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Cyclones and depressions of 1974 – Bay of Bengal and Arabian Sea

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1. Introduction

Seven cyclonic storms and five depressions formed in the Bay of Bengal and the Arabian Sea during the year 1974. Of the seven cyclonic storms, four formed in the Bay of Bengal (two of them of severe intensity) and three in the Arabian Sea (one of severe intensity). Of the five depressions, four formed in the Bay of Bengal and one in the Arabian Sea. The tracks of these cyclonic storms and depressions are shown in Fig. 1 and their monthly distribution in Table 1.

The main features of this year's cyclonic disturbances were :

(*i*) No cyclonic storm struck Tamil Nadu, Andhra Pradesh coasts or the west coast of India.

(*ii*) Two of the Bay cyclones struck Bangla Desh, while one struck Orissa coast and another the West Bengal coast. Some damage was caused only by the Contai cyclone of 15 August.

(*iii*) The frequency of cyclonic storms that formed in the Indian seas in the monsoon and post monsoon seasons this year was abnormal. Only one cyclonic storm developed in the Indian seas during the post monsoon season (October to December) which is rather unusual. Formation of two cyclones in the Bay and one in the Arabian Sea during the southwest monsoon season (June to September) was also an unusual feature.

(*iv*) The two Bay storms in August and September retained the storm intensity for a considerable distance over land after crossing coast.

A brief history of the cyclones and depressions together with important features associated with them is given in the following paragraphs.

2. Bay of Bengal

2.1. *Patuakhali cyclone* (29 May – 1 June)

A low pressure wave moved across Arakan coast on 26th. It became well marked by 27th morning and lay over northeast and adjoining east central Bay off Arakan coast. It moved northwestwards and concentrated into a depression on the morning of 29th with its centre at 0300 GMT near 21·5°N, 89·5°E. It intensified into a cyclonic storm on the morning of 30 May and was centred at 0300 GMT close to Bangla Desh coast near 22°N, 90°E. Then moving very slowly in a northeasterly direction, it crossed Bangla Desh coast near Patuakhali that night and weakened into a deep depression on the morning of 1 June near Agartala. Continuing to move northeastwards, it weakened further into a low over Arunachal Pradesh on 2 June.

Under the influence of this system, there was fairly widespread rain in the Bay Islands from 27 to 30 May with isolated heavy falls on 27th and 28th. Fairly widespread rain or thundershowers also occurred in Gangetic West Bengal on 30 and 31 May and in Assam and adjacent States and sub-Himalayan West Bengal from 31 May to 3 June with isolated heavy falls in Assam and adjacent States from 1 to 3 June.

According to press reports, vast areas of Manipur valley were inundated by floods resulting in some damage to crops and houses.

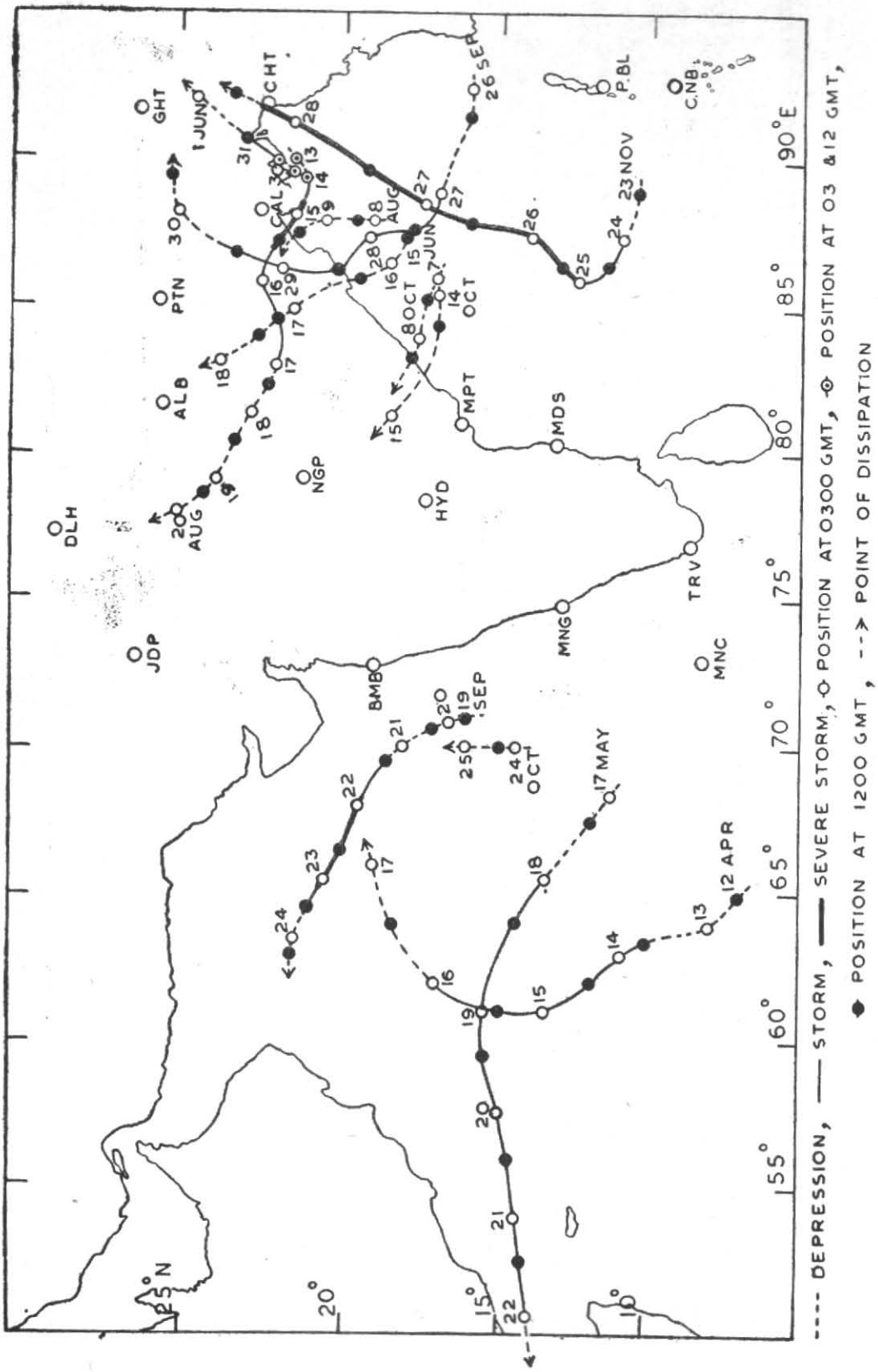

Fig. 1. Tracks of storms/depressions during January to December 1974

TABLE 1

Monthly distribution of cyclones and depressions in the Bay of Bengal and Arabian Sea 1974

	Jan-Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Annual Total	
	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C
Bay of Bengal	—	—	—	—	—	1	1	—	—	—	1	1(1)	—	1	2	—		1(1)	—	—	4	4(2)
Arabian Sea	—	—	—	1	—	1	—	—	—	—	—	—	—	1(1)	1	—	—	—	—	—	1	3(1)
Total	—	—	—	1	—	2	1	—	—	—	1	1(1)	—	2(1)	3	—	—	1(1)	—	—	5	7(3)

D = Depression, C = Cyclonic storm, Figures in brackets indicate the cyclonic storm which had become severe

The lowest mean sea level pressure of 984 mb was reported near the centre of the storm by Patuakhali at 1200 GMT of 30 May, which gives a departure from normal of about *minus* 17 mb. The strongest surface winds reported in the storm field were 42 kt by ship *DDSM* on 30th and 40 to 45 kt by Chittagong and Sandwip on 31st. Some important reports from observatories/ships in the storm field are given in Table 2.

