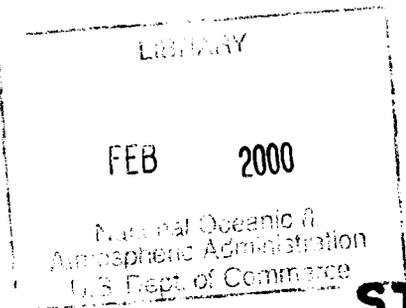


INDIA WEATHER REVIEW, 1969

ANNUAL SUMMARY

PART - C



STORMS & DEPRESSIONS

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1969

DEPRESSIONS AND CYCLONIC STORMS :

During the year, six cyclonic storms and seven depressions formed in the Bay of Bengal and one depression in the Arabian Sea. No cyclonic storm developed in the Arabian Sea. The tracks of the storms and depressions are given in Fig. 1. The dates of activities of the storms and the greatest barometric depths observed or estimated near their centres are given in Table I below :

TABLE I

Locality	Month	Date	Greatest observed or estimated barometric depth
Bay of Bengal	May	14 - 19th	15
-do-	August	13 - 16th	9
-do-	October	9 - 11th	10
-do-	October	21 - 23rd	16
-do-	November	4 - 9th	43
-do-	December	21 - 25th	17

The monthly distribution of the storms and depressions for the year 1969 is given in the Table II..

The detailed descriptions of the storms and depressions are given below :

1. Cyclonic storm in the Bay of Bengal 14th to 19th May

A feeble trough of low developed over the extreme south Bay of Bengal on the 9th. Moving slowly northwards it lay over the south and adjoining central Bay on 11th. By the next day, it became well marked, with an associated upper air trough extending between 1.5 and 6.0 km a.s.l. By the evening of 13th a low pressure area formed over the east central Bay of Bengal with the associated cyclonic circulation extending to 7.2 km a.s.l. This low pressure area moved westwards into west central Bay and concentrated into a depression on the morning of 14th with centre near Lat. 15° N and 87° E. Moving in a westnorthwesterly direction, it intensified into a deep depression and lay with its centre near 15.5° N and 85° E on the morning of 15th. Ship ATBO at 15° N, 85° E reported 25 kt surface wind from southwesterly direction and pressure 999.0 mb.

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INDIA WEATHER REVIEW, 1969

ANNUAL SUMMARY

PART C

S T O R M S A N D D E P R E S S I O N S

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I Depressions and cyclonic storms

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at 0930 IST of 15th. ESSA 8 Satellite picture at 1007 IST also indicated the centre of the system near 15.5°N and 85°E on this day. Moving in a westerly direction the deep depression further intensified into a cyclonic storm by the morning of 16th, when it lay centred near 15.5°N and 85°E. ESSA 8 Satellite picture at 0903 IST indicated the system to be near 15.5°N and 82.5°E Stage X, category 2, with overcast area 3-4 degrees in diameter and bands were seen. Continuing its westerly movement the storm was centred close to south Andhra Coast about 30 km eastnortheast of Ongole at 0830 IST of 17th. ESSA 8 Satellite picture at 0955 IST showed the system to be near 16.3°N and 80°E. The following observations are also of interest in this connection.

Date	Name of ship/ station	Time IST	Position		Wind		Pressure (mb)	Weather
			Lat. °N	Long. °E	Direc- tion	Speed knots		
17th	Ongole	0830	-	-	NNW	30	998.2	Rain
	Gannavaram	0830	-	-	E	25	1001.1	Overcast
	Masulipatam	0830	-	-	ESE	15	999.3	Rain
	Nellore	0830	-	-	SW	5	1002.7	-

The circulation associated with the storm extended upto about 12 km a.s.l. The pressure departures at 0830 hrs IST of 17th were about -5 to -7 mb over south coastal Andhra Pradesh. The storm crossed south Andhra Coast between Ongole and Masulipatam (near Bapatla) on the forenoon of 17th. Its movement slowed down considerably after crossing the coast, but there was no change in its intensity. It recurved northeastwards and was centred at 0830 IST of 18th about 40 kms westsouthwest of Masulipatam on the morning of the next day. Later, weakening into a depression and rapidly moving in a northerly direction it was centred near Bhadrachalam at 1730 IST. Subsequently, it weakened into a low pressure area which lay over northeast Andhra Pradesh and neighbourhood on the morning of 20th.

Based on satellite pictures, this system could be classified as Stage X, cat. 1 or 2, diameter 3 degrees, which gives associated maximum winds of 45-50 kt. Using Fletcher's formula the lowest pressure works out to 989 mb with the associated pressure defect of 15 mb at 0530 hrs IST of 17th.

Under the influence of this system torrential rains and gales lashed the districts of Krishna, Guntur, west and east Godavari and adjoining parts of Khammam district resulting in unprecedented floods, colossal loss of life and property mainly in Krishna and Guntur districts and disruption of all communications. Gannavaram reported a maximum wind speed of 65 kmph on 19th morning. There were also reports of wind speed of 50-55 kt from Ongole. Some of the very heavy amounts of rainfall recorded are given below :-

Date	Station	Rainfall (cm)
17th	Chinnaganjam	20
	Prathipadh	16
	Addanki	15
	Bapatla	15
	Tenali	15
18th	Chinnaganjam	51
	Addanki	30
	Ongole	20
	Vinukonda	15

<u>Date</u>	<u>Station</u>	<u>Rainfall (cm)</u>
	Sattanepalli	13
	Vijayawada	12
	Alamuru	12
	Gannavaram	11
	Nanesaraspeta	11
19th	Vijayawada	25
	Guntur	23
	Tenali	23
	Nenasarapeta	21
	Chinnaganjam	19
	Nandiganea	19
	Bapatla	17
	Jagjaiapet	16
	Prathipadh	16
	Addanki	15
	Sattarepalli	14
	Vijayawada	13
20th	Tiruvini	26
	Khammameth	23
	Jaggaipet	14
21st	Nandigama	19

According to newspaper reports this storm took a toll of over 600 human lives and a few lakh heads of cattle and wiped out a few villages in Bapatla and Ongole talukas in Guntur district, vast areas (several lakhs of acres) of standing crops were destroyed in the districts of Krishna, Guntur, East and West Godavari and Khammam. Extensive damage was caused to major irrigation canal systems, irrigation tanks, roads and railway tracks. The total loss was estimated at more than a hundred crores of rupees. Guntur and Krishna districts were the worst affected districts. According to the touring officer's report, exceptionally heavy rainfall occurred over a narrow belt in Guntur, Krishna and Nellore districts. The heaviest rainfall in the six-day period ending 21st May, was at Chinnaganjam (Guntur district more than 70 cm), the next heaviest fall being in Nandigama Vijayawada section (about 60 cm). Uprooting of trees and telegraph poles was maximum around Vijayawada and Gannavaram.

Under the influence of this storm, which originated as a low pressure ^{area} in the east central Bay on the 13th, the southeast Monsoon advanced as a feeble current into the southeast Bay and south Andaman Sea on the 13th and into south Kerala, southeast Arabian Sea and southwest Bay upto 10°N on the 17th. ESSA 8 Satellite picture (Orbit No. 1914) at 1001 IST of 17th May 1969, is reproduced in Figure 2.

