

Cyclones and depressions over the north Indian Ocean during 2006*

1. Introduction

The cyclogenesis was quite subdued in the pre and post monsoon seasons. As many as 12 low pressure systems having the intensity of depression stage and above formed over the north Indian Ocean. Out of these, only 3 reached Cyclonic Storm intensity (1 Very Severe Cyclonic Storm, 1 Severe Cyclonic Storm and 1 Cyclonic Storm). The rest remained as Deep Depressions (3) and Depressions (6). Two Cyclonic Storms (the Very Severe Cyclonic Storm 'Mala' and the Cyclonic Storm 'Ogni') formed over the Bay of Bengal while the Severe Cyclonic Storm 'Mukda' formed over the Arabian Sea. Out of the 9 Depressions/ Deep Depressions, only 1 formed over the Arabian Sea and another one over land. The remaining 7 formed over the Bay of Bengal.

The first system was a Deep Depression formed over the southern most parts of southeast Arabian Sea during 13 – 14 January, which moved westwards and dissipated over the Ocean. The second one formed as a Very Severe Cyclonic Storm (Mala) over the southeast Bay and adjoining south Andaman Sea during 25 – 29 April, which recurved and crossed Arakan coast on 29. Like last year, the monsoon season was quite active once again. One Severe Cyclonic Storm and 8 Depressions/Deep Depressions formed. The first system, a Deep Depression, formed over the northwest Bay during 2 – 5 July. It moved westnorthwestwards, crossed Orissa coast and weakened over west Madhya Pradesh. In all 4 (a record number) Depressions/Deep Depressions formed over the Bay of Bengal in August, *viz.*, the Deep Depression (2 – 4 August) over the northwest Bay, the Depression (12–13 August) over the north Bay, the Depression (16 – 18 August) over the north Bay and the Depression (29 August – 1 September) over the northwest Bay. All of them crossed Orissa coast and moved in a west/ westnorthwesterly direction. Four more systems, including a Severe Cyclonic Storm and a land Depression formed during September. The first Depression (3 – 4 September) also formed over the northwest Bay and followed the track similar to the August systems. Then the Severe Cyclonic Storm 'Mukda' (21 – 24 September) formed over the east central and adjoining northeast Arabian Sea. It weakened *in situ*, without making any landfall. The land Depression (21 – 24 September) formed over Jharkhand, did not show much movement and dissipated over Bihar and neighbourhood. The fourth, in turn the last system of the season, formed over the east central and adjoining northwest Bay during 28 – 30

September, crossed Orissa coast and moved westwards upto Chattisgarh and neighbourhood. The stormiest of the seasons witnessed only a single storm, the Cyclonic Storm 'Ogni' over the west central Bay during 29 – 30 October, a midget and short lived system. November and December were devoid of any storm or Depression. In the past 50 years in the history of storm tracks, 1961 was the only similar year.

The track / intensity of these systems are given in Fig. 1. A brief history and monthly distribution are given in Tables 1 and 2. The relevant ships' and buoy observations are given in Table 3. Season wise description of these systems are given below.

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

During the season, a Deep Depression formed over the Arabian Sea. Last January also witnessed the formation of a Cyclonic Storm 'HIBARU' in the lower latitudes indicating an incidental increase in the formation of intense systems over the equatorial region.

The details of the system are given below :

2.1. Deep Depression over the southeast Arabian Sea (13-14 January 2006)

2.1.1. Life cycle

A Depression formed in the equatorial easterly wave over the southeast Arabian Sea and lay centred at 1200 UTC of 13, near Lat. 5.0° N / Long. 77.0° E. It intensified into a Deep Depression over Comorin area and lay centred at 0300 UTC of 14, near Lat. 5.5° N / Long. 75.5° E. Moving slightly westwards, it weakened into a Depression and lay centred at 1200 UTC of 14 near Lat. 7.0° N / Long. 73.0° E about 150 km south of Minicoy. It further weakened into a well marked low over the southeast Arabian Sea at 0300 UTC of 15, further into a low pressure area over there on 16 and became less marked on 17.

2.1.2. Satellite cloud features and other observations

Maximum intensity of T-2.0 was reported by Kalpana-1 imagery from 0400 to 1800 UTC of 14. It was

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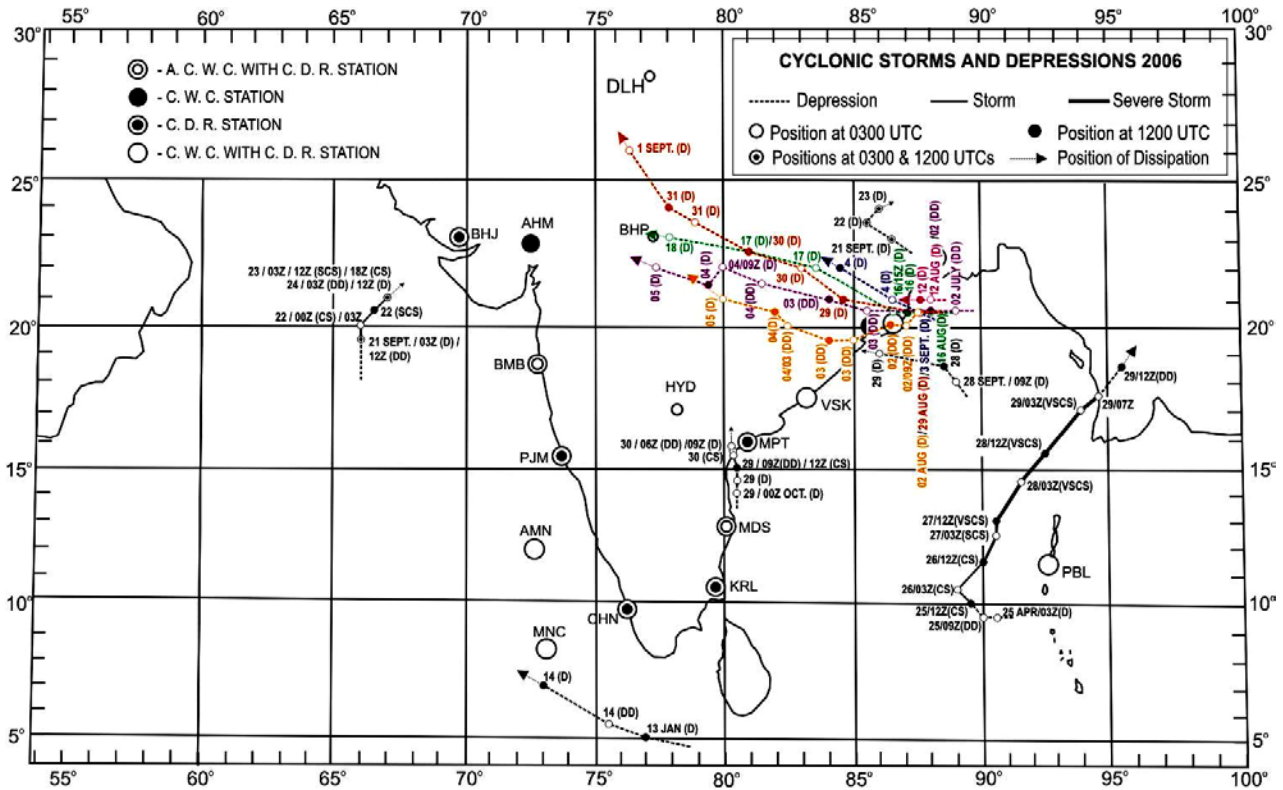


Fig. 1. Tracks of depression/storms during 2006

not tracked by RADAR as it was far away from the coast. The system centers were fixed using satellite observations.

2.1.3. Other features observed

The lowest estimated central pressure was 994 hPa. The maximum estimated wind speed was 30 kts. The system initially moved in a westnorthwesterly direction and then moved westwards and dissipated over the sea area.