The maximum wind speed associated with this system was estimated as 50 kt from satellite pictures. This would give the central pressure for this cyclonic storm as 984 mb, based on Fletcher's formula. This pressure agrees well with the actual pressure of 984 mb reported by Patuakhali at 1200 GMT of 30th, when the storm centre was close to this place.

The cyclone was embedded in the westerlies in the lower levels and in the easterlies in the upper tropospheric levels on 29th and 30th, with the result that it did not move much. By 31st, it was near the ridge line in upper tropospheric levels and came under the influence of the southerly flow of the anticyclonic cell situated over upper Burma and neighbourhood and its movement northnortheastwards was faster.

2.2. *Deep depression (15 – 18 June)*

A low pressure area which lay over central and adjoining north Bay on 14th, concentrated into a deep depression on the evening of 15th with its centre near 18°N, 87·5°E. Moving in a northwesterly direction, it crossed Orissa coast near Puri during 16th night and weakened into a depression on 17th morning over north Orissa and into a low over west Bihar and adjoining east Madhya Pradesh and east Uttar Pradesh by the evening of 18th.

This system caused fairly widespread rain or thundershowers in the Bay Islands from 14th to 16th, in Telangana and coastal Andhra Pradesh from 15th to 17th, in Vidarbha on 18th, in east Madhya Pradesh on 18th and 19th and in many parts of northeast India from 17th to 20th. Under the influence of this system, the southwest monsoon advanced into north Andhra Pradesh, Orissa, Gangetic West Bengal, Bihar State, east Madhya Pradesh, Marathwada and Vidarbha between 16th and 19th. It was active in Telangana on 16th, in coastal Andhra Pradesh and Orissa on 17th, in Vidarbha on 18th and in east Madhya Pradesh on 18th and 19th. Very heavy rain was recorded at a few places in Koraput district on 17th.

Ship *VWLG* reported the lowest pressure of 983 mb at 1045 GMT of 15th near 16°N, 87°E and an estimated WSW wind of 11 B.F. (about 60 kt). This wind speed seems to be indicative of the vigorous monsoon to the south of the depression. Over the landarea, Puri reported the lowest pressure of 985·9 mb and the largest negative pressure departure from normal of 12 mb at 1200 GMT of 16th. Important reports from ships and observatories in the depression field are given in Table 3. The movement of this depression generally followed ESE/SE flow at the 300 mb level.

2.3. *Depression (8-9 August)*

Under the influence of a low pressure wave moving westwards across Burma, the low which lay over north and adjoining central Bay on 7th, concentrated into a depression on the morning of 8th with its centre at 0300 GMT near 19°N, 88°E. Moving northwards initially and later northwestwards, it crossed Orissa coast near Balasore on the night of 9th and weakened into a low on the morning of 10th over north Orissa.

TABLE 2

Date 1974	Time (GMT)	Ship/Station	Location Lat. (°N)	Location Long. (°E)	Wind Dir. (Deg.)	Wind Speed (kt)	Pressure (mb)
29 May	0000	Calcutta			NE	30 (at 0·9 km)	
	0000	Agartala			SE	55 (at 0·9 km)	
30 May	0000	Calcutta			N	25 (upto 0·9 km)	
	0000	Chittagong			SE	20 (at Surface)	
					SE	25 (at 0·3 km)	
	0300	Patuakhali			E	15	988·2
	0300	Barisal			E	25	990·6
	0300	Chandpur			S	30	995·0
	0300	Bhola			SE	20	992·2
	0300	*DDSM*	21·7	89·5	290	42	989·5
	1200	*DDSM*	21·7	89·5	290	40	988·0
	1200	41931			NNE	30	991·0
	1200	Patuakhali			E	20	984·3
	1200	Calcutta			NW-N	35 (at 0·6 and 0·9 km)	
	1200	Agartala			SE	25 (at 0·6 and 0·9 km)	
31 May	0300	Chittagong			S	40	995·7
	0300	Hatia			SW	35	992·0
	0300	Dacca			NE	10	990·5 (Bar Dep.- —14 mb)
	1200	Dacca			050	31	986·9
	1200	Agartala			SE	30 (at 0·6 and 0·9 km)	
1 Jun	0000	Agartala			NW	10	989·6
		Agartala			W	25 (at 0·6 km)	
		Gauhati			ENE	25 (at 0·6 km)	

TABLE 3

Date 1974	Time (GMT)	Ship/Station	Location Lat. (°N)	Location Long. (°E)	Wind Dir. (Deg.)	Wind Speed (kt)	Pressure (mb)
15 Jun	1045	*VWLG*	16·2	87·4	SW/W	60 (11 BF)	983·0
	1200	*VWLG*	18·0	90·4	S	18	
	1200	Bhubaneshwar			NE	30 (at 0·6 and 0·9 km)	
	1200	Gannavaram			WNW	40-45 (at 0·6 and 0·9 km)	
	1200	Paradip			NE	20	
	1500	*VWPV*	14·0	89·1	220	37	998·7
16 Jun	0000	Bhubaneshwar			E	30 (at 0·9 km)	
	1200	Puri			090	11	985·9
	1200	Paradip			E	30	991·9
	1200	Bhubaneshwar			E	35 (at 0·9 km)	
	1200	Visakhapatnam			W	30 (at 0·3 to 0·6 km)	
	1200	*ATEL*	17·9	85·1	240	35	999·1

The system caused fairly widespread rain in coastal Andhra Pradesh, Telangana, Orissa, Gangetic West Bengal, Bihar Plateau and east Madhya Pradesh from 8th to 10th, in west Madhya Pradesh on 9th and in Vidarbha on 10th, with isolated heavy to very heavy falls in Orissa, Andhra Pradesh and Madhya Pradesh.

The largest negative pressure departure from normal was 5 to 6 mb near the centre of the depression, as reported by Sandheads and Sagar Island on 9th. Sandheads reported surface wind NE/20 kt at 0000 GMT and E/20 kt at 0300 and 1200 GMT on 8th. Bhubaneshwar reported northerly wind of 20 to 25 kt and Calcutta easterly wind of 20 to 25 kt upto 0·9 km a.s.l. at 0000 GMT on 8th. The wind at Akyab and Cox's Bazar upto 0·9 km a.s.l. was SE/25-30 kt at 1200 GMT of 8th. Calcutta reported ENE/25 kt wind at 0·6 and 0·9 km a.s.l. at 0000 GMT on 9th.

