88.5	2.0	996	30	1002	6	4 x 4
	0300	22.0	88.5	2.0	996	30	1002	6	4 x 4
		Crossed Near Sagar Island Around 05 UTC							
	0600	22.5	89.5	Deep Depression Over Land					
	1200	23.0	89.5	Deep Depression Over Land					
	1800	23.7	90.5	Deep Depression Over Land					
17	0000	24.0	91.0	Deep Depression Over Land					
	0300	24.5	91.5	Deep Depression Over Land					
	0600	25.0	92.0	Depression Over Land					
	1200	25.5	92.5	Depression Over Land					
	1800	26.0	93.0	Depression Over Land					
18	0000	26.0	93.0	Depression Over Land					
	0300	Weakened Into A Low Pressure Area Over Assam & Neighbourhood.							

TABLE - 5

Best Track Positions Alongwith Other Parameters for Bay of Bengal

Depression of 16-17 September, 1995

Date	Time (UTC)	Centre Lat. (°N)	Centre Long. (°E)	T.No.	Minimum Surface Pressure (hPa)	Maximum Estimated Sustained Surface Wind(kts)	Outermost Closed Isobar(hPa)	ΔP (hPa)	Diameter Size of the Outermost Closed Isobar (°Lat.xLong.)
SEPT.									
16	0300	19.0	90.0	1.5	998	25	1002	4	3 x 3
	0600	19.5	89.5	1.5	998	25	1002	4	3 x 3
	1200	20.0	89.0	1.5	998	25	1002	4	3 x 3
	1800	21.0	88.0	1.5	998	25	1002	4	4 x 3
SEPT.									
17	0000	21.0	87.5	1.5	998	25	1002	4	4 x 3
		Crossed North Orissa Coast Near Balasore Around 0100 UTC							
	0300	21.8	86.8	Depression Over Land About 50 Kms NW Of Balasore					
	0600	22.0	86.5	Depression Over Land					
	1200	23.4	85.3	Depression (Close To Ranchi)					
	1800	Weakened As WML Over Bihar Plateau							

TABLE - 6

Best Track Positions Alongwith Other Parameters for Bay of Bengal

Depression of 26-28 September, 1995

Date	Time (UTC)	Centre Lat. (^{o}N)	Centre Long. (^{o}E)	T.No.	Minimum Surface Pressure (hPa)	Maximum Estimated Sustained Surface Wind(kts)	Outermost Closed Isobar(hPa)	ΔP (hPa)	Diameter Size of the Outermost Closed Isobar (^{o}Lat.xLong.)
Sept. 26	0300	21.5	87.5	1.5	1000	25	1004	4	4 x 3
		Crossed North Orissa Coast Near Balasore Around 05 UTC							
	0600	21.8	87.0	Depression Over Land					
	1200	22.0	86.5	Depression Over Land					
	1800	22.5	86.0	Depression Over Land					
Sept. 27	0000	23.0	86.0	Depression Over Land					
	0300	23.0	86.0	Depression Over Land					
	0600	23.5	86.5	Depression Over Land					
	1200	24.0	87.0	Depression Over Land					
	1800	24.0	87.0	Depression Over Land					
Sept. 28	0000	24.0	87.0	Depression Over Land					
	0300	24.0	87.0	Depression Over Land					
	0600	Weakened Into A WML Over Bihar Plateau And Adjoining West Bengal							

TABLE - 7

Best Track Positions Alongwith Other Parameters for Arabian Sea Cyclone of 12-17 October, 1995*(ARB 9501 1014)*

Date	Time (UTC)	Centre Lat. (^{o}N)	Centre Long. (^{o}E)	T.No.	Minimum Surface Pressure (hPa)	Maximum Estimated Sustained Surface Wind(kts)	Outermost Closed Isobar(hPa)	ΔP (hPa)	Diameter Size of the Outermost Closed Isobar (^{o}Lat.xLong.)
OCT									
12	1200	16.5	70.0	1.5	1008	25	1010	2	3 x 2
	1800	16.7	69.5	1.5	1007	25	1010	3	3 x 3
13	0000	17.0	69.0	1.5	1006	25	1010	4	4 x 3
	0300	17.0	69.0	1.5	1006	25	1010	4	4 x 3
	0600	17.0	69.0	1.5	1006	25	1010	4	4 x 3
	1200	17.0	68.5	2.0	1004	30	1010	6	4 x 3
	1800	17.3	68.0	2.0	1004	30	1010	6	4 x 4
14	0000	17.5	67.5	2.5	1000	35	1008	8	4 x 4
	0300	17.5	67.5	2.5	1000	35	1008	8	4 x 4
	0600	18.0	67.0	2.5	1000	35	1008	8	4 x 4
	1200	18.0	67.0	3.0	998	45	1008	10	4 x 4
	1800	18.0	67.0	3.0	996	45	1008	12	4 x 4
15	0000	18.0	67.0	2.5	1000	35	1008	8	4 x 3
	0300	18.0	67.0	2.5	1000	35	1008	8	4 x 3
	0600	18.0	67.0	2.5	1000	35	1008	8	4 x 3

TABLE - 7 (Contd.)

Date	Time (UTC)	Centre Lat. (^{o}N)	Centre Long. (^{o}E)	T.No.	Minimum Surface Pressure (hPa)	Maximum Estimated Sustained Surface Wind(kts)	Outermost Closed Isobar(hPa)	ΔP (hPa)	Diameter Size of the Outermost Closed Isobar (^{o}Lat.xLong.)
	1200	18.5	66.0	2.5	1000	35	1008	8	4 x 3
	1800	18.5	66.0	2.5	1000	35	1008	8	4 x 3
16	0000	19.0	66.0	2.5	1000	35	1008	8	4 x 3
	0300	19.0	65.5	2.5	1000	35	1008	8	4 x 3
	0600	19.0	65.5	2.5	1000	35	1008	8	4 x 3
	1200	19.5	65.0	2.0	1002	30	1008	6	3 x 3
	1800	19.5	65.0	2.0	1002	30	1008	6	3 x 3
17	0000	19.5	65.0	2.0	1002	30	1008	6	3 x 3
	0300	19.5	64.5	1.5	1004	25	1008	4	3 x 3
	0600	19.5	64.0	1.5	1004	25	1008	4	3 x 2
	1200	19.5	63.5	1.5	1004	25	1008	4	3 x 2
	1800 Weakened Into A Well Marked Low Pressure Area Over West Central Arabian Sea								

TABLE - 8

Best Track Positions Alongwith Other Parameters for Bay of Bengal Severe Cyclonic Storm With a Core of Hurricane Winds of 07-10 November 1995. *(BOB 9502 1108)*

Date	Time (UTC)	Centre Lat. (°N)	Centre Long. (°E)	T.No.	Minimum Surface Pressure (hPa)	Maximum Estimated Sustained Surface Wind(kts)	Outermost Closed Isobar(hPa)	ΔP (hPa)	Diameter Size of the Outermost Closed Isobar (°Lat.xLong.)
Nov.									
07	0300	11.0	91.5	1.5	1000	25	1004	4	3 x 3
	0600	11.5	91.0	1.5	1000	25	1004	4	3 x 3
	1200	12.5	89.5	2.0	996	30	1004	6	4 x 3
	1800	13.0	89.0	2.0	996	30	1004	6	4 x 4
Nov.									
08	0000	13.0	88.5	2.5	996	35	1004	8	4 x 4
	0300	13.5	87.5	3.0	996	45	1006	10	4 x 4
	0600	14.0	86.5	3.0	996	45	1006	10	4 x 4
		Severe Cyclonic Storm At 0900 UTC							
	1200	15.5	85.5	3.5	990	55	1006	16	4 x 4
	1800	17.0	85.2	4.0	984	65	1006	22	5 x 5
Nov.									
09	0000	18.0	85.1	4.0	984	65	1006	22	5 x 5
	0300	19.0	85.0	4.5	978	77	1008	30	4 x 4
		Crossed The North Andhra Coast Around 0500 UTC Close To Ichchapuram							
	0600	19.5	85.0	Over Land As Severe Cyclonic Storm					
	1200	21.0	85.0	Over Land As Cyclonic Storm					
	1800	22.5	85.0	Over Land As Cyclonic Storm					
10	0000	24.0	85.0	Over Land As Cyclonic Storm					
	0300	24.5	85.0	Over Land As Deep Depression					
	0600	25.5	85.0	Over Land As Deep Depression					
	0900	26.5	85.0	Over Land As Depression					
	1200	Weakened Into A WML Over Bihar Plains And Adjoining East U.P							

TABLE 9

Best Track Positions Alongwith Other Parameters for Bay of Bengal Severe Cyclone With a Core of Hurricane Winds of 21-25 November 1995 *(BOB 9503 1122)*

Date	Time (UTC)	Centre Lat. (°N)	Centre Long. (°E)	T.No.	Minimum Surface Pressure (hPa)	Maximum Estimated Sustained Surface Wind(kts)	Outermost Closed Isobar(hPa)	ΔP (hPa)	Diameter Size of the Outermost Closed Isobar (°Lat.xLong.)
Nov.									
21	1200	6.5	91.0	1.5	1002	25	1006	4	3 x 3
	1800	7.0	90.5	1.5	1002	25	1006	4	4 x 3
22	0000	7.5	90.0	1.5	1002	25	1006	4	4 x 4
	0300	7.5	90.0	2.0	1000	30	1006	6	4 x 4
	0600	8.0	89.0	2.0	1000	30	1006	6	5 x 4
	0900	Intensified Into A Cyclonic Storm							
	1200	8.5	88.5	2.5	998	35	1006	8	5 x 5
	1800	9.5	87.5	3.0	994	45	1006	12	5 x 5
23	0000	10.0	86.5	3.0	994	45	1006	12	5 x 5
	0300	10.0	86.0	3.5	990	55	1006	16	5 x 5
	0600	10.5	85.5	3.5	990	55	1006	16	5 x 5
	1200	11.0	85.0	3.5	988	55	1006	18	5 x 5
	1800	12.0	85.0	4.0	984	65	1006	22	5 x 5
24	0000	13.5	85.0	4.5	976	77	1006	30	5 x 5
	0300	14.5	85.0	5.0	964	90	1006	42	5 x 5
	0600	15.0	85.0	5.0	960	90	1006	46	5 x 5
	1200	16.5	86.5	5.5	956	102	1008	52	5 x 5
	1800	18.0	88.8	5.0	962	90	1008	46	5 x 4

TABLE 9 (Contd.)

Date	Time (UTC)	Centre Lat. (°N)	Centre Long. (°E)	T.No.	Minimum Surface Pressure (hPa)	Maximum Estimated Sustained Surface Wind(kts)	Outermost Closed Isobar(hPa)	ΔP (hPa)	Diameter Size of the Outermost Closed Isobar (°Lat.xLong.)
25	0000	19.0	89.0	4.5	970	77	1004	36	4 x 4
	0300	20.0	90.5	4.5	972	77	1006	34	4 x 4
	0600	21.0	92.0	4.0	978	65	1006	28	4 x 4
		Crossed The Bangladesh Coast South Of Cox's Bazar Around Noon							
	0900	21.5	93.5	Over Land As Cyclonic Storm					
	1200	Weakened Into A WML Over Myanmar							

TABLE - 10

Forecast Position Errors for Tropical Cyclones in The Bay of Bengal and The Arabian Sea in 1995 Based On Climatology, Persistence and CLIPER Models.

Tropical Cyclone	12 hour			24 hour			36 hour			48 hour		
	P	C	CL	P	C	CL	P	C	CL	P	C	CL
12 Oct - 17 Oct. 1995	50	116	93	98	300	195	140	-	-	230	-	-
07 Nov - 10 Nov. 1995	213	216	193	500	403	380	720	550	650	-	-	-
21 Nov - 25 Nov. 1995	121	180	172	360	413	392	650	540	676	743	670	697
Average for 1995	128	171	153	319	372	329	503	545	663	486	670	697

C - Climatology
P - Persistence
CL - CLIPER

TABLE - 11

Forecast Position Errors for Individual Tropical Cyclones Over The Bay of Bengal and The Arabian Sea in 1995 Based On Analogue and CLIPER Forecast Models

Tropical cyclones	ANALOGUE Forecast Errors (km)				CLIPER			
	12-hr	24-hr	36-hr	48-hr	12-hr	24-hr	36-hr	48-hr
12 - 17 Oct. 1995	38	116	187	285	93	195	-	-
07 - 10 Nov. 1995	55	225	490	-	193	380	650	-
21 - 25 Nov. 1995	95	232	425	660	172	392	676	697
Average Error for **1995**	63	191	367	473	153	322	633	697
Average Error for **1994**	152	213	306	363	113	254	311	465

TABLE - 12

Forecast Skill (%) of Other Model With Respect To CLIPER
for Tropical Cyclones in The Bay of Bengal and The Arabian Sea in 1995

Tropical cyclones	CLIPER Vs Persistence				CLIPER Vs Climatology				CLIPER Vs Analogue				CLIPER Vs Model			
Hrs	12	24	36	48	12	24	36	48	12	24	36	48	12	24	36	48
12 - 17 Oct. 1995	+46	+50	-	-	-25	-54	-	-	+59	+41	-	-	--	-	-	-
07 - 10 Nov. 1995	- 10	- 32	- 11	-	-12	-06	+15	-	+71	+41	+25	-	-	+58	-	+82
21 - 25 Nov. 1995	+30	+08	+04	-07	-05	-05	+20	+04	+45	+41	+37	+05	-	+69	-	+78
Average Error	+22	+09	-03	-07	-14	-22	+17	+04	+58	+41	+31	+05	-	+64	-	+76

Positive skill indicates Other Model (OM) forecast is better than CLIPER.
Negative skill indicates the CLIPER forecast is better than OM forecast.

FIGURES

LIST OF FIGURES

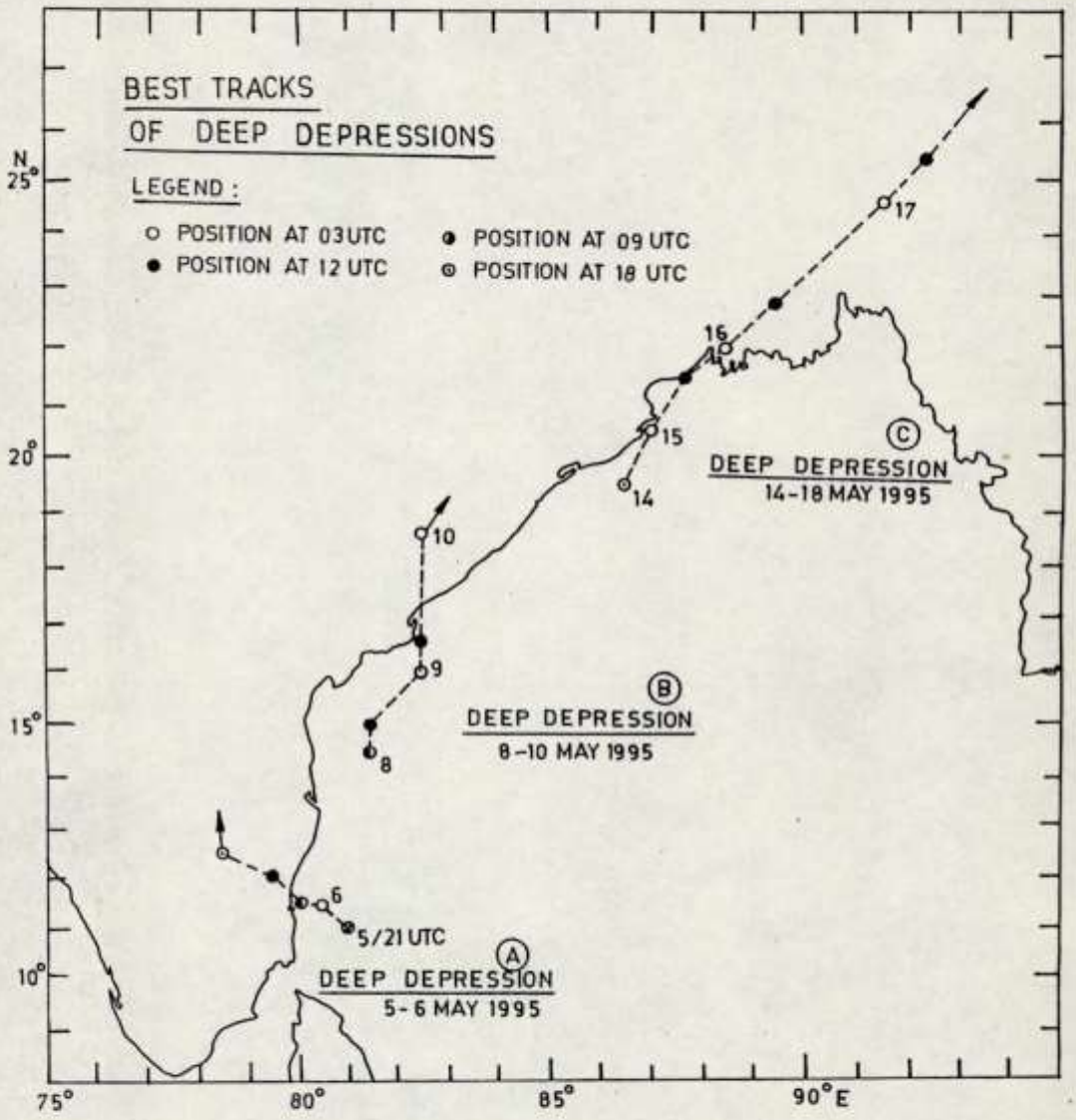

BEST TRACKS
OF DEEP DEPRESSIONS
LEGEND :
POSITION AT 03 UTC
POSITION AT 09 UTC
POSITION AT 12 UTC
POSITION AT 18 UTC
N
25°
20°
15°
10°
75°
80°
85°
90°E
5/21 UTC
6
8
9
10
14
15
16
17
A
DEEP DEPRESSION
5-6 MAY 1995
B
DEEP DEPRESSION
8-10 MAY 1995
C
DEEP DEPRESSION
14-18 MAY 1995

FIG. 1(a)

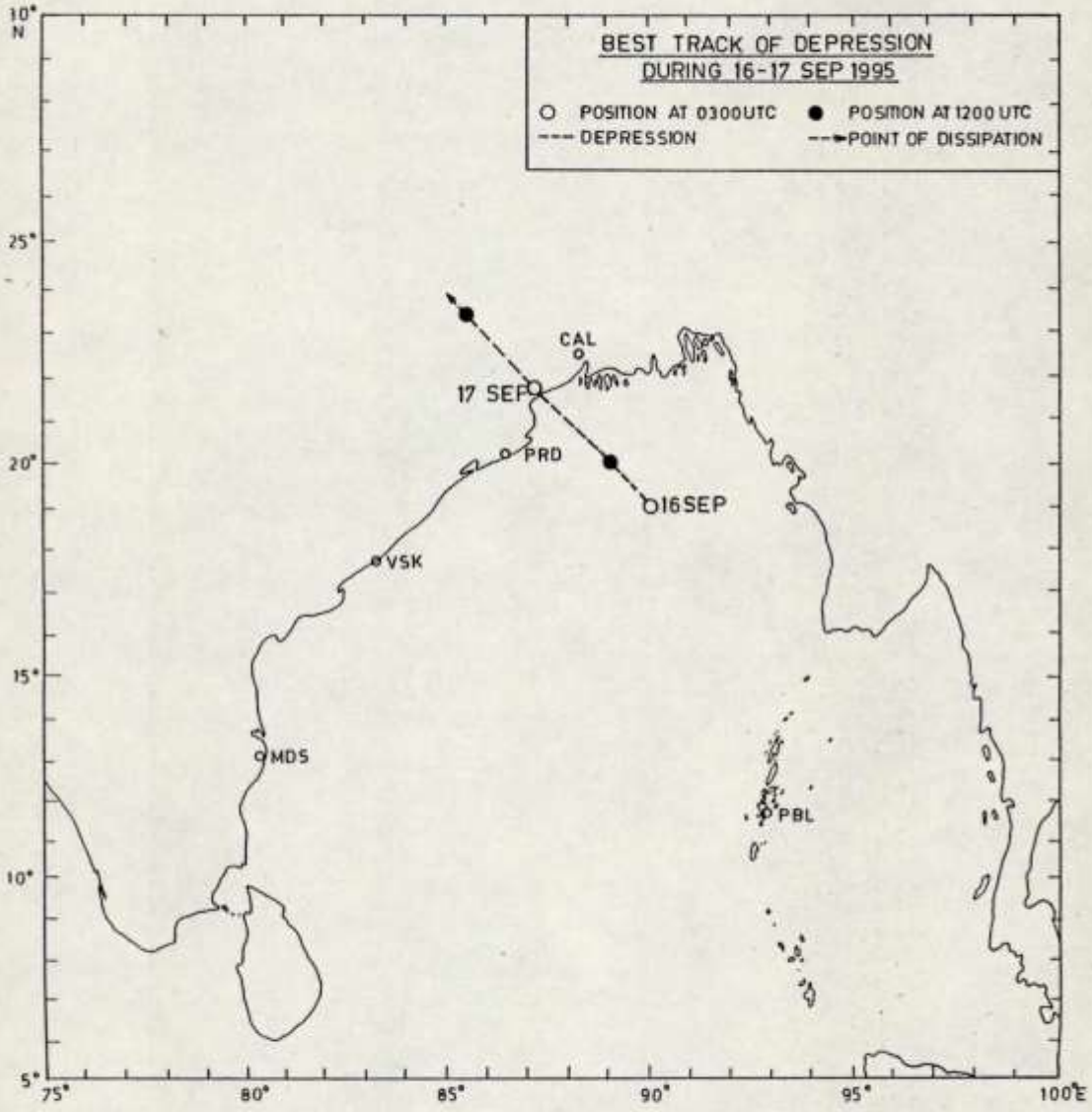

BEST TRACK OF DEPRESSION
DURING 16-17 SEP 1995
POSITION AT 0300UTC
POSITION AT 1200 UTC
DEPRESSION
POINT OF DISSIPATION
10° N
25°
20°
15°
10°
5°
75°
80°
85°
90°
95°
100°E
CAL
17 SEP
PRD
16SEP
VSK
MDS
PBL

