

Cyclones and depressions over the north Indian Ocean during 2009*

1. Introduction

During 2009, 8 cyclonic disturbances formed over the Indian seas. These include one Severe Cyclonic Storm (AILA), three Cyclonic Storms (BIJLI, PHYAN and WARD), two Deep Depressions and two Depressions. Out of these, 2 systems *viz.*, the Severe Cyclonic Storm (AILA) and the Cyclonic storm (BIJLI) occurred during the pre-monsoon season, four systems (2 Deep Depressions and 2 Depressions) occurred during the southwest monsoon season and two Cyclonic Storms (PHYAN and WARD) occurred during the post-monsoon season.

The Severe Cyclonic Storm (AILA) crossed West Bengal coast near Sagar Island. The cyclonic storm (PHYAN) crossed Maharashtra coast between Alibag and Mumbai. As many as 7 Cyclonic Storms including 5 Severe Cyclonic Storms have crossed Maharashtra-Goa coasts during the period 1891-2008. Out of these, 2 occurred during the pre-monsoon season and the remaining 5 during the post monsoon months *viz.*, October & November. In the year 1966, one Severe Cyclonic Storm (8-14 November) crossed Maharashtra coast about 200 kilometers south of Mumbai. Another severe cyclonic storm crossed coast, a little to the south of Mumbai on 16 October 1940.

The Cyclonic Storm (BIJLI) crossed Bangladesh coast near Chittagong. The Cyclonic Storm (WARD) struck Sri Lanka coast near Trincomalee as a Deep depression. The Cyclonic Storm "Ward" moved very slowly, initially northwards and then west southwestwards across Sri Lanka.

Two Depressions each, formed during the monsoon season over the Bay of Bengal and over the Arabian Sea.

The track/intensity of these systems is depicted in Fig. 1. A brief history and monthly distribution are given in Tables 1 & 2. The relevant ship and buoy observations are given in Table 3. Detailed season-wise description of these systems is given in the following sections.

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

No intense system formed during the season.

3. Disturbances formed during the Pre Monsoon Season (March to May)

Two intense systems *viz.*, the Severe Cyclonic Storm (AILA) and the Cyclonic Storm (BIJLI) formed during the season. The details are as follows.

3.1. Cyclonic Storm (BIJLI) over the Bay of Bengal (14 – 17 April 2009)

3.1.1. Life cycle

A low pressure area formed over the southeast Bay of Bengal and neighbourhood on 13. It became well marked over there on 14. It subsequently concentrated into a Depression near Lat. 12.5° N / Long. 88.0° E (about 700 km southeast of Visakhapatnam) at 0900 UTC of 14 and remained practically stationary over there until 1200 UTC. Moving slowly northwest-wards, it lay near Lat. 13.5° N / Long. 87.5° E (about 650 km southeast of Visakhapatnam) at 0300 UTC of 15. Further it intensified into a Deep Depression near Lat. 14.0° N / Long. 87.5° E at 0600 UTC of 15 and intensified into Cyclonic Storm (Bijli) near Lat. 15.0° N / Long. 86.5° (about 470 km southeast of Visakhapatnam) at 1200 UTC. Continuing its movement in northwesterly direction it lay centred at 0300 UTC of 16 near Lat. 17.0° N / Long. 86.0° E about 300 kms eastsoutheast of Visakhapatnam. It moved further in a northeasterly direction and lay centred at 1200 UTC of 16 near Lat. 18.5° N / Long. 86.5° E about 200 kms south of Paradip, and at 0300 UTC of 17 near Lat. 20.5° N / Long. 88.5° E about 150 kms south of Digha. Continuing to move in a northeasterly direction, it weakened into a Deep Depression and lay at 0900 UTC of 17, near Lat. 21.5° N / Long. 89.5° E about 200 kms eastsoutheast of Digha. Further, it moved in an easterly direction and weakened into a Depression at 1200 UTC of 17 near Lat. 21.5° N / Long. 90.0° E about 250 kms eastsoutheast of Digha. It moved further northeastwards and crossed Bangladesh coast near Chittagong (Lat. 22.2° N / Long. 91.8° E) at 1600 UTC of 17 and weakened into a well marked low pressure area over Bangladesh and adjoining Mizoram & Tripura at 1800 UTC on 17. It further weakened and became unimportant at 0300 UTC on 18.