2·4. *Contai severe cyclone (13-20 August)*

A low pressure wave moved westwards across upper Burma into northeast Bay on 11th. It concentrated into a depression (probably deep) on the morning of 13th with its centre at 0300 GMT near 21·5°N, 90°E. The depression intensified into a cyclonic storm on the morning of 14th when it was centred near 21·2°N, 89·5°E. Moving slowly westnorthwest, this storm became severe on the morning of 15th with its centre near Sagar Island and crossed West Bengal coast near Contai that noon. This system weakened into a cyclonic storm on that night and retained that intensity over land upto 17th morning when it was centred over east Madhya Pradesh near Champa. Then moving westnorthwest across Madhya Pradesh as a deep depression, it weakened into a low over east Rajasthan by 20th evening.

This system caused generally widespread rainfall in Gangetic West Bengal, Orissa and Bihar Plateau from 14th to 17th, in Madhya Pradesh from 14th to 20th and in east Rajasthan on 20th and 21st, with isolated heavy to very heavy falls in Gangetic West Bengal and scattered heavy to very heavy falls in Madhya Pradesh on some days. According to press reports and information collected from State Govt. officials, this cyclone uprooted trees and telegraph posts, damaged houses and flooded some parts in the districts of Midnapore, Hoogly, Howrah and 24-Parganas in West Bengal. Contai sub-division in Midnapore district was the worst affected. Low lying areas of Digha and Juneput were inundated by tidal waves of height 3 metres.

Egra, Khajurim, Midnapore Sadar (South), Tamluk, Ghatal and Kheri Basin near Panchkura also experienced tidal inundation. Heavy rain in Madhya Pradesh caused floods in the *Narmada*, *Betwa* and *Waingang*a which inundated many parts of Hoshangabad, Vidisha and Bhandara districts. Jabalpur town was completely cut off. Many trees were uprooted in some parts of Madhya Pradesh also. Floods in the *Narmada* affected Broach and Baroda districts of Gujarat. Balasore district in north Orissa experienced gales and heavy to very heavy rain which caused floods in that district resulting in some damage to crops.

The lowest sea level pressure reported close to the centre of the storm by observatories along the storm track was :

(*i*) 977·1 mb at 0300 GMT of 15th at Sagar Island.

(*ii*) 973·4 mb at 0700 GMT of 15th at Sagar Island.

(*iii*) 973·1 mb at 0800 GMT of 15th at Contai.

(*iv*) 978·5 mb at 1200 GMT of 15th at Midnapore.

(*v*) 980·8 mb at 0300 GMT of 16th at Chaibasa.

(*vi*) 982·3 mb at 1200 GMT of 16th at Jharsuguda.

(*vii*) 983·5 mb at 0300 GMT of 17th at Champa.

The largest negative pressure departure from normal reported close to the storm centre was 24 mb at 0300 GMT of 15th, 23 mb at 1200 GMT on 15th and 21 mb at 0300 GMT of 16th. Sagar Island recorded the strongest surface wind of about 55 kt at 0900 GMT of 15th. The hourly observations of wind and pressure recorded by Sagar Island on 14th and 15th are depicted in Fig. 2. Calcutta reported the strongest upper wind of 65 to 70 kt (easterly) at 0·6 and 0·9 km a.s.l. at 0000 GMT of 15th. Some of the important observations reported by land stations and ships in the depression/storm field are given in Table 4.

This storm was tracked by the cyclone warning radar at Calcutta from 09 GMT of 14th to 00 GMT of 16th. The radar showed the open eye of the storm from 1700 GMT of 14th to 1800 GMT of 15th. Three radar pictures of the storm are shown in Figs. 3-5. The radar track of this storm is given in Fig. 6. From the satellite cloud pictures, this system could be classified as Category 3 in Stage X (*vide* code 373, Manual on codes, W.M.O. Publication No. 306) with diameter of the central overcast 3 to 4 degrees. This gives an estimated maximum surface wind of about 75 kt. For this maximum wind, the pressure at the centre of the storm works out to be 970 mb, which agrees well with the lowest pressure of 973 mb reported by Sagar Island and Contai. Satellite picture of this storm is reproduced in Fig. 7.

TABLE 4

Date	Time	Ship/Station	Location		Wind		Pressure
			Lat.	Long.	Dir.	Speed	
1974	(GMT)		(°N)	(°E)	(Deg.)	(kt.)	(mb)
13 Aug	0000	Calcutta			NNE	30 (at 0·9 km)	
	0000	Agartala			E	30 (at 0·9 km)	
	0300	Sandheads			W	25	994·4
	1200	Agartala			ESE	40 (at 0·9 km)	
	1200	Dacca			E	40 (at 0·9 km)	
	1200	Jesssre			E	30 (at 0·9 km)	
14 Aug	0000	Calcutta			ENE	35 (at 0·9 km)	
	0000	Bhubaneshwar			WNW	45 (at 0·9 km)	
	0300	Sandheads			270	40	987·8
	0300	Sagar Island			NNW	30	990·9
	1200	Calcutta			ENE	55 (at 0·6 km)	
	1200	Cox's Bazar			SE	40 (at 0·6 km)	
15 Aug	0000	Calcutta			E	65-70 (at 0·6 and 0·9 km)	
	0000	Sagar Island			NNW	40	977·2
	0000	*ATLG*	20·5	88·5	240	35	982·6
	1200	*ATLJ*	21·0	88·2	230	35	986·0
	1200	Midnapore			020	27	978·5
	1200	Sagar Island			SSW	50	981·3
	1200	Calcutta			SE	45 (at 0·6 and 0·9 km)	
16 Aug	0000	Asansol			E	25	
	0000	Calcutta			SE	40 (at 0·9 km)	
	0000	Bhubaneshwar			W	35 (at 0·9 km)	
	1200	Ranchi			ESE	35	
	1200	Ambikapur			N	40	
	1200	Jharsuguda			WSW	25	
17 Aug	0000	Ranchi			ESE	25	
	0000	Gaya			E	30 (at 0·9 km)	
	0000	Allahabad			NE	30 (at 0·9 km)	

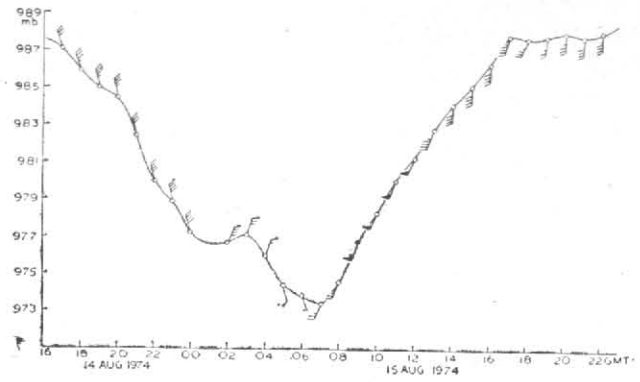

Fig. 2. Hourly observations of wind (kt) and pressure (mb) at Sagar Island

Fig. 3. Picture of Contai cyclone taken by Calcutta Radar at 0906 GMT on 14 August 1974

Fig. 4. Picture of Contai cyclone taken by Calcutta Radar at 1734 GMT on 15 August 1974. The cyclone was severe with an open eye

As the storm was situated in the southern periphery of the upper tropospheric anticyclone, its general westward movement appears to have been influenced by the upper tropospheric easterlies.