FIG. 1(b)

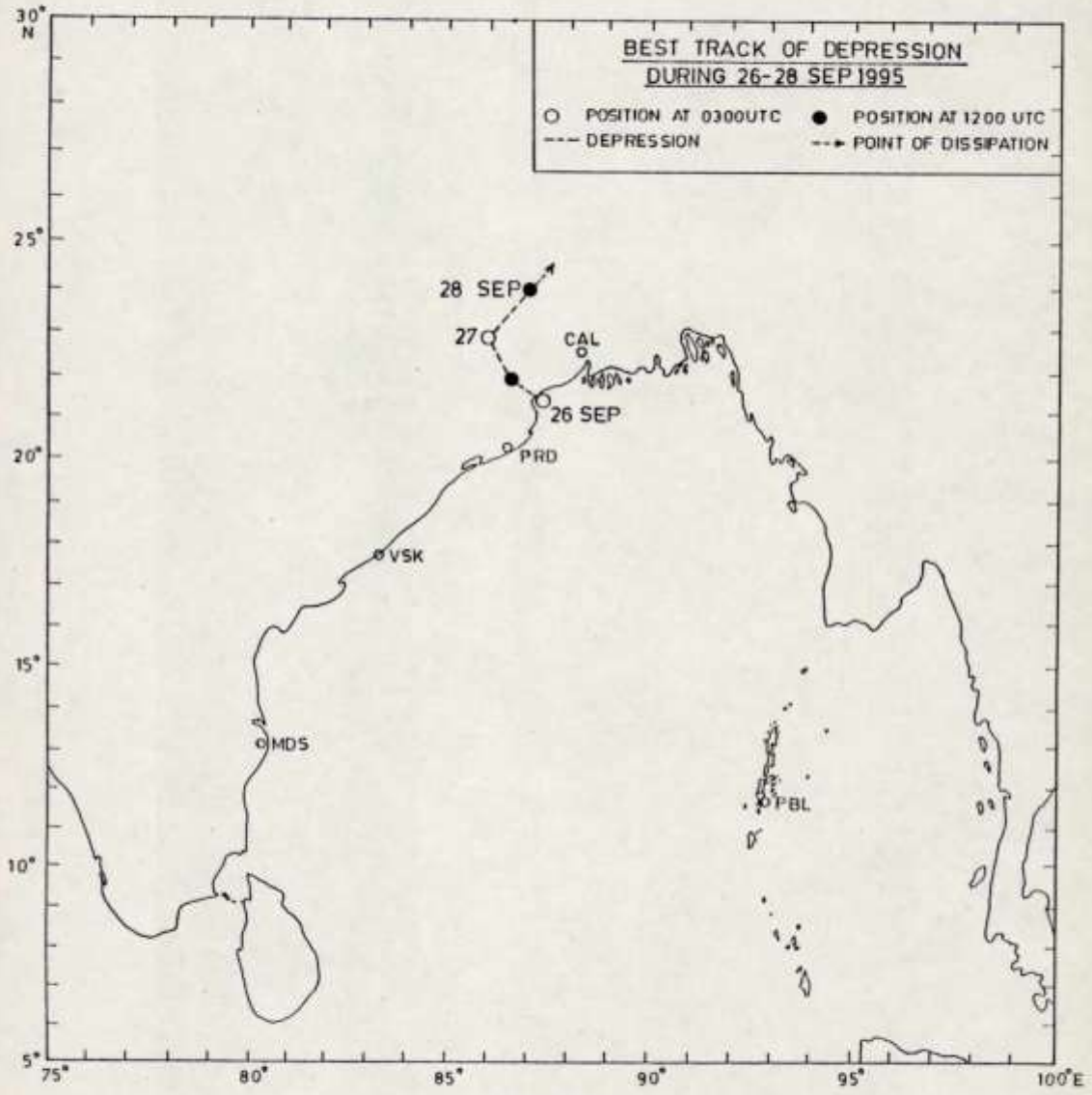

BEST TRACK OF DEPRESSION
DURING 26-28 SEP 1995
POSITION AT 0300UTC
POSITION AT 1200 UTC
DEPRESSION
POINT OF DISSIPATION
30° N
25°
20°
15°
10°
5°
75°
80°
85°
90°
95°
100°E
28 SEP
27
CAL
26 SEP
PRD
VSK
MDS
PBL

FIG. 1(c)

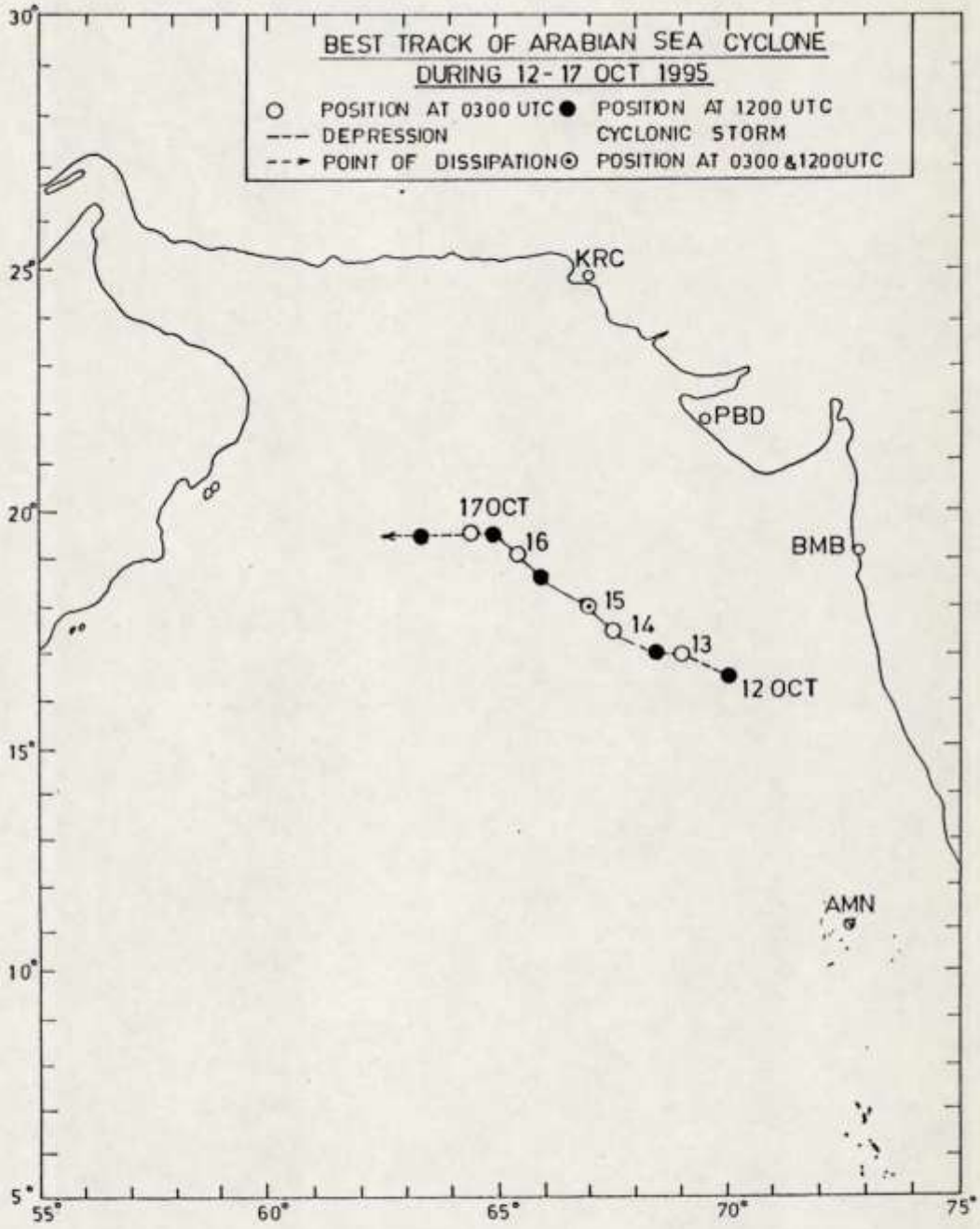

BEST TRACK OF ARABIAN SEA CYCLONE
DURING 12-17 OCT 1995
POSITION AT 0300 UTC
POSITION AT 1200 UTC
DEPRESSION
CYCLONIC STORM
POINT OF DISSIPATION
POSITION AT 0300 &1200UTC
KRC
PBD
BMB
AMN
17OCT
16
15
14
13
12 OCT
30°
25°
20°
15°
10°
5°
55°
60°
65°
70°
75°

FIG. 1(d)

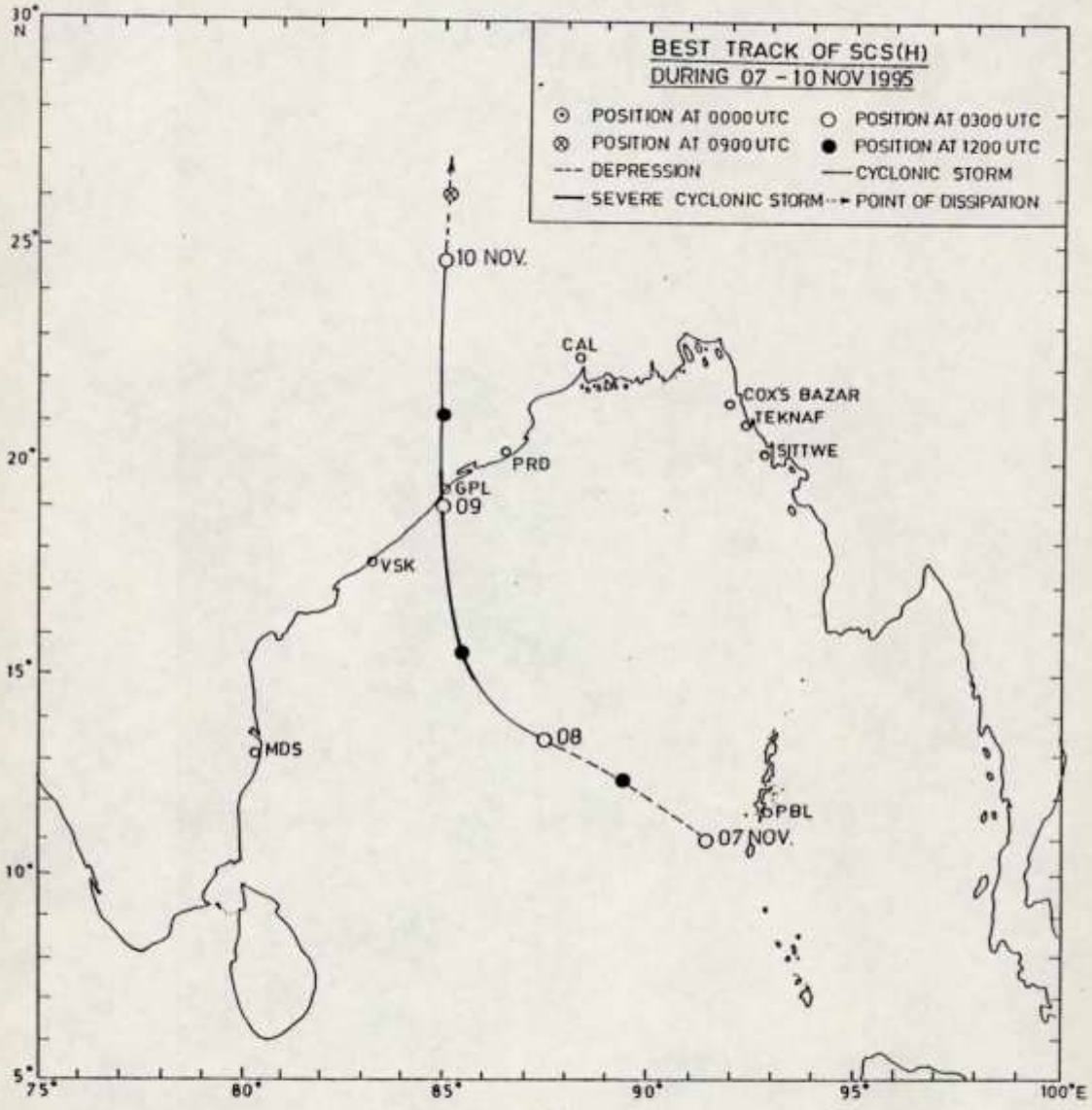

BEST TRACK OF SCS(H)
DURING 07 - 10 NOV 1995
POSITION AT 0000 UTC
POSITION AT 0300 UTC
POSITION AT 0900 UTC
POSITION AT 1200 UTC
DEPRESSION
CYCLONIC STORM
SEVERE CYCLONIC STORM
POINT OF DISSIPATION
10 NOV.
09
08
07 NOV.
CAL
COX'S BAZAR
TEKNAF
SITTWE
PRD
GPL
VSK
MDS
PBL
30° N
25°
20°
15°
10°
5°
75°
80°
85°
90°
95°
100°E

FIG. 1(e)

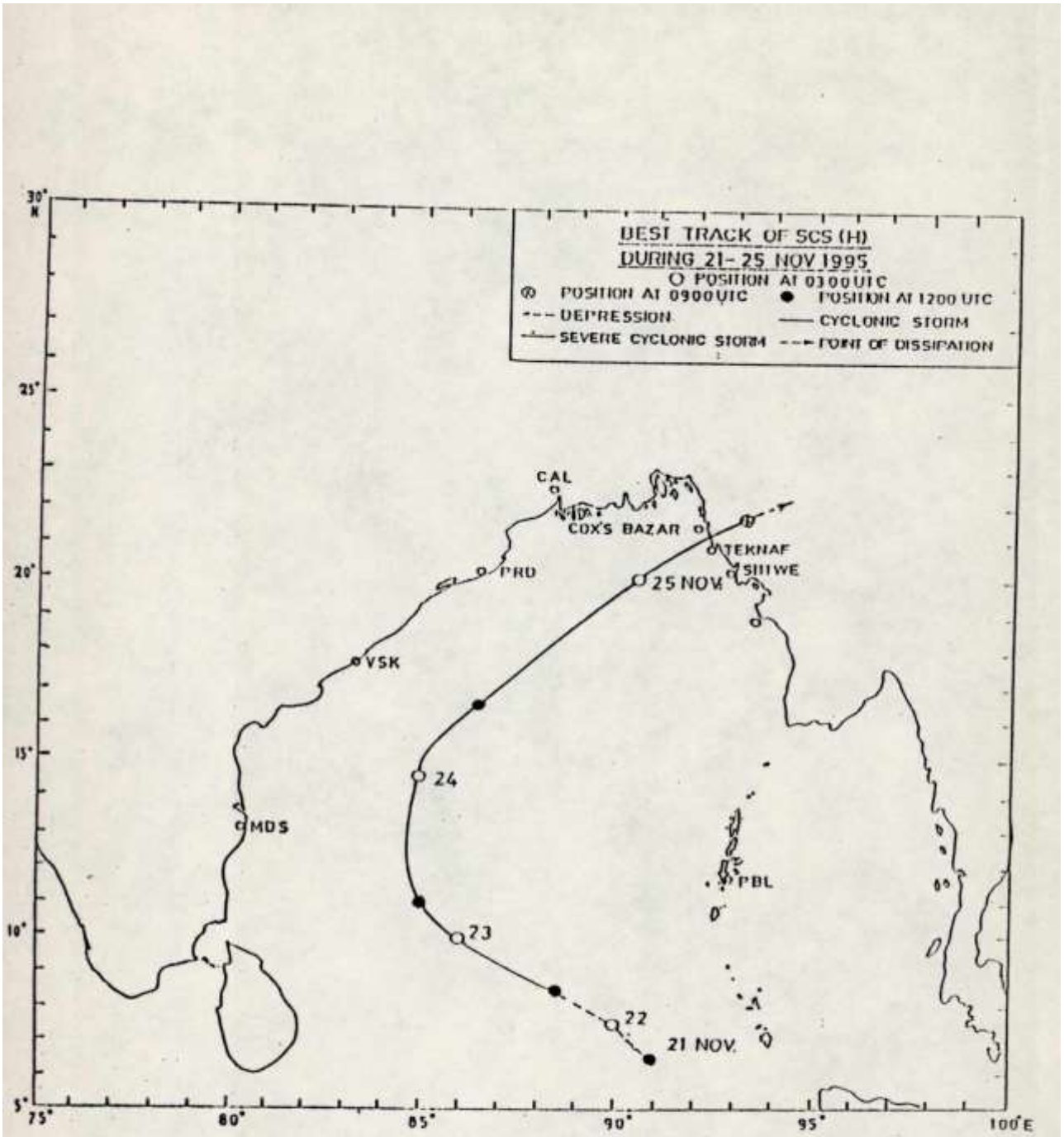

BEST TRACK OF SCS (H)
DURING 21-25 NOV 1995
O POSITION AT 0300 UTC
⊗ POSITION AT 0900 UTC
● POSITION AT 1200 UTC
--- DEPRESSION
—— CYCLONIC STORM
—— SEVERE CYCLONIC STORM
---► POINT OF DISSIPATION
CAL
COX'S BAZAR
TEKNAF
SITTWE
PRD
25 NOV
VSK
24
MDS
PBL
23
22
21 NOV
30° N
25°
20°
15°
10°
5°
75°
80°
85°
90°
95°
100° E

FIG. 1(f)

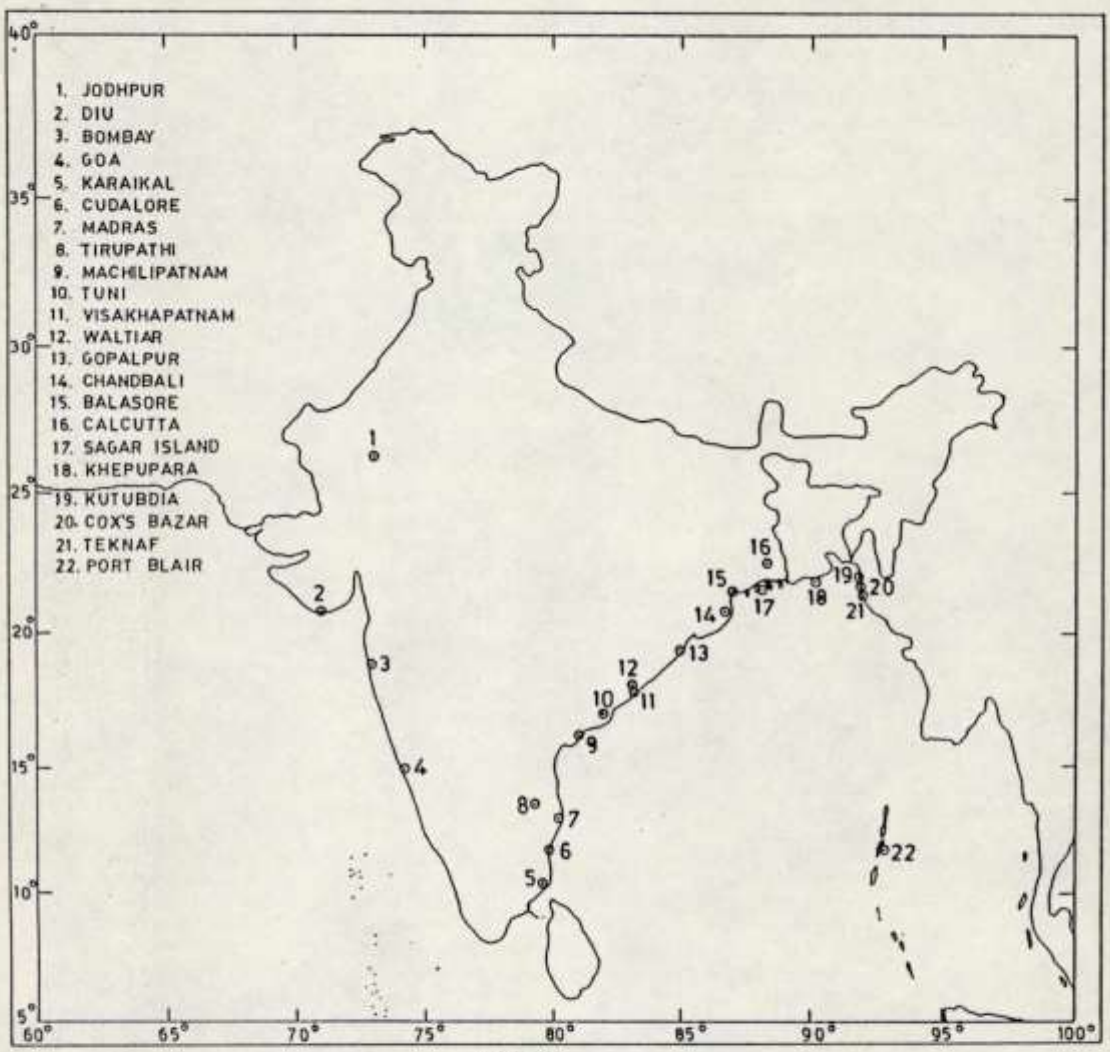

1. JODHPUR
2. DIU
3. BOMBAY
4. GOA
5. KARAIKAL
6. CUDALORE
7. MADRAS
8. TIRUPATHI
9. MACHILIPATNAM
10. TUNI
11. VISAKHAPATNAM
12. WALTIAR
13. GOPALPUR
14. CHANDBALI
15. BALASORE
16. CALCUTTA
17. SAGAR ISLAND
18. KHEPUPARA
19. KUTUBDIA
20. COX'S BAZAR
21. TEKNAF
22. PORT BLAIR
40°
35°
30°
25°
20°
15°
10°
5°
60°
65°
70°
75°
80°
85°
90°
95°
100°

FIG. 2.