3.1.2. Satellite cloud features and other observations

The system was mainly tracked by satellite. The maximum intensity of T. No. 2.5 was reported from 1200

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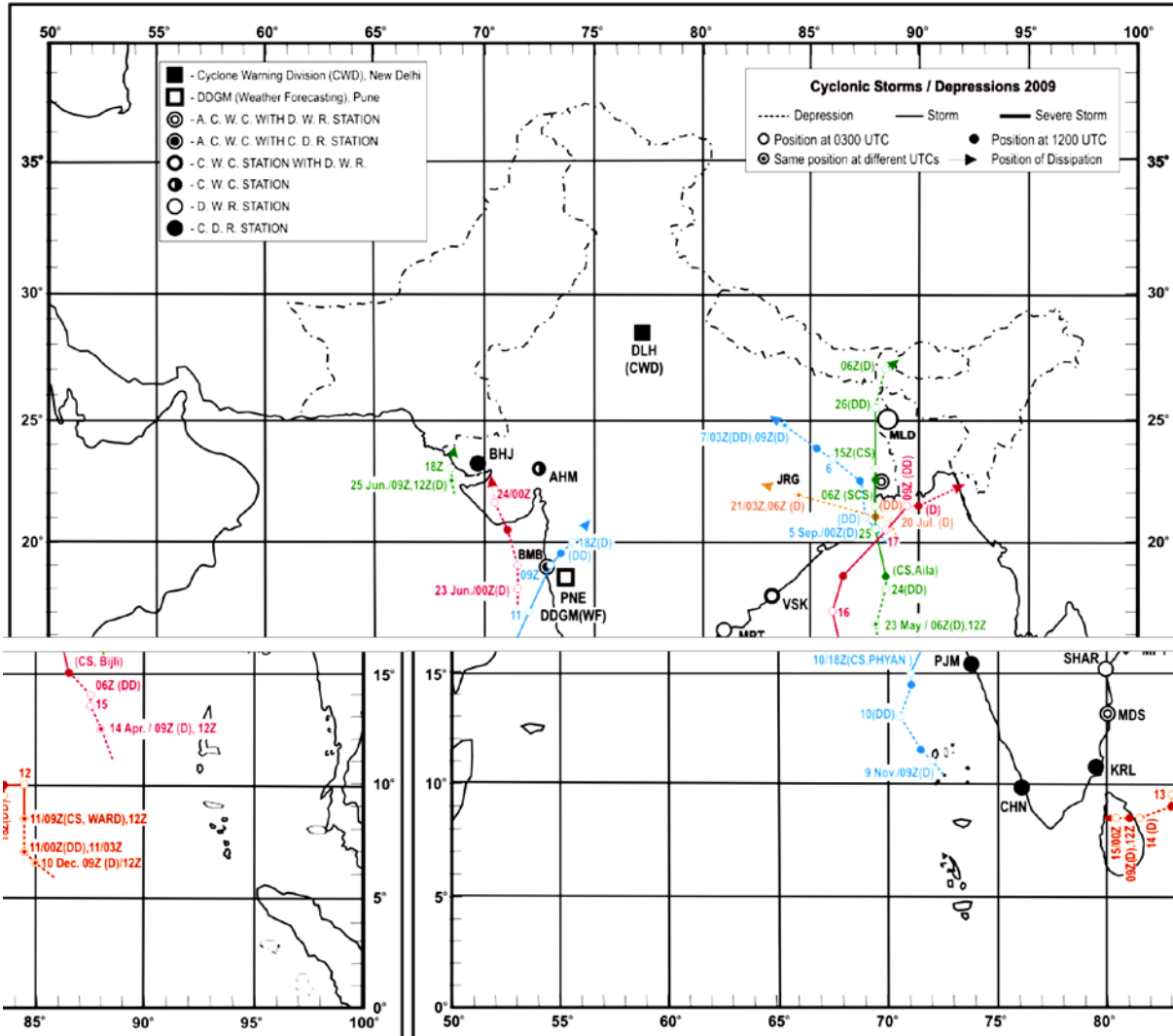


Fig. 1. Tracks of cyclonic storms/depressions - 2009

of 15 to 0700 UTC of 17 (Fig. 2). As per satellite observations, the system crossed the southeast Bangladesh coast at 2100 UTC of 17 and lay over land with centre 21.6° N / 92.0° E.

DWR Visakhapatnam : The centre of the storm was estimated from the spiral bands and was reported with poor confidence. No eye wall was observed during the observation.

CDR Paradip : The centre of the system was reported from 0100 UTC of 16 with poor/fair confidence based on the spiral/curved line features. One patch of cloud which caused weather over Paradip moved fast after 1900 UTC of 16.

Prominent spirals were seen from 0300 UTC of 16 and centres were fixed with fair confidence. The echo strength observed to be reduced from 2000 UTC of 16 and no centre could be defined from 2200 UTC of 16 to 0200 UTC of 17. The organisation of cloud mass was seen at 0300 UTC of 17 with one spiral and centres were given from 0300 UTC to 0700 UTC of 17.