(2) Depression in the Arabian Sea - 5th to 6th June:

A trough of low was lying over the east central Arabian Sea off Mysore-south Maharashtra coasts on the 1st June. It gradually extended northwards to south Gujarat coast, and became well marked by the 3rd. It was also extending into the lower and middle tropospheric level. A depression formed in this trough over the east central Arabian Sea off south Gujarat - north Maharashtra coasts on the morning of 5th with centre at 0830 IST near 19°N and 69°E. Moving in an eastnortheasterly direction, it was centred near 19.5°N and 70.5°E at 1730 IST of 5th. The following observations are significant in this connection.

C₄

Date	Name of ship/ station	Time IST	Position		Wind		Pressure (mb)	Weather
			Lat. °N	Long. °E	Direc- tion	Speed knots		
5th	VWBK	1730	17.5	68.5	WNW	20	1000.3	Mainly overcast
	Bombay	1730			S	10	999.9	- do -
	Surat	1730			SW	10	998.4	-
	Bhavnagar	1730			S	17	998.9	-
	Mahuva	1730			NE	7	999.0	Overcast
	Veraval	1730			NE	10	998.5	Rain
	Porbandar	1730			N	7	999.0	Rain

The upper air cyclonic circulation associated with the system extended upto 5.4 km a.s.l.

The depression took a northeasterly course and was crossing the south Gujarat coast near Diu at 0830 IST of 6th. Veraval reported surface wind of 15 kt from northwesterly direction and pressure 999.0 mb (departure from normal -5mb). Mahuva reported light surface wind from southeasterly direction with pressure 998.9 mb at 0830 IST of this day. It lay about 50 km northnorthwest of Bhavnagar at 1730 IST of 6th. It weakened into a low pressure area over Gujarat region by the next morning.

Under the influence of this system the monsoon advanced into the entire Maharashtra state, south Gujarat state and the central Arabian Sea.

It was active in Konkan on the 6th and in south Gujarat state on the 7th and 8th.

3. Depression in the Bay of Bengal - 16th to 20th June.

A cyclonic circulation extending between 2.1 and 7.2 km a.s.l. developed over the central Bay of Bengal on the 15th. This circulation extended to lower levels by the next morning and under its influence a low pressure area formed over the central Bay. The low concentrated into a depression by the evening of the same day with centre near 15°N and 88.5°E. Ship ATAF at position 14.5°N and 86.7°E reported surface wind of 30 kt from northwesterly direction pressure 1001.8 mb and intermittent rain. Moving in a northwesterly direction, the depression was centred near 16.0°N and 87.5°E at 0830 IST of 17th. Later, it moved in a northerly direction and was centred at 0830 IST of 18th near 18.0°N and 87.5°E. The cyclonic circulation associated with this system extended to about 7.2 km a.s.l. The depression took a northwesterly course moved rapidly and was centred at 0830 IST of 19th near 20.0°N and 90.0°E. Continuing to move in the same direction, the depression crossed the east Pakistan coast near Chittagong during the course of the night and was centred near Aijal on the morning of the 20th. Later, it weakened into a low pressure area and merged into the seasonal trough over Assam. Under the influence of this depression, fairly widespread rainfall occurred in Assam on the 20th.

4. Deep depression in the Bay of Bengal 28th July to 1st Aug.

A low pressure area formed over the northwest and adjoining central Bay of Bengal on the 26th. It persisted there on the 27th and the associated upper air cyclonic circulation extended upto 7.2 km a.s.l. It became well-marked by the same evening and concentrated into a depression on the morning of 28th with centre at 0830 IST near 19°N and 89.5°E. Moving in a northwesterly direction it was centred near 19.5°N and 89.5°E at 1730 IST of the same day. Continuing to move northwestwards, it intensified

further into a deep depression and was centred near 20°N and 88.5°E at 0830 IST of 29th. Sandheads reported the lowest pressure of 990.7 mb at 0830 IST of this day with a pressure departure of -9.8 mb. ESSA 8 satellite picture at 29/0905 IST showed the system to be stage C near 20°N and 88°E with bands in all sectors. The deep depression was centred close to Orissa coast near Balasore at 0830 IST of 30th. It crossed the north Orissa coast near Balasore during the forenoon, and maintaining its northwesterly direction, was centred about 70 km northeast of Jharsuguda on 31st morning. It weakened into a depression by that evening with centre near Ambikapur. Later moving in a westerly direction it was centred about 100 km east of Umaria on the morning of 1st August. It later weakened into a low pressure area over northeast Madhya Pradesh and adjoining south-east Uttar Pradesh.

Under the influence of this system, the monsoon was active in east Madhya Pradesh, on the 28th, 29th and 31st July and vigorous on the 1st August, active in Orissa from 29th to 31st and in west Madhya Pradesh on the 30 July and 1st August. Some of the noteworthy amounts of heavy rainfall were :

<u>Date</u>	<u>Station</u>	<u>Rainfall (cm)</u>
28th	Kanker	13
29th	Puri	19
	Koraput	13
	Tikamgarh	13
	Jagdalpur	10
30th	Bhubaneswar	28
	Puri	17
	Cuttack	10
	Sagar	9
31st	Jharsuguda	14
	Pachmarhi	13
	Narsinghpur	11
	Jabalpur	9
	Brahmpuri	9
1st	Jabalpur	22
	Pachmarhi	14
	Seoni	11
	Sagar	11
	Narsinghpur	10
2nd	Hoshangabad	11
	Pachmarhi	10

According to press reports, the heavy rains caused floods in many districts of Orissa. River Indravathi was in spate and flooded many parts of Jagdalpur. The heavy rains in Madhya Pradesh caused floods in the Narmada, Tapti and Wainganga inundating vast areas in many districts of Madhya Pradesh and paralysing road traffic. Some villages in Broach and Baroda districts of Gujarat State were also affected by the floods in the Narmada and Tapti.

5. Depression in the Bay of Bengal 8th August.

A low pressure area developed over the head Bay of Bengal on the morning of 7th. The associated cyclonic circulation extended upto 7.2 km a.s.l. by the evening of the same day, it became well-marked and concentrated into a depression by the next morning with centre at 0830 IST near 21.5°N and 89.5°E. ESSA 8 satellite picture at 0953 IST reported stage C near 21.5°N and 90°E. The pressure departures over the head Bay of Bengal and the adjoining land areas were of the order of -6 to -7 mb at this time.

Moving northwest, it crossed the Sunderbans coast near 89°E during the course of the Bay and was centred close to Calcutta at 1730 IST. Weakening into a low pressure area thereafter, it moved over to west Uttar Pradesh by the 12th and weakened further thereafter.

This depression caused active monsoon conditions in Orissa on the 8th and in Gangetic West Bengal on the 8th and 9th. Some of the heavy rainfall amounts are given below :

<u>Date</u>	<u>Station</u>	<u>Rainfall (cm)</u>
8th	Dum Dum	10
	Puri	9
9th	Dhanbad	12
	Midnapore	11
	Purulia	11

6. Cyclonic storm in the Bay of Bengal :- 13th to 16th August.

An upper air cyclonic circulation extending upto 6.0 km a.s.l. developed over east Pakistan and the adjoining head Bay of Bengal on the morning of the 12th. A feeble low pressure area formed over the head Bay of Bengal by the evening of the same day. The low concentrated into a depression by the morning of 13th and was centred at 0830 IST near 21°N and 89.5°E. There was a fall of pressure over the head Bay and adjoining land areas of Gangetic West Bengal and of Orissa and the departures were about -4 to -5 mb over the head Bay at this time. The circulation also extended upto 6.0 km a.s.l. On this morning Nimbus satellite reported at 1028 IST stage C+ near 20.5°N and 88.5°E with overcast area two degrees in diameter. Moving in a westnorthwesterly direction, the depression rapidly intensified into a cyclonic storm and was centred at 1730 IST of 13th near 21.5°N and 88.0°E. In this connection, the following observations are of interest.