Severe cyclonic storms are rare in August. Further, storms retaining their storm intensity for a considerable distance over land are also rare. This cyclonic storm had these two exceptionally interesting features.

2.5. *Paradip cyclone (26-30 September)*

A low moved from the east into north Andaman Sea on 24th. It moved northwestwards and concentrated into a depression on the morning of 26th with its centre at 0300 GMT near 16°N, 92·5°E. Then moving westnorthwest, it intensified into a cyclonic storm at 0300 GMT the next day when it was centred near 17°N, 89°E. Subsequently taking a northwesterly course, it crossed Orissa

coast close to Paradip on 28th evening. Then moving northwards as a cyclonic storm and recurving northeastwards, it weakened into a deep depression close to Malda by the morning of 30th. It weakened further into a low over north Bangla Desh and adjoining Assam on the morning of 1 October.

This system caused generally widespread rain in the Bay Islands from 24th to 26th with isolated heavy falls on 25th. Fairly widespread rain with isolated heavy falls also occurred in Orissa on 28th and 29th, in Gangetic West Bengal from 28th to 30th, in Bihar Plateau on 29th and 30th and in sub-Himalayan West Bengal and Assam and adjacent States from 29 September to 1 October. No damage was caused by this system. There were also no reports of tidal waves associated with this storm.

Paradip reported the largest negative pressure departure from normal of 15 mb near the storm centre at 1200 GMT of 28th. It reported the lowest pressure of 989 mb at 1400 GMT of that day and the strongest surface wind of 45 kt from southwest at 1700 GMT that day. Baripada reported the lowest pressure of 994 mb at 0300 GMT of 29th, Bankura 991 mb at 1200 GMT of 29th and Malda 995 mb at 0300 GMT of 30th, close to the centre of the system. The corresponding pressure departures from normal were –14 mb, –13 mb and –13mb respectively. Some of the important observations in the field of this system are given in Table 5. The strong winds associated with this cyclone appear to have been confined to a narrow core near the centre.

This system was tracked by the Cyclone Warning radar at Paradip from 0100 GMT to 1300 GMT of 28th. The track of the storm as per radar observations is given in Fig. 10. The radar showed an open eye at 0500 GMT of 28th. Based on satellite pictures, the maximum wind speed associated with this storm was estimated as 50 kt, which gives the central pressure as 986 mb. This agrees fairly well with the pressure of 989 mb reported by Paradip near the storm centre. The satellite picture of this storm on 27th evening and 29th morning are given in Figs. 8 and 9.

Broadly this storm moved initially westnorthwestwards, then northwest, then northwards and finally in a northeasterly direction. The recurveture phase agrees with the shifting southwards of the upper tropospheric ridge line on 29 September. Thereafter the storm came under the influence of the westerlies to the north of the ridge line and moved ENE-wards.

2·6. *Depression (7-8 October)*

A low pressure area which lay over west central Bay on 5th and 6th concentrated into a depression

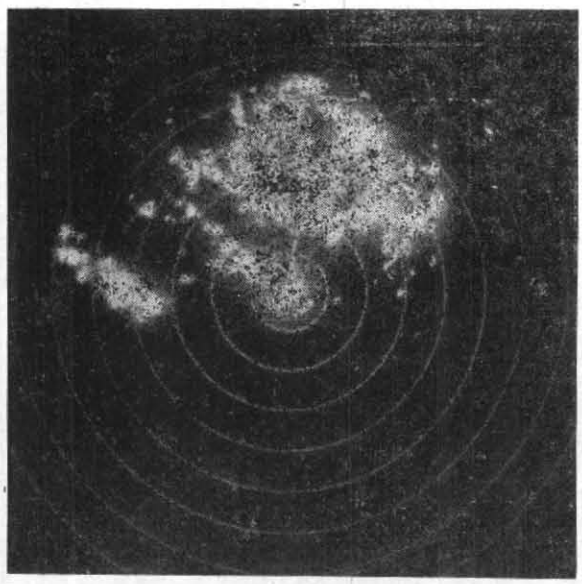

Fig. 5. Picture of Contai cyclone taken by Paradip Radar at 1244 GMT on 15 August 1974. (Range. 400 km; centre of storm: 010 deg/224km)

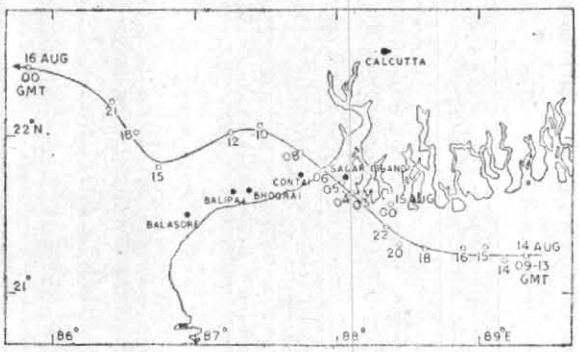

Fig. 6. Radar track of Contai cyclone of August 1974

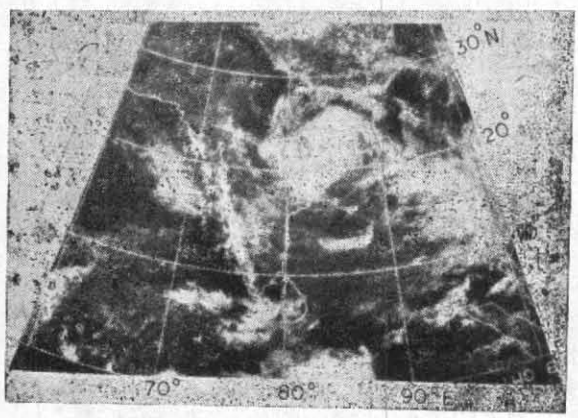

Fig. 7. Satellite (NOAA-2) view of Contai cyclone at about 0400 GMT on 16 August 1974

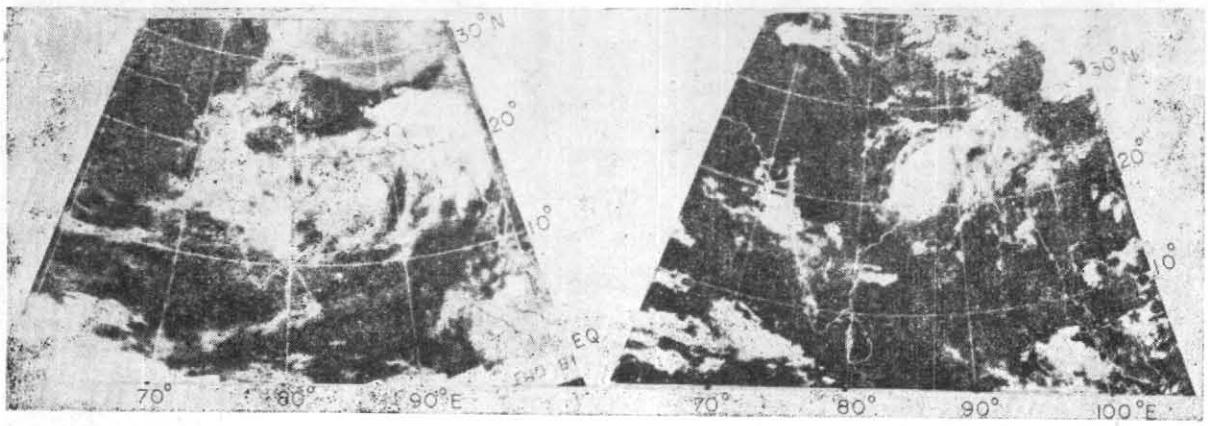

Fig. 8. Satellite (NOAA-2) view of Paradip cyclone at about 1500 GMT on 27 September 1974