3.1.3. Other features observed

The lowest Estimated Central Pressure (ECP) was 994 hPa. The maximum estimated mean wind speed was 40 kts. The system moved initially in northwesterly direction, then northerly and then re-curved into northeasterly direction and crossed Bangladesh coast near

TABLE 1

Brief history of cyclonic storms and depressions over the Indian seas and neighbourhood during 2009

S. No.	Category	Life Period	Place / Time of landfall	Lowest Estimated central Pressure (hPa)	Max. wind (Estimated/observed) (kts)	Highest "T" No.
1.	Cyclonic Storm (BJLI)	14 - 17 Apr	Crossed Bangladesh coast near Chittagong at 1600 UTC of 17	994	40	2.5
2.	Severe Cyclonic Storm (AILA)	23 - 26 May	Crossed West Bengal coast near Sagar Island between 0800 and 0900 UTC of 25	967	60	3.5
3.	Depression	23 - 24 Jun	South Gujarat coast, near Diu, around 1400 UTC of 23	-	-	1.5
4.	Depression	25 - 26 Jun	-	-	-	1.5
5.	Deep Depression	20 - 21 Jul	North Orissa-West Bengal coasts between Balasore and Digha between 1600 and 1700 UTC of 20.	988	35	1.5
6.	Deep Depression	5 - 7 Sep	West Bengal coast near Digha between 0700 and 0800 UTC of 5.	986.2	30	2.0
7.	Cyclonic Storm (PHYAN)	9 - 12 Nov	Maharashtra coast between Alibaug and Mumbai between 1000 UTC and 1100 UTC of 11.	988	45	2.5
8.	Cyclonic Storm (WARD)	10 - 15 Dec	North Sri Lanka near Trincomalee between 0800 and 0900 UTC of 14.	996	45	3.0

TABLE 2

Storms / depressions statistics 2009

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	-	1	-	-	-	2	
Cyclonic Storms	-	-	1	-	-	-	-	-	-	-	1	2	
Severe Cyclonic Storms	-	-	-	1	-	-	-	-	-	-	-	1	
Very Severe Cyclonic Storms	-	-	-	-	-	-	-	-	-	-	-	-	
Super Cyclonic Storms	-	-	-	-	-	-	-	-	-	-	-	-	
Total	-	-	1	1	-	1	-	1	-	-	1	5	
Land Depression													
Deep Depressions	-	-	-	-	-	-	-	-	-	-	-	-	
Over Arabian Sea													
Depressions/Deep Depressions	-	-	-	-	2	-	-	-	-	-	-	2	
Cyclonic Storms	-	-	-	-	-	-	-	-	-	1	-	1	
Severe Cyclonic Storms	-	-	-	-	-	-	-	-	-	-	-	-	
Very Severe Cyclonic Storms	-	-	-	-	-	-	-	-	-	-	-	-	
Super Cyclonic Storms	-	-	-	-	-	-	-	-	-	-	-	-	
Total	-	-	1	1	2	1	-	1	-	1	1	8	