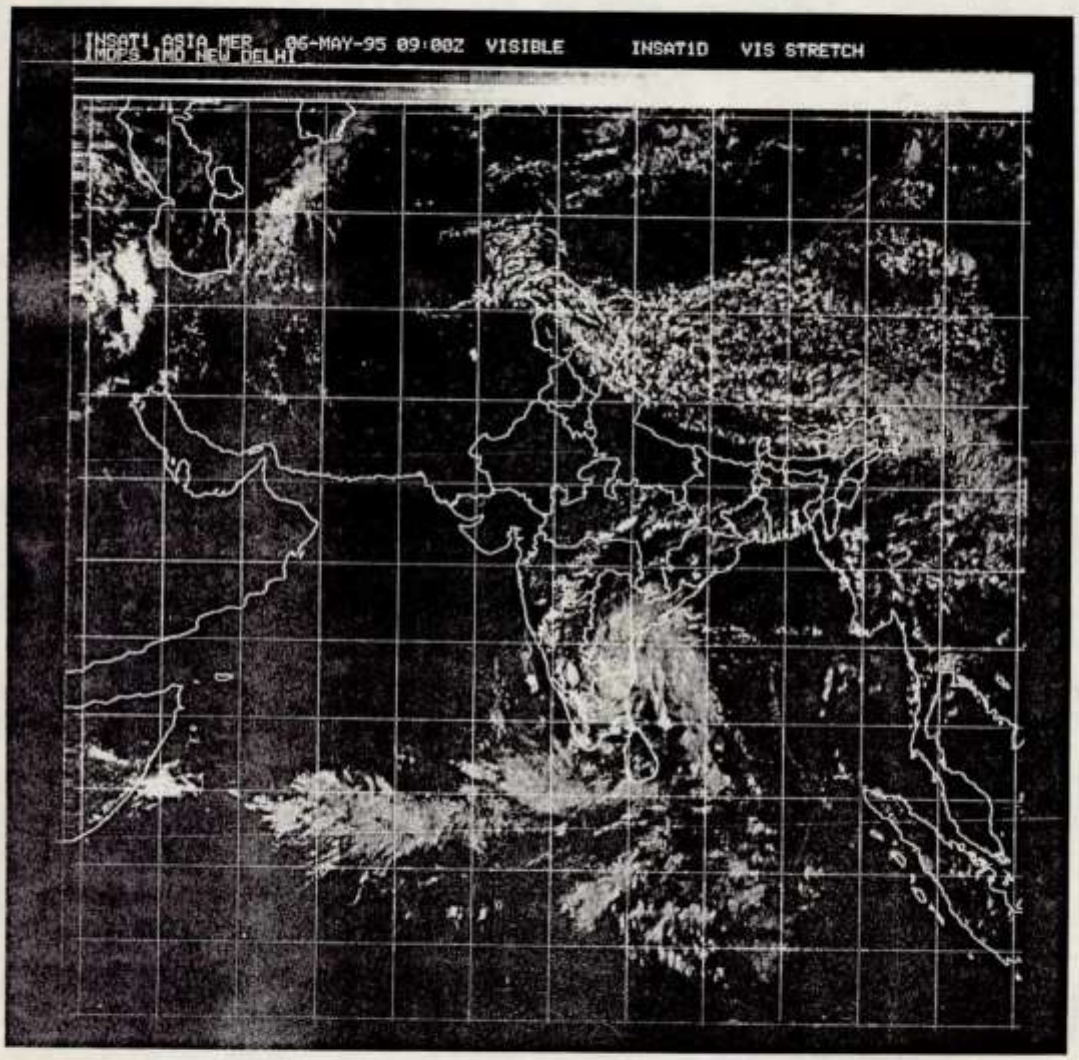

INSAT1 ASIA MER 06-MAY-95 09:00Z VISIBLE INSAT1D VIS STRETCH
IMDPS IMD NEW DELHI

FIG. 3.

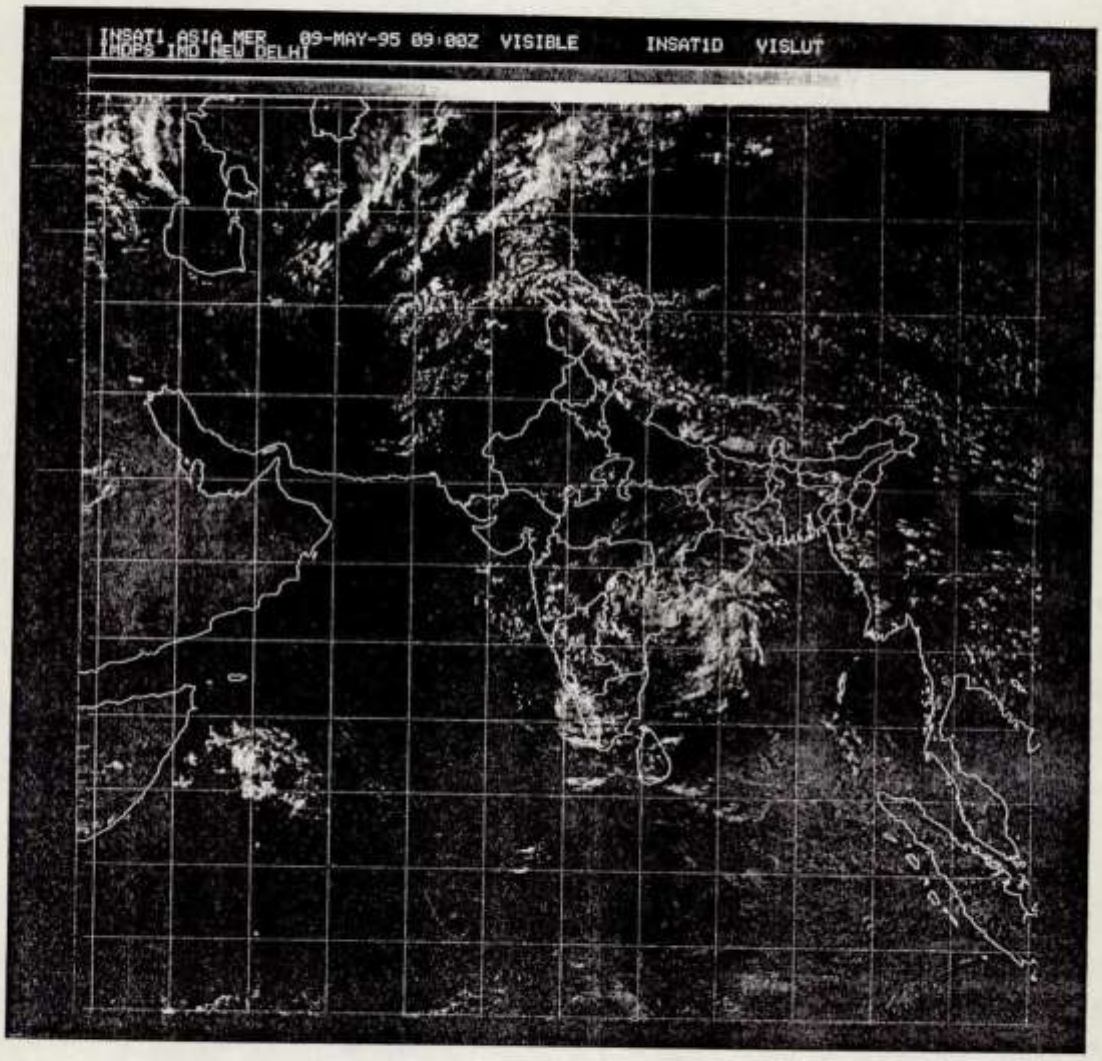

INSAT1 ASIA MER 09-MAY-95 09:00Z VISIBLE INSAT1D VISLUT
IMDPS IMD NEW DELHI

FIG. 4.

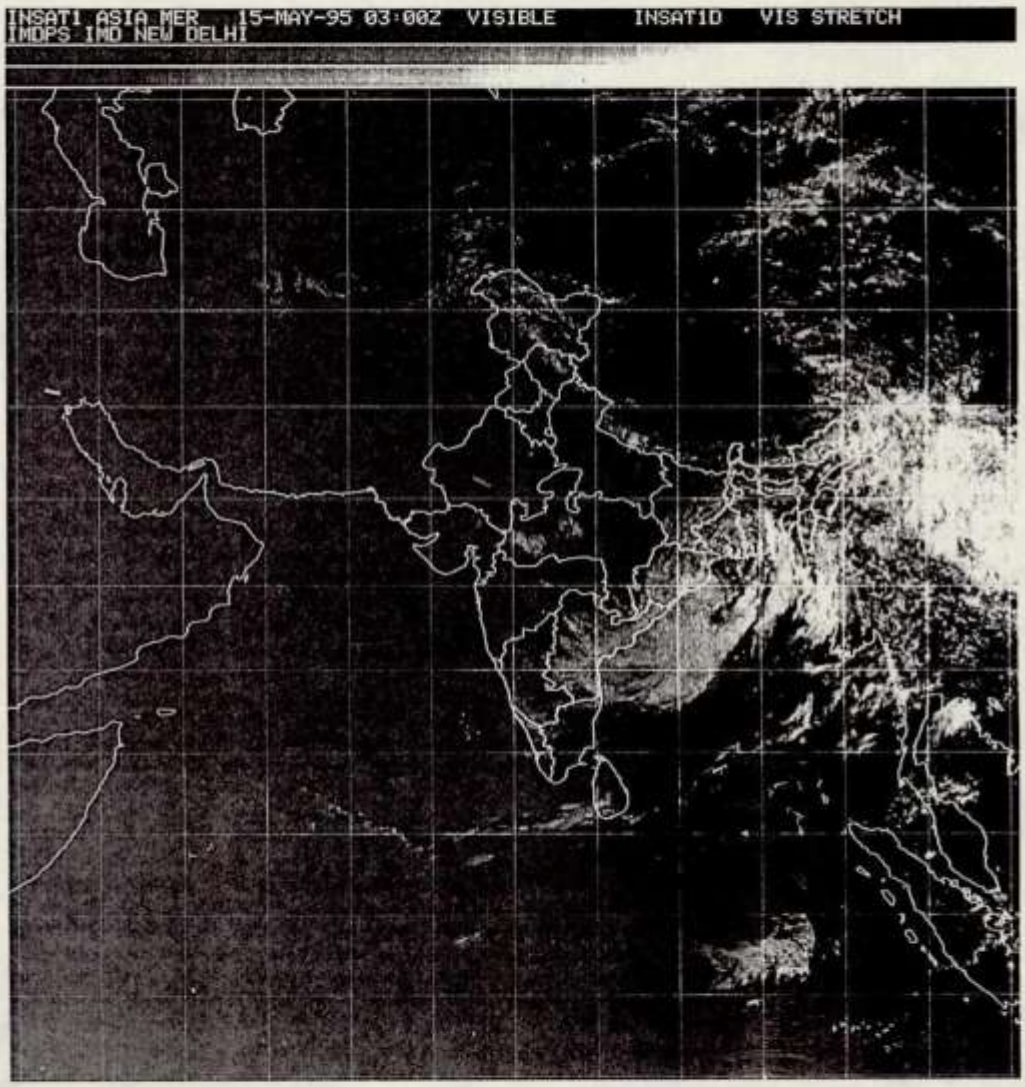

INSATI ASIA MER 15-MAY-95 03:00Z VISIBLE INSAT1D VIS STRETCH
IMDPS IMD NEW DELHI

FIG. 5.

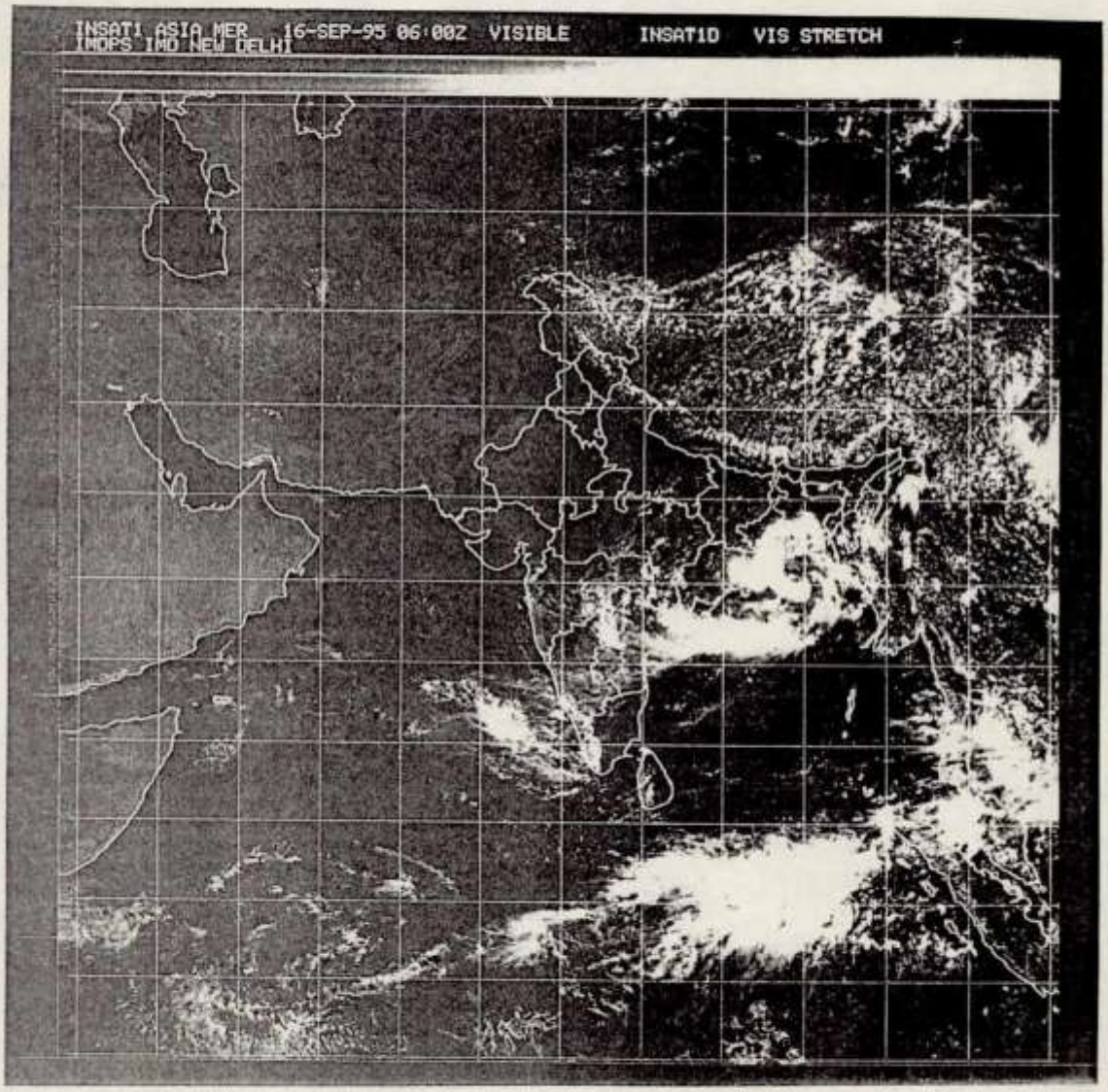

INSAT1 ASIA MER 16-SEP-95 06:00Z VISIBLE INSAT1D VIS STRETCH
IMOPS IMD NEW DELHI

FIG. 6.


INSAT1 ASIA MER 26-SEP-95 03:00Z VISIBLE INSATID VIS STRETCH
IMDPS IMD NEW DELHI

FIG.7.