Fig. 9. Satellite (NOAA-2) view of Paradip cyclone at about 0400 GMT on 29 September 1974

TABLE 5

Date 1974	Time (GMT)	Ship/Station	Location Lat. (°N)	Location Long. (°E)	Wind Dir. (Deg.)	Wind Speed (kt)	Pressure (mb)
26 Sep	0000	Rangoon			SE (at 0·3 and 0·6 km)	25-35	
	0900	*ATGX*	15·1	90·3	010	10	1000·0
	1200	*ATGX*	15·9	90·0	010	10	1001·0
27 Sep	0000	*ATGX*	19·1	88·9	060	17	1001·2
28 Sep	0000	Bhubaneshwar			NE (at 0·9 km)	30	
	0000	Calcutta			E (at 0·9 km)	25	
	0000	Gopalpur			N (at 0·9 km)	25	
	1200	Paradip			E	35	990·1
	1200	Sandheads			SSE	35	—
29 Sep	0000	Calcutta			S (at 0·6 and 0·9 km)	40-45	
	0000	Bhubaneshwar			WNW (at 0·6 and 0·9 km)	30-35	
	1200	Purulia			N	25	993·6
	1200	Panagarh			SE	20	993·5
	1200	Calcutta			S (0·3 to 0·9 km)	45-55	
30 Sep	0000	Calcutta			SW (at 0·9 km)	30	
	0000	Agartala			S (at 0·9 km)	35	

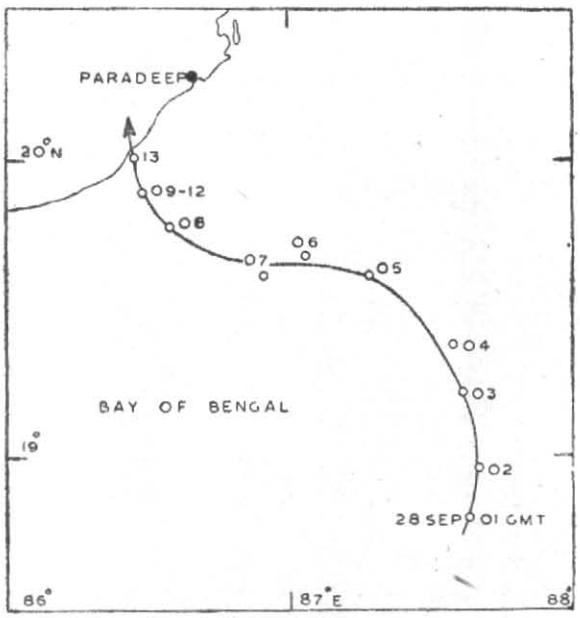

Fig. 10. Radar track of Paradip cyclone of September 1974

(probably deep) at 0300 GMT of 7th with its centre near 17°N, 86°E. Moving westnorthwest, it crossed Andhra coast close to Visakhapatnam during the evening of 8th and weakened into a low over north Telangana and neighbourhood the next morning.

This system caused fairly widespread rain or thundershowers in coastal Andhra Pradesh and coastal Orissa from 7th to 9th, in Telangana on 8th and 9th and in Vidarbha on 9th with a few heavy falls in Orissa and Andhra Pradesh.

Visakhapatnam recorded the highest negative pressure departure of 6 mb from normal at 0300 GMT of 8th and 5·4 mb at 1200 GMT of 8th. Visakhapatnam and Bhubaneshwar reported NNE/35 kt and ENE/35 kt winds respectively at 0·9 km a.s.l. at 0000 GMT on 7th. On 8th morning (0000 GMT) the winds at 0·9 km a.s.l. at the above stations

were NE/25 kt and ESE/25 kt respectively. Ship *ATBF* reported surface wind 200°/18 kt at 0000 GMT of 8th near 16°N, 86°E.

2.7. *Deep depression (14-15 October)*

A low which lay over north Andaman Sea on 10th moved westnorthwestwards to west central Bay, where it concentrated into a deep depression on the morning of 14th with its centre at 0300 GMT near 17°N, 85·5°E. It crossed Andhra coast between Visakhapatnam and Kakinada during the early morning of 15th and weakened into a low over north Telangana and adjoining Vidarbha by 15th evening.

This system caused fairly widespread rain or thundershowers in coastal Andhra Pradesh on 14th, in the whole of Andhra Pradesh on 15th and 16th and in interior Maharashtra on 16th with isolated or scattered heavy falls in Andhra Pradesh. Orissa also experienced scattered thundershowers on 15th.

Ship *Chiguza Maru* reported surface wind as WNW/25 kt at 0600 GMT of 14th near 17°N, 84°E Ship *ATJX* reported surface wind as ENE/17 kt at the same time on the same day near 18°N, 85°E. The wind at Visakhapatnam at 0·6 and 0·9 km a.s.l. at 0600 GMT on 14th was N/NNE 45-50 kt and at 1200 GMT the same day was ENE/25-30 kt. Jagdalpur reported ENE/25 kt, Gannavaram N/20 kt and Visakhapatnam SSE/15 kt at 0000 GMT of 15th at 0·9 km a.s.l. The pressure departure from normal reported by observatories near the centre of the depression over land was about 7 mb. The movement of both the above depressions was in keeping with the easterly/eastsoutheasterly flow at 300/200-mb levels.

2.8. *Chittagong cyclone (23-28 November)*

A low which lay over south Andaman Sea on 21st moved westnorthwestwards, concentrated into a depression at 1200 GMT of 23rd near 10·5°N, 89°E and intensified into a cyclonic storm at 0300 GMT of 24th with its centre near 11°N, 87·5°E. Then moving northwestwards, it became severe on the morning of 25th when it was centred near 12·5°N, 86°E. Subsequently recurving and moving in a northnortheasterly direction, it crossed Bangla Desh coast near Chittagong shortly after noon on 28th and weakened into a low over east Bangla Desh by 29th morning.

This system caused widespread rain in Bay Islands from 21st to 26th with scattered or isolated heavy falls on some of these days. It also caused fairly widespread rain or thundershowers in Tamil Nadu on 23rd and 24th, in Rayalaseema on 24th and in Assam and adjacent States from 28th to 30th. Isolated rainfall occurred in coastal Andhra Pradesh and Telangana on 23rd and 24th, in Orissa on 27th and in Gangetic West Bengal on 28th. This cyclone did not cause any damage in India. However, according to press reports, this cyclone caused damage to life and property in the coastal areas and off-shore islands of Kutubia, Maheshkhali and Sandwip in Bangla Desh and was associated with tidal waves about 3 to 4 m high.