TABLE 3
Crucial Ship/buoy observations during the storm/depression periods 2009

Call Sign	Date/Time (UTC)	Position of the Ship		Wind		Pressure PPPP (hPa)
		Lat. (Deg. N)	Long. (Deg. E)	Dir. (Deg.)	Speed (kts)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A) Cyclonic Storm BJLI over the Bay of Bengal (14 – 17 April 2009)						
VTZJ	14/1200	12.5	84.2	000	15	1007.0
ATSJ	15/0000	11.4	83.7	330	05	1009.5
ONEU	16/1200	14.9	85.7	250	15	999.0
(B) Severe Cyclonic Storm AILA over the Bay of Bengal (23 – 26 May 2009)						
DAJL	24/1200	14.8	94.2	200	35	1002.9
DAJL	25/0000	17.3	93.0	200	30	1001.0
(C) Depression over the east central Arabian Sea (23 – 24 June 2009)						
Ship	23/0000	14.9	68.9	200	20	1005.8
(D) Cyclonic Storm (PHYAN) over southeast and adjoining east central Arabian Sea (9 – 12 November)						
A8IE6	09/1200	14.7	67.6	0000	15	1002.0
OXORZ	09/1200	8.9	70.3	225	25	1001.5
MYJM3	10/0000	8.5	70.6	225	30	1002.2
VTXK	10/1200	10.0	67.6	290	35	1004.8
A*IE4	10/1200	12.9	60.0	310	20	1006.5
MYMJ	10/1200	7.6	73.6	225	25	1003.0
A8LP6	10/1200	20.5	64.2	020	15	1006.0
SHIP	11/0000	17.1	68.3	0000	25	999.0
9VAYG	11/0000	13.1	69.2	320	15	1000.0
A8CG7	11/0000	11.8	74.5	270	10	1003.4
(E) Cyclonic Storm (WARD) over southwest and adjoining southeast Bay of Bengal (10 – 15 December)						
DPUW	10/1200	5.6	84.2	270	20	1006.0
DQXQ	10/1200	6.1	90.6	110	10	1009.5
SBLW	10/1200	6.0	86.7	180	20	1006.6
VVJ7	11/0000	5.9	84.6	260	15	1009.3
DDZCZ	11/0000	5.7	82.7	320	20	1018.3
DFGX2	11/0600	5.7	84.0	290	15	1008.5
VWSZ	11/0600	14.6	84.9	045	40	1010.6
WKPF	12/0000	10.1	82.2	040	13	1006.3
SBLW	12/0000	6.8	77.8	360	21	-
WRYC	12/1200	6.0	84.0	180	25	1007.5
WKPF	12/1200	5.8	80.3	290	20	1005.0
MYMJ3	13/0000	6.0	86.8	130	17	1010.6
A8IV9	13/1200	9.8	82.4	350	08	1007.5
OHOH	13/1200	5.7	85.0	180	20	1008.5
ATMG	13/1200	9.5	81.7	070	40	1006.5
PHPQ	13/1200	9.5	81.7	270	15	1010.9
AUFI	14/0000	6.7	77.1	050	24	1014.0

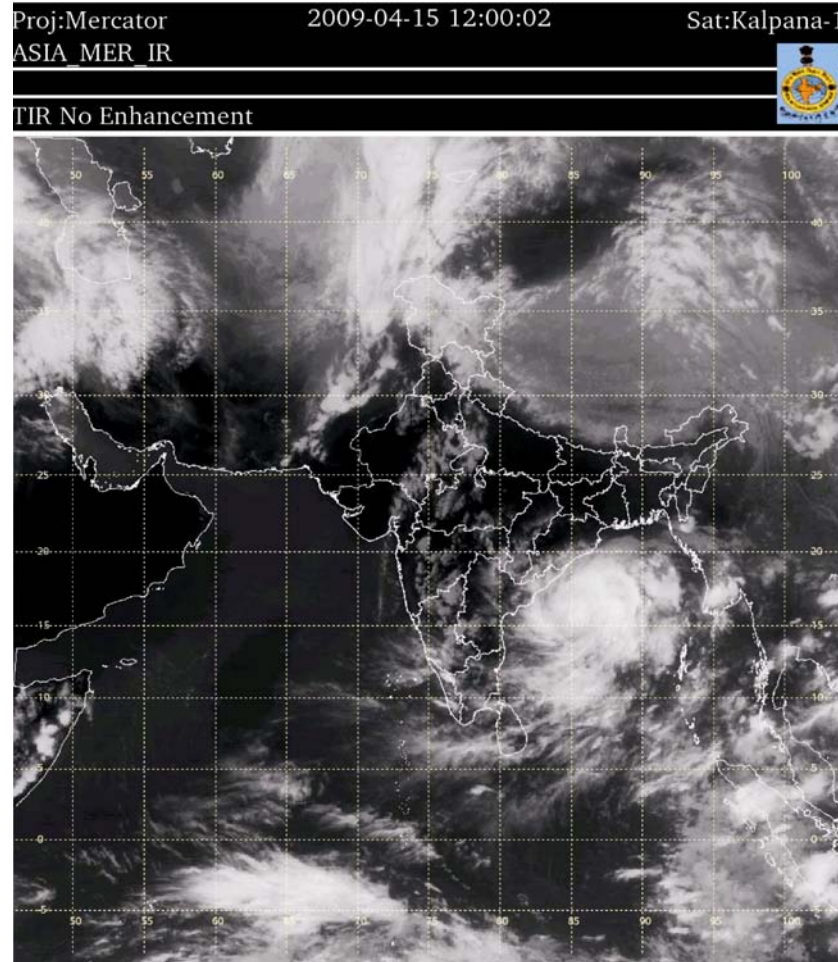


Fig. 2. Satellite imagery of cyclonic storm 'BILLI'

Lat. 22.2° N / Long. 91.8° E south of Chittagong around 1600 UTC of 17.

3.1.4. *Weather and damage caused*

As the system moved away from the east coast of India, it did not affect the weather over the country.