2.1.4. Weather and damage

Scattered rainfall activity was observed in Lakshadweep from 14 to 16 January with Minicoy reporting 2 cm of rainfall on 14.

The system did not affect the weather in India.

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

Only one intense low pressure system formed during the pre-monsoon season. The details are as follows.

3.1. Very Severe Cyclonic Storm (Mala) over the southeast Bay and adjoining south Andaman Sea (25 – 29 April 2006)

3.1.1. Life cycle

A trough of low organised into a low pressure area over the southeast Bay and adjoining south Andaman Sea during 22 – 24. It concentrated into a Depression and lay centred at 0300 UTC of 25, near Lat. 9.5° N / Long. 90.5° E (about 350 km southwest of Port Blair). It rapidly intensified into a Cyclonic Storm and lay centred at 1200 UTC of 25 near Lat. 10.0° N / Long. 89.5° E; at 0300 UTC of 26, near Lat. 10.5° N / Long. 89.0° E and at 1200 UTC of 26, near Lat. 11.5° N / Long. 90.0° E. Moving in a northnortheasterly direction, it intensified into a Severe Cyclonic Storm and lay centred at 0300 UTC of 27 near Lat. 12.5° N / Long. 90.5° E (about 250 km westnorthwest of Port Blair); further into a Very Severe Cyclonic Storm lay centred at 1200 UTC of 27, near Lat. 13.0° N / Long. 90.5° E; at 0300 UTC of 28, near Lat. 14.5° N / Long. 91.5° E; 1200 UTC of 28, near Lat. 15.5° N / Long. 92.5° E and at 0300 UTC of 29, near Lat. 17.0° N / Long. 94.0° E. Moving northeastwards, it

TABLE 1
Brief history of cyclonic storms and depressions over the Indian seas and neighbourhood during 2006

S. No.	Category	Life Period	Place / Time of landfall	Lowest estimated central pressure (hPa)	Max. wind (estimated/observed) (kts)	Highest "T" No.
1.	DD	13 – 14 Jan	Nil	994	30	2.0
2.	VSCS (Mala)	25 – 29 Apr	Arakan coast south of Sandoway around 0700 UTC of 29.	950	102	5.5
3.	DD	2 – 5 Jul	Orissa coast between Paradip and Chandbali around 1500 UTC of 2.	–	30	2.0
4.	DD	2 – 5 Aug	South Orissa coast between Puri and Gopalpur at 0300 UTC of 3.	–	30	2.0
5.	D	12–13 Aug	Orissa coast close to Balasore around 1500 UTC of 12.	–	25	1.5
6.	D	16 – 18 Aug	N. Orissa coast close to Chandbali around 1430 UTC of 16.	–	25	1.5
7.	D	29 Aug – 1 Sep	Orissa coast near Paradip around the noon of 29.	–	30	2.0
8.	D	3 – 4 Sep	N. Orissa coast near Chandbali around 0100 UTC of 4.	–	25	1.5
9.	SCS (Mukda)	21 – 24 Sep	Nil	–	55	3.5
10.	D	21 – 24 Sep	–	–	–	–
11.	D	28 – 30 Sep	Orissa coast close to Gopalpur around 1200 UTC of 29.	–	30	2.0
12.	CS (Ogni)	29 – 30 Oct	S. Andhra coast between Ongole and Bapatla by noon.	–	35	2.5

D – Depression, DD – Deep Depression, CS – Cyclonic Storm, SCS – Severe Cyclonic Storm, VSCS – Very Severe Cyclonic Storm

TABLE 2
Storms / depressions statistics 2006

Name of the system	Winter	Pre-monsoon			Monsoon				Post-monsoon			Total
	Jan – Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Over Bay of Bengal												
Depressions/Deep Depressions	–	–	–	–	–	1	4	2	–	–	–	7
Cyclonic Storms	–	–	–	–	–	–	–	–	1	–	–	1
Severe Cyclonic Storms	–	–	–	–	–	–	–	–	–	–	–	–
Very Severe Cyclonic Storms	–	–	1	–	–	–	–	–	–	–	–	1
Super Cyclonic Storms	–	–	–	–	–	–	–	–	–	–	–	–
Total	–	–	1	–	–	1	4	2	1	–	–	9
Land Depression												
Deep Depressions	–	–	–	–	–	–	–	1	–	–	–	1
Over Arabian Sea												
Depressions/Deep Depressions	1	–	–	–	–	–	–	–	–	–	–	1
Cyclonic Storms	–	–	–	–	–	–	–	–	–	–	–	–
Severe Cyclonic Storms	–	–	–	–	–	–	–	1	–	–	–	1
Very Severe Cyclonic Storms	–	–	–	–	–	–	–	–	–	–	–	–
Super Cyclonic Storms	–	–	–	–	–	–	–	–	–	–	–	–
Grand Total	1	–	1	–	–	1	4	4	1	–	–	12

TABLE 3

Crucial ship/buoy observations during the storm/depression periods 2006

Call Sign (1)	Date/Time (UTC) (2)	Lat. Deg. N (3)	Long. Deg. E (4)	Dir. Deg. (5)	Speed kts (6)	PPPP hPa (7)
(A) Deep Depression over the southeast Arabian Sea (13-14 January 2006)						
DGOL	131200	6.8	76.8	290	15	1007.5
DGOL	141200	7.1	68.6	340	15	1008.8
(B) Very Severe Cyclonic Storm (Mala) over the southeast Bay and adjoining south Andaman Sea (25 – 29 April 2006)						
A8FL2	240000	6.0	91.7	270	20	1008.0
DQVI	251200	6.0	87.8	270	15	1005.0
HZDD	251200	6.3	93.4	200	05	1006.2
HZDD	260000	6.1	90.4	110	25	1005.9
DCCR2	260000	5.9	84.8	270	20	1007.8
HZDD	260000	6.1	90.4	200	25	1007.6
9VBP2	260000	6.1	96.1	270	15	1009.6
PCIM	270000	6.0	89.5	270	10	1006.2
ZCB25	270000	6.0	87.0	255	15	1006.5
HZDD	270000	5.9	84.3	200	25	1006.0
PCIM	271200	6.3	94.8	190	05	1006.2
ZCB25	271200	6.2	90.0	250	25	1006.8
A8F65	271200	5.8	85.8	220	20	1005.5
Buoy	280000	13.8	93.4	180	20	1003.1
Buoy	280000	18.0	90.0	090	15	1006.0
Buoy	281200	18.0	90.0	045	15	1002.4
Buoy	290000	18.0	90.0	210	15	1003.7
(C) Severe Cyclonic Storm (Mukda) over the east central and adjoining northeast Arabian Sea (21-24 September 2006)						
Ship	210000	19.6	64.1	330	10	1002.8
Ship	211200	19.5	69.4	200	20	1003.5
Ship	221200	16.0	66.3	225	25	1001.0

crossed Arakan coast about 100 km south of Sandoway at 0700 UTC of 29, rapidly weakened into a Deep Depression and lay centred at 1200 UTC of 29, near Lat. 18.5° N / Long. 95.5° E and subsequently became less marked on 30.

3.1.2. Satellite cloud features and other observations

The system was tracked by satellite, ship and buoy. Maximum intensity of T-5.5 was reported by Kalpana - 1 imagery from 0900 UTC of 28 to 0300 UTC of 29.

Eye pattern was seen from 1200 UTC of 27. Temperature of the Eye decreased continuously and in infrared imagery, Eye was observed and hence the intensity of the vortex was kept at T-5.5 from 0900 UTC of 28 to 0300 UTC of 29. Satellite cloud imagery of 0900 UTC of 28 is shown in Fig. 2.

The system was far off from the RADAR range.

