

## Cyclones and depressions over north Indian Ocean during 2002\*

### 1. Introduction

There were 6 intense cyclonic disturbances (4 cyclonic storms and 2 depressions) over the north Indian Ocean during 2002. Out of these cyclonic disturbances 5 formed over the Bay of Bengal and 1 over the Arabian Sea. Only one cyclonic storm crossed the Indian coast and it had reached the intensity of a severe cyclonic storm just before the landfall. No cyclonic disturbance formed in the winter as well as monsoon season.

The first system (cyclonic storm) formed over the Arabian Sea during 6-10 May, which became a cyclonic storm after crossing Long. 60° E and subsequently crossed Arabia coast. The second system (deep depression) formed over Bay of Bengal during 11-12 May. It crossed Tenasserim coast on 12 morning. The third was a depression formed over Bay of Bengal during 22-23 October, which weakened into a low pressure area over the Ocean itself. The fourth system (severe cyclonic storm) formed over Bay of Bengal during 10-12 November. It crossed West Bengal coast, south of Kolkata near Sagar Island on 12 and caused some damage in Gangetic West Bengal and Orissa. The fifth system (cyclonic storm) formed over Bay of Bengal during 23-28 November. This system dissipated over northeast Bay and caused no damage. The last system during the year also was a cyclonic storm formed over Bay of Bengal during 21-25 December in a comparatively lower latitude. This also did not cross coast and caused no damage.

Tracks of these systems are given in Fig. 1. The brief history and monthly distribution are given in Table 1 and 2 respectively. There were no ship reports in the vicinity of these systems. The relevant Buoy observations are given in Table 3. Seasonwise description of these systems are given below.

### 2. Disturbances formed during the Winter season (January and February)

No intense cyclonic disturbance formed during the season.

### 3. Disturbances formed during the Pre-monsoon season (March to May)

During the season, one cyclonic storm formed over the Arabian Sea and one depression formed over the Bay of Bengal. Details are given below:

#### 3.1. Cyclonic storm over the Arabian Sea (6-10 May 2002)

This is the only cyclonic storm formed during pre-monsoon season. It intensified into a cyclonic storm after crossing the Long. 60° E, during its westnorth westward movement.

##### 3.1.1. Life cycle

Under the influence of a trough in easterlies over southeast Arabian Sea, a depression formed at 0300 UTC of 6 near Lat. 11.0° N/ Long. 67.0° E. It moved in a northwesterly direction and intensified into a deep depression near Lat. 13.5° N/ Long. 64.5° E at 0300 UTC of 7. Subsequently, it moved westwards and weakened into a depression near Lat. 13.5° N/ Long. 62.0° E at 0300 UTC of 8. Following a westnorthwesterly course, it once again intensified into a deep depression near Lat. 14.0° N/ Long. 59.5° E at 0300 UTC of 9. Continuing its westnorthwesterly movement, it further intensified into a cyclonic storm near Lat. 14.5° N/ Long. 58.5° E at 0600 UTC of 9. Thereafter, it moved in a northwesterly direction and crossed Arabia coast around 0900 UTC of 10 and weakened thereafter. As the system moved away from the Indian coast, it did not cause any weather and damage over the country.

##### 3.1.2. Satellite cloud features and other observations

The system was tracked solely on the basis of Satellite observations. Maximum intensity of the system as given by INSAT was T 2.5 (35 kts) from 0600 UTC of 9 to 0600 UTC of 10. No eye was noticed by INSAT.

##### 3.1.3. Weather and damage

The system did not cause any weather or damage over the country. Qairoon Hairiti recorded very heavy rainfall of 25 cm. Heavy rainfall of the order of 6 to 7 cm occurred in Salalah (Oman). Storm surge caused rough sea conditions raising wave heights upto