3.2. *Severe Cyclonic Storm (AILA) over the Bay of Bengal (23 – 26 May 2009)*

3.2.1. *Life cycle*

A low pressure area formed over the east central Bay of Bengal and neighbourhood on 22. It became well marked over the west central Bay of Bengal and neighbourhood on 23 morning, concentrated into a

Depression and lay centred at 0600 UTC of 23, near Lat. 16.5° N / Long. 88.0° E (about 470 km southsoutheast of Paradip). It remained practically stationary until 23 night and thereafter, it moved generally in a northeasterly direction. It intensified into a Deep Depression and lay centred at 0300 UTC of 24, near Lat. 18.0° N / Long. 88.5° E and into a Cyclonic Storm (Aila) which lay centred at 1200 UTC of 24, near Lat. 18.5° N / Long. 88.5° E. It lay centred at 0300 UTC of 25, near Lat. 20.5° N / Long. 88.0° E and further intensified into a Severe Cyclonic Storm at 0600 UTC, near Lat. 21.5° N / Long. 88.0° E (close to Sagar Islands). Subsequently, it crossed West Bengal coast, close to Sagar Islands between 0800 & 0900 UTC and lay centred at 1200 UTC of 25, near Lat. 22.5° N / Long. 88.0° E close to Kolkata. Moving further northwards, it weakened into a Cyclonic Storm and lay centred at 1500 UTC, near Lat. 23.0° N / Long. 88.0° E,

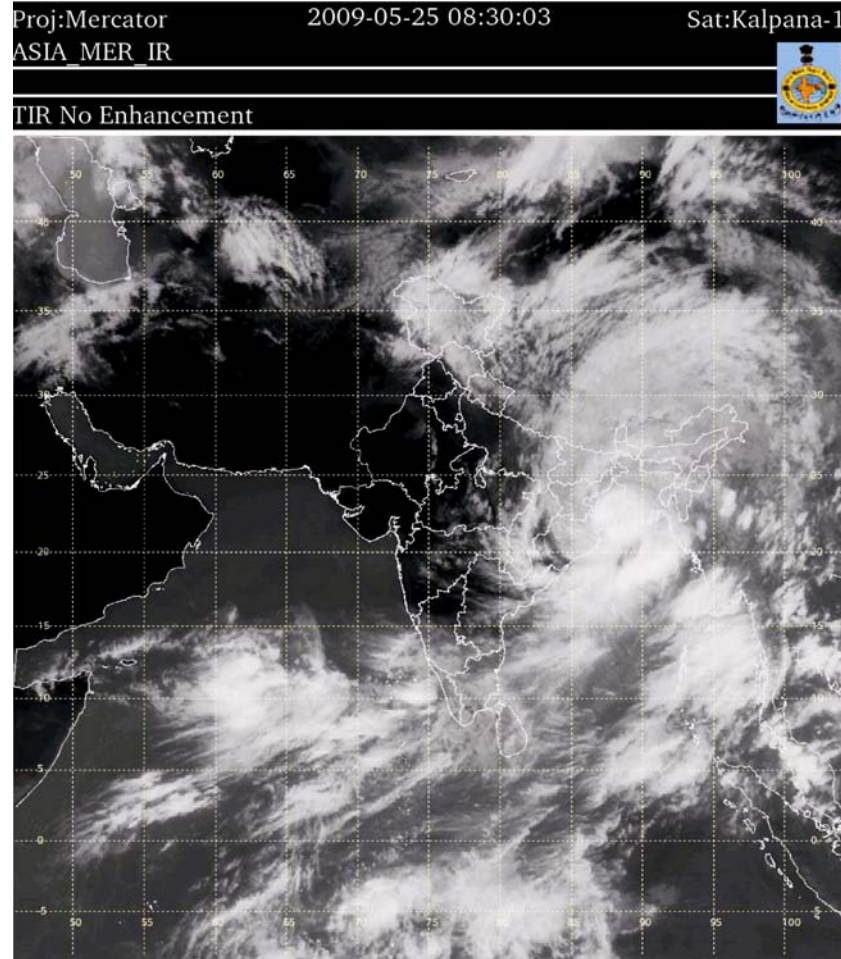


Fig. 3. Satellite imagery of cyclonic storm 'AILA'

about 50 km north of Kolkata and into a Deep Depression, which lay centred at 0300 UTC of 26, near Lat. 25.5° N / Long. 88.0° E about 50 km north of Malda. It further weakened into a Depression at 0600 UTC of 26, centered near Lat. 27.0° N / Long. 88.5° E and into a well marked low pressure area over Sub-Himalayan West Bengal & Sikkim and neighbourhood by 0900 UTC of 26 and became less marked in the evening.

3.2.2. *Satellite cloud features and other observations*

The system was tracked by satellite and RADAR. The maximum intensity of T. No. 3.5 was reported from 0600 to 0800 UTC of 25. There were mainly two intense zones of convection in association with the system, one to the northwest and the other to the southeast of the centre.