TABLE 6

Date 1974	Time (GMT)	Ship/Station	Location Lat. (°N)	Location Long. (°E)	Wind Dir. (Deg.)	Wind Speed (kt)	Pressure (mb)
24 Nov	0300	*ATCW*	12·4	85·2	040	24	1003·0
	0600	*ATCV*	11·8	85·2	040	30	1002·0
	0600	Port Blair			SE (at 0·6 and 0·9 km)	30	
	0900	*ATBG*	10·7	87·6	210	15	996·6
	1200	*ATBG*	10·6	88·2	210	20	997·7
	1230	*ATJK*	11·7	83·7	N (BF 6-7)	27	1003·0
					Squally weather, sea swell N 12 ft.		
25 Nov	0500	*ATJK*	11·5	83·5	NW (BF-9)	44	1004·0
26 Nov	0600	Port Blair			S (0·6 and 0·9 km)	35-45	
	1500	*VWDG*	17·5	90·8	140	20	1003·0
27 Nov	0000	*VWDG*	19·0	89·7	140	20	998·9
	0500	*WEXF*	19·2	90·4	120	35	1003·8
	1200	*VWDG*	20·1	88·7	050	30	995·0
28 Nov	0300	Cox's Bazar			110	21	996·8
	0300	Chittagong			050	23	999·6
	0300	Hatia			050	44	998·5
	0300	Sandheads	21·6	88·0	N	30	1006·9

At 0300 GMT of 28th, Cox's Bazar reported the largest pressure departure of *minus* 18 mb from normal.

Important reports from ships and observatories near the storm field are given in Table 6. No ships' reports were available very close to the storm centre.

This cyclone was tracked by the Paradip radar from 270700 GMT to 271600 GMT and Calcutta radar from 271800 GMT to 280200 GMT. Cox's Bazar radar observations were not available on an operational basis during the period of the cyclone but were obtained from Bangla Desh Meteorological Service by post subsequently. The paths of the cyclone as tracked by the above three radars are shown in Fig. 11. A picture of the storm as seen in Calcutta radar is given in Fig. 12.

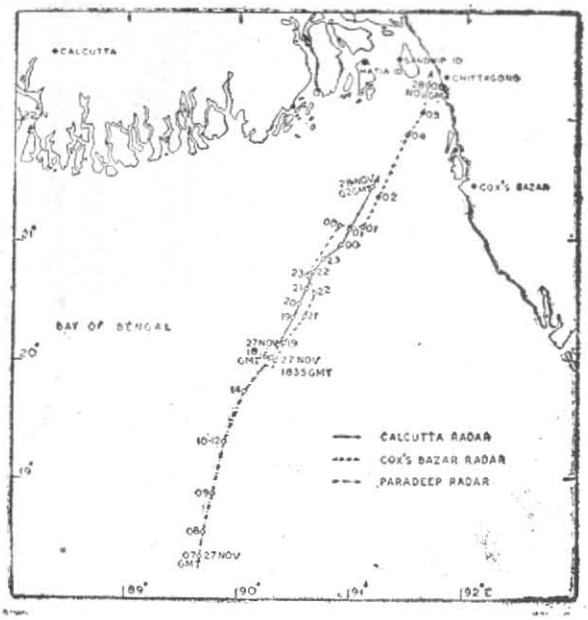

Fig. 11. Radar track of Chittagong cyclone of November 1974

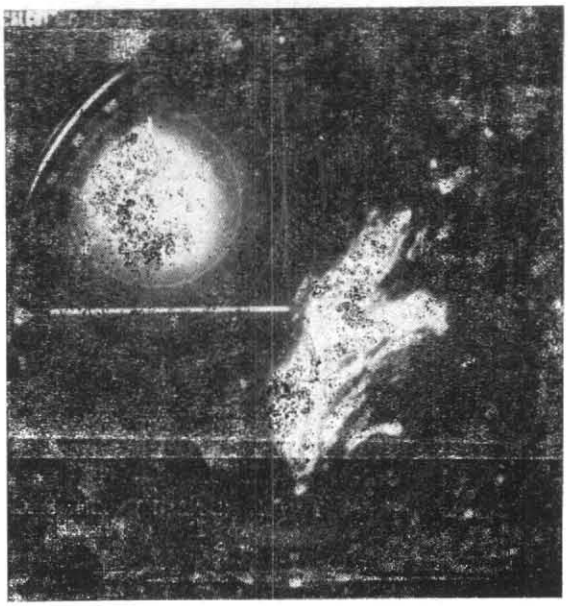

Fig. 12. Picture of Chittagong cyclone taken by Calcutta Radar at 1900 GMT on 27 November 1974

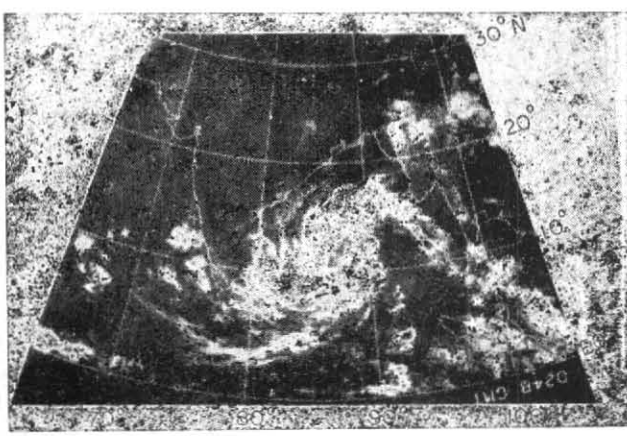

Fig. 13. Satellite (NOAA-3) view of Chittagong cyclone (formative stage) at about 0300 GMT on 24 November 1974

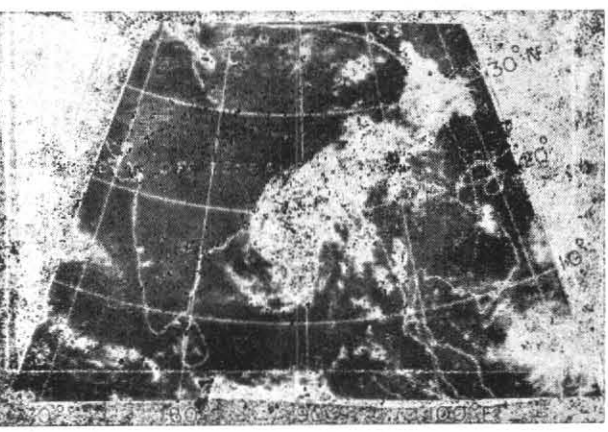

Fig. 14. Satellite (NOAA-3) view of Chittagong cyclone at about 0300 GMT on 27 November 1974

The APT pictures did not show any eye associated with the cyclone. This cyclone was classified on the basis of APT pictures as being in Stage X Category 2 with diameter of the central overcast as 3 to 4 degrees. This gives the maximum wind associated with this cyclone as 60 kt. The estimted pressure at the centre of the cyclone of this maximum wind works out to be 988 mb. Satellite pictures of this storm on 24th and 27th are given in Figs. 13 and 14. The movement of the storm is well in keeping with the flow patterns at 250/150-mb levels. Strong southsouthwesterlies prevailed at these levels over the storm area between 25 and 28 November 1974.