3.1.3. Other features observed

The lowest estimated central pressure was 950 hPa. The maximum estimated wind speed was 102 kts. The

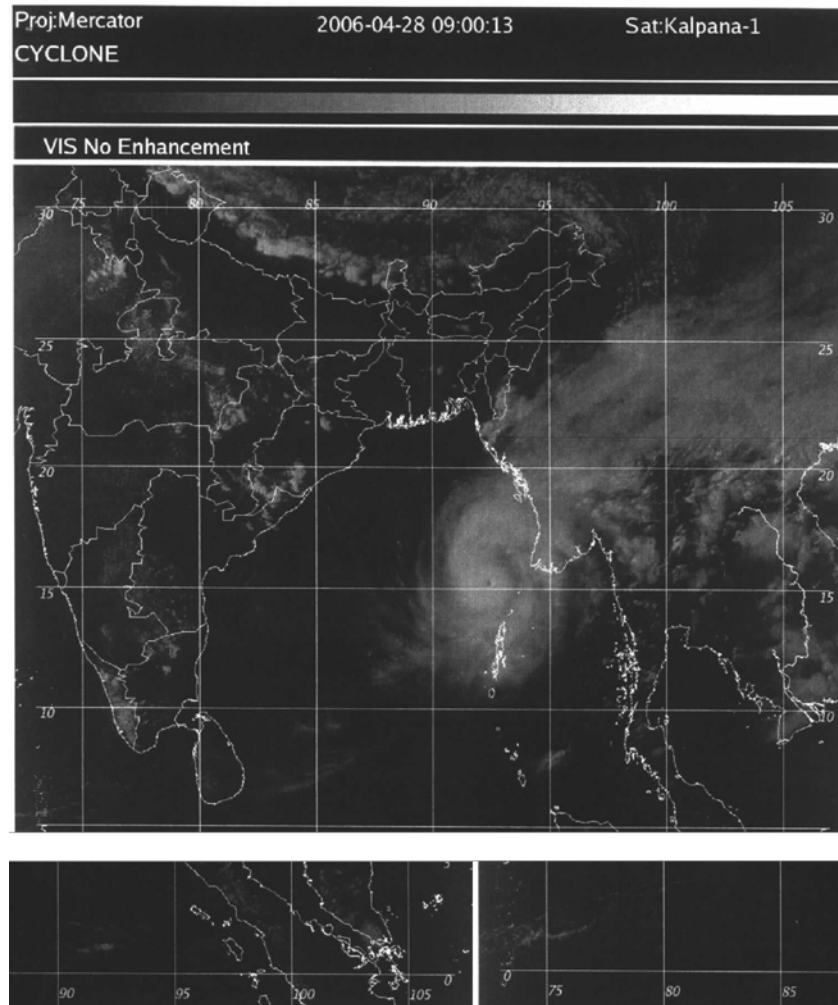


Fig. 2. Satellite imagery of 0900 UTC of 28 April 2006, Very Severe Cyclonic Storm (mala) over the Bay of Bengal, (25-29 April 2006)

system initially moved in a northwesterly direction and then recurved northeastwards and crossed Arakan coast around 0700 UTC of 29 April.

The wind shear (10-20 mps) between mid & upper levels initially inhibited the intensification of the system irrespective of the SST values of the order of 28-29° C over the area. Later on when the rapid intensification into a Very Severe Cyclonic Storm occurred during 27 & 28, the wind shear had become quite negligible (*i.e.*, of the order of 5-10 mps).

The system followed the climatological track. Out of the total 31 systems formed during the period of April since 1877 till 2005, in Bay, 27 had moved towards

Arakan coast, 1 towards Bangladesh (Chittagong) and 3 towards Tamil Nadu coast.

Numerical models converged in their track prediction, probably, because the system followed climatology and the data fed into the models are basically of climatology due to lack of observations. The mean track prediction error for 48 hrs period position forecast by the Quasi-Lagrangian Model (QLM) used in IMD was 145 km.

3.1.4. *Weather and damage*

Widespread to fairly widespread rainfall occurred over Andaman & Nicobar islands from 24 to 29 April with isolated heavy rainfall.

The chief amounts of rainfall in cms are :

25 Apr 2006	: Nancowry 7
27 Apr 2006	: Car Nicobar 10
28 Apr 2006	: Hut Bay 6
29 Apr 2006	: Port Blair 6

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

It was an active season, as mentioned in the beginning. In all, 9 intense low pressure systems including a severe cyclonic storm formed : the details of which are given below :

4.1. Deep Depression over the northwest Bay (2 – 5 July 2006)

4.1.1. Life cycle

Under the influence of an upper air cyclonic circulation, a low pressure area formed over the north Bay on 30 June. It became well marked over there on 1 July and rapidly concentrated into a Deep Depression which lay centred at 0300 UTC of 2, near Lat. 20.5° N / Long. 89.0° E and lay centred at 1200 UTC of 2, near Lat. 20.5° N / Long. 88.0° E about 150 km southeast of Balasore. Moving westwards, it crossed Orissa coast between Paradip and Chandbali around 1500 UTC of 2 and lay close to Cuttack at 0300 UTC of 3. Subsequently it moved westnorthwestwards and lay close to Sambalpur (Orissa) at 1200 UTC of 3 and close to Raipur (Chattisgarh) at 0300 UTC of 4. Thereafter, it weakened into a Depression over Vidarbha and neighbourhood by 0900 UTC and lay centred close to Nagpur at 1200 UTC of 4. Continuing its westnorthwestward movement, it lay close to Betul (west Madhya Pradesh) at 0300 UTC of 5. It further weakened into a well marked low pressure area over west Madhya Pradesh and adjoining southeast Rajasthan by the afternoon and lay over south Rajasthan and adjoining west Madhya Pradesh in the evening of 5. It became less marked on 6.

4.1.2. Satellite cloud features and other observations

The system was tracked by satellite till 1600 UTC of 2 July. Maximum intensity of T-2.0 was reported from 1200 to 1600 UTC of 2.

4.1.3. Other features observed

Estimated maximum wind speed was 30 kts. The system moved in a westerly direction and crossed Orissa coast as a Deep Depression. After crossing, the system moved in a westnorthwesterly direction and became less marked over west Madhya Pradesh and adjoining southeast Rajasthan.

4.1.4. Weather and damage

Monsoon was vigorous in Orissa and coastal Andhra Pradesh and active over Madhya Pradesh, Chattisgarh and Telangana. Widespread rainfall activity with isolated extremely heavy rainfall occurred from 1 to 5 July in Orissa and with isolated heavy to very heavy falls over Vidarbha, Chattisgarh, coastal Andhra Pradesh and Telangana.

Some chief amounts of rainfall are :

Orissa

01 Jul 2006	: Nimapara 23
02 Jul 2006	: Puri 27, Nimapara & Alipingal 15 each
03 Jul 2006	: Nawrangpur 38, Rayagada 30, Gunupur 27, Jeypore, Banpur, R. Udayagiri & Kanker 25 each, Gariaband 19, Deobagh 14
04 Jul 2006	: Titlagarh 32, Janagard & Kosagumda 31 each, Bhavanipatna 30, Tikabali 29, Nawrangpur 25, Kanker 21, Gariaband 19, Jagdalpur 14
05 Jul 2006	: Badwani 9

Coastal Andhra Pradesh

03 Jul 2006	: Pathapatnam & Komrada 19 each, Veeraghattam 15, Palakonda 14
04 Jul 2006	: Asifabad 19, Sirpur 17
05 Jul 2006	: Palasa, Sompeta & Tekkali 8 each

Vidarbha

- 04 Jul 2006 : Gadchiroli 23, Washim 17, Yeotmal 16
- 05 Jul 2006 : Sangrampur & Deoli 19 each, Karanja 14, Samudrapur 13

Incessant heavy rains claimed 36 lives in Orissa. It also led to the flooding of various districts of Orissa. Seventeen cattles died. In Vidarbha 41 persons and 5 cattles died. Many crops were damaged. Three thousand families were affected in Andhra Pradesh.