There was a weak convection zone at the centre. It was also supported by the rainfall distribution. As the system moved inland in a northerly direction and weakened gradually, the two convective zones went apart from each other with one lying over sub-Himalayan West Bengal and neighbourhood and the other lying over Bangladesh. The minimum cloud top temperatures were about -70° to -80° C in association with the system. As per the satellite account also, the cyclonic storm crossed the land near 22.0° N / 88.3° E at 0830 UTC of 25 May with intensity T 3.5. (Fig. 3).

The Severe Cyclonic Storm, (AILA) was tracked by conventional Cyclone Detection Radar (CDR) at Paradip and Doppler weather Radar (DWR), Kolkata. Both the radars could locate the system centre as the system moved nearer to the radar centre.

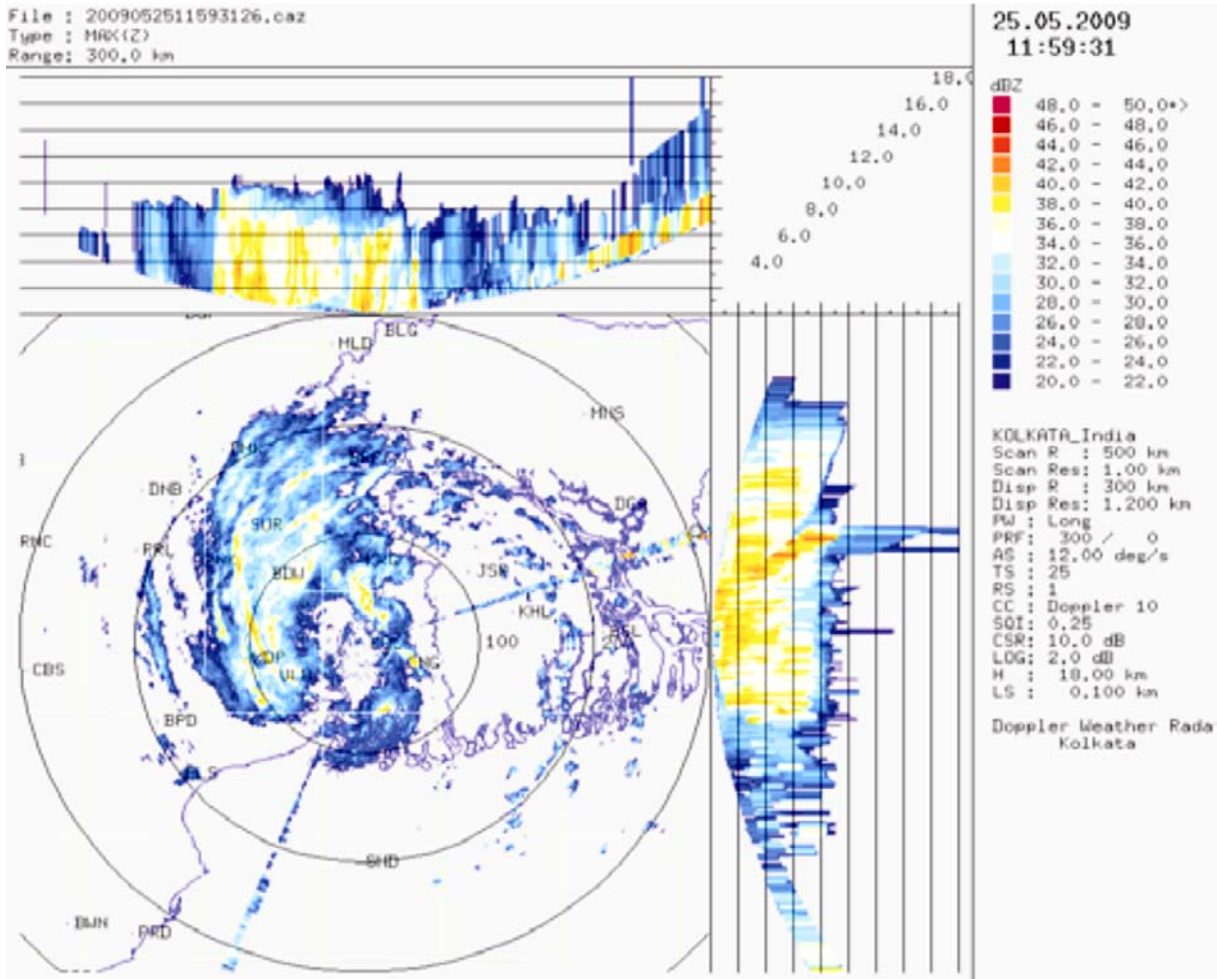


Fig. 4. Radar Reflectivity from DWR Kolkata of severe cyclonic storm "AILA"

DWR Kolkata : DWR, Kolkata was monitoring the system continuously since 0000 UTC of 24 May 2009 in every 15 minutes interval. The spiral band with semi circular eye of the storm with diameter about 100 km was observed at 0400 UTC of 25 May 2009. Spiral bands were also organized but were not clearly defined and the storm centre was determined from the bands having poor confidence. The system weakened slightly after landfall but again intensified at 1100 UTC of 25. At 1200 UTC, all the echoes moved over land (Fig. 4).