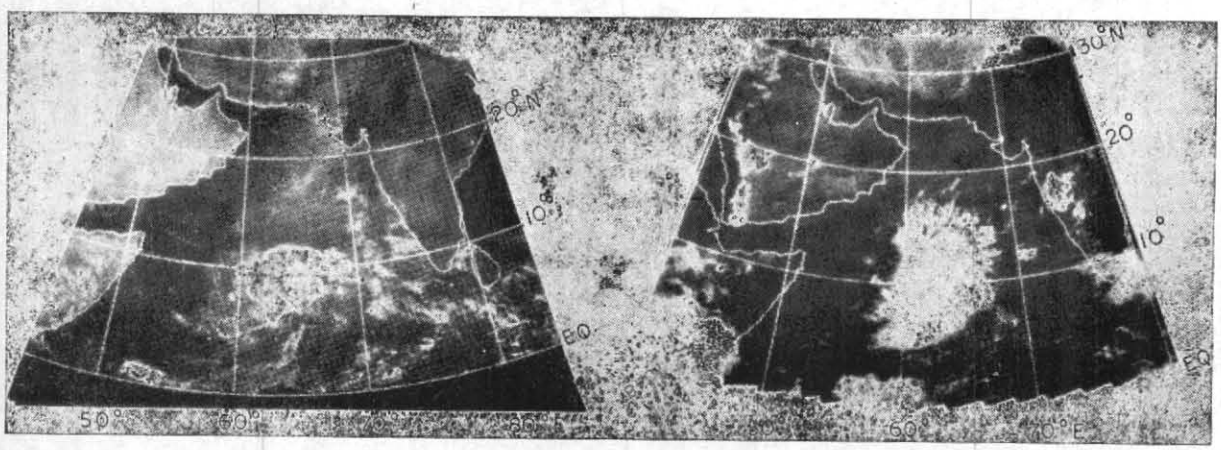

Fig. 15. Satellite (NOAA-3) view of Arabian Sea cyclone at about 0500 GMT on 13 April 1974

Fig.16. Satellite (NOAA-3) view of Arabian Sea cyclone at about 1600 GMT on 13 April 1974

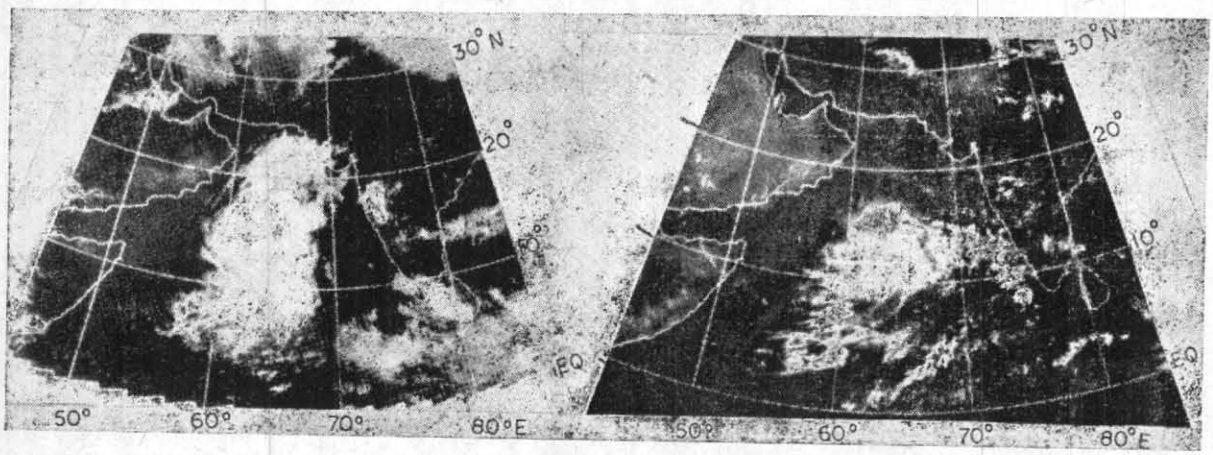

Fig. 17. Satellite (NOAA-3) view of Arabian Sea cyclone at about 1600 GMT on 14 April 1974

Fig. 18. Satellite (NOAA-3) view of Arabian Sea cyclone at about 0500 GMT on 18 May 1974

3. Arabian Sea

3.1. *Cyclonic storm (12-17 April)*

A low which lay over Lakshadweep and adjoining southeast Arabian Sea moved westwards and concentrated into a depression on the evening of 12th with its centre at 1200 GMT near 7°N, 65°E. Then moving in a northwesterly direction, it intensified into a cyclonic storm by 1200 GMT of 13th when it was centred near 10°N, 63·5°E. Continuing to move in a northwesterly direction upto 15th and then recurving northeastwards, it weakened into a depression by 16th evening and dissipated over the northern parts of east central Arabian Sea by 17th afternoon.

No ships' reports were available in and near the field of this storm. The track of this storm was finalised only with the help of satellite cloud pictures. The maximum wind speed associated with this cyclonic storm was estimated as 45 kt from satellite pictures. This gives the central pressure of the storm as 996 mb.

The satellite pictures of this storm on 13th and 14th are reproduced in Figs. 15 to 17.

3.2. *Cyclonic storm (17 to 22 May)*

A well marked low which lay over southeast Arabian Sea and adjoining Lakshadweep on 15th, concentrated into a depression on the morning of 17th over southeast Arabian Sea with its centre at 0300 GMT near 11·5°N, 68·5°E. Moving northwest, the depression intensified into a cyclonic storm on the morning of 18th and lay with its

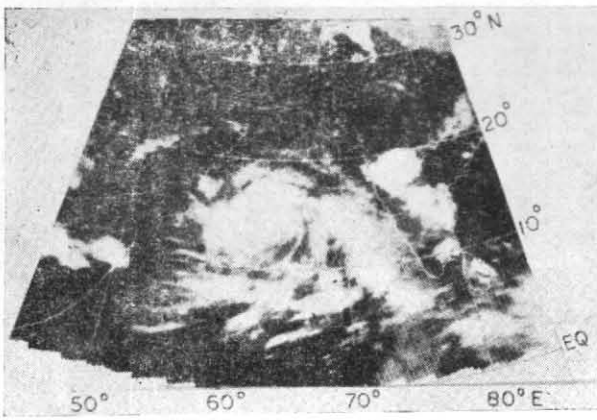

Fig. 19. Satellite (NOAA-3) view of Arabian Sea cyclone at about 1600 GMT on 18 May 1974

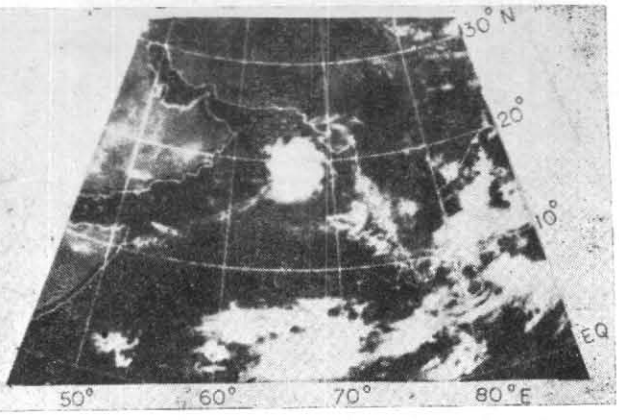

Fig. 20. Satellite (NOAA-2) view of Arabian Sea cyclone at about 0500 GMT on 22 September 1974