Date	Name of ship/ station	Time IST	<u>Position</u>		<u>Wind</u>		Pressure (mb)	Weather
			Lat. °N	Long. °E	Direc- tion	Speed knots		
13th	Sandheads	1730			SW	50	991.0	Drizzle
	Sagar Island	1730			ENE	20	992.4	Overcast
	Contai	1730			Var	Light	992.7	Overcast
	Balasore	1730			NNW	5	993.5	Rain
	Chandbali	1730			NW	5	995.3	Showers
	Calcutta	1730			E	15	995.4	Rain
	Calcutta	1730			ESE	20 K at 300 m		
					ESE	25 K at 600 m		
					ESE	20 K at 900 m		
					ESE	20 K at 1500 m		
Cuttack		1730			W	30 K at 300 m		
					W	35 K at 600 m		
					WNW	30 K at 900 m		
					WNW	30 K at 1500 m		
Dacca		1730			SE	20 K at 300 m		
					SE	20 K at 600 m		
					ESE	25 K at 900 m		
					SE	25 K at 1500 m.		

The circulation was extending upto 10.5 km a.s.l. at this time. The 24 hour pressure falls were of the order of 6-7 mb. over the head Bay of Bengal and at Sandheads it was the maximum, being 7.7 mb. The pressure defect at Sandheads was about 8 mb at 1730 IST of 13th. Continuing its westnorthwesterly course, the storm crossed the north Orissa coast near Balasore during the night and weakened into a deep depression, which was centred at 0830 IST of 14th about 100 km south of Jamshedpur. ESSA 8 satellite picture at 14/0911 IST showed the system near 22.5°N and 85.0°E with overcast area of two degrees in diameter and bands in all sectors. Moving in a northwesterly direction, the deep depression was centred about 100 km southeast of Satna at 0830 IST of 15th. Weakening into a depression, it lay near Banda at 1730 hrs IST of 15th. Later, moving in a westerly direction, the depression lay centred at 0830 IST of 16th about 70 km westsouthwest of Jhansi. It weakened into a low pressure area subsequently and it lay over northwest Madhya Pradesh and adjoining southwest Uttar Pradesh on the evening of the same day.

The lowest estimated pressure associated with this system was 990 mb at 1730 IST of 13th and the corresponding pressure defect was about 9 mb.

This system caused active monsoon conditions in Gangetic West Bengal from the 13th to 15th, in Bihar state and east Madhya Pradesh on the 14th, in Orissa on the 15th, in west Madhya Pradesh on the 15th and 16th and in east Rajasthan on the 16th and 17th and vigorous monsoon conditions in Orissa on the 14th and in east Madhya Pradesh on the 15th. Some of the very heavy amounts of rainfall associated with this system are as follows :

<u>Date</u>	<u>Station</u>	<u>Rainfall (cm)</u>
13th	Sandheads	12
14th	Chandbali	23
	Jharsuguda	19
	Cuttack	14
	Keonjargarh	11
	Angul	11
	Ranchi	10
15th	Mandla	11
	Nimach	10
16th	Kota AP	10
17th	Jhalawar	35

Heavy rain in east Rajasthan caused floods in Chittorgarh and Jhalawar districts disrupting road communications.

7. Depression in the Bay of Bengal /- 6th to 11th September.

An east-west trough between 1.5 and 5.4 km a.s.l. lay over the north Peninsula on the 2nd and the trough line was running along Lat. 17°N at 2.1 km a.s.l. By the 4th, the trough became well marked and a cyclonic circulation developed over the west central Bay of Bengal and it extended upto 7.2 km a.s.l. with a southerly slope. The trough associated with this circulation extended into the east central Bay also, where a low pressure area formed on the morning of 4th. By the morning of 6th, the low concentrated into a depression with centre 0830 IST near 17.5°N and 86.5°E. The circulation associated with the depression extended upto 7.2 km a.s.l. Moving in a northwesterly direction, the depression crossed Orissa coast near Gopalpur on the morning of 7th and was centred at 0830 IST of the same day about 100 km westnorthwest of Gopalpur. Continuing its northwesterly movement, it was centred at 0830 IST of the next day about 60 km southeast of Seoni. Thereafter moving in a westnorthwesterly direction, the depression lay over west Madhya Pradesh on the morning of 9th with centre at 0830 IST about 100 km southwest of Bhopal. It lay over Gujarat region on the morning of 10th with centre at 0830 IST

near Dohad. ESSA 8 satellite picture at 10/0913 IST revealed a cyclonic circulation near 22.5°N and 74°E. There was a change in its course thereafter and it started moving in a northerly direction. It was centred at 1730 IST of 10th about 50 km southwest of Nimach. Later moving in a northnortheasterly direction, it lay over Rajasthan with centre at 0830 IST of 11th about 50 km southwest of Tonk and at 1730 IST about 50 km. Southwest of Jaipur. It weakened into a well marked low by near morning and subsequently merged into the seasonal trough by the evening of 12th.

The monsoon trough in the lower levels (upto 1.5 km a.s.l.) extended north-west from the system into Uttar Pradesh on the 5th and 6th. When the depression moved over the central parts of the country, a trough between 1.5 and 5.4 km a.s.l. extended northwards from the system into Haryana and Punjab from the 8th to 12th, while the monsoon trough in the lower and middle troposphere extended eastwards to Gangetic West Bengal and neighbourhood from the 8th to 12th. In association with these developments the monsoon was active to vigorous in Maharashtra State on many days from 2nd to 9th, in Haryana, Gujarat Region and Punjab on a few days from the 8th to 12th. Active monsoon conditions also prevailed in Uttar Pradesh, west Madhya Pradesh, Orissa, coastal Andhra Pradesh, Bihar plateau, Gangetic West Bengal and east Rajasthan on a few days between 6th and 13th. Some of the noteworthy amounts of rainfall during the period were :

<u>Date</u>	<u>Station</u>	<u>Rainfall (cm)</u>
5th	Bagati	10
6th	Yeotmal	14
	Varanasi AP	12
7th	Gopalpur	11
8th	Palam	10
	Brahmapuri	9
	Balasore	9
9th	Rohtak	13
	Rajpur	11
10th	Alwar	22
	Contai	14
	Meerut	14
	Sagar Island	12
	Broach	9
11th	Patiala	20
	Baroda	17
	Alwar	12
	Karnal	11
12th	Nimach	13
	Ratlam	12

According to press reports, the heavy rains in Maharashtra caused floods in Godavari and three other rivers inundating vast areas in Nanded, Parbhani and Aurangabad districts of Marathwada, the worst affected district being Nanded. The flood waters of Narmada and Tapti and other rivers in south Gujarat State inundated vast areas in Dhulia and Jalgaon districts and many districts in south Gujarat, the worst affected districts being Surat, Baroda and Broach. The breaches in many dams and irrigation tanks in Alwar district of east Rajasthan inundated many villages in that district and dislocated rail traffic between Jaipur and Delhi .