4.2. Deep Depression over the northwest Bay (2 – 5 August 2006)

4.2.1. Life cycle

Under the influence of an upper air cyclonic circulation, a low pressure area formed over the north Bay off West Bengal – Orissa coasts on 1 August, which became well marked over there in the evening. It concentrated into a Depression and lay centred at 0300 UTC of 2, near Lat. 20.5° N / Long. 87.5° E. Drifting southwestwards, it intensified into a Deep Depression and lay centred at 0900 UTC of 2, near Lat. 20.0° N / Long. 87.0° E and at 1200 UTC near Lat. 20.0° N / Long. 86.5° E. Drifting slightly westsouthwestwards, it crossed south Orissa coast between Puri and Gopalpur around 0300 UTC of 3; when it lay centred near Lat. 19.5° N / Long. 85.0° E about 50 km northnortheast of Gopalpur. Further moving westwards and then northwestwards, it lay centred near: Lat. 19.5° N / Long. 84.0° E at 1200 UTC of 3; Lat. 20.0° N / Long. 82.5° E at 0300 UTC of 4 and after weakening into a Depression at 1200 UTC, it lay near Lat. 21.0° N / Long. 81.0° E. It lay near Lat. 21.0° N / Long. 80.0° E at 0300 UTC of 5. It further weakened into a well marked low over Vidarbha and adjoining southwest Madhya Pradesh in the evening of 5. It lay over: north Madhya Maharashtra and adjoining areas of Vidarbha and southwest Madhya Pradesh on 6 morning; southwest Madhya Pradesh and adjoining north Madhya Maharashtra on 6 evening and over west Madhya Pradesh and neighbourhood on 7. Further weakening into a low pressure area it lay over northwest Madhya Pradesh and adjoining east Rajasthan during 8 to 11; moved over to southeast Rajasthan and neighbourhood on 12; over southeast Rajasthan on 13 and merged with the heat low on 14.

4.2.2. Satellite cloud features and other observations

The maximum intensity of the system as reported by Kalpana - 1 imagery was T-2.0 from 0300 UTC to 0600 UTC of 3.

4.2.3. Other features observed

The maximum mean estimated wind speed was 30 kts. The system moved initially in a westsouthwesterly direction and crossed south Orissa coast between Puri and Gopalpur around 0300 UTC of 3.

The westsouthwestward movement of the system along the coast was rather unusual. It had showed mixed up characteristics of a Cyclonic Storm and a monsoon Depression viz., (i) No vertical tilt, (ii) intensification with height, as in a cold core system, (iii) very narrow core and (iv) strong winds, steep pressure gradient and thus more number of closed isobars. After crossing, it moved in a westerly direction.

4.2.4. Weather and damage

Widespread rainfall activity with isolated extremely heavy and scattered heavy rainfall occurred over: Orissa from 1 – 4 August; Vidarbha from 3 – 7 August; Andhra Pradesh from 3 – 5 August; Chattisgarh from 3 – 5 August; west Madhya Pradesh from 5 – 9 August and Marathwada from 4 – 7 August.

The chief amounts of rainfall (cm) are :

Orissa

- 01 Aug 2006 : Akhuapada 14, Keonjhar 12
- 02 Aug 2006 : Baliguda 25, Kotagarh 16
- 03 Aug 2006 : Jeypore & Koraput 23 each, Komna & Pottangi 20 each
- 04 Aug 2006 : Pottangi 32, Malkangiri 29, Jeypore 22, Koraput 21

Chattisgarh

- 03 Aug 2006 : Gariaband 10, Dantewada 9
- 05 Aug 2006 : Konta 11

West Madhya Pradesh

- 05 Aug 2006 : Khargaon 14
- 06 Aug 2006 : Khargaon 20, Manawar 12
- 07 Aug 2006 : Sendhawa 29, Badwani 15
- 08 Aug 2006 : Badnagar 13, Ratlam 11
- 09 Aug 2006 : Mandsaur 17, Agar 10

Andhra Pradesh

03 Aug 2006 : Vizianagaram 21, Ranasthalam
20, Kalingapatnam 19

04 Aug 2006 : Koida 36, Kaleswaram 29

05 Aug 2006 : Kaleswaram 63, Utnoor 31,
Kamareddy 28

06 Aug 2006 : Mudhol 14, Nirmal 13

Vidarbha

05 Aug 2006 : Darwha 22, Yeotmal 17

06 Aug 2006 : Washim 25, Mangrulpir 23,
Chikhali 22, Buldhana 20

07 Aug 2006 : Buldhana 24, Malkapur, Motala
& Chikhali 21 each

Marathwada

04 Aug 2006 : Hingoli 20

05 Aug 2006 : Purna 21, Hingoli 20, Parbhani
16

06 Aug 2006 : Hingoli 30, Parbhani 28

07 Aug 2006 : Kalamnoori 32, Hingoli 30,
Parbhani 28, Jintoor 26, Pathri
25.

The following damages were reported :

North coastal Andhra Pradesh

Loss of life : 62

Loss of crops : 50,000 acres

Villages submerged : 900

Damage to houses (fully) : 2000

Damage to houses (partly) : 12000

Orissa

Loss of life : 45

No. of houses damaged : 1.05 lakhs

Damage to crops : 6.68 lakh hectares

No. of districts affected : 27 out of 30 districts

Vidarbha

Loss of life : 13

Madhya Pradesh

Loss of life : 55

Road and rail traffic affected.

Marathwada

Loss of life : 76

4.3. Depression over the north Bay (12–13 August 2006)

4.3.1. Life cycle

Under the influence of an upper air cyclonic circulation over the north Bay, a low pressure area formed there by the evening of 11, which concentrated into a Depression and lay centred at 0300 UTC of 12, near Lat. 21.0° N / Long. 88.0° E (about 100 km eastsoutheast of Balasore) and at 1200 UTC near Lat. 21.0° N / Long. 87.5° E. It crossed Orissa coast, close to Balasore around 1500 UTC of 12; weakened into a well marked low and lay over Chattisgarh and neighbourhood on 13; east Madhya Pradesh and neighbourhood on 14 and as a low pressure area over west Madhya Pradesh and adjoining southeast Rajasthan on 15 & 16; Saurashtra & Kutch and adjoining northeast Arabian Sea during 17 - 19 and became less marked on 20.

4.3.2. Satellite cloud features and other observations

The maximum intensity of the system as reported by Kalpana - 1 imagery was T-1.5 from 0900 UTC to 1500 UTC of 12. The vortex continuously moved in a westerly direction and crossed Orissa coast between 1200 UTC and 1500 UTC. The vortex had shear pattern during its life period.

4.3.3. Other features observed

The estimated mean wind speed was 25 kts. The system moved in a westerly direction and crossed Orissa coast around 1500 UTC of 12 close to Balasore.

4.3.4. *Weather and damage*

Widespread to fairly widespread rainfall activity with very heavy to extremely heavy rainfall was reported over Orissa (12–13), Chattisgarh, Vidarbha and east Madhya Pradesh (13–14), west Madhya Pradesh (14–15) and east Rajasthan (15–16).