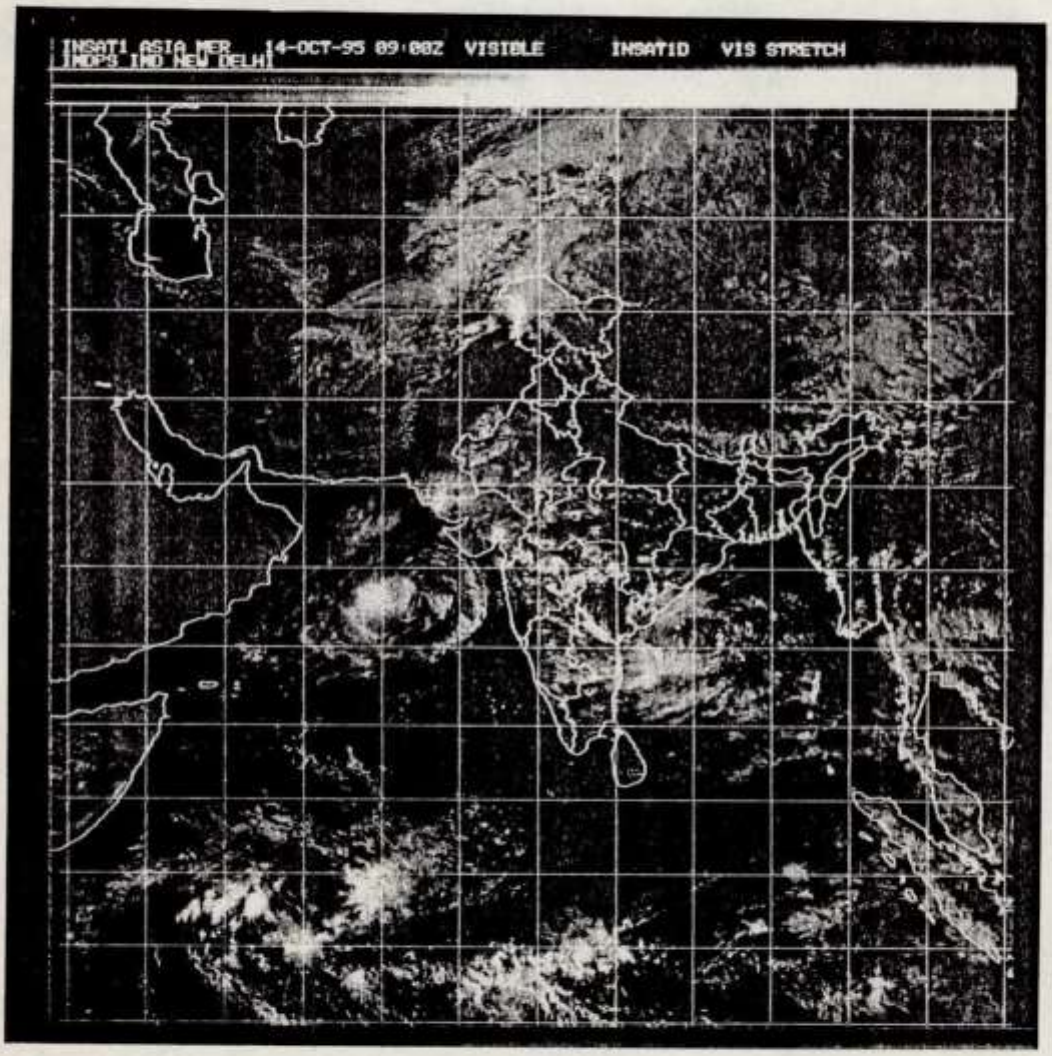

INSAT1 ASIA MER 14-OCT-95 09:00Z VISIBLE INSAT1D VIS STRETCH
IMDPS IMD NEW DELHI

FIG. 8

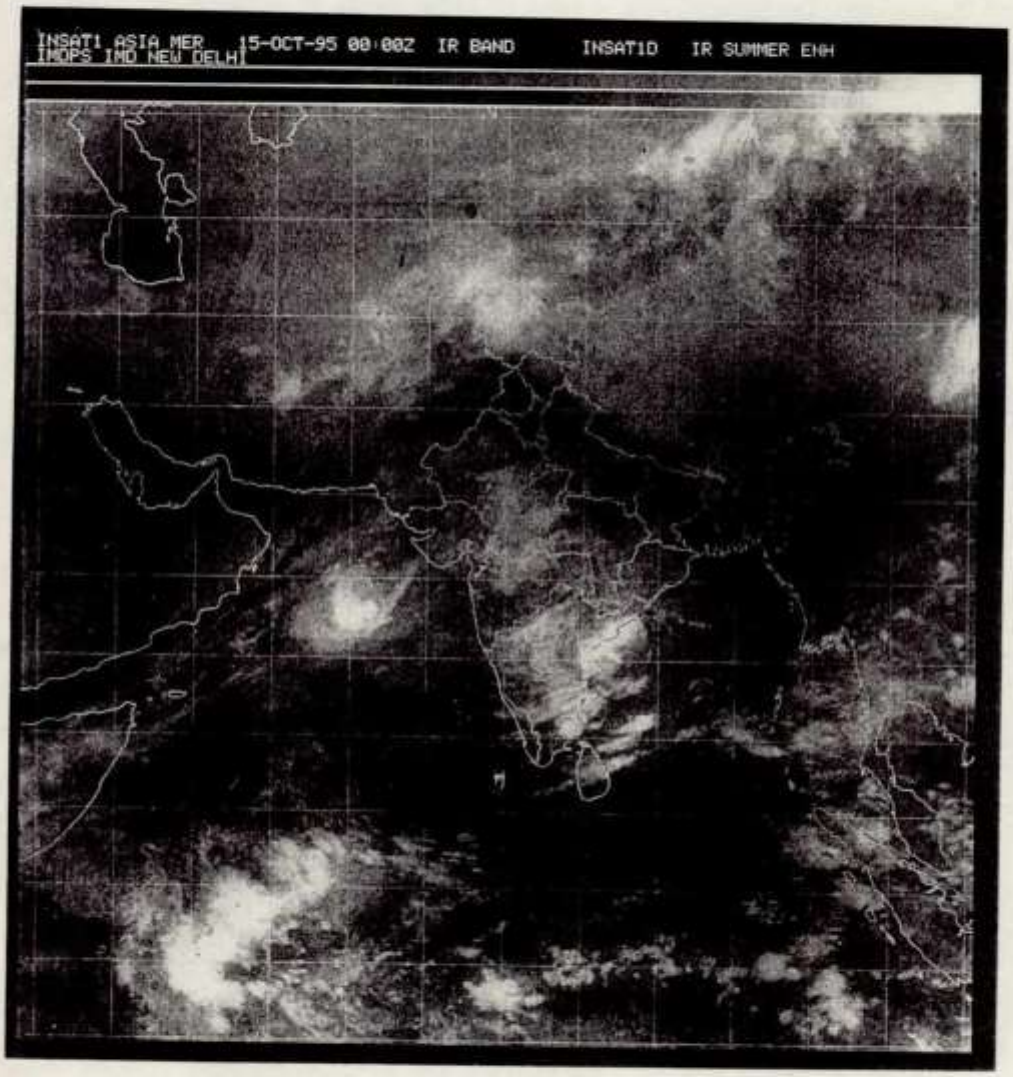

INSAT1 ASIA MER 15-OCT-95 00:00Z IR BAND INSAT1D IR SUMMER ENH
IMOPS IMD NEW DELH

FIG. 9

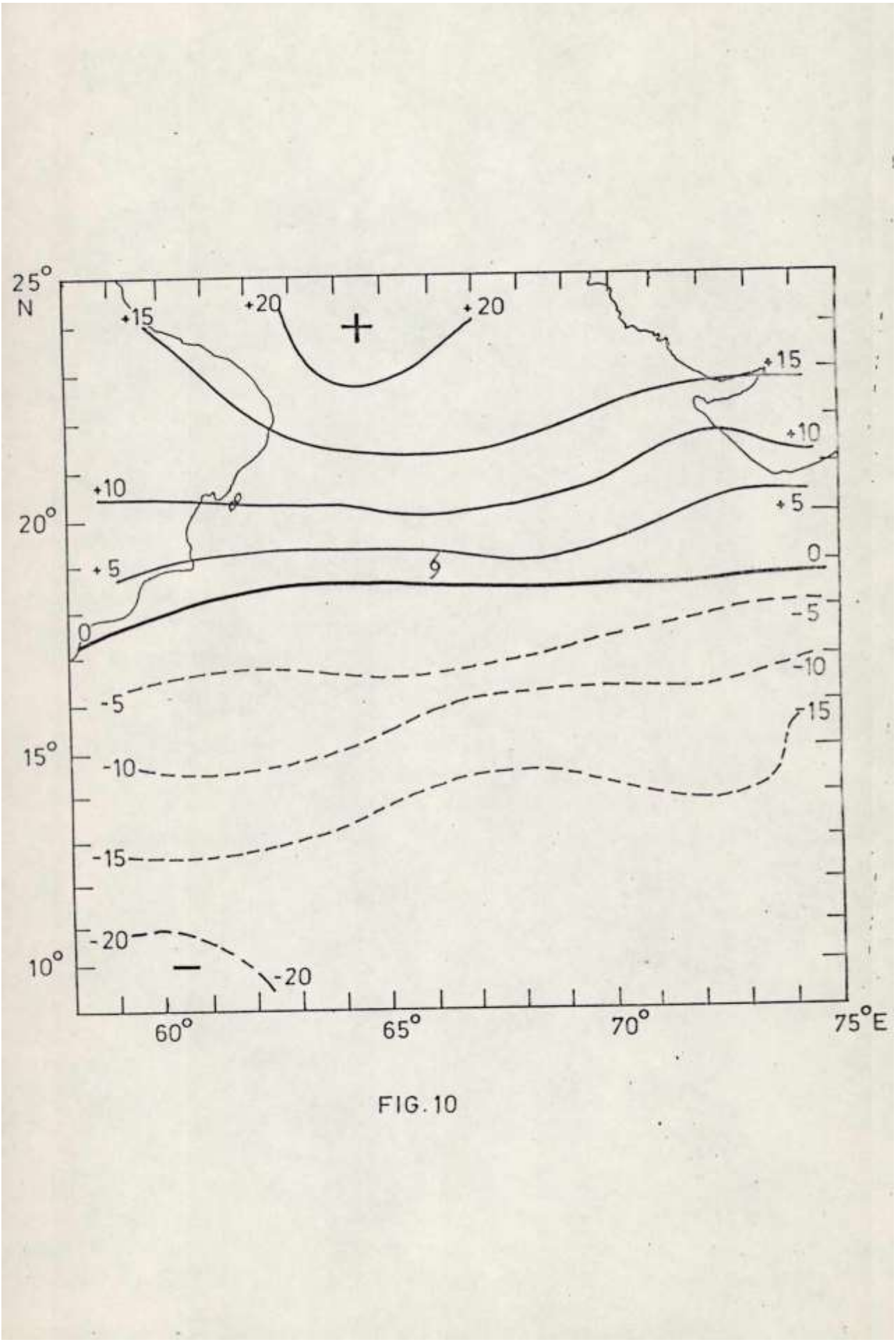


FIG. 10

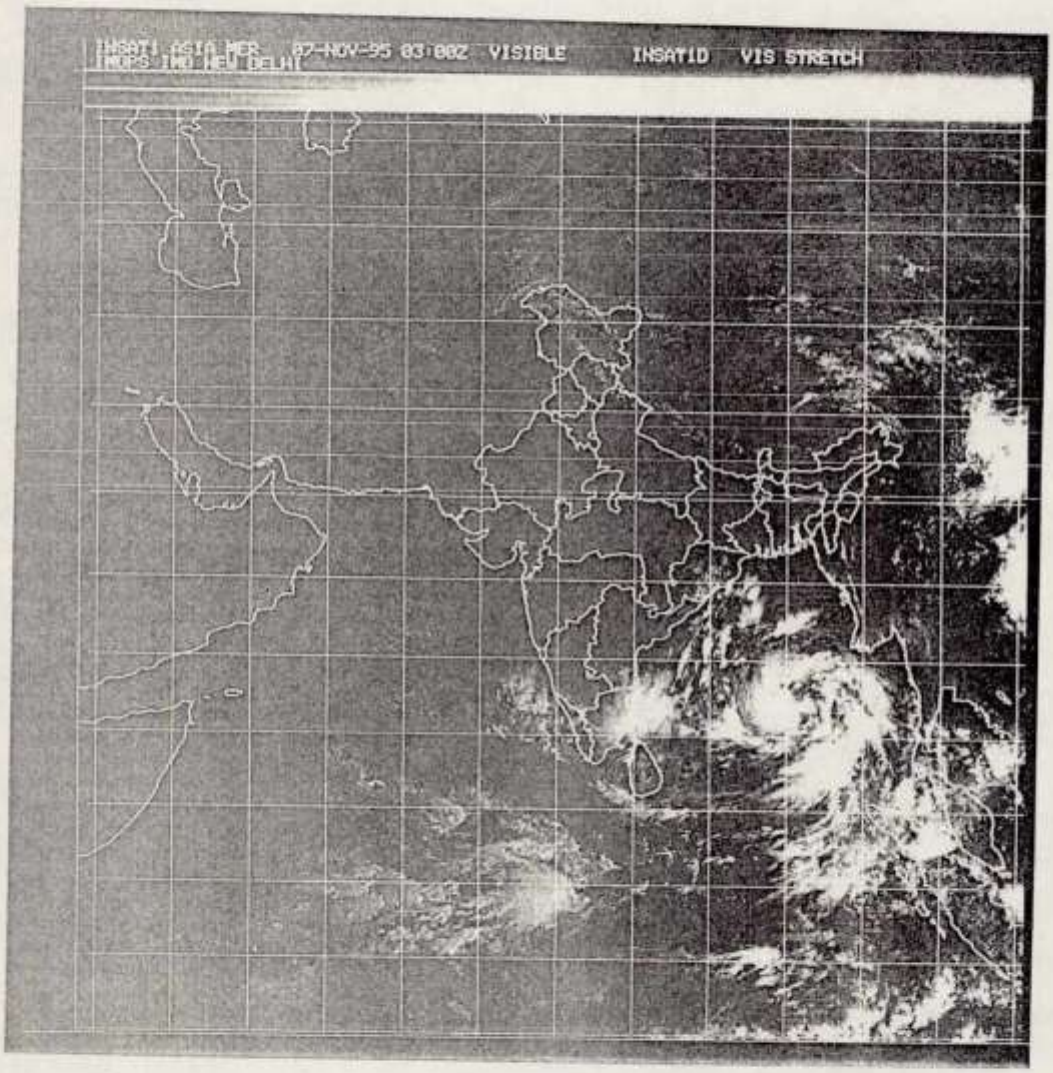

INSAT1 ASIA MER 07-NOV-95 03:00Z VISIBLE INSATID VIS STRETCH
INDIA IMD NEW DELHI

FIG. 11.

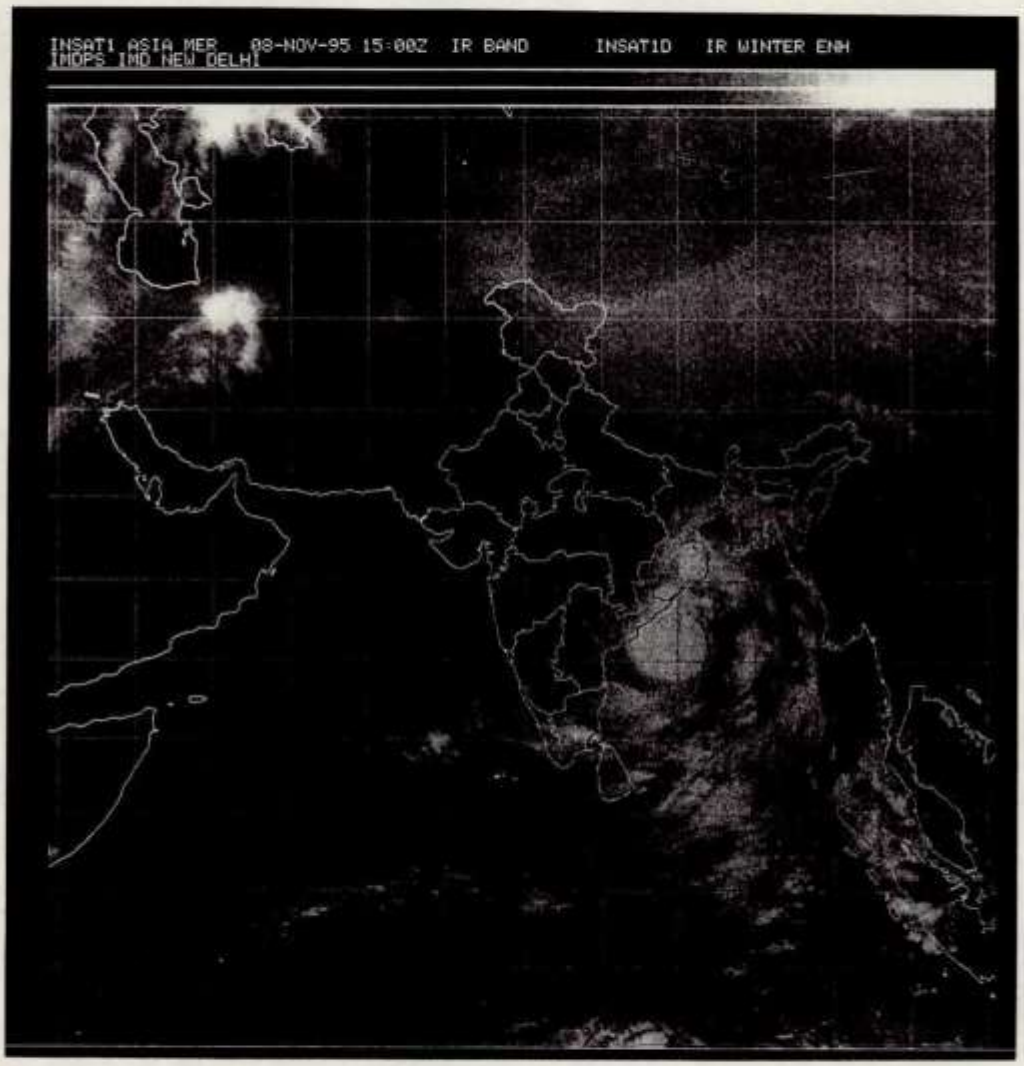

INSAT1 ASIA MER 08-NOV-95 15:00Z IR BAND INSAT1D IR WINTER ENH
IMDPS IMD NEW DELHI

FIG.12.

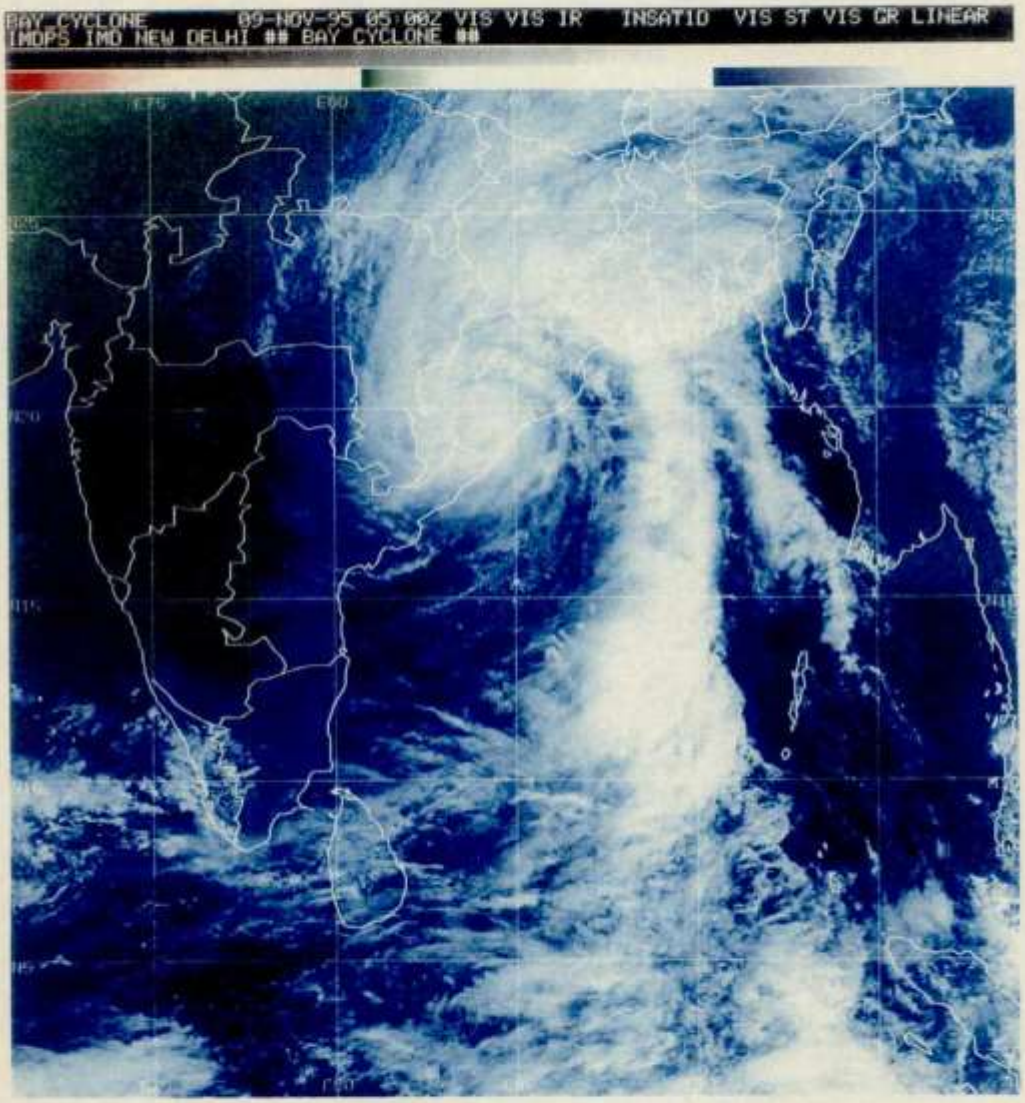
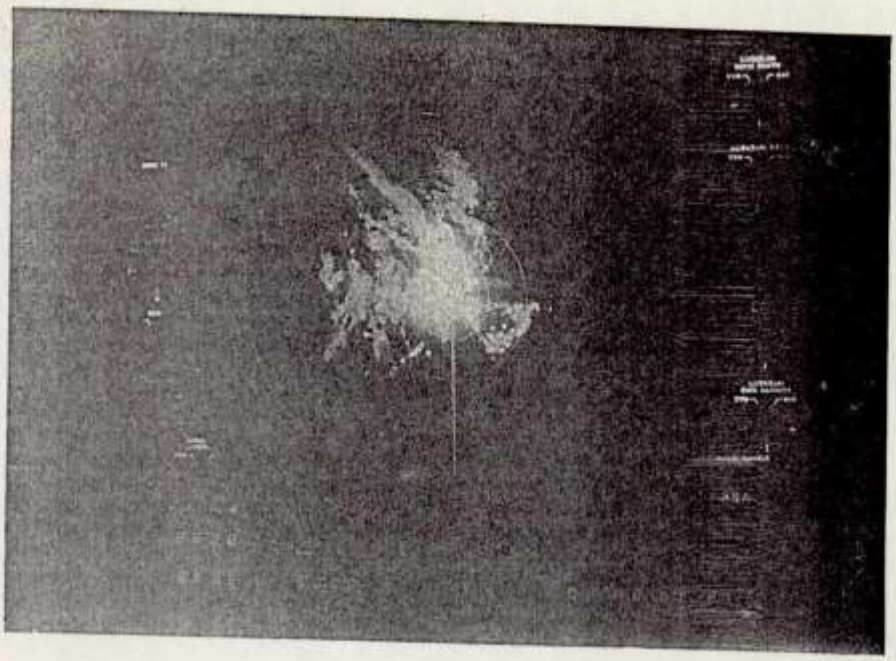

BAY CYCLONE 09-NOV-95 05:00Z VIS VIS IR INSATID VIS ST VIS GR LINEAR
IMDPS IMD NEW DELHI ## BAY CYCLONE ##

FIG.13.