8. Depression in the Bay of Bengal - 18th to 23rd September :

A trough in the lower and middle tropospheric levels was extending from the east central Bay to north Andaman Sea on the 11th. On the next day, the eastern end of the seasonal trough was extending into the north and east central Bay of Bengal. There was also a general fall of pressure along the Burma coast and the central Bay of Bengal. By the 13th the upper air trough was also well marked and on the evening of the same day, an upper air cyclonic circulation developed over the central and adjoining north Bay between 3.6 and 5.4 km a.s.l. This circulation extended to the lower levels also on the 14th morning and a feeble low pressure area formed over the east central and adjoining northeast Bay of Bengal. This low moved westwards and became well marked on the 15th. The low persisted over the central Bay of Bengal on the 16th and 17th and concentrated into a depression on the morning of 18th with centre at 0830 IST near 17.5°N and 87.5°E. The associated upper air cyclonic circulation extended upto 5.4 km a.s.l. Moving in a northwesterly direction, the depression lay centred near 18.5°N and 86.5°E at 1730 IST of the same day. Taking a westnorthwesterly course the depression crossed the south Orissa coast near Gopalpur during the course of the night and lay centred at 0830 IST of 19th about 80 km south of Titlagarh. ESSA 8 satellite picture at 19/0915 IST showed a cyclonic circulation near 19°N and 82.5°E with overcast heavy Cirriform clouds embedded with Cb, 2-3 degrees in diameter. It was centred near Kanker in east Madhya Pradesh on the morning of 20th and moving northwest, was centred near Gondia in Vidarbha on the 21st morning. It later moved rapidly northnorthwestwards and was centred about 100 km northnorthwest of Jabalpur on 22nd morning and near Mainpuri in west Uttar Pradesh on the morning of 23rd. It weakened into a low pressure area and moving further northwards became less marked by the 26th.

A trough in the upper air between 1.5 and 6.0 km a.s.l. extended westwards from the depression across the north Peninsula from 17th to 19th. Associated with these systems, the monsoon was active in Uttar Pradesh, Madhya Pradesh and Vidarbha on the 22nd. It was vigorous in Telangana on the 19th in Orissa and Vidarbha on the 20th and Uttar Pradesh on the 23rd. Some of the significant amounts of heavy rainfall were:

<u>Date</u>	<u>Station</u>	<u>Rainfall (cm)</u>
19th	Jagdalpur	15
	Gopalpur	15
	Sironcha	13
20th	Ramgundam	13
	Khari	11
	Gopalpur	9
22nd	Banda	9
	Moradabad	9
23rd	Bareilly	18
	Nainital	17
	Mainpuri	12
	Moradabad	12
	Mukteswar	12
	Kheri	10
24th	Mukteswar	13
	Nainital	13
	Moradabad	12

According to press reports, the heavy rains in Telangana caused floods in the Godavari which inundated low lying areas in Bhadrachalam. Floods were also reported in the Wainganga and other rivers in Vidarbha.

9. Deep depression in the Bay of Bengal - 23rd to 26th September :

A well marked low pressure area which lay over Viet Nam on the 20th, gradually moved northwestwards across Thailand and south Burma and lay over central Burma on the morning of 22nd. By the morning of 23rd, the low concentrated into a depression with centre at 0830 IST about 100 km north of Akyab. Akyab reported surface wind of 30 kt from westerly direction and rain at 0530 IST and wind from westsouthwesterly direction 25 kt, pressure 1006.1 mb and rain at 0830 IST on this day. The cyclonic circulation associated with the system extended upto 7.2 km a.s.l. ESSA 8 satellite pictures at 23/0902 IST showed the system as Stage X Cat 2 centre near 20.5°N and 91.0°E with overcast area of 4 degrees in diameter. Moving northwest, the depression emerged into the north-east angle Bay and was centred at 1730 IST of 23rd near 22°N and 91.5°E. Continuing its northwesterly movement, the deep depression crossed the East Pakistan coast near 90.5°E during the early hours of 24th and lay centred at 0830 IST near Barisal. ESSA 8 Satellite picture at 24/0941 IST showed a cyclonic circulation near 23°N and 90°E with a central overcast area of two degrees in diameter and well marked bands in all the sectors. The circulation associated with the system was extending upto 7.2 km a.s.l. at this time. Maintaining northwesterly movement, the deep depression was centred near Pabna (East Pakistan) at 0830 IST of 25th. It lay over Sub-Himalayan West Bengal and adjoining Bihar Plains with centre at 0830 IST of 26th near Malda. Later it moved in a northerly direction and was centred about 30 km south of Purnea on the evening of the same day. It started weakening thereafter and lay as a low pressure area over east Bihar and adjoining West Bengal on the 27th.

This system caused fairly widespread rain over northeast India from the 25th to 27th with active monsoon conditions in Gangetic West Bengal on the 25th and 26th and in Bihar Plains on the 26th and 27th. Some of the heavy rainfall amounts were :

<u>Date</u>	<u>Station</u>	<u>Rainfall (cm)</u>
25th	Krishnanagar	14
	Bagati	9
26th	Balurghat	13
	Malda	11
	Darbhanga	9
27th	Balurghat	10

10. Cyclonic storm in the Bay of Bengal - 9th to 11th October.

A feeble low pressure area developed over the west central and adjoining southwest Bay of Bengal on the morning of the 8th. Moving northeastwards, it lay over the west central Bay on the evening of the same day. The associated upper air cyclonic circulation extended upto 5.4 km a.s.l. By the morning of the 9th, the low concentrated into a depression with centre at 0830 IST near 18.5°N and 87.0°E. The circulation now extended upto 7.2 km a.s.l. It moved northnortheastwards, intensified into a deep depression and was centred at 1730 IST near 20°N and 87.5°E. The following observations are of interest in this connection :

Date	Name of ship/ station	Time IST	<u>Position</u>		<u>Wind</u>		Pressure (mb)	Weather	
			Lat. °N	Long. °E	Direc- tion	Speed knots			
9th	MV Visvavijay	1730	19.9	87.8	S	17	1004.9	Rain	
	Puri	1730			N	5			1008.9
	Paradeep	1730			NE	5			1006.9
	Sandheads	1730			E	17			1009.4
	Cuttack	1730			NE	25 k at 300 m			
					NE	25 K at 600 m			
					ENE	20 K at 900 m			
ENE			20 K at 1500 m						
Gopalpur	1730	N	10 K at 300 m						
		N	10 K at 600 m						

Even though the deep depression was close to Orissa coast, the 24 hours pressure changes all over Orissa and West Bengal were positive and the pressure departures from normal were above plus 2 mb over these areas. Taking a northeasterly course, the deep depression intensified further into a cyclonic storm by the early morning of 10th and was centred at 0830 IST near 21°N and 88°E. Sandheads reported surface wind of 40 kt from easterly direction at 0530 IST of this day. The other significant observations of interest are given below :

Date	Name of station/ ship	Time IST	Wind		Pressure (mb)	Weather
			Direc- tion	Speed knots		
10th	Sandheads	0830	S	20	1008.6	Mainly overcast
	Sagar Island	0830	ENE	10	1010.1	- do -
	Contai	0830	ENE	10	1010.9	Overcast
	Balasore	0830	NNE	5	1011.0	Overcast
	Chandbali	0830	NNW	5	1011.0	Overcast
	Paradeep	0830	NW	15	1011.0	Variable sky
	Calcutta	0530	NE	20 K at 300 m.		
			E	25 K at 600 m.		
			E	20 K at 900 m.		
			ESE	20 K at 1500 m.		
Cuttack	0530	WNW	20 K at 300 m.			
		WNW	15 K at 600 m.			
		WNW	15 K at 900 m.			
		NW	10 K at 1500 m.			