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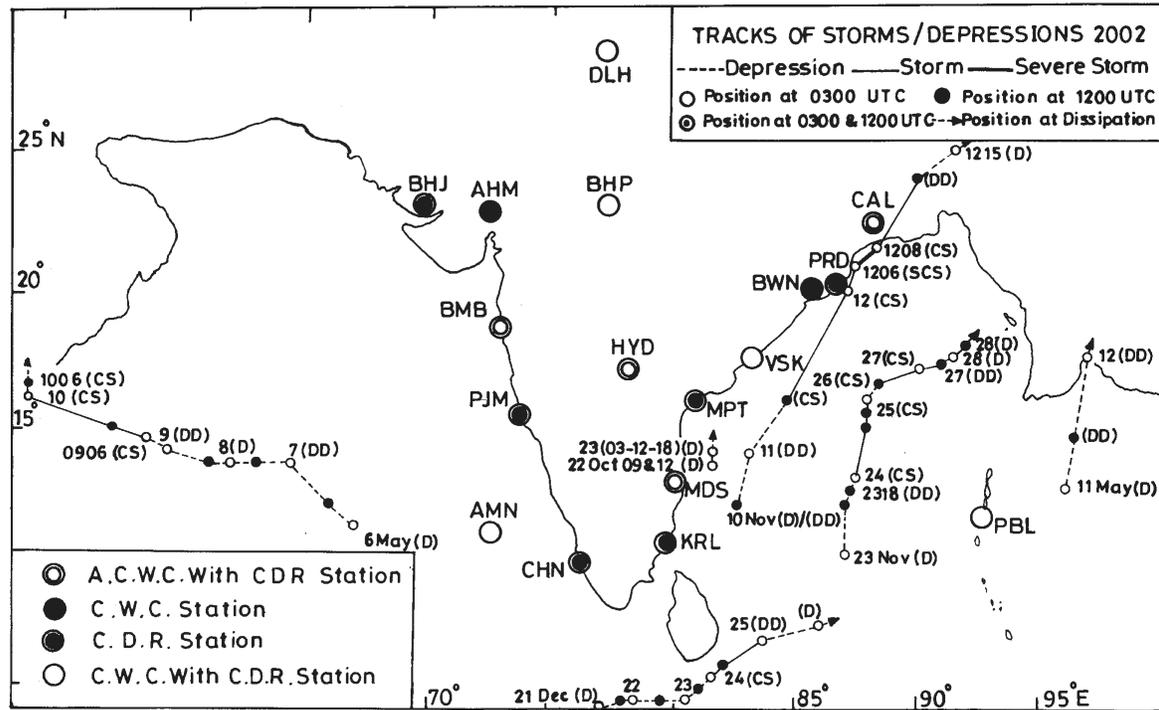


Fig. 1. Tracks of depression/storms during 2002

4 m. The cyclone left 9 people dead and several injured in Oman.

### 3.2. Deep depression over Bay of Bengal (11-12 May)

#### 3.2.1. Life cycle

Under the influence of a trough in the easterlies, a low pressure area formed over south Andaman Sea on 9 evening. It concentrated into a depression near Lat. 12.5° N/ Long. 96.0° E at 0300 UTC of 11. Moving in a northnortheasterly direction, it intensified into a deep depression at 1200 UTC of 11 near Lat. 14.5° N/ Long. 96.5° E. It crossed Myanmar coast and lay as deep depression near Lat. 17.5° N/ Long. 97.0° E at 0300 UTC of 12. Subsequently, it weakened into a low pressure area over Myanmar.

#### 3.2.2. Satellite cloud features and other observations

Maximum intensity of the system as given by INSAT was T1.5 from 0600 UTC to 0900 UTC of 10.

#### 3.2.3. Weather and damage

The system did not cause any weather or damage over the country.

### 4. Disturbances formed during the Monsoon season (June to September)

No cyclonic disturbance formed during the season.

### 5. Disturbances formed during the Post-monsoon season (October to December)

During this season, one severe cyclonic storm, two cyclonic storms and one depression formed over the Bay of Bengal. Details are presented below :

#### 5.1. Depression over the Bay of Bengal (22-23 October)

##### 5.1.1. Life cycle

Under the influence of a trough of low and upper air cyclonic circulation, a low pressure area formed over southwest and adjoining west-central Bay on 21 morning. It became well marked on 22 morning and concentrated into a depression at 0900 UTC of 22 near Lat. 13.5° N/ Long. 81.5° E. Moving in a northerly direction, it weakened into a low pressure area over west-central and adjoining northwest Bay off coastal areas of Andhra Pradesh and Orissa on 24 morning.

TABLE 1

Brief history of cyclonic storms and depressions over the Indian seas and neighbourhood during 2002

S. No.	Type of system	Life period	Point of crossing the coast	Lowest estimated central pressure (hPa)	Recorded max. wind	Highest "T" No. (estimated)
1.	CS	6-10 May	Crossed Arabia coast	-	-	2.5
2.	DD	11-12 May	Crossed Myanmar coast	-	-	1.5
3.	D	22-23 October	Dissipated over sea. No landfall	-	-	2.0
4.	SCS	10-12 November	West Bengal coast near Sagar Islands	990	-	4.5
5.	CS	23-28 November	Dissipated over sea. No landfall	-	-	2.5
6.	CS	21-25 December	Dissipated over sea. No landfall	-	-	2.5

D- Depression, DD-Deep depression, CS – Cyclonic storm, SCS - Severe cyclonic storm