The chief amounts of rainfall in cms are :

Orissa

12 Aug 2006 : Nimapara & Binika 25 each,
Gope 23, Puri 21

13 Aug 2006 : Binika 40, Bijepur 32.

Chattisgarh

13 Aug 2006 : Simga 33, Mahasamund 31

14 Aug 2006 : Dongargaon 13, Ambagarh
Chowki 11.

East Madhya Pradesh

13 Aug 2006 : Lanji 16, Balaghat 11

14 Aug 2006 : Amarwada 34, Lanji 23.

Vidarbha

14 Aug 2006 : Gondia 24

West Madhya Pradesh

14 Aug 2006 : Hoshangabad 38, Budhani 33,
Bhopal 29

15 Aug 2006 : Shajapur 18, Ratlam 17

East Rajasthan

15 Aug 2006 : Khanpur 18, Sangod 17

16 Aug 2006 : Kherwara 18, Loharia 11

As per press reports, damage due to the system in :

Orissa

Loss of lives : 13

Crops damage : 1.25 lakh hectare

Total people affected : 11 Lakh

Total districts affected : 11

Madhya Pradesh

Total death : 59

Road, rail & air traffic disrupted, houses damaged, about 7 lakh people were evacuated.

In Chattisgarh 6 people lost their lives.

4.4. *Depression over the north Bay (16 – 18 August 2006)*4.4.1. *Life cycle*

Under the influence of an upper air cyclonic circulation, a low pressure area formed over the northwest Bay on 15 evening. It rapidly concentrated into a Depression and lay centred at 0300 UTC of 16 near Lat. 20.5° N / Long. 88.0° E and at 1200 UTC near Lat. 20.5° N / Long. 87.0° E (about 50 km southeast of Chandbali). Moving further westwards, it crossed north Orissa coast close to Chandbali around 1430 UTC of 16 and lay centred at 1500 UTC near Lat. 20.5° N / Long. 86.5° E close to Chandbali. Moving in a northwesterly direction it lay centred at 0300 UTC of 17 near Lat. 22.0° N / Long. 83.5° E (about 100 km east of Champa) and at 1200 UTC near Lat. 22.5° N / Long. 81.0° E (about 80 km west of Pendra). Further moving in a westnorthwesterly direction, it lay centred at 0300 UTC of 18 near Lat. 23.0° N / Long. 78.0° E (about 100 km southeast of Bhopal) and subsequently weakened into a well marked low over northwest Madhya Pradesh and adjoining east Rajasthan in the same evening. It lay as a low pressure area over southeast Rajasthan and adjoining northwest Madhya Pradesh on 19 and over southwest Rajasthan and neighbourhood during 20 – 22. It became less marked on 23.

4.4.2. *Satellite cloud features and other observations*

The maximum intensity reported by Kalpana - 1 imagery was T-1.5 from 0900 to 1700 UTC of 16. The vortex was “band pattern” during its life period.

4.4.3. *Other features observed*

The maximum estimated wind speed was 25 kts. The system moved in a westerly direction and crossed around 1430 UTC of 16 August. After crossing it moved in a westnorthwesterly direction.

4.4.4. *Weather and damage*

The system caused very heavy to extremely heavy rainfall at isolated places with widespread to fairly widespread rainfall activity in Orissa (14 – 16), west Madhya Pradesh (17 – 19), east Rajasthan (19 – 20) and scattered rainfall activity over west Rajasthan (20 – 22).

The chief amounts of rainfall are :

Orissa

- 14 Aug 2006 : Mundali 11
 15 Aug 2006 : Baripada 14, Sukinda 11
 16 Aug 2006 : Nimapara 10

East Madhya Pradesh

- 18 Aug 2006 : Jabalpur 9

West Madhya Pradesh

- 18 Aug 2006 : Hoshangabad 18
 19 Aug 2006 : Ratlam 24, Sailana 20, Shajapur, Agar 19 each

West Rajasthan

- 20 Aug 2006 : Udaipur 10
 21 Aug 2006 : Jaisalmer 14, Barmer 12
 22 Aug 2006 : Barmer 16, Ramsar 21

East Rajasthan

- 19 Aug 2006 : Banswada 23, Danpur 21
 20 Aug 2006 : Kotda 28, Gokunda 21

The damage reported by media in Orissa was

- Total death : 38
 Crop area affected : 1.60 lakh hectares
 Total people affected : 25 lakh
 Total districts affected : 27

Madhya Pradesh

Total death : 11

Many villages were flooded, Traffic disrupted in Madhya Pradesh and Rajasthan.

4.5. *Depression over the northwest Bay (29 August – 1 September 2006)*

4.5.1. *Life cycle*

Under the influence of an upper air cyclonic circulation a low pressure area formed over the north Bay on 27, which became well marked over the northwest Bay off Gangetic West Bengal - Orissa coasts on 28. Subsequently it concentrated into a Depression and lay centred at 0300 UTC of 29 near Lat. 20.5° N / Long. 87.5° E, about 100 km eastsoutheast of Chandbali; crossed Orissa coast near Paradip around noon and lay centred at 1200 UTC near Lat. 21.0° N / Long. 84.5° E, about 100 km southeast of Sambalpur. Moving northwestwards, it lay centred at 0300 UTC of 30 near Lat. 22.0° N / Long. 83.0° E close to Champa and at 1200 UTC, near Lat. 22.5° N / Long. 81.0° E, about 100 km westsouthwest of Pendra. Further moving westnorthwestwards it lay centred at 0300 UTC of 31 August near Lat. 23.5° N / Long. 79.0° E (about 50 km southeast of Sagar) and at 1200 UTC near Lat. 24.0° N / Long. 78.0° E (close to Sagar). Subsequently moving northnorthwestwards, it lay at 0300 UTC of 1 September over east Rajasthan and adjoining northwest Madhya Pradesh near Lat. 26.0° N / Long. 76.5° E (close to Sawai Madhopur) and weakened into a well marked low over there in the evening. It moved over to Haryana and neighbourhood on 2, lay as a low pressure area over Punjab and neighbourhood on 3 and became less marked on 4.

4.5.2. *Satellite cloud features and other observations*

T-2.0 was the maximum intensity reported by Kalpana-1 imagery at 0900 UTC of 29.

4.5.3. *Other features observed*

The maximum estimated wind speed was 30 kts. The system moved in a northwesterly direction and then in a westnorthwesterly direction and crossed Orissa coast around 1000 UTC of 29 August near Paradip. Finally it moved in a northnorthwesterly direction over land maintaining its intensity.

4.5.4. *Weather and damage*

Widespread rainfall activity with very heavy to extremely heavy rainfall at scattered places occurred over Orissa on 29 & 30. Widespread to fairly widespread rainfall activity with isolated heavy to very heavy rainfall also occurred over Chattisgarh on 30 & 31 August, east Madhya Pradesh on 31 August & 1 September; very heavy to extremely heavy rainfall occurred over west Madhya Pradesh on 31 August & 1 September and over east Rajasthan on 1 September. The system as a low pressure area also, gave heavy to very heavy rainfall with widespread rainfall activity over Punjab and Haryana on 2 & 3 September.

The chief amounts of rainfall in cms are:

Orissa

29 Aug 2006 : Baliguda 21
30 Aug 2006 : Bijepur & Tikabali 32 each,
Baliguda 30, Sohela 29,
Dunguripali 23, Phulbani 20

East Madhya Pradesh

31 Aug 2006 : Lanji 16, Narsinghpur 13
01 Sep 2006 : Khurai 9

Chattisgarh

30 Aug 2006 : Kanker 16, Saraipali 14
31 Aug 2006 : Gandaipandra 19

West Madhya Pradesh

31 Aug 2006 : Betul 15, Chincholi 13
01 Sep 2006 : Narsingarh 25, Khilchipur 24,
Bhopal 21, Ganjbasoda 20

East Rajasthan

01 Sep 2006 : Banswara 17, Inlera 13

Haryana

02 Sep 2006 : Tohana 8, Chirag & Delhi 7
each
03 Sep 2006 : Bahadurgarh 7

Punjab

02 Sep 2006 : Amritsar 14, Batala 10
03 Sep 2006 : Amritsar 13, Ferozepur 9

Orissa and Madhya Pradesh reeled under flood situation. Houses were damaged. Traffic disrupted. Floods in Madhya Pradesh took a toll of 9 lives.