ESSA 8 satellite picture at 10/0800 IST showed Stage "C" near 20.5°N and 88.0°E. Even though the storm was close to the West Bengal-Orissa coast, the 24 hours pressure changes were only about -1 to -2.5 mb over West Bengal and the highest pressure fall of 2.5 mb was at Sandheads and the pressure defect at this station at 0830 IST of 10th was 1.3 mb only. From this it would appear that this system was of a very small extent. On the morning of this day a trough in the westerlies was lying over Uttar Pradesh and Madhya Pradesh with its axis at 500 mb running from Lucknow to Bhopal. Under its influence, the storm moved rapidly northeastwards crossed the east Pakistan coast near 89.0°E during the evening and weakened into a depression. It lay with centre near Barisal in east Pakistan at 0830 IST of 11th. ESSA-8 satellite picture at 11/0859 IST reported a cyclonic circulation near 22.5°N and 90.5°E. It weakened into a well marked low pressure area by the same evening over east Pakistan and adjoining Assam and filled up next morning.

The lowest estimated central pressure associated with this system was 1000 mb at 0830 IST of 10th and the corresponding pressure defect was about 10 mb.

Under the influence of this system, northeast India received good rainfall. Some of the noteworthy amounts of rainfall were :

<u>Date</u>	<u>Station</u>	<u>Rainfall (cm)</u>
9th	Paradeep	10
	Sriniketan	10
	Puri	8
	Berhampore	7
	Cuttack	7
	Jharsuguda	7
	Jhahpurnagar	7
	North Lakhimpur	6

<u>Date</u>	<u>Station</u>	<u>Rainfall (cm)</u>
10th	Purnea	8
	Sagar Island	6
11th	Haflong	14
	Agartala	5
12th	Kailashahar	11
	Silchar	6

11. Cyclonic storm in the Bay of Bengal 21st to 23rd October.

An upper air trough extending upto 3.0 km a.s.l. developed over the Andaman on the 17th. It persisted over the same area on the 18th. Under its influence a low pressure area formed over the south and adjoining central Bay of Bengal on the morning of 19th. Moving further west, it lay over the southwest Bay of Bengal on the 20th morning and became well marked by the same evening. It concentrated into a depression on the morning of 21st with centre at 0830 IST near 11.0°N and 83.0°E. The associated upper air cyclonic circulation extended upto 9.0 km a.s.l. Moving in a northwesterly direction it intensified and lay as a deep depression at 1730 IST of 21st with centre near 11.5°N and 81.5°E. Continuing its northwesterly movement, it intensified further into a cyclonic storm during the night and was centred at 0830 IST of 22nd near 12°N and 81°E. The following observations are significant in this connection :

Date	Name of ship/ station	Time IST	<u>Position</u>		<u>Wind</u>		Pressure (mb)	Weather
			Lat. °N	Long. °E	Direc- tion	Speed knots		
22nd	GMSN	0530	12.5	80.3	NE	20	1003.2	Rain
	VWCK	0830	13.2	80.6	ENE	30	1004.9	Rain
	GMSN	0950	12.6	80.7	NE	27	1003.4	Rain
	GMSN	1030	12.6	80.9	NE	20	1002.9	Showers
	VWWP	1030	12.3	82.8	S	15	1005.9	Overcast
	GMSN	1130	12.6	81.1	ENE	20	1003.0	Rain
	JCZM	1130	13.1	83.0	SE	10	1005.7	Rain
	VWCK	1130	13.5	81.3	NE	30	1004.6	Showers
	GMSN	1230	12.3	81.1	E	30	1002.2	
	Madras	0830			NNE	5	1006.5	Rain
	Cuddalore	0830			WNW	10	1005.8	Rain
	Madras	0530			NE	30 K at 300 m.		
					NE	30 K at 600 m.		
					NE	40 K at 900 m.		
				NE	30 K at 1500 m.			
Trincomalee	0530			W	25 K at 300 m.			
				WSW	15 K at 600 m.			
				W	15 K at 900 m.			
				WSW	20 K at 1500 m.			

ESSA-8 satellite picture at 22/0848 IST showed the system to be of Stage 'X' cat. 1 near 12.5°N and 82.0°E and the overcast area to be three degrees in diameter. It was centred near 12.5°N and 80.5°E at 1730 IST of the same day. Upper winds at Madras backed and strengthened to 40 kt in the evening. Nagapattinam reported westerly wind 35 Kt at 300 m., WNW/40 Kt at 600 m., NW/40 Kt at 900 m. and NNW/45 Kt at 1500 m. a.s.l. at that hour. Continuing its northwesterly movement, the cyclonic storm was lying close to Tamil Nadu coast, about 40 Km south of Madras at 0830 IST of 23rd. Madras reported surface wind of 20 Kt from easterly direction and pressure 1000.4 mb. The 24 hours pressure change at Madras at 0830 IST was -6.1 mb and the corresponding pressure defect was 10.8 mb. ESSA-8 satellite pictures at 25/0852 IST showed the system to be Stage 'X' Cat. 2 with centre near 13°N and 80°E, Cirrus outflow towards the west and north.

Crossing the Tamil Nadu coast south of Madras during the forenoon, it weakened into a depression and was centred at 1730 IST of 23rd about 40 km north-northeast of Vellore. Weakening further and moving northwestwards, it lay over Rayalaseema and adjoining south Interior Mysore as a low pressure area on the 24th. This low emerged into the east-central Arabian Sea off Mysore-Goa-south Maharashtra coasts on the 25th and moved away westwards later.

This storm could be categorised to belong to Stage X, cat. 1 or 2. diameter 2-3 degrees, which gives a maximum wind of about 45 Kt associated with it. Using Fletcher's formula, the lowest pressure associated with the system works out to be 995 mb. at 0830 IST of 23rd. The corresponding pressure defect works out to be about 16 mb.

This system caused fairly widespread rain in Andhra Pradesh, Tamil Nadu and Mysore State with isolated heavy falls in Andhra Pradesh and Tamil Nadu and scattered rainfall in Kerala during the period 21st - 25th and scattered rainfall in Konkan and Madhya Maharashtra from 26th to 28th. Some of the noteworthy amounts of heavy rainfall were :

<u>Date</u>	<u>Station</u>	<u>Rainfall (cm)</u>
21st	Kallakurichi	8
22nd	Madras Airport	23
	Pondicherry	17
	Cuddalore	11
	Alleppey	8
23rd	Pondicherry	16
	Nellore	15
	Tirupathi	14
	Cuddalore	13
	Vellore	9
24th	Ongole	9
	Kakinada	8
	Kalingapatam	8
	Tirupattur	8
	Cuddapah	7
25th	Khammam	11
	Kakinada	8
26th	Sholapur	5

According to press reports, the torrential rain in Madras City and neighbourhood paralysed the city life, left more than 20,000 slum-dwellers homeless and caused breaches in the railway tracks on the Madras-Arkonam section. The rainfall at Madras Airport on 22nd almost touched the 81 year old record of 23.4 cm at that place. Tambaram near Madras recorded 29 cm and Sholavaram 48 cm for the 24 hours period ending 0830 IST of 2nd. The heavy rain relieved the water scarcity in Madras City.

12. Severe cyclonic storm in the Bay of Bengal - 4th to 9th November :

A low pressure area lay over the Gulf of Siam on the morning of 2nd. The associated upper air cyclonic circulation extended upto 900 m a.s.l. By the evening, the low was emerging into the Andaman Sea across the Tennasserim coast. On the morning of 3rd, it lay over the Andaman Sea and was well marked. Bay Islands reported widespread rainfall at 0830 IST of this day. The pressure departures at Port Blair and Car Nicobar were about -4.1 and -4.3 mb respectively at this time. The low concentrated into a depression on the morning of 4th with centre at 0830 IST near 12.5°N and 93.5°E. Moving in a westerly direction, the depression intensified into a deep depression by the evening of 4th centred at 1730 IST near 12.5°N and 92.5°E. Moving rapidly westnorthwestwards,

it further intensified into a cyclonic storm and was centred at 0830 IST of 5th near 13.0°N and 90.0°E.