TABLE 7

Date 1974	Time (GMT)	Ship/Station	Location Lat. (°N)	Location Long. (°E)	Wind Dir. (Deg)	Wind Speed (kt)	Pressure (mb)
17 May	0600	*PGNL*	14·1	70·3	110	11	1005·8
	0900	*VWVW*	11·2	67·7	NW	08	998·5
	1200	Amini			S (at 0·6 and 0·9 km)	25	
18 May	0600	*PGNL*	16·1	68·0	110	15	1004·4
	1200	*PDZK*	18·0	67·5	080	18	1002·3
	1200	*ATBG*	12·4	63·9	270	27	1002·3
19 May	1200	*VWVW*	12·2	59·6	W	20	999·4
			Ship reported moderate sea and swell and occasional squalls				
21 May	0600	*GTOQ*	16·4	54·6	080	35	1003·0
22 May	0300	Riyan (40586)			N	35	1004·2

centre at 0300 GMT near 13·5°N, 65·5°E. Subsequently moving westnorthwest upto 19th and then westsouthwest, it weakened into a depression by 22nd afternoon and then into a low by the same evening over Gulf of Aden.

This system caused good incursion of moisture into the Peninsula resulting in scattered thundershowers over the Peninsula from 15th to 17th.

Some ships' reports in the field of the depression/storm are given in Table 7. The lowest pressure of 998·5 mb. was reported by ship *VWVW* at 0900 GMT of 17th near 11·2°N, 67·7°E very close to the depression centre. The strongest wind reported in the storm field was easterly 35 kt at 0600 GMT of 21st by ship *GTOQ* near 16·5°N, 54·5°E and N/35 kt by Riyan observatory in coastal Arabia at 0300 GMT of 22nd. The satellite cloud pictures of this storm on 18th are reproduced in Figs. 18 and 19. The maximum wind of 40 to 45 kt associated with this system was estimated from the satellite pictures gives the central pressure for this storm as 994 to 996 mb.

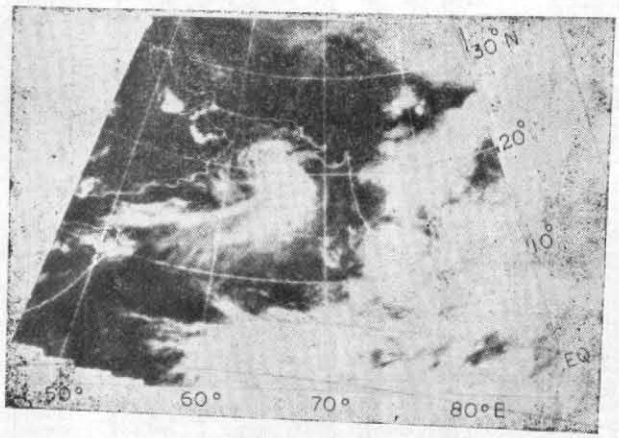

Fig. 21. Satellite (NOAA-2) view of Arabian Sea cyclone at about 1600 GMT on 22 September 1974

3.3. *Cyclonic storm (19-24 September)*

A low which lay over east central Arabian Sea off Karnataka-south Maharashtra coasts on 17th and 18th, concentrated into a depression on the evening of 19th near 16°N, 71°E. Moving in a northwesterly direction, it intensified into a cyclonic storm by 1200 GMT of 21st with its centre near 18·5°N, 69.5°E. It became severe on 22nd morning and moving westnorthwest, it weakened into a depression by 24th morning and dissipated over northwest Arabian Sea by 25th.

As the system was moving as a depression across east central Arabian Sea, it caused fairly widespread rain or thundershowers along the west coast from 19th to 21st with some heavy falls in coastal Karnataka on 19th and 20th.

This system was tracked with the help of the low level winds along the west coast and a few ships' reports over east central Arabian Sea off the west coast from 19th to 22nd. Goa reported southerly 25 kt and Ratnagiri SSE/15-20 kt at 1200 GMT of 19th at 0·6 and 0·9 km a.s.l. On the next evening, Goa reported southwest 25 kt and Ratnagiri S/25 kt at 0·9 km a.s.l. On 21st morning (0000 GMT), Ratnagiri reported S/30 kt and Bombay SE/15 kt at 0·9 km a.s.l. On that evening (1200 GMT) Veraval reported E/25 kt and Bombay SSE/25 kt at 0·9 km a.s.l. Ship *Tasman Sea Horse* belonging to the Oil and Natural Gas Commission recorded surface wind SE/25-30 kt at 0000 GMT and 1200 GMT of 21st over the Bombay High area,

TABLE 8

Date 1974	Time (GMT)	Ship/ Station	Location Lat. (°N)	Location Long. (°E)	Wind Dir. (Deg.)	Wind Speed (kt.)	Pressure (mb)
21 Sep	0000	*PFHO*	16·2	70·3	290	17	1002·5
	1200	*SHIP*	19·5	70·2	E	25	
22 Sep	1200	*ATJX*	18·6	68·2	270	20	1004·8
23 Sep	0600	*ATJX*	18·5	64·6	280	24	1007·5
	1800	*ATJX*	20·3	62·6	300	18	1005·5
24 Sep	0000	*MACS*	20·2	62·8	270	18	1005·6

i.e. abont 100 km west of Bombay. The same ship reported SE'ly swells of 12 to 18 ft with period 1/2 sec. The wind at 0·6 and 0·9 km a.s.l. over Veraval was SE/45 kt at 0000 GMT of 22nd and the surface wind at Veraval at that time was SE/25 kt. On the 23rd and 24th, this storm was tracked with the help of satellite pictures and a few ships' reports over north Arabian Sea. Ships' reports near the depression/storm field are given in Table 8.

Two satellite views of this storm on 22 September are given in Figs. 20 and 21. From the satellite pictures, the maximum wind speed associated with this storm was estimated as 60 kt which gives the central pressure for this storm as 990 mb.

3.4. *Depression (24-25 October)*

A depression formed over east central Arabian Sea off Karnataka-south Maharashtra coasts on 24th with its centre at 0300 GMT near 14·5°N, 70·0°E. It moved northwards and weakened into a

low off Maharashtra coast by 25th evening. This system caused fairly widespread rain or thundershowers in Konkan from 24th to 26th. No heavy rain was reported from this area.

Amini reported surface wind WSW/20 kt at 0300 GMT and Mangalore S/20 kt at 0000 GMT at 0·6 and 0·9 km a.s.l. on 24th. Ratnagiri reported SE/15 kt at 0·3 km a.s.l. and S/15 kt at 0·6 km at 1800 GMT the same day and SE/20-25 kt at 0000 GMT of 25th between 0·3 and 0·9 km a.s.l. No ships' reports were available from the depression field.