TABLE 2

Storms/depressions statistics 2002

Name of the system	Winter	Pre-monsoon			Monsoon				Post-monsoon			Total
	Jan-Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
<b>Over Bay of Bengal</b>												
Depressions/deep depressions	-	-	-	1	-	-	-	-	1	-	-	2
Cyclonic storms	-	-	-	-	-	-	-	-	-	1	1	2
Severe cyclonic storms	-	-	-	-	-	-	-	-	-	1	-	1
Very severe cyclonic storms	-	-	-	-	-	-	-	-	-	-	-	-
Super cyclonic storm	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	1	-	-	-	-	1	2	1	5
<b>Over Arabian Sea</b>												
Depressions/deep depressions	-	-	-	-	-	-	-	-	-	-	-	-
Cyclonic storms	-	-	-	1	-	-	-	-	-	-	-	1
Severe cyclonic storms	-	-	-	-	-	-	-	-	-	-	-	-
Very severe cyclonic storms	-	-	-	-	-	-	-	-	-	-	-	-
Super cyclonic storm	-	-	-	-	-	-	-	-	-	-	-	-
Grand Total				2	-	-	-	-	1	2	1	6

TABLE 3

Crucial Buoy observations during the storm periods					
Call Sign	Date/time (UTC)	Lat. (°N)	Long. (°E)	Dir. (°)	Speed (kts)
(1)	(2)	(3)	(4)	(5)	(6)
<b>Severe cyclonic storm over the Bay of Bengal (10-12 November 2002)</b>					
DS5	1103	14.0	83.4	130	30
<b>Cyclonic storm over the Bay of Bengal (23-28 November 2002)</b>					
DS3	2303	12.0	90.8	110	25
DS3	2312	12.0	90.8	180	20
DS3	2403	12.0	90.8	210	20
DS4	2503	18.4	87.6	110	20
DS3	2603	12.0	90.8	190	20
DS4	2612	18.4	87.6	260	20
DS4	2803	18.4	87.6	360	15

#### 5.1.2. *Satellite cloud features and other observations*

Maximum intensity of the system as given by INSAT was T 2.0 from 1200 UTC of 22 to 0700 UTC of 23.

#### 5.1.3. *Weather and damage*

Since the system weakened over the sea area, no damage was reported. When the system moved inland as a low pressure area, significant rainfall occurred in south coastal Andhra Pradesh. The chief rainfall amounts (cm) are given below:

26 October : Nellore & Gudur 9 each, Kandukur 7 and Srikalahasti 6.

27 October : Nellore 19, Kandukur 18 and Vinjamur 10.

### 5.2. *Severe cyclonic storm over the Bay of Bengal (10-12 November)*

#### 5.2.1. *Life cycle*

Under the influence of a trough, a low pressure area formed over southeast and adjoining southwest Bay on 8 morning. It concentrated into a depression near

Lat. 12.0° N/ Long. 82.5° E at 0300 UTC of 10. It intensified into a deep depression over the same region at 1200 UTC of 10. Moving in a northnortheasterly direction, it intensified into a cyclonic storm near Lat. 16.0° N/ Long. 84.5° E at 1200 UTC of 11. Subsequently, moving in a northnortheasterly direction, it further intensified into a severe cyclonic storm at 0600 UTC of 12 near Lat. 21.0° N/ Long. 87.5° E. It rapidly weakened into a cyclonic storm at 0800 UTC of 12 near Lat. 21.7° N/ Long. 88.3° E and crossed West Bengal coast south of Kolkata near Sagar Island around 0900 UTC of 12. It further moved in a northeasterly direction and weakened into a deep depression at 1200 UTC of 12 near Lat. 24.0° N/ Long. 90.0° E. Further weakening into a depression, it lay near Lat. 25.0° N/ Long. 91.5° E at 1500 UTC of 12. It rapidly weakened into a low pressure area at 0300 UTC of 13 and lay over Bangladesh and neighbourhood.

#### 5.2.2. *Satellite cloud features, Radar and other observations*

Maximum intensity of the system as given by METSAT was T 4.5 (77 kts) at 0600 UTC to 0700 UTC of 12. No eye was noticed in the METSAT Cloud Imagery.

DWR Chennai tracked the system only during its depression stage. It reported maximum wind speed of 55 kmph around the centre of the system from 0600 UTC to 1100 UTC of 10. Features of the system as seen from Radar revealed signs of organisation from 2100 UTC of 9. From 0600 UTC to 1100 UTC of 10, the vortex centre

could be estimated from radar products. Doppler Weather Radar (DWR) at Kolkata reported Closed Elliptical Eye at 0700 UTC and 0730 UTC of 12 and 'Partial Eye' at 0800 UTC of 12. It reported maximum wind speed at the eye-wall region as 44-52 mps (88-104 kts) at 0700 UTC, 36-44 mps (72-88 kts) at 0730 UTC and 28-36 mps (56-72 kts) at 0800 UTC of 12.