Nimbus-3 satellite picture at 1016 IST showed the system to be of Stage X Cat. 2 with center near 13.0°N and 89.0°E, central overcast area 1.5 to 2° in diameter, Cirrus outflow to the north and northeast and bandings in all sectors. Continuing to move in the same direction, it intensified further into a severe cyclonic storm during the night and lay centred at 0830 IST of 6th near 14.5°N and 87.0°E. In this connection the following observations are significant :

Date	Name of ship/ station	Time IST	Position		Wind		Pressure (mb)	Weather
			Lat. °N	Long. °E	Direc- tion	Speed knots		
6th	VWRB	0530	11.4	87.2	W	30	1004.5	-
	VWPS	0530	13.5	91.7	SSE	27	1006.6	Overcast
	GNFH	0530	18.6	87.7	ENE	27	1007.5	Showers
	GWLF	0530	18.5	87.5	E	40	1008.9	Showers
	ATAF	0530	14.5	83.0	N	10	1006.2	Overcast
	GNFH	0830	18.1	87.4	E	35	1007.9	Rain
	VWPS	0930	13.8	90.8	SSE	30	1008.4	Drizzle
	JAGVIJAY	1130	10.8	88.0	SW	20	1007.1	Overcast
	GNFH	1130	17.9	87.5	E	40	1007.4	Rain
	Port Blair	0530			SSE	20 K at 300 m.		
					SSE	35 K at 600 m.		
				SSE	30 K at 900 m.			
				SSE	30 K at 1500 m.			

Even though there were no ships close to the centre of the system, judging by the wind speed of 30 to 40 kt, reported by ships about three degrees to the east and north of the system, it would be summarised that the storm was severe in intensity at this time. ESSA-8 satellite picture at 0813 IST showed the system to be Stage X Cat. 3 with centre near 14.5°N and 86°E eye visible and the central overcast area to be 4-5 degrees in diameter. Nimbus-3 satellite picture at 1116 IST of the same day showed clear eye near 15°N and 85.5°E. The satellite pictures corroborated the fact that the system was a severe cyclonic storm on 6th morning.

Maintaining its westnorthwesterly movement, the severe cyclonic storm was centred near 15°N and 85.5°E at 1730 IST of 6th. Some ships were available near the field of the storm and their observations are given in the Table below, along with a few land observations :

Date	Name of ship/ station	Time IST	Position		Wind		Pressure (mb)	Weather
			Lat. °N	Long. °E	Direc- tion	Speed knots		
6th	GHZT	1730	16.5	85.5	NE	45	997.1	Rain
	GWLF	1730	18.0	86.0	NE	30	1003.1	Rain
	GWFH	1730	17.5	87.9	E	35	1003.9	Rain
	VWBK	1730	14.9	82.9	NW	20	1001.1	Rain
	VWRB	1730	9.9	89.1	WSW	25	1007.1	Overcast
	Visakhapatnam	1730			NNE	15	1005.1	Rain
	Kakinada	1730			NE	5	1004.8	Overcast
	Nellore	1730			NW	2	1006.9	Overcast

The 24 hours pressure fall along the Andhra coast at this time was about 4 mb. and the pressure departures were about -5 mb. Continuing to move westnorthwestwards, the severe cyclonic storm was centred at 0830 IST of 7th near 16°N and 84°E. The 24 hours pressure falls along Andhra coast were of the order of 5 to 13 mb and the highest fall of

12.8 mb was reported by Kakinada at 0830 IST of 7th. The following observations are also significant in this connection.

Date	Name of ship/ station	Time IST	Position		Wind		Pressure (mb)	Weather
			Lat. °N	Long. °E	Direc- tion	Speed knots		
7th	GMVF	0530	15.3	85.0	SSE	50	996.4	Rain
	GHZT	0530	16.5	86.0	ESE	35	996.0	Rain
	VWBK	0530	13.8	83.2	W	20	997.8	Overcast
	GWFH	0530	15.5	88.2	S	25	1004.8	-
	XKCW	1000	17.1	83.5	NE	35	997.3	Overcast
	VWPS	1130	15.5	86.5	SSW	35	1006.8	Drizzle
	Visakhapatnam	0830			ENE	40	1001.3	Rain
	Gannavaram	0530			NNW	15 K at 300 m.		
					N	35 K at 600 m.		
					N	40 K at 900 m.		

The circulation associated with the system extended upto 10.5 km a.s.l. at this time.

ESSA-8 satellite picture at 07/0858 IST showed the storm to be Stage X Cat. 3 diameter 6-7° near 16°N and Long. 83°E with considerable outflow in all sectors. The eye was visible at this time also. Nimbus-3 satellite picture at 1030 IST showed the storm to be Stage X, Cat 3 near 16°N and 85°E, diameter 6 degree with spiral bands. A photograph of this picture is reproduced in Fig. 3.

Moving rapidly westnorthwestwards, the severe cyclonic storm crossed the Andhra coast between Masulipatam and Kakinada during the afternoon of 7th and was centred at 1730 IST near Nidadavolu. Nidadavolu reported the lowest pressure of 975.2 mb at 1730 IST of this day and the corresponding pressure defect was 35.8 mb. The circulation associated with the storm extended upto 9.0 km a.s.l.

Moving westwards across Telangana, the severe storm weakened and lay as a cyclonic storm near Hyderabad at 0830 IST of 8th. Later weakening into a depression, it was centred near Gulbarga at 1730 IST of 8th. The depression later took a northwesterly course and was centred near Ahmadnagar the next morning. Later on, it weakened into a low pressure area and lay over north Maharashtra State and adjoining Gujarat State on the evening of the same day.

This system caused widespread rainfall in the Bay Islands on the 5th, 6th and 7th, widespread rain also occurred in coastal Andhra Pradesh, Telangana and Orissa on the 8th and in Marathwada, Telangana, Orissa and north Interior Mysore on the 9th. Some of the noteworthy amounts of heavy rainfall were :-

Date	Station	Rainfall (cm)
6th	Car Nicobar	11
7th	Visakhapatnam	10
8th	Kalingapattinam	15
	Masulipatam	11
	Vijawada	10
	Kakinada	10
	Gannavaram	9
	Nidadavolu	8
	Waltair	8
	Visakhapatnam	7
	Khammam	7
9th	Hanamkonda	8

According to press reports and the touring officer's report, this cyclonic storm took a toll of about 200 lives and caused heavy damage to standing crops (particularly paddy and sugarcane) and to other property in Krishna, East and West Godavari districts of coastal Andhra Pradesh. The most gruesome tragedy was the death of 42 fishermen living in the Kolletikota Island Hamlet in the Kolleru Lake which was washed away by a "water-spout" as the storm moved across the Kolleru lake on the evening of the 7th. Tidal waves affected the coastal areas of Andhra Pradesh between Visakhapatnam and Coringa (near Kakinada). The maximum wind speed experienced at some places in East and West Godavari districts has been estimated to be of the order of 100-150 kmph. Several thousands of houses were damaged. The damage caused by this storm was reported to be heavier than that caused by the cyclone which hit Andhra Pradesh in May 1969. Gannavaram Observatory recorded a maximum wind speed of 98 kmph between 1930 and 2030 IST of 7th and a negative pressure departure of 23 mb on that evening. Kakinada Observatory recorded an average wind speed of 150 kmph on the afternoon of 7th. Some of the very heavy rainfall amounts recorded by the state raingauge stations on the 8th are :

Bhimavaram	19 cm
Narsapur	16 cm
Addathegals (Agency)	15 cm
Muzvid	15 cm
Razole	14 cm
Amlapuram	14 cm

The storm was at its severest intensity on the 7th. It could be classified to belong to Stage X cat. 3 with an overcast area of 6 degrees in diameter. This gives the maximum wind associated with the storm to be about 95 Kt (177 kmph). Using Fletcher's formula, the lowest pressure associated with the system works out to be 970 mb. at 0830 IST of 7th and the corresponding pressure defect is of the order of 43 mb. This agrees with the lowest observed pressure of 975 mb at Nidadavolu at 1730 IST of 7th and the negative pressure departure of 43 mb agrees fairly with the observed departure of 36 mb at Nidadavolu for the same hour.