(a)



(b)

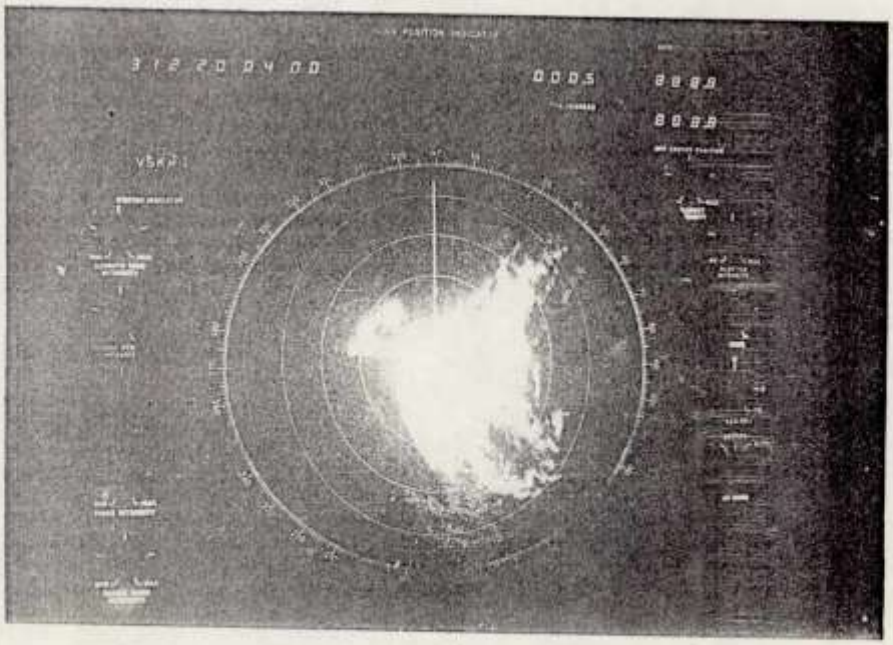
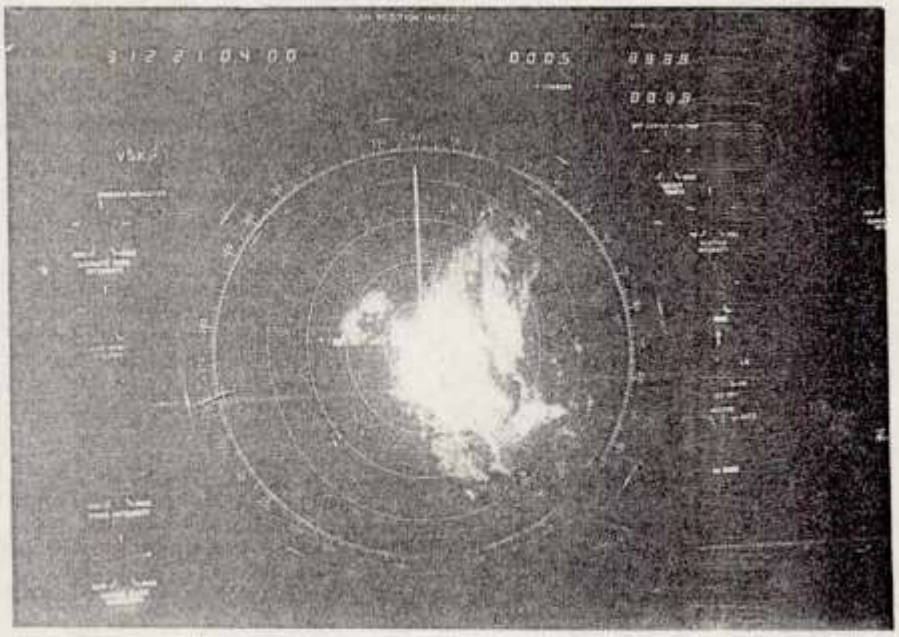


FIG.14.

(c)



(d)

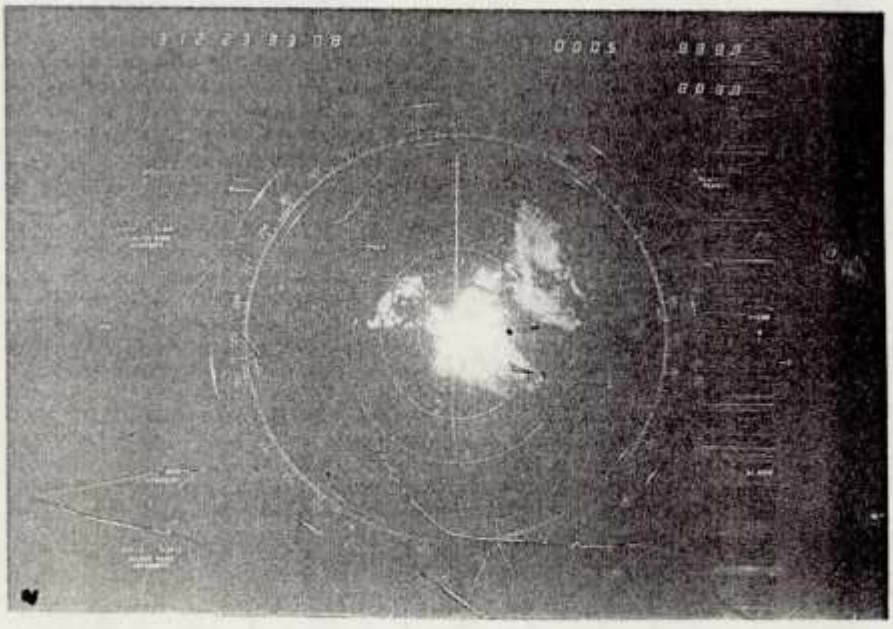


FIG. 14.

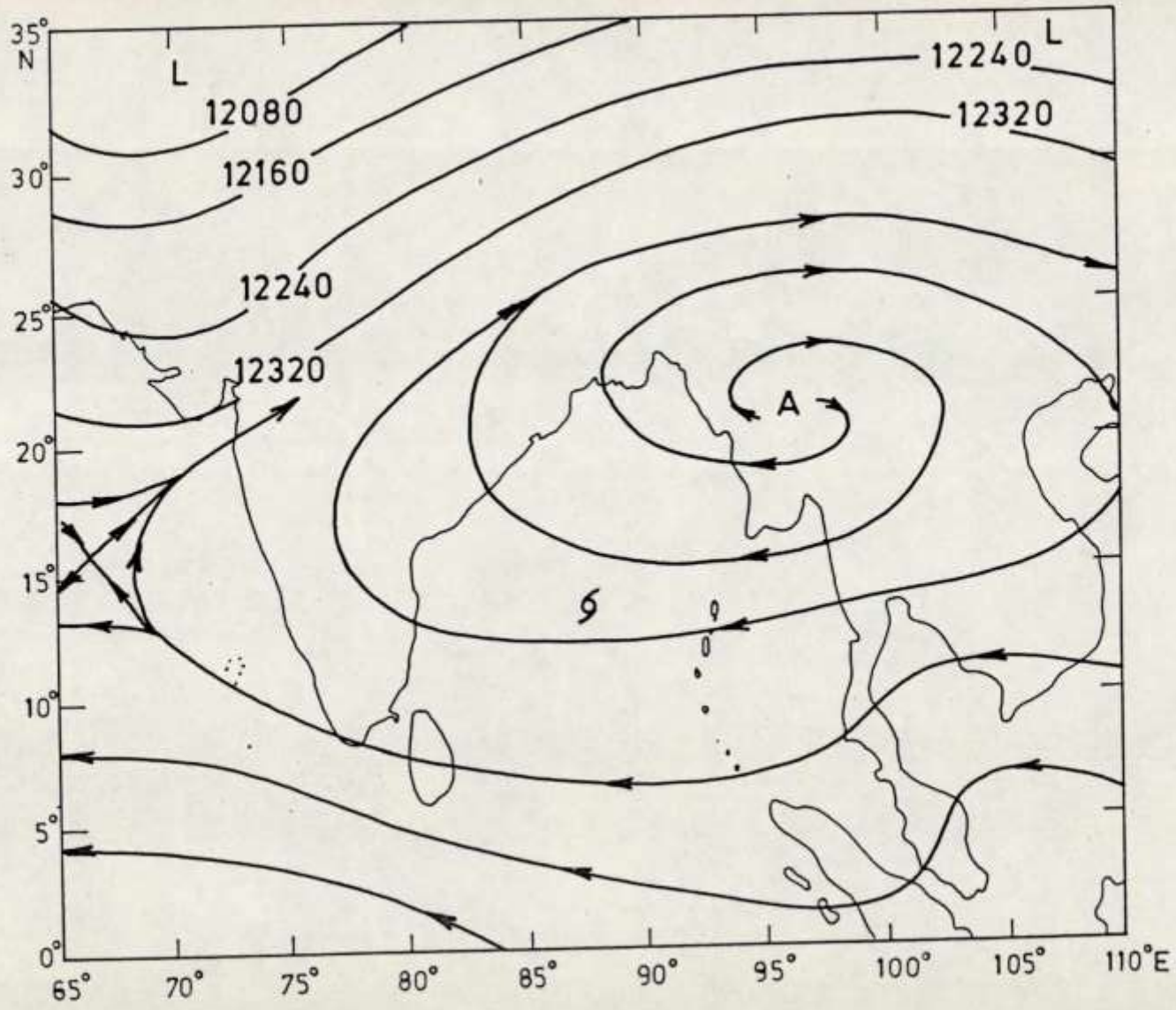

35°
N
30°
25°
20°
15°
10°
5°
0°
65°
70°
75°
80°
85°
90°
95°
100°
105°
110°E
L
12080
12160
12240
12320
L
12240
12320
A

FIG. 15.

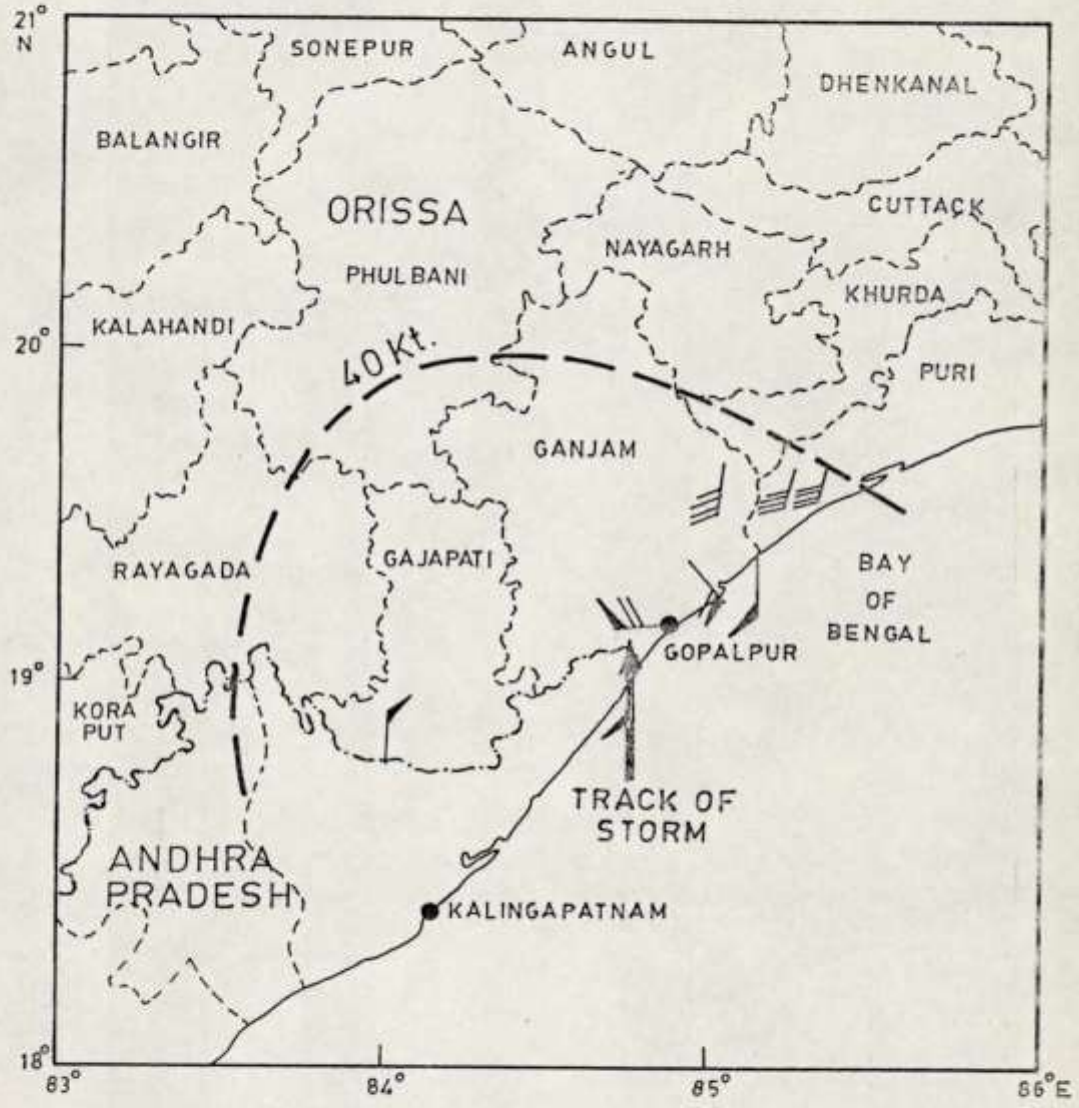

21° N
SONEPUR
ANGUL
DHENKANAL
BALANGIR
ORISSA
CUTTACK
NAYAGARH
PHULBANI
KHURDA
KALAHANDI
20°
40Kt.
PURI
GANJAM
RAYAGADA
GAJAPATI
BAY
OF
BENGAL
GOPALPUR
19°
KORA
PUT
TRACK OF
STORM
ANDHRA
PRADESH
KALINGAPATNAM
18°
83°
84°
85°
86°E

FIG. 16.

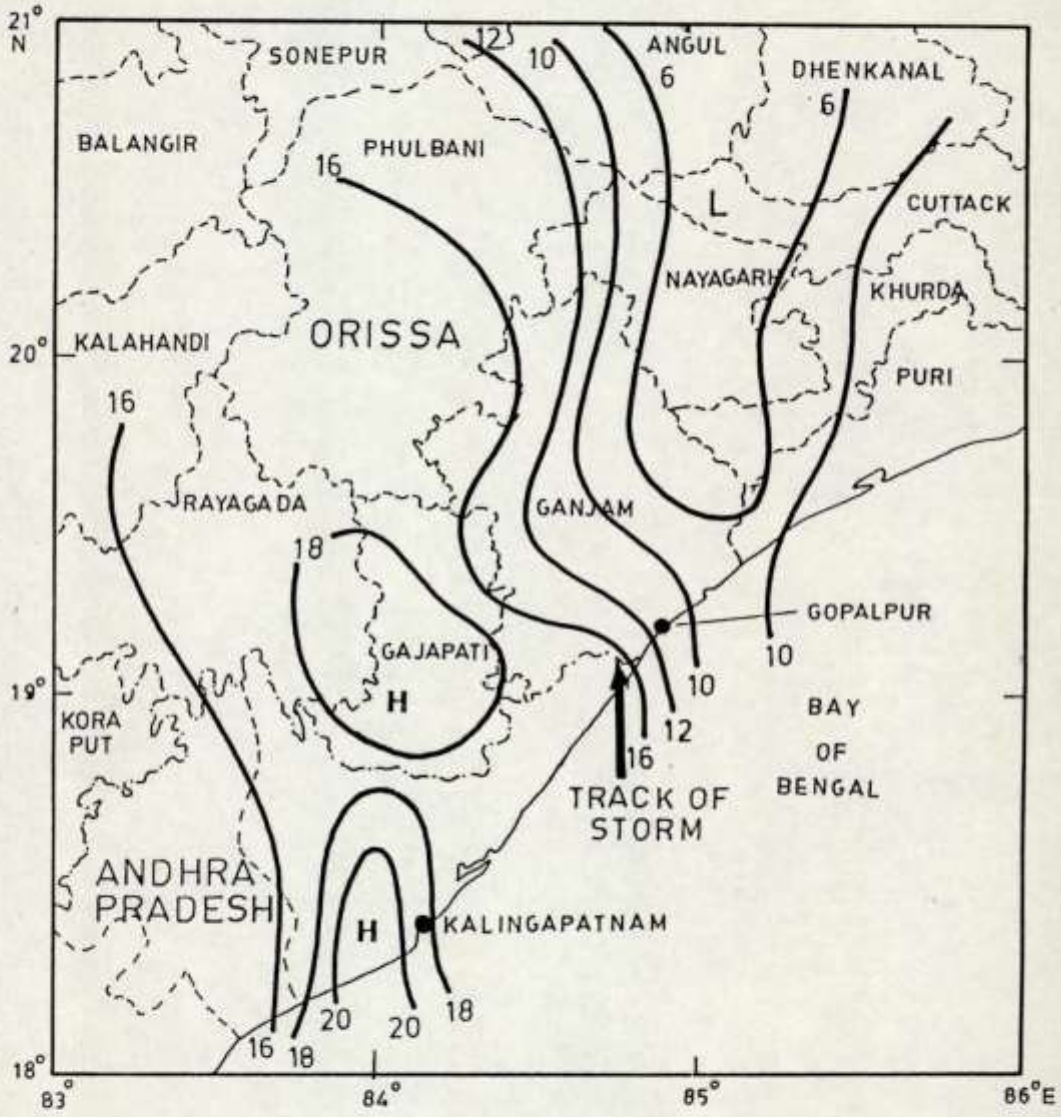
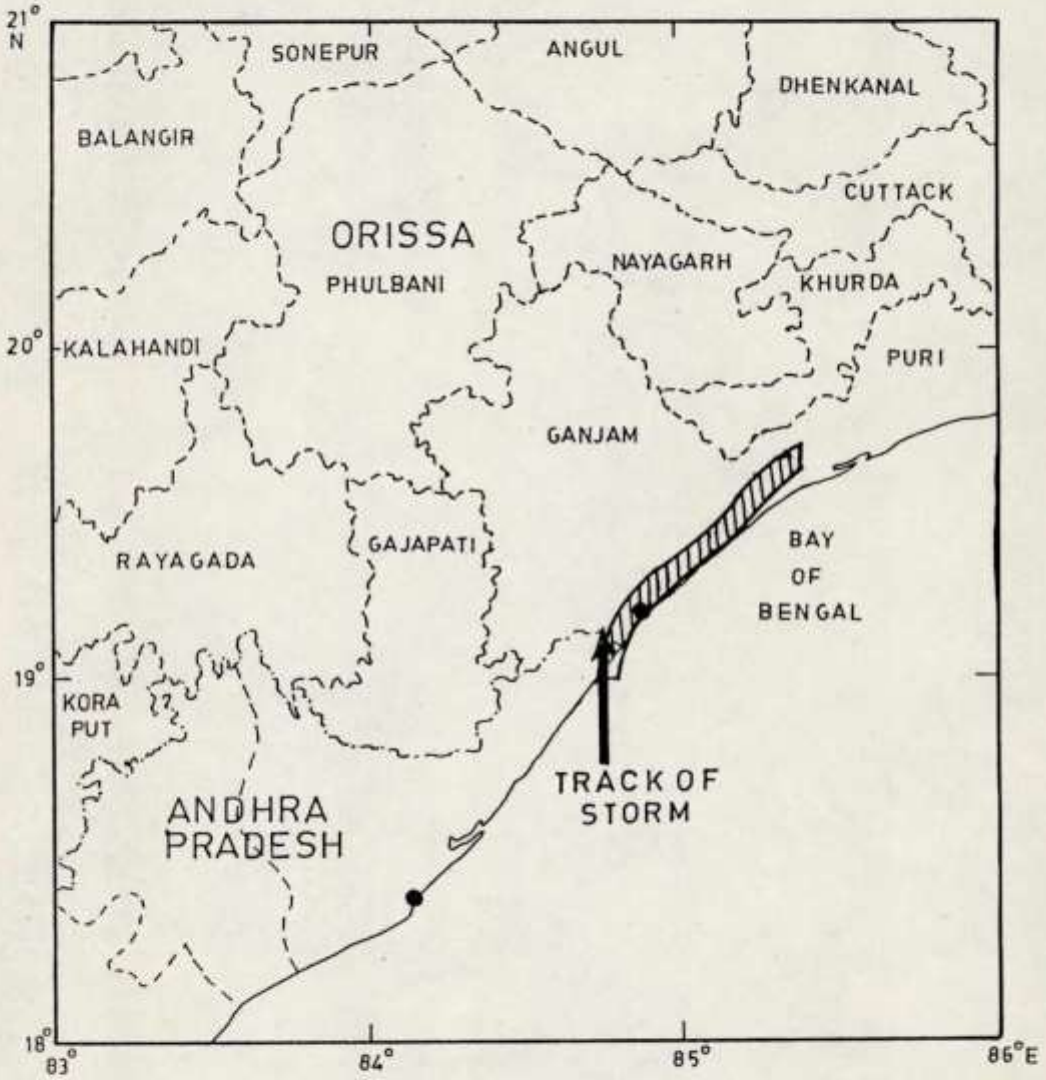

21° N
20°
19°
18°
83°
84°
85°
86°E
SONEPUR
BALANGIR
PHULBANI
ANGUL
DHENKANAL
CUTTACK
NAYAGARH
KHURDA
PURI
KALAHANDI
ORISSA
RAYAGADA
GANJAM
GOPALPUR
GAJAPATI
KORA PUT
BAY OF BENGAL
TRACK OF STORM
ANDHRA PRADESH
KALINGAPATNAM
L
H
H
12
10
6
6
16
16
18
10
10
12
16
16
18
20
20
18

FIG. 17



AREAS AFFECTED BY STORM SURGE OF 1-1·5 M

FIG. 18

FIG. 19.