According to these radar imageries, there were two main regions of convection, one to the northwest and the other to the southeast of the centre. These two convective regions also went apart from each other as the system moved northward. Hence it was similar to convection observed by the satellite and was also supported by the rainfall distribution. Another feature observed by the

DWR, Kolkata was the pre-cyclone squall line. It was observed on 24 night when the system was over the sea and centred near Paradip latitude. The occurrence of this pre-cyclone squall line improved the confidence of the forecasters to expect the northerly movement of the system.

The maximum wind observed through DWR Kolkata is as follows.

(a) From PPI_V pictures

The maximum radial wind recorded by DWR is as follows:

(i) 51 mps at 1.66 km height at a distance of 140 km from DWR on 0507 UTC of 25 May 2009.

(ii) 33 mps at a height of 0.19 km at a distance of 20 km at 0920 UTC and 45 mps at 2 km height at 0820 UTC just over Kolkata on 25 May 2009.

(b) From VVP_2 pictures

Maximum horizontal wind observed was 75 knots easterly to southeasterly at height from 0.6 km to 4.5 km. during 0620 to 0835 UTC.

The AWS and hourly coastal observations indicated that the system crossed West Bengal coast close to the east of Sagar Island between 0800 and 0900 UTC of 25. The observations from AWS also could help in estimating the maximum wind and lowest Central Pressure of the system. The lowest MSLP of 967 hPa was recorded by Kakdwip AWS in Sunderban delta which is located close to the north of Sagar Island.

3.2.3. Other features observed

The lowest Estimated Central Pressure was 967 hPa at the time of landfall. The maximum estimated mean wind speed was 60 kts. The system crossed West Bengal coast close to Sagar Island between 0800 and 0900 UTC of 25 as a Severe Cyclonic Storm with wind speed of 100 to 110 kmph. The surface wind over Sagar Island was northeasterly at 0700, northerly at 0800 and westerly at 0900 UTC indicating landfall between 0800 and 0900 UTC.

The system moved in a near northerly direction throughout its life period. Rapid intensification took place just a few hours before landfall. It could retain its intensity of cyclone for about 15 hrs after the landfall. After the landfall, the system continued to move in a northerly direction and gradually weakened. Also, it is the first Cyclonic Storm in the month of May to cross West Bengal after 1989.

3.2.4. Weather and damage caused

Widespread rain/thundershowers with scattered heavy to very heavy rainfall and isolated extremely heavy rainfall occurred over Orissa on 25 and over West Bengal & Sikkim on 25 & 26. Widespread rainfall with isolated heavy to very heavy rainfall also occurred over Assam & Meghalaya on 26 & 27 May.

According to media reports, a storm surge of 3 m (10 ft) impacted western regions of Bangladesh, submerging numerous villages. The Sunderbans, was

inundated with 6 m (20 ft) of water as per the media reports. Considering the astronomical tidal wave at the time of landfall, which was about 4-5 meters, the maximum storm surge over Sunderban area could be estimated to be about 2 m.

Some chief amounts of rainfall in centimeters are:

Orissa

25 May : Paradip 26, Kakatpur 18, Chandbali & Alippingal 15 each, Neemapara & Patamundai 14 each, Nawana 13, Rajkanika 10, Cuttack & Akhuapada 9 each, Bhubaneswar, Soro & Gathgaon 8 each, Jajpur, Bhagiriposhi & Gop 7 each, Kendrapara, Bhograi, Sukhinda, Puri & Nilgiri 6 each, Balasore, Naraj, Govindpur, Balimundali, Kodala, Jamsolaghat, Rajghat. Athagarh, Jenapur & Anandpur 5 each.

26 May : Nawana 12, Bhogari & Rajghat 11 each, Nilgiri 6, Rajkanika, Jamsolaghat & Rairangpur 5 each.

Gangetic West Bengal

25 May : Digha 7, Alipur, Shantiniketan, Basirghat, Barrackpur & Sriniketan 6 each, Jalpaiguri, Dum Dum & Canning 5 each.