4.6. *Depression over the northwest Bay (3 – 4 September 2006)*

4.6.1. *Life cycle*

Under the influence of an upper air cyclonic circulation, a low pressure area formed over the north Bay on 3 early morning, which became well marked in the forenoon, subsequently concentrated into a Depression and lay centred at 1200 UTC near Lat. 20.5° N / Long. 88.5° E (about 180 km southeast of Balasore). Moving in a westnorthwesterly direction, it crossed north Orissa coast close to Chandbali; around 0100 UTC of 4 and lay centred at: 0300 UTC near Lat. 21.0° N / Long. 86.5° E (close to Chandbali); at 1200 UTC near Lat. 22.0° N / Long. 84.5° E (about 50 km east of Jharsuguda). Further it moved northwestwards and weakened into a well marked low over north Chattisgarh and adjoining east Madhya Pradesh on 5 and over west Madhya Pradesh and neighbourhood on 6. It lay as a low pressure area over southwest Rajasthan and neighbourhood on 7 & 8 and moved away westwards on 9.

4.6.2. *Satellite cloud features and other observations*

The maximum intensity of T-1.5 was reported by Kalpana-1 imagery from 0300 UTC of 3 to 0600 UTC of 4.

4.6.3. *Other features observed*

The maximum estimated wind speed was 25 kts. The system moved in a westnorthwesterly direction and crossed Orissa coast around 0300 UTC of 4. It became less marked over north Chattisgarh and adjoining east Madhya Pradesh on 5.

4.6.4. *Weather and damage*

Widespread to fairly widespread rainfall activity with heavy to very heavy rainfall at isolated places occurred over : Orissa on 4 & 5; Chattisgarh on 5; east Madhya Pradesh on 5 & 6, west Madhya Pradesh on 6 & 7; Telangana on 5 & 6 and east Rajasthan on 7. Extremely

heavy and very heavy rainfall at isolated places occurred over west Rajasthan on 8.

The chief amounts of rainfall in cms are :

Orissa

04 Sep 2006 : Gobindpur 15, Jeypur 14,
Pattamundai 13

05 Sep 2006 : Pallahara 13, Bhubaneshwar 12

Chattisgarh

05 Sep 2006 : Balodabazar 12, Amragarh 11

East Madhya Pradesh

05 Sep 2006 : Lanji 11

06 Sep 2006 : Katangi 11

Telangana

05 Sep 2006 : Khammam 7

06 Sep 2006 : Yellandu 7

East Rajasthan

07 Sep 2006 : Banswara 30, Bagidora 29,
Sajangarh 28, Shergarh 27,
Kesarpura 24, Gadhi 22, Danpur
21

West Rajasthan

08 Sep 2006 : Chohtan 14

Four injured in Madhya Pradesh because of a house collapsing in heavy rains.

4.7. Severe Cyclonic Storm (Mukda) over the east central and adjoining northeast Arabian Sea (21-24 September 2006)

4.7.1. Life cycle

Under the influence of an upper air cyclonic circulation over the east central Arabian Sea off south Maharashtra – Goa coasts, a low pressure area formed over there on 15. It lay over the east central Arabian Sea and adjoining Maharashtra coast on 16, over the east central Arabian Sea off north Maharashtra- south Gujarat

coasts on 17 & 18, over south Gujarat coast and adjoining northeast Arabian Sea on 19 and over the northeast Arabian Sea off Saurashtra coast on 20. It concentrated into a Depression and lay centred near Lat. 19.5° N / Long. 66.0° E (about 450 km southwest of Porbandar) at 0300 UTC of 21. It remained practically stationary and intensified into a Deep Depression in the evening, further into a cyclonic storm (Mukda) in the early morning and lay centred near Lat. 20.0° N / Long. 66.0° E (about 400 km southwest of Porbandar) at 0300 UTC of 22. Slightly moving northeastwards, it further intensified into a severe cyclonic storm and lay centred at 1200 UTC near Lat. 20.5° N / Long. 66.5° E (about 350 km southwest of Porbandar) and near Lat. 21.0° N / Long. 67.0° E (about 300 km westsouthwest of Porbandar) at 0300 UTC of 23. Remaining practically stationary over there, it weakened into a cyclonic storm at 1800 UTC of 23, into a Deep Depression at 0300 UTC of 24 and into a Depression over the same area at 1200 UTC of 24. During the mid night of 24, it further weakened into a well marked low pressure area over the northeast and adjoining east central Arabian Sea, persisted there on 25 and started drifting slowly westwards on 26 & 27 and moved away westwards on 28.

4.7.2. Satellite cloud features and other observations

The highest T number of 3.5 was given by Kalpana-1 imageries at 0600 UTC of 22 to 0600 UTC of 23 September. Due to unfavourable conditions, the vortex disorganized at 0900 UTC of 23, when it was centred at Lat. 20.5° N / Long. 67.2° E. The vortex continuously disorganized and remained practically stationary with the following observations :

September

231500 UTC : Lat. 20.5° N / Long. 67.2° E,
T 2.5/ CI 3.0

240000 UTC : Lat. 20.5° N / Long. 67.4° E,
T 2.0/ CI 2.5

241200 UTC : Lat. 20.2° N / Long. 67.0° E,
T 1.5

250000 UTC : Lat. 20.2° N / Long. 67.0° E,
T 1.0

The vortex further organised at 1200 UTC of 26 with intensity T 1.5 centred near Lat. 20.0° N / Long. 66.5° E and then moved in a westerly direction and again disorganized. Fig. 3 shows a satellite imagery of the system, before weakening.

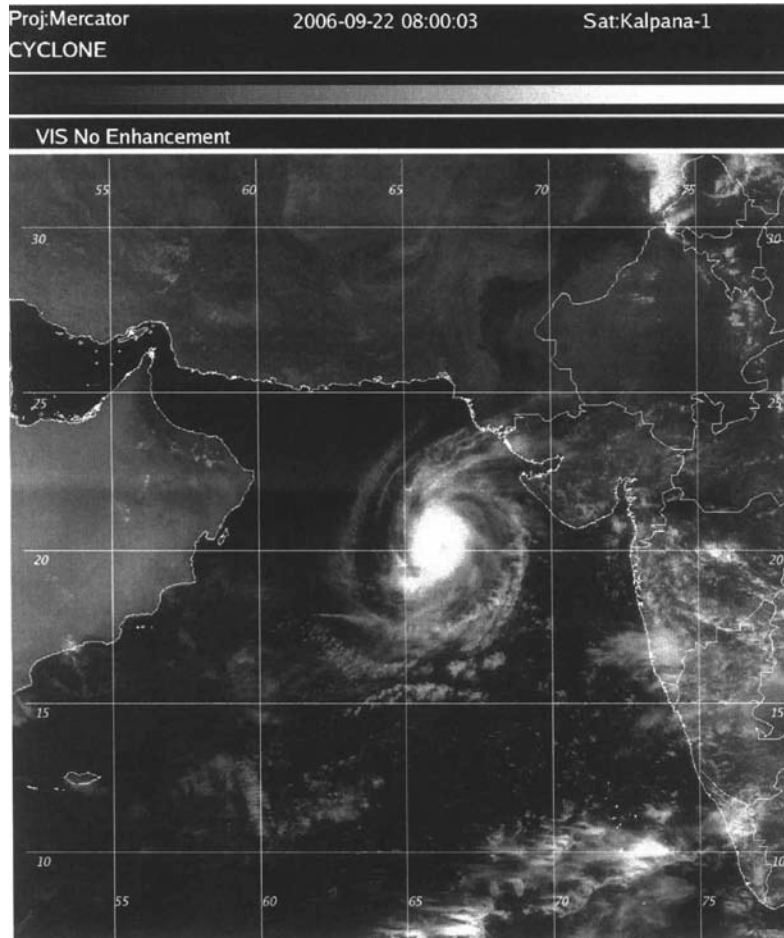


Fig. 3. Satellite imagery of Severe Cyclonic Storm (Mukda) over the east central and adjoining northeast Arabian Sea, (21-24 September 2006)

The system was not tracked by RADAR.