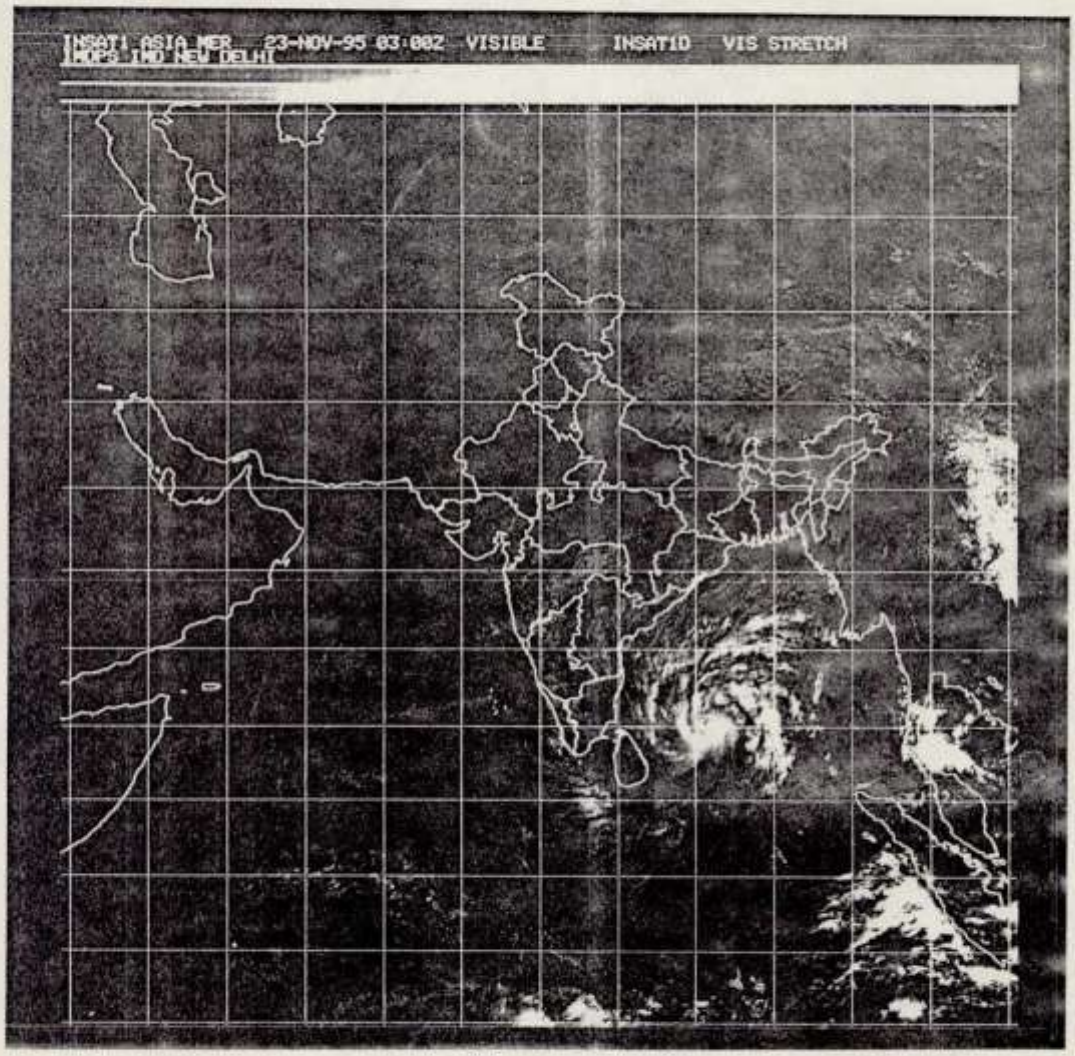

INSAT1 ASIA MER 23-NOV-95 03:00Z VISIBLE INSATID VIS STRETCH
MAPS IND NEW DELHI

FIG. 20

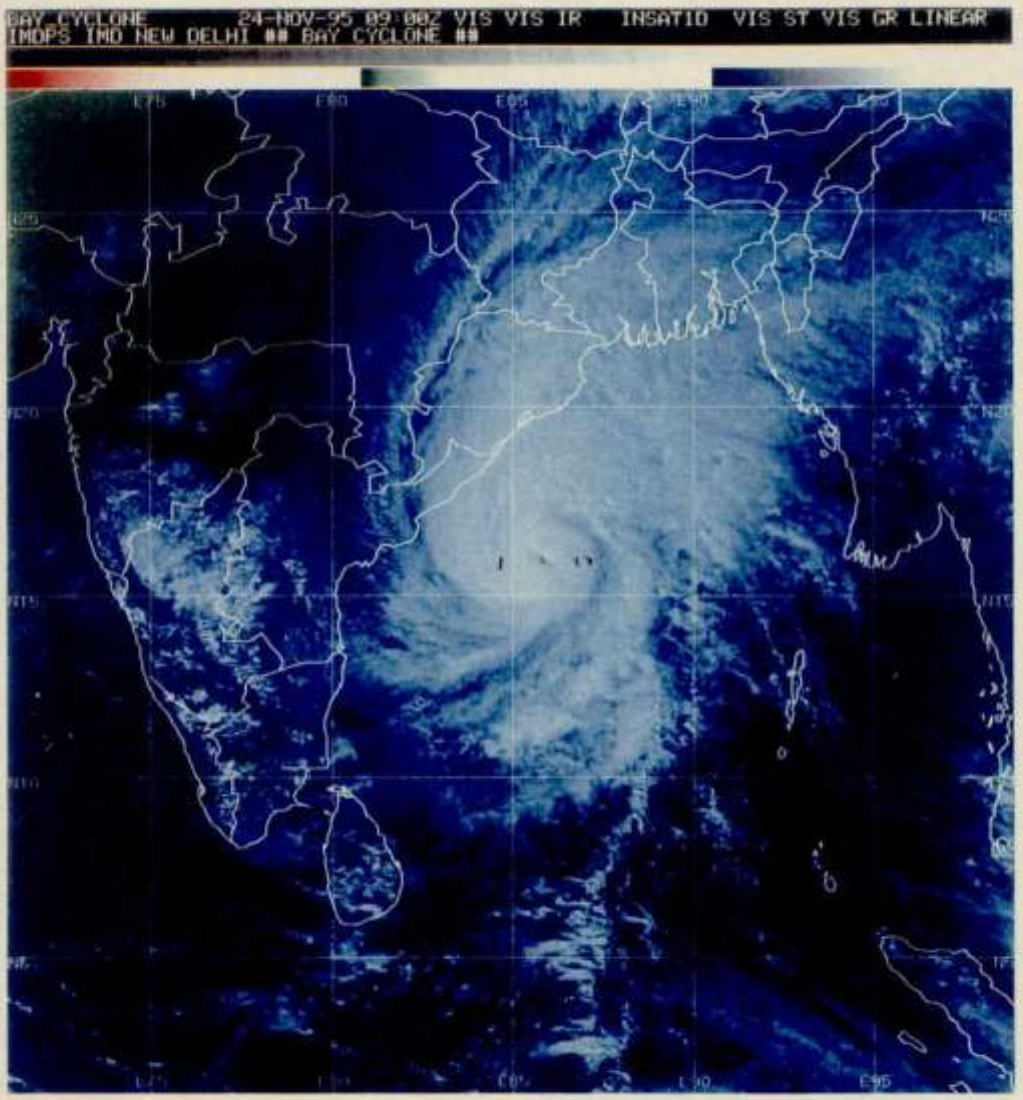

BAY CYCLONE 24-NOV-95 09:00Z VIS VIS IR INSATID VIS ST VIS GR LINEAR
IMDPS IMD NEW DELHI ## BAY CYCLONE ##

FIG. 21.

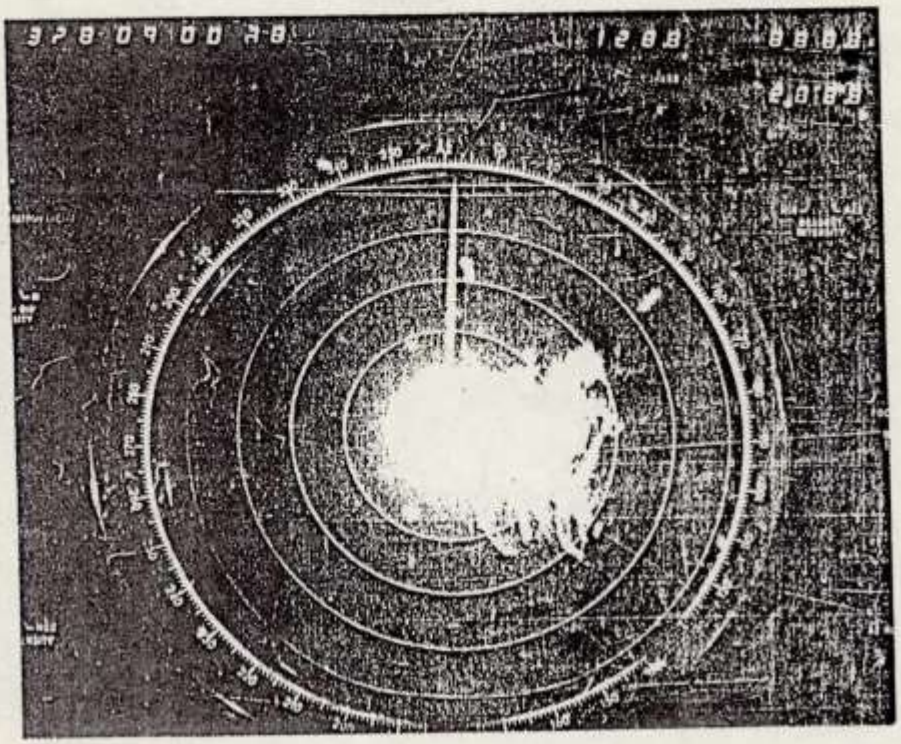


FIG. 22.

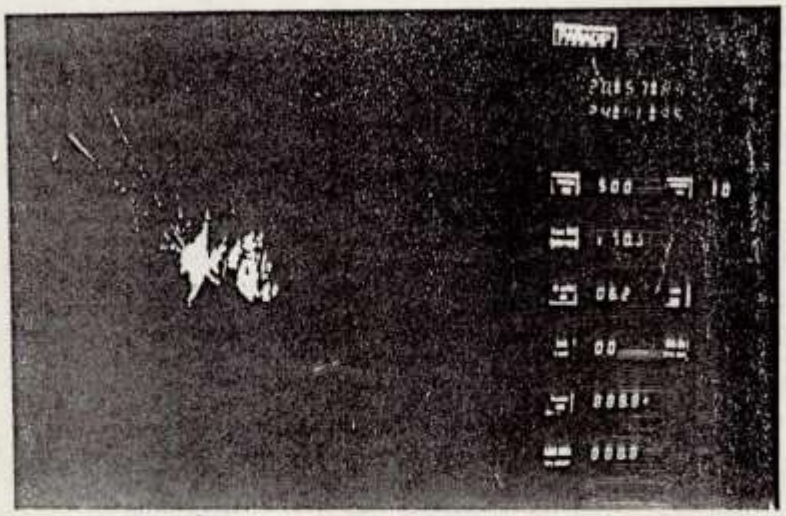


FIG. 23.

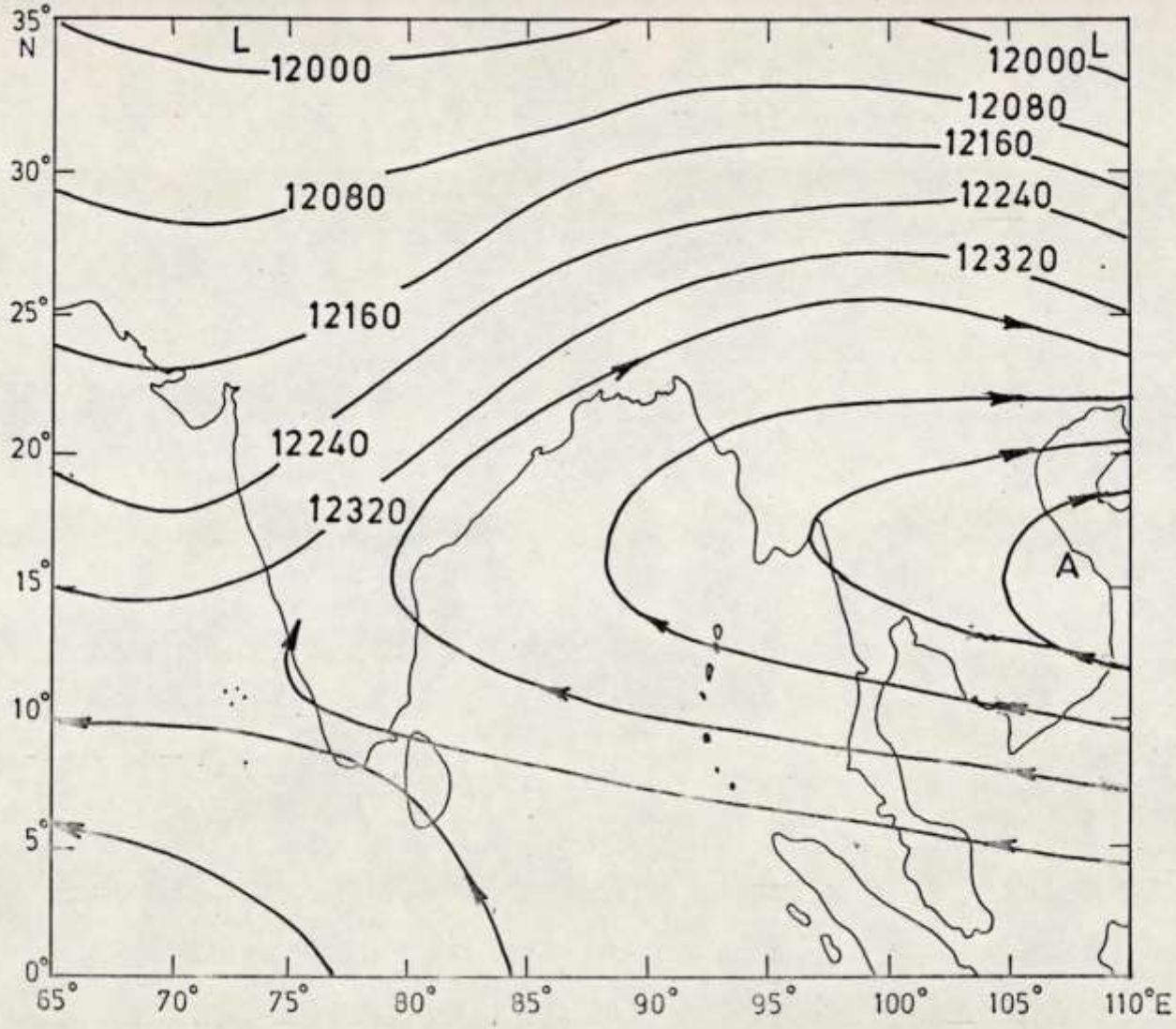
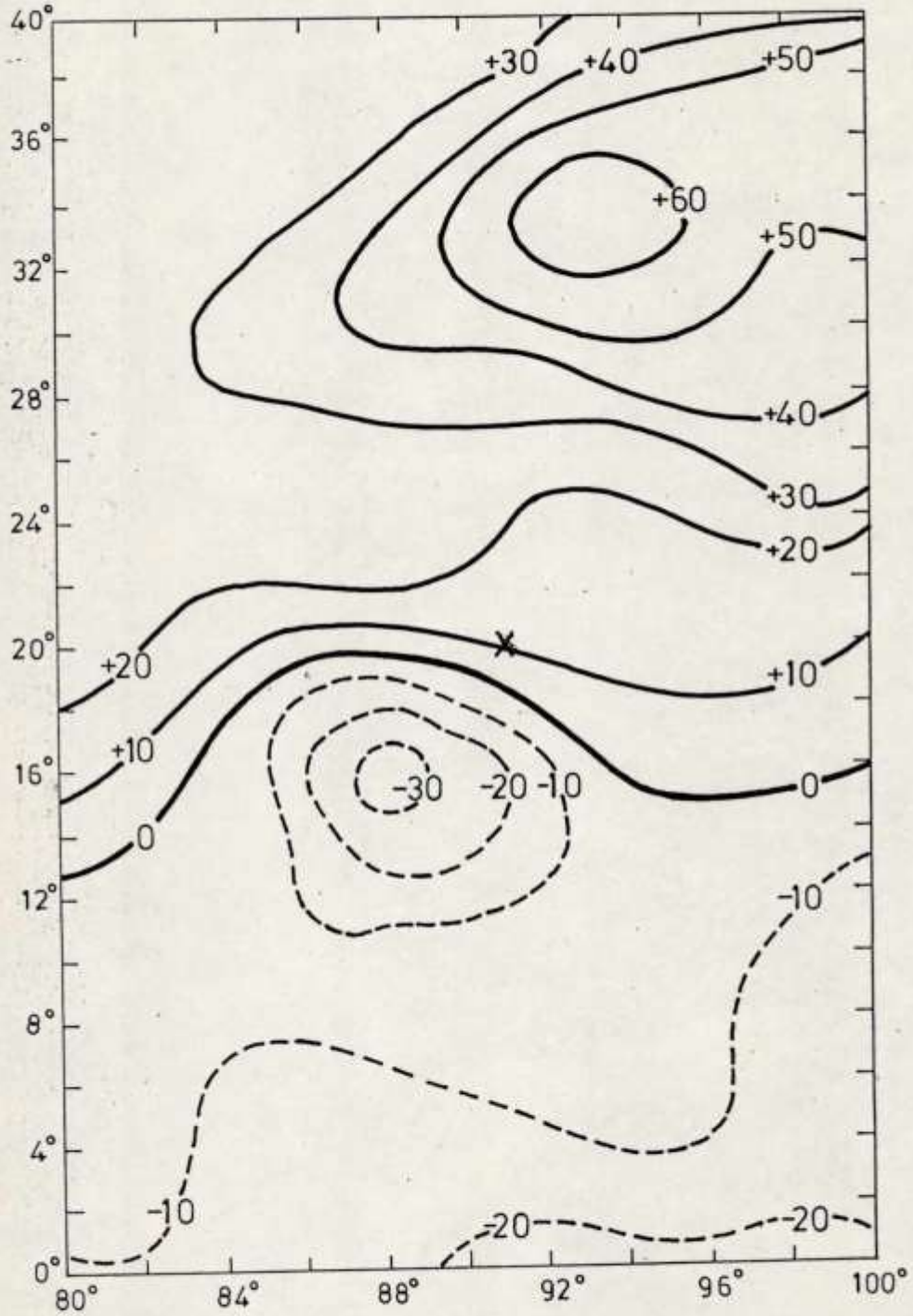
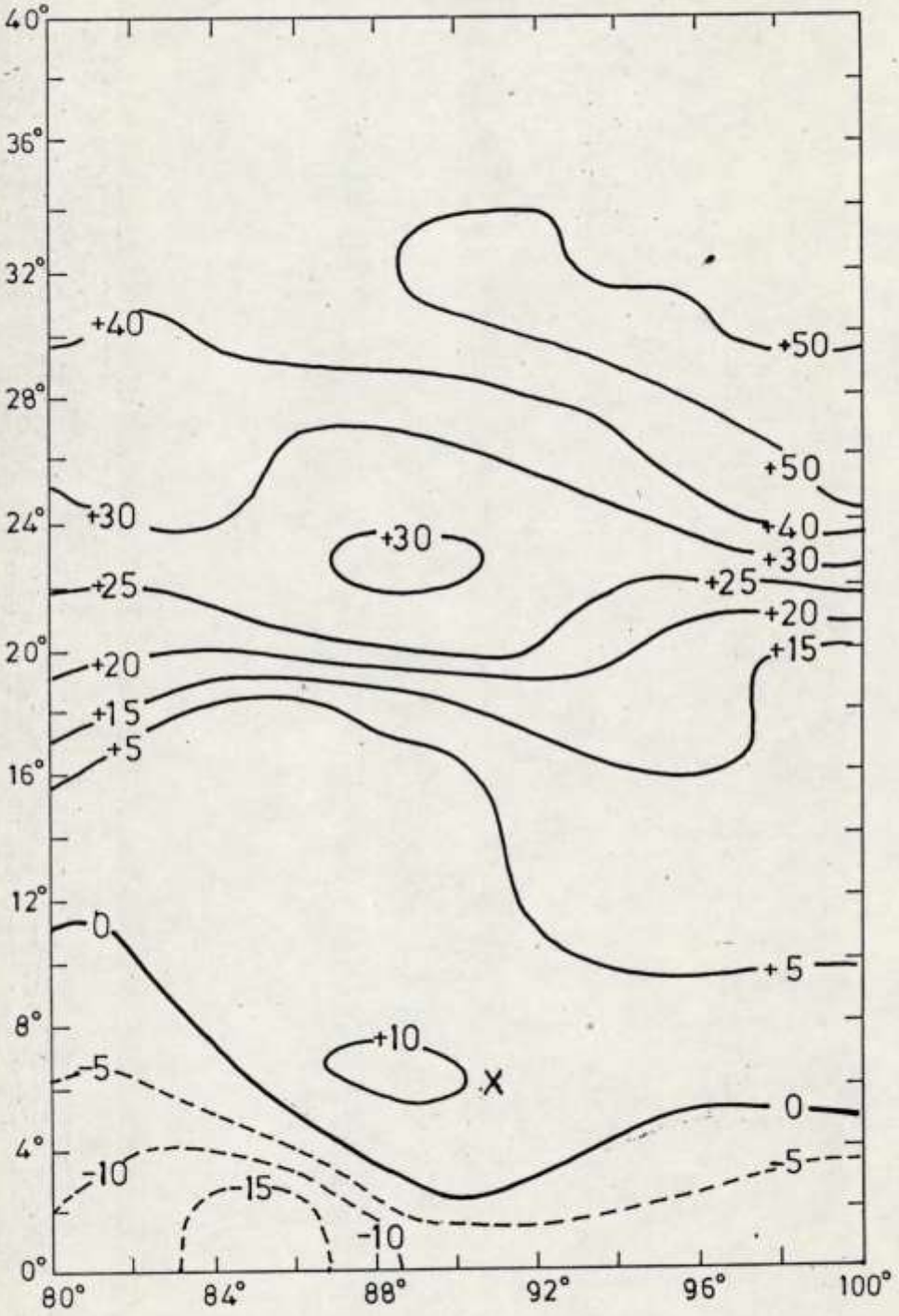