13. Depression in the Bay of Bengal - 11th to 13th December :

A trough of low pressure moved into the south Andaman Sea on the 1st. It moved westwards and lay over the extreme southwest Bay on the 4th. In this trough, a low pressure area developed over the southwest Bay off Ceylon on the 7th. Slowly moving in a northerly direction, it was lying off the east coast of Ceylon on the morning of 10th. Moving further northwards, it became well marked by the evening, when it lay off the Tamil Nadu coast. ESSA-9 observations of 1400 IST of December 10, received from Washington indicated a Stage 'C' system near 11.5°N, 82.5°E.

The low concentrated into a depression on the 11th with centre at 0830 IST near 11°N and 81.5°E. 24-hours pressure changes along Tamil Nadu coast were of the order of -3 to -4 mb and the pressure departures were about -4 to -5 mb, Cuddalore reporting the maximum pressure departure of -5.4 mb at 0830 IST of 11th. ESSA-8 satellite pictures at 0920 IST showed the system to be of Stage 'C' near 11°N and 81.5°E and Nimbus-3 satellite picture at 1121 IST showed the system to be Stage 'C', near 11°N and 82°E. The circulation associated with the depression extended to about 5.4 km a.s.l.

Moving in a northnorthwesterly direction, the depression was centred near 13.5°N and 81.0°E at 0830 IST of 12th. The maximum pressure departure of -7.1 mb at 0830 IST was reported by Madras. Nimbus-3 satellite pictures at 1212 IST showed the system to be Stage C-plus, near 14°N and 81°E. Continuing to move northwards upto the evening and later moving slightly towards the northnorthwest, the depression lay over the west central Bay of Bengal off south Andhra coast on the morning of 13th with centre at 0830 IST near 15.5°N and 81.5°E. By the evening, the circulation associated with the system was extending upto 3.0 km a.s.l. only, and the depression had weakened into a trough of low over the west central and adjoining southwest Bay of Andhra - Tamil Nadu coasts. This persisted over these areas for the next three days.

In association with this system, there was scattered rain in Tamil Nadu upto the 13th with isolated heavy falls on some days and fairly widespread rain with isolated heavy to very heavy falls from the 14th to 18th. Andhra Pradesh also experienced fairly widespread rain from the 12th to 14th with scattered heavy to very heavy falls on the 12th and the 13th. Some of the noteworthy amounts of heavy rainfall were :-

<u>Date</u>	<u>Station</u>	<u>Rainfall (cm)</u>
5th	Nagapattinam	10
10th	Nagapattinam	7
12th	Nellore	17
	Madras	7
	Vedaranniyam	7
13th	Masulipatam	14
	Kakinada	10
	Nidadavolu	8
14th	Atirampattinam	10

14. Cyclonic storm in the Bay of Bengal 21st to 26th December.

A feeble low pressure area was lying over the extreme southwest Bay of Bengal, west of north Sumatra, on the morning of the 18th. Moving westwards, the low became well marked by the evening of 20th and was lying over the extreme southeast Bay of Bengal south of 5°N. The low concentrated into a depression on the morning of 21st with centre at 0830 IST near 4°N and 90.5°E.

ESSA-8 satellite pictures at 21/0830 IST showed Stage 'C' with centre near 4.5°N and 90°E and with bandings all around. Moving westnorthwest, the depression was centred at 0830 IST of 22nd near 5°N and 87.5°E. Continuing its westnorthwesterly movement, it intensified into a deep depression with centre at 1730 IST of 22nd near 5.5°N and 86°E. A ship at 5.7°N and 86.4°E reported surface wind of 20 Kt from southeast, pressure 1003.7 mb and rain. ESSA 9 observation of 22nd 1310 IST received from Washington indicated a Stage "C" system at 6°N, 86°E. Taking a northwesterly course, the deep depression intensified further into cyclonic storm and was centred at 0830 IST of 23rd near 6°N and 85.5°E. In this connection the following observations are of interest :

Date	Name of ship/ station	Time IST	Position		Wind		Pressure (mb)	Weather
			Lat. °N	Long. °E	Direc- tion	Speed knots		
23rd	SMSB	1130	6.0	84.9	N	30	996.8	Showers
	JRFP	1130	4.2	84.5	W	20	1009.0	Partly cloudy
	Trincomalee	0830			NNE	15	1012.4	-
	Batticola	0830			-	-	1012.4	Showers
	Hambantota	0830			NNE	10	1011.0	Partly cloudy

ESSA-8 satellite pictures at 23/0818 IST reported Stage C-plus near 5.5°N and 86°E with overcast area about two degrees towards the edge of the picture. Continuing its northwesterly movement, the cyclonic storm was centred near 6.5°N and 85°E at 1730 IST. Bulletin from Washington based on ESSA-9, observations of 23rd December 1410 IST indicated a Stage X Cat 2 system of Diameter 4°, ESSA-2 satellite picture at 23/1628 IST however, suggested the centre of the storm to be near 6.5°N and 85.0°E.

The 24 hours pressure changes over Ceylon and along the Tamil Nadu coasts were of the order of -2mb at 1730 IST of 23rd.

Moving westwards, the cyclonic storm was centred at 0830 IST of 24th near 6.5°N and 84.5°E. It remained practically stationary upto 25th morning. Nimbus-3 satellite picture at 25/1127 IST SHOWED THE SYSTEM TO BE Stage "B". After 0830 IST, the storm weakened into a depression and moving in a southwesterly direction, it was centred at 1730 IST near 5.5°N and 83.5°E. The following observations are significant in this connection.

Date	Name of ship/ station	Time IST	Position		Wind		Pressure (mb)	Weather
			Lat. °N	Long. °E	Direc- tion	Speed knots		
25th	JFWP	1430	5.8	82.5	N	15	1006.6	Partly cloudy
	GHFD	1530	6.0	81.1	NE	20	-	Rain
	"Kuala Lumpur"	1730	6.2	83.6	E	20	1006.4	Rain
	PFYU	1730	5.1	84.8	S	15	1006.2	Rain

Again taking a westerly course, the depression was centred at 0830 IST of 26th near 5.5°N and 82.5°E and near 5.5°N and 81.5°E, the same evening. Later, it weakened into a low pressure area and moving further west, lay over Comorin and adjoining south Cochin on 27th. It persisted there till 29th and moved away further westwards later.