4.7.3. Other features observed

The maximum estimated wind speed was 55 kts. The system moved in a northerly direction and then in a northeasterly direction and dissipated over the sea area.

Though the system was under the influence of a deep upper air westerly trough, the satellite derived wind shear values and its tendency did not seem to be high to cause the weakening. The INSAT derived SST values were also high enough for the sustenance of the system. But the slight strengthening as seen in the cloud organization, after the weakening of the system and the moving away of the trough indicate the influence, it might have had in the *in situ* weakening of the system. Also the influence of cold/dry air advection from the rear of the trough cannot be ruled out as a cause for *in situ* weakening.

Almost all numerical models failed to predict the *in situ* weakening in the beginning. The track prediction error in the forecast position by QLM was 162 km in this case.

4.7.4. Weather and damage

As the system did not cross the coast, no damage was reported from Gujarat State. However, some heavy rainfall occurred at isolated places in Saurashtra & Kutch, which are :

21 Sep 2006	: Upleta 7
22 Sep 2006	: Lodhika 7
24 Sep 2006	: Jodia 8
25 Sep 2006	: Upleta 10

4.8. *Land Depression over Jharkhand (21 – 24 September 2006)*

4.8.1. *Life cycle*

A low pressure area formed over the northeast Bay off Arakan coast and adjoining east central Bay on 18 evening. It lay over the northeast Bay on 19 and became well marked over there in the evening. It lay over Gangetic West Bengal and adjoining northwest Bay on 20 and concentrated into a Depression which lay centred close to Jamshedpur on 21. It moved slightly northwestwards and lay centred over Jharkhand, about 50 km east of Ranchi on 22. Moving slightly northeastwards, it lay centred close to Dhanbad on 23. It weakened into a well marked low pressure area over Bihar and neighbourhood on 24 morning, lay as a low pressure area over there on 25 & 26 and became less marked on 27.

4.8.2. *Satellite cloud features and other observations*

Satellite and RADAR observations were not available, as the system formed over land.

4.8.3. *Other features observed*

The system was a well-marked low pressure area over the Sea and concentrated into a Depression over land, close to Jamshedpur. The system moved in a northwesterly direction and became less marked over Bihar and neighbourhood.

4.8.4. *Weather and damage*

Widespread rainfall activity with heavy to very heavy rainfall over West Bengal from 20 to 25; Jharkhand from 21 to 23 and over Bihar from 22 to 25 (extremely heavy rainfall at isolated places on 25).

The chief amounts of rainfall (cm) are :

Gangetic West Bengal

20 Sep 2006	: Burdwan 9
21 Sep 2006	: Durgachak 21, Canning Town 14
22 Sep 2006	: Tantloi & Kolkata 21 each, Kolkata AP 18
23 Sep 2006	: Tantloi 17, Suri 13
25 Sep 2006	: Tantloi 11

Sub-Himalayan West Bengal & Sikkim

22 Sep 2006	: Malda 7
23 Sep 2006	: Darjeeling 13
24 Sep 2006	: Darjeeling 18, Sevoke 11
25 Sep 2006	: Darjeeling 10

Bihar

22 Sep 2006	: Jamshedpur 11
23 Sep 2006	: Ranchi 13
24 Sep 2006	: Bhagalpur 18
25 Sep 2006	: Motihari 30, Muzaffarpur 27

In West Bengal, 61 people died, Lakhs of people were rendered homeless and crops damaged. In Bihar, heavy to very heavy rain took a toll of 37 lives. In Jharkhand, many houses were damaged and transport disrupted.

The heaviest rain in the past 23 years brought Kolkata city under water.

4.9. *Depression over the east central and adjoining northwest Bay (28–30 September 2006)*

4.9.1. *Life cycle*

A low pressure area lay over the east central and adjoining northeast Bay off Arakan coast on 27; over the east central and adjoining northeast Bay on 28 morning; became a well marked low pressure area at 0600 UTC and concentrated into a Depression over the east central Bay at: 0900 UTC near Lat. 18.0° N / Long. 89.0° E (about 380 km southeast of Paradip); 1200 UTC near Lat. 18.5° N / Long. 88.5° E and at 0300 UTC of 29, it lay over the northwest and adjoining central Bay near Lat. 19.0° N / Long. 86.0° E (about 125 km eastsoutheast of Gopalpur). Moving in a westerly direction, it crossed the coast close to Gopalpur near Lat. 19.0° N / Long. 84.5° E around 1200 UTC. It continued to move westwards, weakened into a well marked low over south Chattisgarh and neighbourhood at 0300 UTC and moving further westwards, it lay over Vidarbha and adjoining south Chattisgarh at 1200 UTC of 30 September and as a low pressure area over Madhya Maharashtra and adjoining Vidarbha on 1 October and became less marked on 2.

4.9.2. *Satellite cloud features and other observations*

The maximum intensity of T 2.0 was given by Kalpana - 1 imagery from 1200 UTC of 28 to 0900 UTC of 29.

4.9.3. *Other features observed*

The maximum estimated wind speed was 30 kts. The system moved in a westnorthwesterly direction and crossed Orissa coast, south of Gopalpur.

4.9.4. *Weather and damage*

Widespread rainfall activity with very heavy to extremely heavy rainfall was reported in Orissa on 29 & 30 September. Widespread to fairly widespread rainfall activity with heavy rainfall was also reported over Chattisgarh on 30 September and on 1 October.

The chief amounts in cms are :

Orissa

29 Sep 2006 : Puri 12, Krishnaprasad, Bhavanipatna 11
30 Sep 2006 : Navrangpur 25, Umerkote 23, Cuttack 20, Mahendragarh 17

Chattisgarh

30 Sep 2006 : Kanker 7

Vidarbha

01 Oct 2006 : Chandur 7

Damage due to the system was nil from the above regions.

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

Only one cyclonic storm formed during the season. The details are given below.

5.1. *Cyclonic Storm (Ogni) over the west central Bay (29 - 30 October 2006)*

5.1.1. *Life cycle*

A Depression formed over the west central Bay at 0000 UTC of 29 and lay centred near Lat. 14.0° N / Long. 80.5° E (about 50 km east of Nellore). It moved slightly

northwards and intensified into a Deep Depression at 0900 UTC of 29 near Lat. 15.0° N / Long. 80.5° E (about 50 km east of Kaveli). Remaining practically stationary, it further intensified into a Cyclonic Storm (Ogni) at 1200 UTC of 29. Moving slightly northnorthwestwards, it lay centred near Lat. 15.6° N / Long. 80.3° E (close to Ongole) at 0300 UTC of 30. It continued to move in a northnorthwesterly direction, weakened into a Deep Depression at 0600 UTC of 30, near Lat. 15.7° N / Long. 80.3° E and crossed south Andhra coast between Ongole and Bapatla by noon. Moving further in a northerly direction, it weakened into a Depression at 0900 UTC near Lat. 15.8° N / Long. 80.3° E and into a well marked low pressure area at 1200 UTC over south coastal Andhra Pradesh and neighbourhood. It rapidly weakened and became less marked thereafter.

5.1.2. *Satellite cloud features and other observations*

The maximum intensity as given by Kalpana-1 imagery was T-2.5 from 1500 UTC of 29 to 0600 UTC of 30. As per satellite observations the system disorganized at 1000 UTC of 30 over land. The system was tracked by Kalpana - 1, DWR Chennai, Machilipatnam and Sriharikota.