35°
N
30°
25°
20°
15°
10°
5°
0°
65°
70°
75°
80°
85°
90°
95°
100°
105°
110°E
L
12000
12080
12160
12240
12320
L
12000
12080
12160
12240
12320
A

FIG. 24



00 UTC OF 25.11.1995

FIG. 25(a)



12 UTC OF 21. 11. 1995

FIG. 25(b)

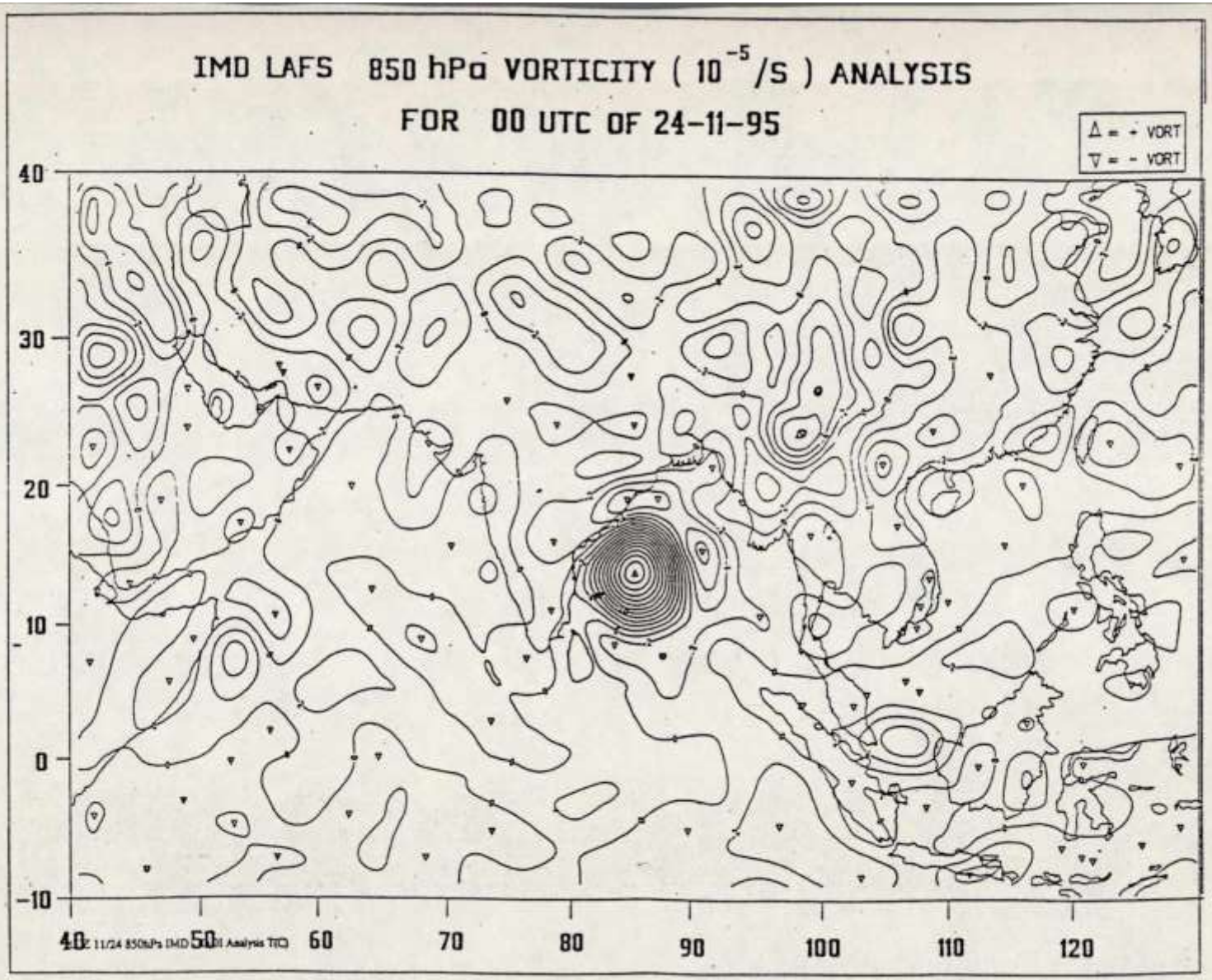


Fig. 2 6. Relative vorticity field (analysis) at 850 hPa on 24.11.95/00 UTC

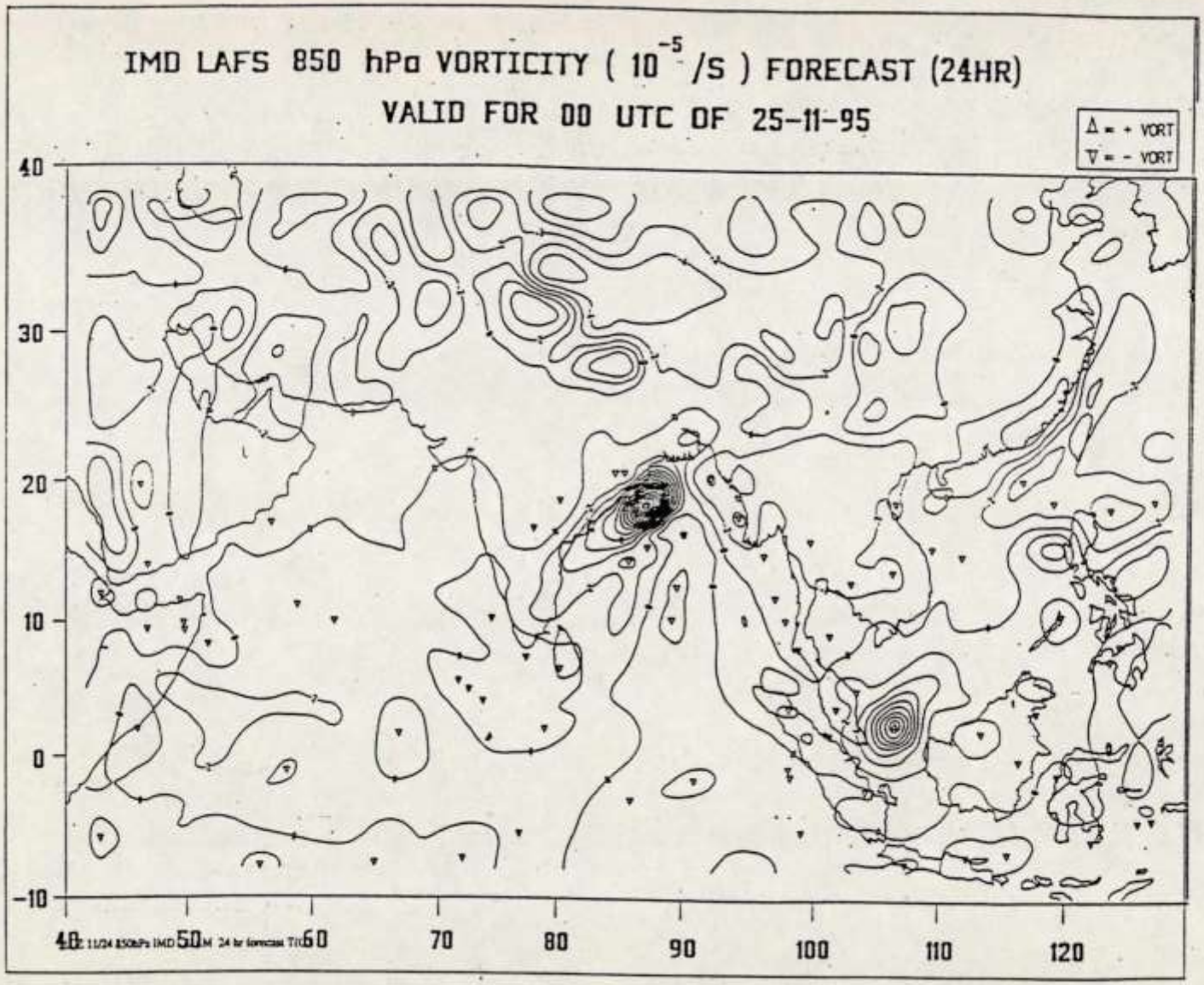


Fig. 27. Relative vorticity field (24h predicted) at 850 hPa based on initial conditions of 24.11.95/ 00 UTC

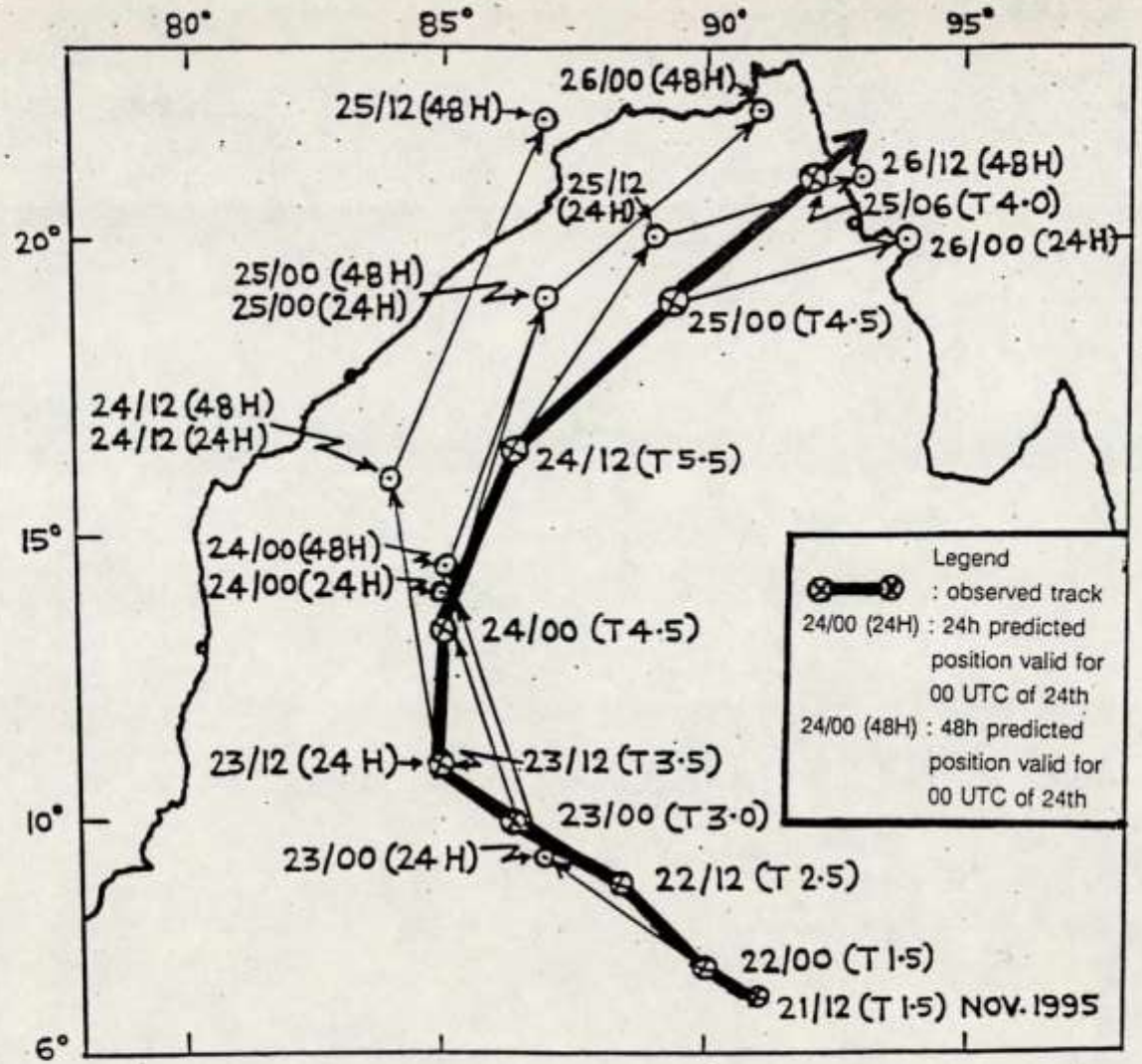
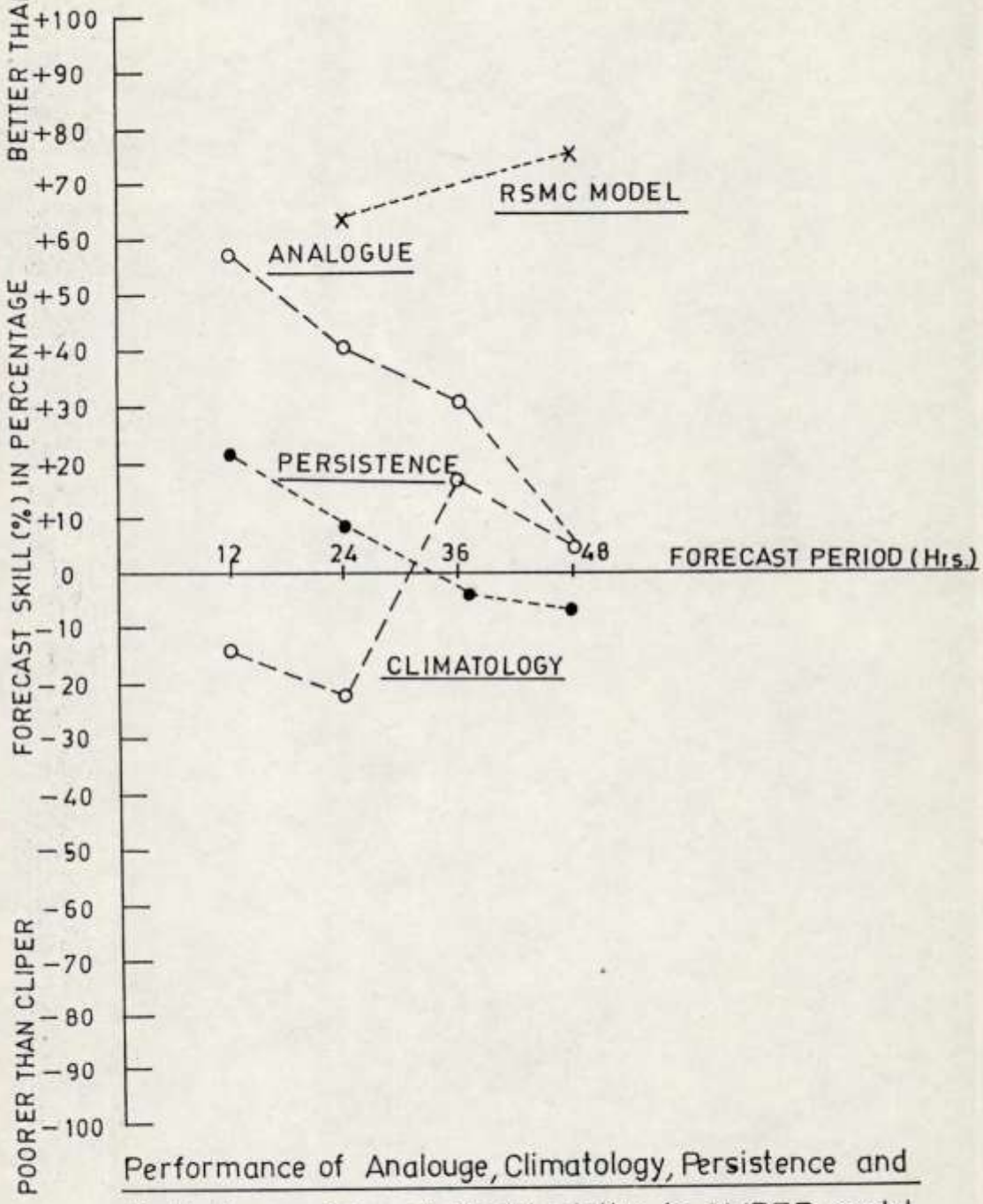


Fig. 28. Observed and predicted (24h, 48h) tracks of the severe cyclonic storm, 21-25 November, 1995



Performance of Analouge, Climatology, Persistence and Limited area forecast Model relative to CLIPER model.

FIG. 29.