In association with this system, there was fairly widespread rain with isolated very heavy falls in south Tamil Nadu between 28th and 31st. The noteworthy amounts of rainfall were :

Date	Station	Rainfall (cm)
28th	Vedarabbiyam	27
	Nagapattinam	13
	Atiramapattinam	8
29th	Vedaranniyam	12
30th	Vedaranniyam	16
	Nagapattinam	13
31st	Vedaranniyam	9
	Pamban	9
	Nagapattinam	9

The lowest pressure associated with this system was estimated to be 995^{mb} at 0830 IST of 23rd and the associated pressure defect works out to be about 17 mb.

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TABLE II

Monthly distribution of cyclonic storms and depressions in the Bay of Bengal and Arabian Sea - 1969

Month	Jan.		Feb.		Mar.		Apr.		May.		Jun.		Jul.		Aug.		Sep.		Oct.		Nov.		Dec.		Total	
	D	C	D	C	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	3	-	-	2	-	1(1)*	1	1	7	6(1)*
Arabian Sea	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Total	-	-	-	-	-	-	-	-	-	1	2	-	1	-	1	1	3	-	-	2	-	1(1)*	1	1	7	6(1)*

D - Depression

C- Cyclone

*Severe cyclonic storm

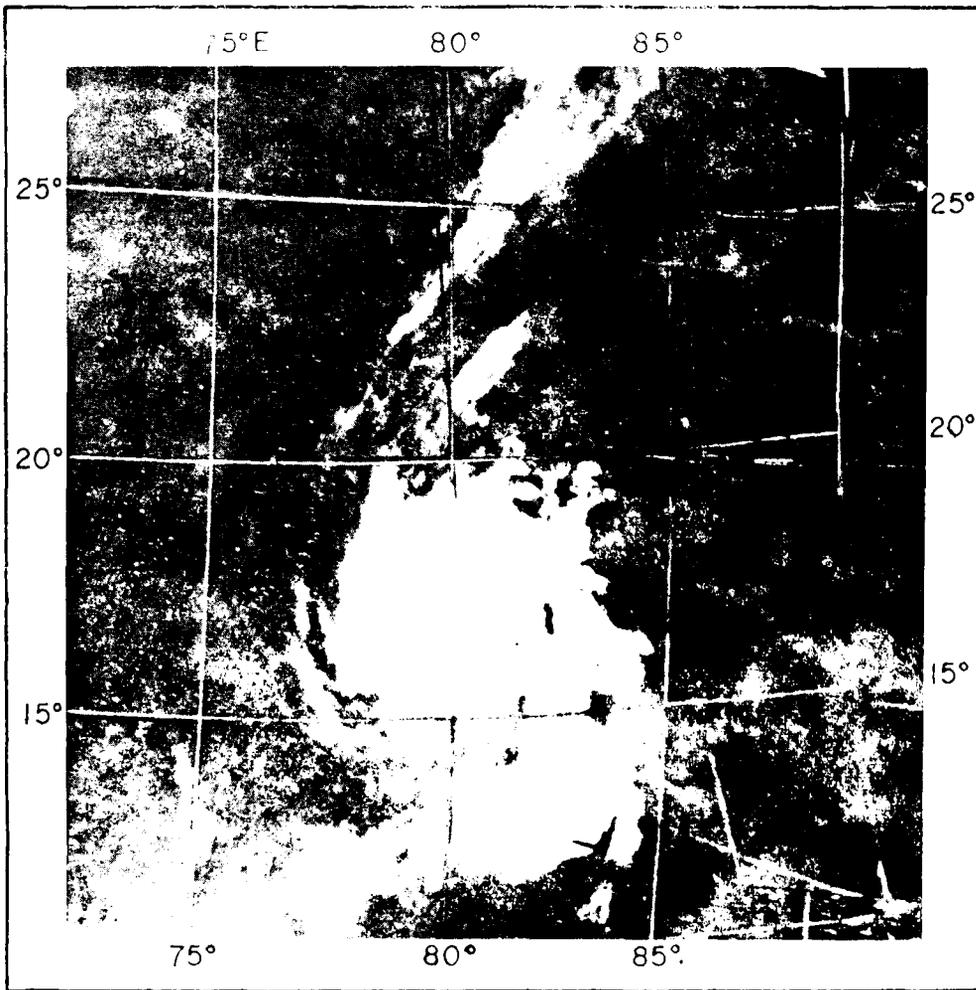


FIG. 2
ESSA-8
1001 HRS IST
17 MAY 1969

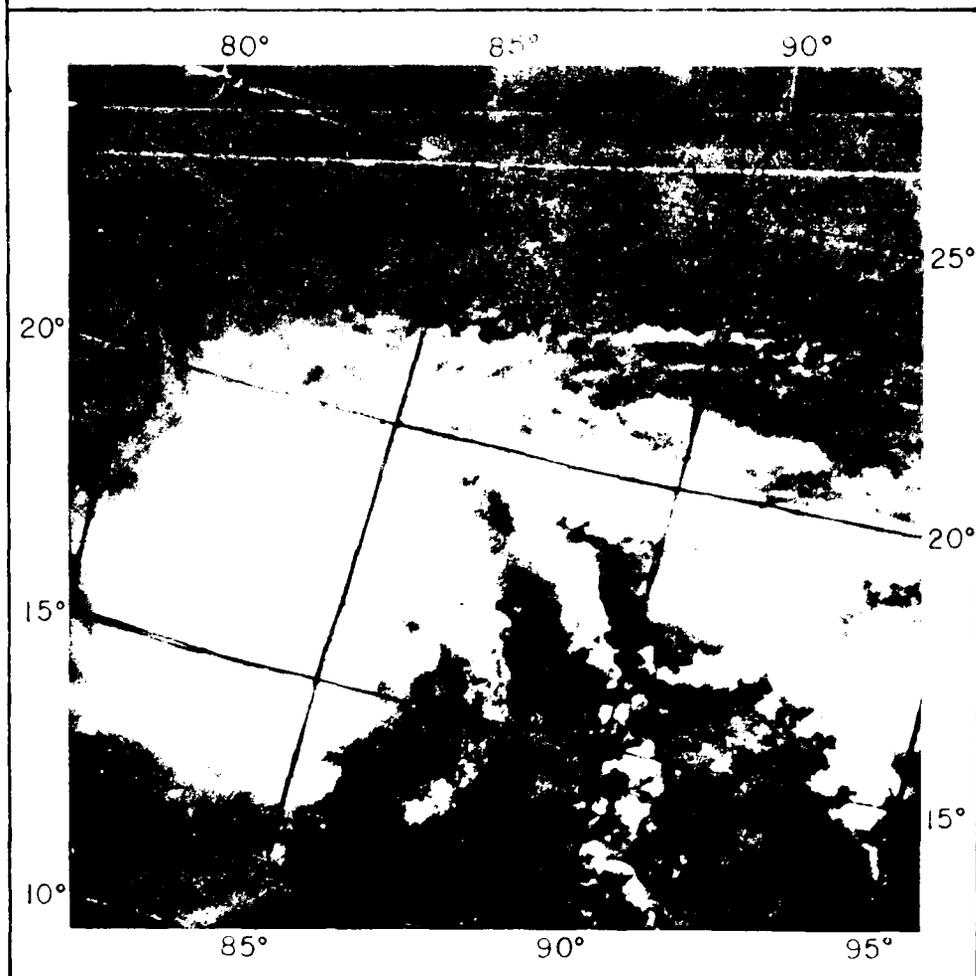


FIG. 3
NIMBUS-3
1030 HRS IST
7 NOV. 1969