The DWR reports are summarized below. Also two imageries obtained by the DWR Machilipatnam are shown in Fig. 4.

<i>Centres (Lat. °N/ Long. °E) fixed by Date/Time</i>	<i>DWR Chennai</i>	<i>DWR Sriharikota</i>	<i>DWR Machilipatnam</i>
	<i>Lat. °N / Long. °E</i>		
290300	14.5/80.4 Max. wind 30 mps at 1.89 km	14.5/80.4	14.4/80.0
290600	14.8/80.3 Max. wind 38 mps at 2.93 km	14.8/80.3	14.7/80.3
290900	15.0/80.2 Max. wind 34 mps at 3.59 km	15.0/80.2	15.0/80.3
291100		15.0/80.2	
291200	15.1/80.2 Max. wind 38 mps at 3.85 km	15.3/80.3	15.1/80.3
291500	15.2/80.2 Max. wind 25 mps at 4.46 km	15.3/80.3	15.2/80.3

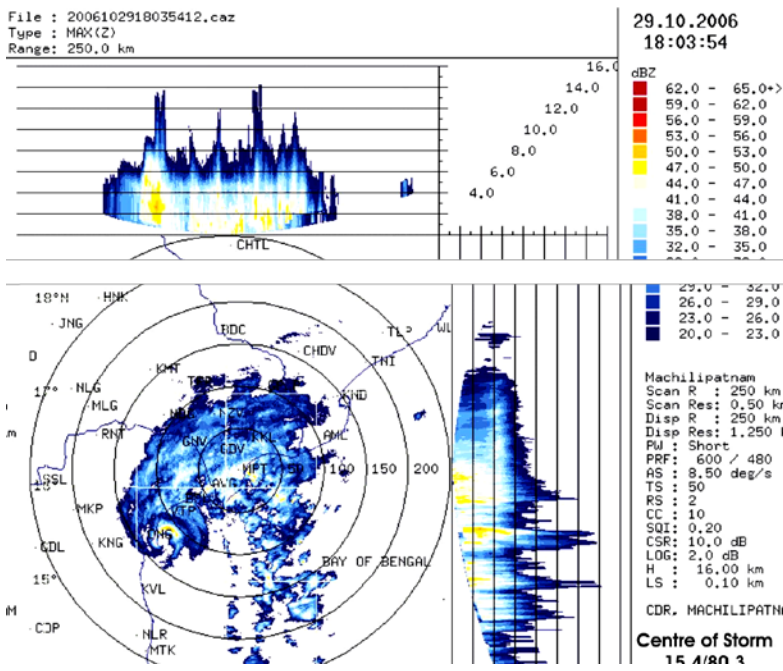
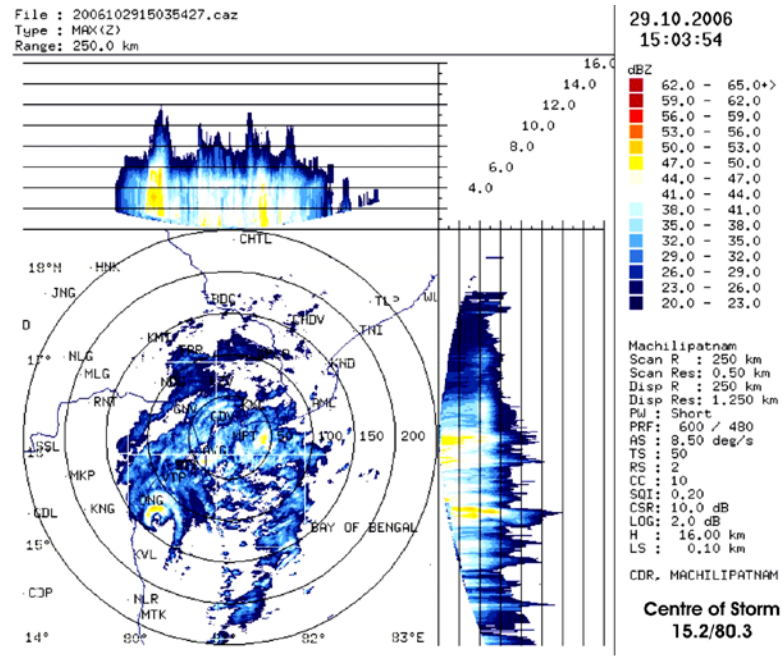


Fig. 4. Imageries of "Ogni" by DWR Machilipatnam

291800	15.4/80.2	15.4/80.2	15.4/80.3	300300	15.6/80.3	15.6/80.3
292100	15.5/80.2	15.5/80.3	15.5/80.3	300600	15.6/80.2	15.7/80.3
300000	15.5/80.2	15.5/80.2	15.5/80.3	300900	-	15.7/80.3

DWR Chennai also reported that, the features of cyclonic storm like spiral bands, eye-wall region, eye etc. were seen more prominently and well-defined between 281500 UTC to 291200 UTC. Midway through its course, the system was closest to the coast near Chennai. Speed of the system was more than 20 kmph and eventually slowed down before crossing the coast. Maximum reliable record of wind speed was about 38 mps between levels 3 and 4 km from 290600 UTC to 291200 UTC. The strong winds experienced by the fishermen away from the coast indicate that though the system core was narrow, the wind speed over the eyewall region at sea level was quite strong as indicated in the PPV images.

As per DWR SHAR, general maximum velocities recorded was about 35 mps.

According to DWR Machilipatnam, about 4 to 5 spiral bands could be seen. "Eye" of the storm was sometimes full and sometimes partial. Maximum wind speed in the eyewall region was 38 mps at 1.5 – 2 km height at 1500-2300 UTC of 29. Speed of the storm was 10 kmph from 290000 UTC to 290900 UTC.

5.1.3. *Other features observed*

The maximum estimated wind speed was 35 kts. Moving fast in a northerly direction, the system skirted north Tamil Nadu – south Andhra coast for about 500 kms in two days and crossed Andhra coast between Ongole and Bapatla around 0730 UTC of 30 as a deep depression. The system had slowed down before crossing. Surface Observation of Machilipatnam:

Maximum surface winds - east/20 kts at 300200

Lowest surface pressure - 1007.9 hPa at 291000 UTC

Highest surface pressure fall - 1.9 hPa at 290000 UTC

5.1.4. *Weather and damage*

Fairly wide spread to wide spread rainfall activity with heavy to very heavy rain at a few places and (extremely heavy rainfall at isolated places) over south

coastal Andhra Pradesh from 28 October – 3 November and over Tamil Nadu from 26 – 29 October.

The chief amounts of rainfall in cms are :

Andhra Pradesh

28 Oct 2006 : Palasa 11

29 Oct 2006 : Ongole 19, Amalapuram, Kakinada & Kandukur 13 each

30 Oct 2006 : Avanigadda 35, Repalle 28, Machilipatnam 27, Bapatla 20, Amalapuram 16

31 Oct 2006 : Gudivada 55, Machilipatnam 34, Avanigadda 32, Narsapur 22, Repalle & Vijaywada 19 each

01 Nov 2006 : Machilipatnam 17, Chinoor 12

02 Nov 2006 : Dharmavaram 11

03 Nov 2006 : Kalyandurg 19, Avanigadda 11

Tamil Nadu

26 Oct 2006 : Chennai & Red Hills 14 each

27 Oct 2006 : Parangipettai 14, Cuddalore 12

28 Oct 2006 : Panruti 16, Kovilpatti 15, Chennai 14

29 Oct 2006 : Chennai 19, Tiruvallur 18, Red Hills 13

According to media reports, the storm claimed 28 lives and about 35,000 livestock. It disrupted road/rail traffic. Crops in thousands of hectares were submerged in Prakasam, Guntur & Krishna

districts. Strong winds were experienced by fishermen even far away from the coast and some of them were missing during the period 29 October to 2 November.