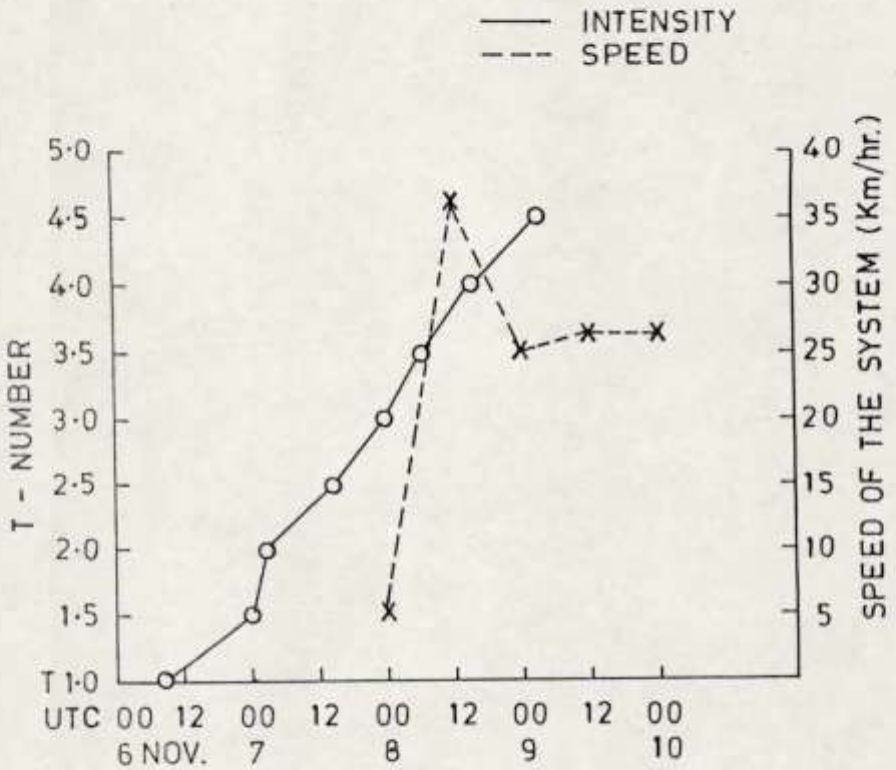
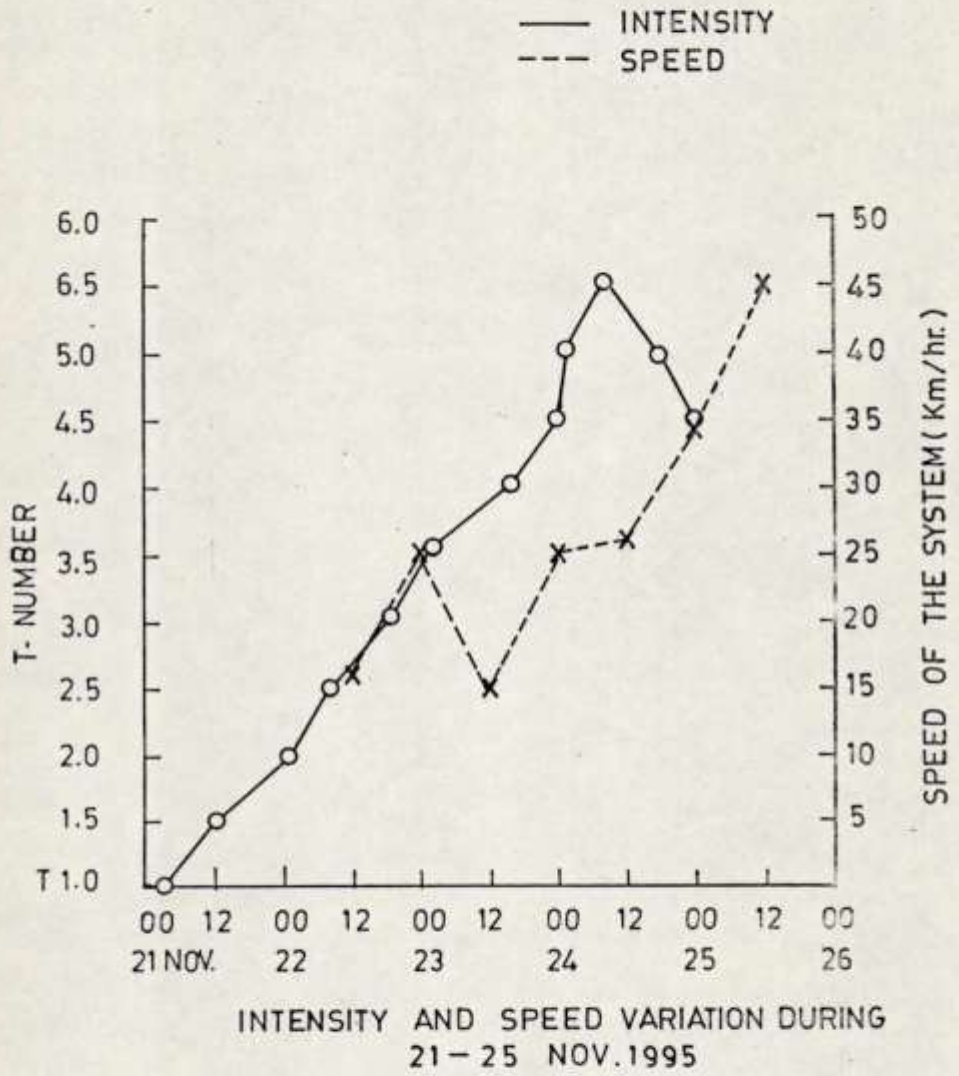

INTENSITY
SPEED
T - NUMBER
SPEED OF THE SYSTEM (Km/hr.)
5·0
4·5
4·0
3·5
3·0
2·5
2·0
1·5
T 1·0
40
35
30
25
20
15
10
5
UTC 00 12 00 12 00 12 00 12 00
6 NOV. 7 8 9 10

FIG. 30.



INTENSITY AND SPEED VARIATION DURING
21 – 25 NOV. 1995

FIG. 31.

PRESS CLIPPINGS

THE HINDU : 10 NOV. 1995

Boats missing in storm

From Our Staff Reporter

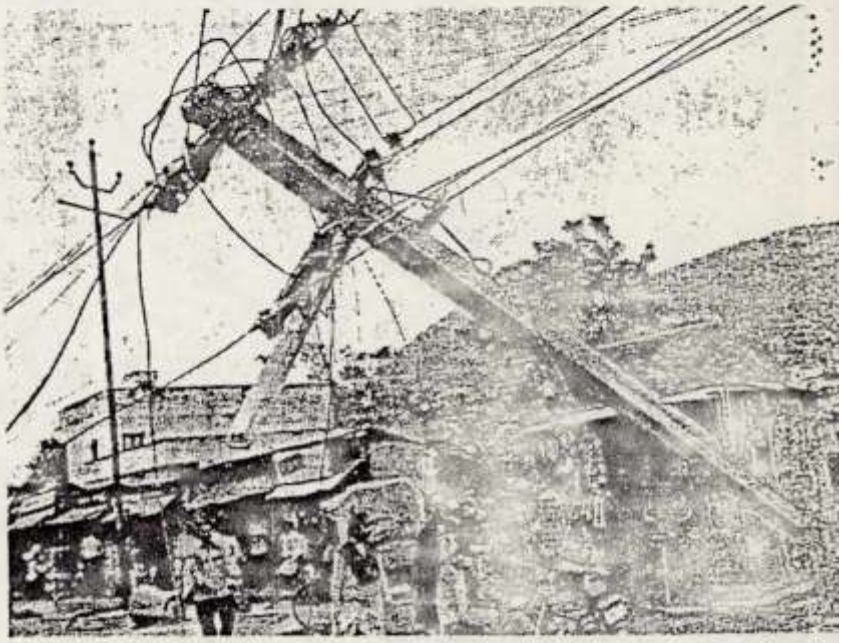
VISAKHAPATNAM, Nov. 9.

At least 20 mechanised fishing boats that had sailed from Visakhapatnam and Kakinada are reported to have sunk in the Bay of Bengal after being caught in the cyclonic storm.

While some of the crew had swum to the nearest shore or were picked up by passing vessels, nearly 15 fishermen were still missing, according to Mr. Ch. Satyanarayana Murthy, general secretary of Visakha Dolphin Boat Operators Welfare Association.

The Association on Thursday represented to the District Collector to launch a rescue mission for the missing crew by the Coast Guard. The vessels that are believed to have sunk in the sea had sailed during the past four to five days.

Five fishing vessels capsized at the jetty in the fishing harbour here under the impact of Wednesday's strong gale, Mr. Murthy said.



An electric pole dangles precariously at Thatichetlapalem in Visakhapatnam on Thursday after fell due to hurricane winds.

INDIAN EXPRESS : 10 NOV. 1995

Gale throws rail traffic out of gear

From Our Staff Reporter

VISAKHAPATNAM, Nov. 9.

The gale that lashed the coastal districts disrupted rail traffic in the South Eastern Railway (SER).

An official spokesman of Waltair division of SER said trees uprooted by the gale fell across tracks on Wednesday and impeded the movement of trains. The following trains are running late on Thursday: 2841 Howrah-Madras Coromandel Express, 6003 Howrah-Madras Mail, 8045 Howrah-Hyderabad East Coast Express and 6520 Guwahati-Bangalore Express.

The following trains were cancelled on Thursday: 1 VK Visakhapatnam-Kirandul passenger, 2 VK Kirandul-Visakhapatnam passenger, DMU/458-457 Visakhapatnam-Tuni-Visakhapatnam, 232-DMU Visakhapatnam-Palasa, 225 Palasa-Visakhapatnam passenger, 226 Visakhapatnam-Palasa passenger (terminated at Vizianagaram and returned to Vizag as 2251), 8447 Bhubaneswar-Rourkela Hirakhand Express, 7016 Visakha Express (passing through Vizag on Thursday ran upto Srikakulam Road and returned as 7015 for Secunderabad), 8479 Puri-Tirupati Express, 1020 Konark Express and 8045 East Coast Express of Thursday, scheduled to pass through Vizag on Friday, is rescheduled to leave Howrah four hours behind the scheduled time.

The 8045 Howrah-Hyderabad East Coast Express scheduled to leave Howrah on Friday and pass through Vizag on Saturday is cancelled. The 7003 Howrah-Secunderabad Falaknuma Express, scheduled to leave Howrah on Friday is rescheduled to leave on Saturday to pass through Vizag the same day. The 8403 Puri-Ahmedabad weekly express of Thursday is cancelled.

The 6520 Guwahati-Bangalore Express scheduled to pass through Vizag at 3 p.m. on Thursday is running 13 hours behind schedule. The 6003 Howrah-Madras Mail scheduled to pass through Vizag at 1 p.m. on Thursday is expected after midnight.

The 8045 Howrah-Hyderabad East Coast Express scheduled to pass through Vizag at 5 a.m. on Thursday arrived at 8 p.m. The 2841 Howrah-Madras Coromandel Express passed through Vizag at 1 p.m. on Thursday against the normal time of 4-50 a.m.

Cyclone toll rises to 18

BHUBANESWAR, Nov. 10 (IITC)

The cyclone that ravaged most parts of coastal Orissa during the last two days left a trail of misery and sorrow in which 11 people have did so far and 17 are reported missing. In terms of damage, it is still being assessed but official sources claim it would be high.

According to PTI, death toll has risen to 18.

Fishing trawlers and a launch belonging to the Coast Guard are reported to have sunk at Sandakunda off Paradeep Port and eight bodies have been recovered so far. The other trawlers sank off Rajnagar and Ganjam. Most of the fisherman were said to be from Andhra Pradesh.

In Chilka lake, about 300 fishering boasts, most of them small country-made ones, have sunk. Fortunately, no loss of life was reported from the lake as most of the fishermen reportedly, swam to safety. However, hundreds of fishermen, are said to be missing in other parts of the State.

The coast guard personnel aboard the Razia Sultan that sunk off Paradeep had a narrow escape. The vessel was entering the port after a night long patrol when the fury of the cyclone during which gusts of wind attained speed of nearly seventy km an hour, dashed the vessel against a supporting wall and bored holes in its hull. All the personnel were rescued.

Standing crops in large areas have been damaged while numerous house collapses have been reported from the district.

HYDERABAD: A seven-member Central team is arriving here tomorrow to assess the damge caused due to last month's torrential rains in the coastal and Telengana regions of Andhra Pradesh.

Speaking to reporters today, State Relief Commissioner H. S. Brahma said the team, which includes Mr A. K. Praddhan, Joint Secretary, (Finance), Mr Ashok Saikia, Joint Secretary, (Agriculture) and Mr Indrajit Malhotra (deputy adviser, planning commission) will split into two teams. One team consisting of three members will assess the damage in the coastal Andhra region, while the other will visit Telengana region on Nov. 12 and 13, he said.

THE HINDUSTAN TIMES
11 NOV. 1995

INDIAN EXPRESS : 11 NOV. 1995

Srikakulam district battered again

From Our Staff Reporter

SRIKAKULAM, Nov. 10.

People of Srikakulam, bound by a 193-km long coastline, seem to be a cursed lot, as even before they could get a breather after the devastating October cyclone, Nature unleashed its fury again on the night of November 8, this time with the double-edged weapon of a cloudburst accompanied by a hurricane wind that proved merciless in its sweep. Overnight, vast tracts of land in the district was flattened. At Chennayyavalasa village in Jalamuru mandal, V. Ramulu (65), died when a wall collapsed on him.

Acres and acres of banana plantations, paddy fields, hundreds of trees (many of the uprooted ones impeding traffic on the National Highway No.5), electricity poles and thatched huts, were seized to the ground.

Twenty five families at Vaddapalem village in Sompeta mandal and 35 in Saravakota had to be evacuated.

Farmers took the worst beating. Surveying the damage in his two-acre field, a farmer at Arasavilli says, One more month and I could have harvested my paddy. Last year, my field yielded 46 bags. He hopes to dry up what appears to be a crop runover by a road-roller for selling as cattle feed.

In Srikakulam town, the gale disloged the power distribution network, snapped the only drinking water pipeline coming from Nagavalli river and sent trees crashing on houses.

A temple priest and his family were jolted out of sleep when a 50-year-old peepal tree crashed on their house at 5 a.m. Three women were injured.

"The gale caused a fresh damage of Rs.9 lakhs in the municipal limits," says Mr. D. Bhavani Shankar, Municipal Chairman.

Overnight, the district recorded rainfall ranging from 18 mm to 198.6 mm (at an average of 93 mm), the total amounting to 3,279.6 mm. Srikakulam, Etcherla, Narasannapeta, Amadalavalasa, Gara, Mellaputti, Kanchili, Sompeta, Mandasa, Palasa, Vajrapukothuru, Nandigama, Tekkali, Kotabommali and Juluru received more than 100 mm of rainfall.

During the South-West Monsoon (May to September), the district recorded 761.9 mm and during the North-East monsoon (October 1 to 16) 300.8 mm.

"What is, however, clear is that the latest spell of rain and gale that persisted from Wednesday night to the early hours of Thursday have left a fresh trail of devastation. Cashew, coconut and banana plantations suffered extensive damage. There is also loss to private and public properties," the Joint Collector says.

Preliminary reports say that 40 catamarans have been swept away and 40 thatched huts destroyed. Fishermen at sea, all having sailed from Visakhapatnam or Bheemunipatnam were caught unawares.

Till Friday afternoon, there were reports of nine boats touching various parts of the coast in Sompeta and Mandasa mandals. Five fishermen reported missing from Jeerupalem village in Narasannapeta mandal, turned up in Visakhapatnam.

The district administration despatching senior officers for coordination of relief and rehabilitation and 10-member teams have been sent to all mandals for enumeration.

Besides arranging relief camps, Rs.500 has been sanctioned for every fully damaged house and Rs.200 for the partly damaged ones.

THE HINDU: 11 NOV 1995

40 fishermen feared drowned in sea

From Our Staff Reporter

VISAKHAPATNAM, Nov. 10.

As many as 61 mechanised fishing vessels and over 40 fishermen were reported missing in the Bay of Bengal during the cyclone that hit north Andhra last night.

A search is on for the fishermen, and the Coast Guard, Madras, has deployed two ships for rescue operations. According to Mr. P. C. Appa Rao, president of the Andhra Pradesh Mechanised Fishing Boat Operators' Association, the Coast Guard Ship Vikram and CGS Jeejibhoy were carrying out the search in the sea off north Andhra and Orissa coasts. While CGS Jeejibhoy which was already in the sea, was given the message to conduct rescue operations, CGS Vikram which has a helicopter on board, set out on Friday morning on the same mission, he disclosed.

According to reports reaching here, 49 of the survivors swam to safety and reached Srikakulam while the bodies of some of them who had drowned in the sea, were washed ashore by Friday at different places along the coast in Orissa and north Andhra. The initial loss to property is estimated at Rs. 3.5 crores. Four of the 61 boats were anchored at the Fishing Harbour here. "Never before we have witnessed such a tragedy. We fear quite many of the missing are drowned. The gale snapped the strong ropes with which were the boats were tied to the jetty," Mr. K. Poliah, honorary president of the association, said.

The fear of heavy loss of life has upset the community which suspended all fishing operations from Visakhapatnam since Thursday. The fishing harbour at Visakhapatnam was thronged by anxious members of fishermen's families keen on knowing the whereabouts of their men caught in the storm, all through the day and night. Some of them have left by taxis to Srikakulam and other coastal towns of Andhra Pradesh and Orissa borders on information that some bodies were washed ashore.

Members of fishermen's families surrounded Y. Lakshmaiah, the first of the survivors to reach here on Friday morning who narrated the tragedy that befell the community. Lakshmaiah, who along with six others, had left Visakhapatnam harbour on October 30, said they were fishing off Puri coast in Orissa on Wednesday midnight when the cyclone hit them. They began their return journey immediately, and with great difficulty entered Andhra region when he was thrown off the rocking boat, and carried away almost five kilometres into the sea. He, however, had a miraculous escape, and swam for nearly eight hours to reach Barua in Srikakulam, from where he returned to Visakhapatnam city on Friday morning.

Lakshmaiah said he could not save his uncle, Akula Damaiah, 40, a resident of Komada village in Vizianagaram, who had drowned, while two others swam to safety. The whereabouts of the remaining three was not known. S. Kamaiah, the second survivor to reach Visakhapatnam on Friday afternoon, said three of his men in the boat were drowned in Gopalpur, while he swam ashore.

The damage to life and property would have been much more but for many of the fishermen deciding to stay back for the Polamamba Jatara at Bheemunipatnam, scheduled to be held on November 8. "At least 80 boats stayed back and with the cyclone warning, the festival itself was put off. The boats from Kakinada did not arrive here due to poor catches. Normally there would be at least 100 boats from Kakinada out of the 500 mechanised fishing boats operating from Visakhapatnam fishery harbour," Mr. Appa Rao said.

Dazed fisherwomen at the Fishing Harbour in Visakhapatnam on Friday, eagerly awaiting news of the missing menfolk who had gone on fishing.

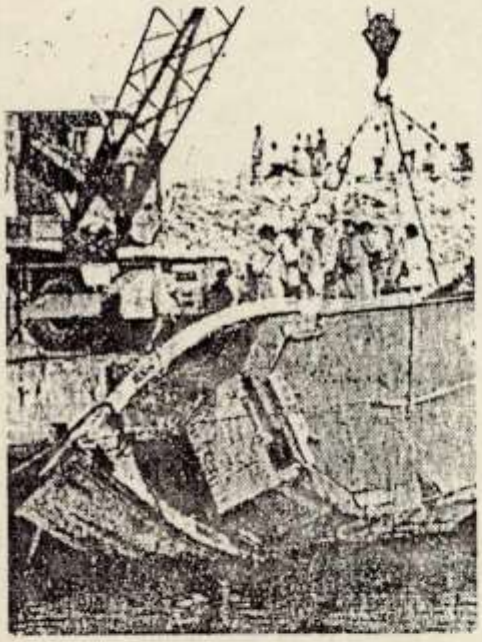
THE HINDU : 12 NOV. 1995

Missing fishermen yet to be traced

From Our Staff Reporter

VISAKHAPATNAM, Nov. 11.

The Visakhapatnam fishing harbour wore a deserted look on Saturday with most of the fishermen's families who lost their breadearners and boats in the cyclone, confining to homes and mourning the loss, while some others were in search of the missing persons or bodies. According to unofficial reports, 70 boats sank or ran aground due to the cyclone. As many as 50 fishermen were feared drowned.



A trawler that sank in the jetty at Vizag being removed by a crane on Saturday. Four boats sank due to cyclonic winds on Thursday night.

According to Mr. P. C. Appa Rao, president of the Andhra Pradesh Mechanised Fishing Boat Operators' Association (APMFBOA) here, 25 bodies had been washed ashore near Puri on Orissa coast till Saturday afternoon. About 30 of the survivors had reached Visakhapatnam so far, 25 of them on Friday. A body was found near Palasa coast and it was sent for post mortem to the hospital in Barua of Srikakulam district, he said and urged the officials to hand over the bodies to the families without delay, skipping the routine process.

He, however, was sore that no official information was provided to the association either by the district administration, or by the Indian Navy and Coast Guard. "Two ships were sent on rescue mission by the Coast Guard after the Collector requestioned their help, we were told. But nothing had been heard from them so far. When we inquired with the Navy, they asked us to contact the Coast Guard, and the latter, passed the buck back to the Navy," the APMFBOA president lamented. He was also unhappy that in the absence of official information, the actual toll was not known. However, he was preparing a list of the missing mechanised vessels and men, he said.

CGS Vikram, a Coast Guard vessel, was expected to launch a search from Saturday night. The ship reached here during the day. All the north coastal Andhra districts were put on alert as the survivors and bodies of those feared killed, might reach the shore. A Naval helicopter had made an aerial survey of the sea on Saturday.

Mr. Devender Goud, Minister for Revenue, would visit the Fishing Harbour on Sunday morning and Dr. S. A. Rehaman, MLA, had contacted the Chief Minster, Mr. N. Chandra Babu Naidu, and requested him to send a team of officials from the Department of Fisheries to the city. The Revenue and Police officials had visited the Fishing Harbour on Saturday.

EXCAVATED SAND AROUND THE TEMPLE AT THE BEACH NEAR "KHAMBALARAYADU PETA" (NORTH ANDHRA PRADESH) CAUSED BY WHIRLWIND ASSOCIATED WITH THE CYCLONIC STORM ON 9TH NOVEMBER, 1995.