The estimated lowest central pressure of the system was 990 hPa at 0600 UTC of 12. Maximum estimated wind speed was 77 kts. The system initially moved in a northnorthwesterly direction till morning of 11 and then re-curved into northeasterly direction and continued its northerly movement till crossing the coast. The system had rapid movement from 1200 UTC of 11 to 0300 UTC of 12 at about 36 kmph. This was due to the steering of the system due to very strong southwesterlies as observed along the east coast at 300 and 250 hPa at 0000 UTC of 11.

### 5.2.3. *Weather and damage*

Heavy to very heavy rainfall occurred at a few places in coastal Orissa on 11 and Gangetic West Bengal on 12. Heavy rainfall occurred at isolated places in coastal Andhra Pradesh on 10 and 11.

Principal amounts of rainfall (cm) are :

- 10 November : Kavali 9, Gudur 5, Nellore 4.
- 11 November : Paradip 25, Puri & Surlurpet 6 each, Balasore 5, Tada 4, Bhubaneswar & Cuttack 3 each.
- 12 November : Canning Town 11, Basirhat 8, Contai and Digha 7 each, Kolkata (ALP) & (DUM) 6 each, Durgachak, Magra & Uluberia 5 each, Diamond Harbour & Krishnanagar 4 each.

The system caused no serious damage over the land area. As per the report given by Department of Relief, Government of West Bengal, 3 fishermen died (in south 24 Paraganas District). Seventy two persons were reported missing in Howrah and 24 Paraganas districts. Eleven Trawlers / boats were also reported to have capsized off the coastal areas of these districts.

As per report of CWC Visakhapatnam, 11 crew were missing as a fishing trawler capsized near Paradip on 12. As per press reports, damage occurred in Bhadrak and

Jagatsinghpur districts of Orissa. A number of thatched houses were damaged in Paradip port. Two trawlers were damaged off the coastal areas of Bhadrak district.

### 5.3. *Cyclonic storm over the Bay of Bengal (23-28 November)*

#### 5.3.1. *Life cycle*

Under the influence of a trough, a low pressure area formed over southeast Bay and adjoining south Andaman Sea on 22 morning. On the evening of 22, it became a well marked low pressure area over the same region. It concentrated into a depression by 0300 UTC of 23 near Lat. 10.0° N/ Long. 87.0° E. Moving in a northerly direction, it intensified into a deep depression near Lat. 12.5° N/ Long. 87.0° E at 1800 UTC of 23 and further into a cyclonic storm near Lat. 13.0° N/ Long. 87.5° E at 0300 UTC of 24. Thereafter, it moved in a northnortheasterly direction for some time, then recurved into an eastnortheasterly direction and subsequently weakened into a deep depression near Lat. 17.2° N/ Long. 91.0° E at 1200 UTC of 27. It further weakened into a depression at 1800 UTC of 27 near Lat. 17.5° N/ Long. 91.0° E. On 29 morning, it weakened into a low pressure area over northeast and adjoining east central Bay of Bengal.

#### 5.3.2. *Satellite cloud features, Radar and other observations*

The system was tracked all through with the help of METSAT.

The maximum 'T' number reported by METSAT was T 2.5 (35 kts) from 0300 UTC to 0900 UTC of 24 and from 0300 UTC of 26 to 0300 UTC of 27.

#### 5.3.3. *Weather and damage*

As the system recurved in an eastnortheasterly direction and weakened over the Ocean, it did not cause any weather and damage over the country.

### 5.4. *Cyclonic storm over the Bay of Bengal (21-25 December)*

#### 5.4.1. *Life cycle*

In an equatorial trough, a low pressure area developed off southwest coast of Sri Lanka and adjoining Indian Ocean on 20 evening. It concentrated into a

depression at 0300 UTC of 21 near Lat.  $4.0^{\circ}$  N/ Long.  $77.0^{\circ}$  E. Initially moving eastward and then in a northnortheasterly direction, it intensified into a cyclonic storm near Lat.  $5.5^{\circ}$  N/ Long.  $81.5^{\circ}$  E at 0300 UTC of 24. It further moved in a northeasterly direction and weakened into a deep depression at 0300 UTC of 25 near Lat.  $7.0^{\circ}$  N/ Long.  $83.5^{\circ}$  E. Subsequently, moving in an eastnortheasterly direction, it weakened into a depression at 1200 UTC of 25 near Lat.  $7.5^{\circ}$  N/ Long.  $86.0^{\circ}$  E. It further weakened into a low pressure area over southwest adjoining southeast Bay of Bengal after 1500 UTC of 25.

#### 5.4.2. *Satellite cloud features, Radar and other observations*

The maximum 'T' number was T 2.5 (35 kts) from 0300 to 1200 UTC of 24 as reported by METSAT.

#### 5.4.3. *Weather and damage*

The system dissipated over the ocean and it did not cause any damage.

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