26 May : Panagarh, Kalaikunda & Sriniketan 17 each, Midnapur & Digha 14 each, Barrackpur 12, Barampur 10, Dum Dum 9, Bankura & Krishnanagar 7 each, Alipur & Canning 5 each.

Sub-Himalayan West Bengal & Sikkim

25 May : Barobhisa 10, Jalpaiguri 5.

26 May : Singlabazar 14, Malda 13, Gajoldoba 11, Khanitar 10, Jalpiaguri 9, Domohani & Champasari 8 each, Pushvihar & Alipurduar 7 each, Sevoke & NH-31 6 each, Sukhiapokhari, Diana, Nagrakata, Bharobhisa & Gangtok 5 each.

27 May : Darjeeling 27, Singlabazar & Lava 18 each, Bijanbari 15, Sukhiapokhari 11, Sevok 10, Bagdogar 7, Hasimara 6, Champasari 5.

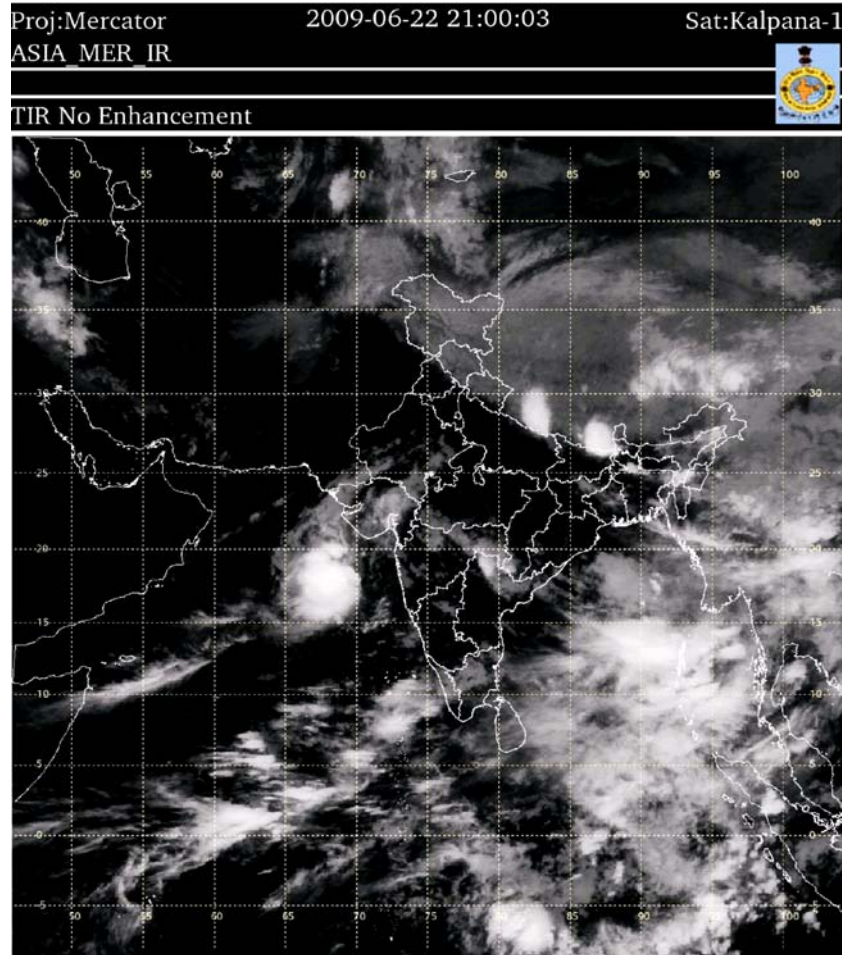


Fig. 5. Satellite imagery of the depression over east central Arabian sea (23-24 June 2009)

Arunachal Pradesh

27 May : Bhalukpong 7.

Assam & Meghalaya

25 May : Dekiajuli 5.

26 May : Cherapunji 21, Shillong 12, Kokrajhar 9, Golpara 8, Bhalpur 7.

27 May : Jiamanas NH 12, Cherapunji 9, Shillong 8, Bekird 7, Panbari 6, AIE NH, Balipeta & Golpara 5 each.

Nagaland-Manipur-Mizoram & Tripura

25 May : Lengpui 5.

26 May : Dharmangar & Paniagar 8 each, Kailashahar & Belonia 6 each.

27 May : Belonia 13.

As per media reports, in West Bengal about 100 people died. About 2.2 million people were affected. More than 61,000 houses collapsed and more than 132,000 houses were partially damaged.

It caused extensive damage to rice and other crops. In Sundarbans, heavy downpour raised river levels while

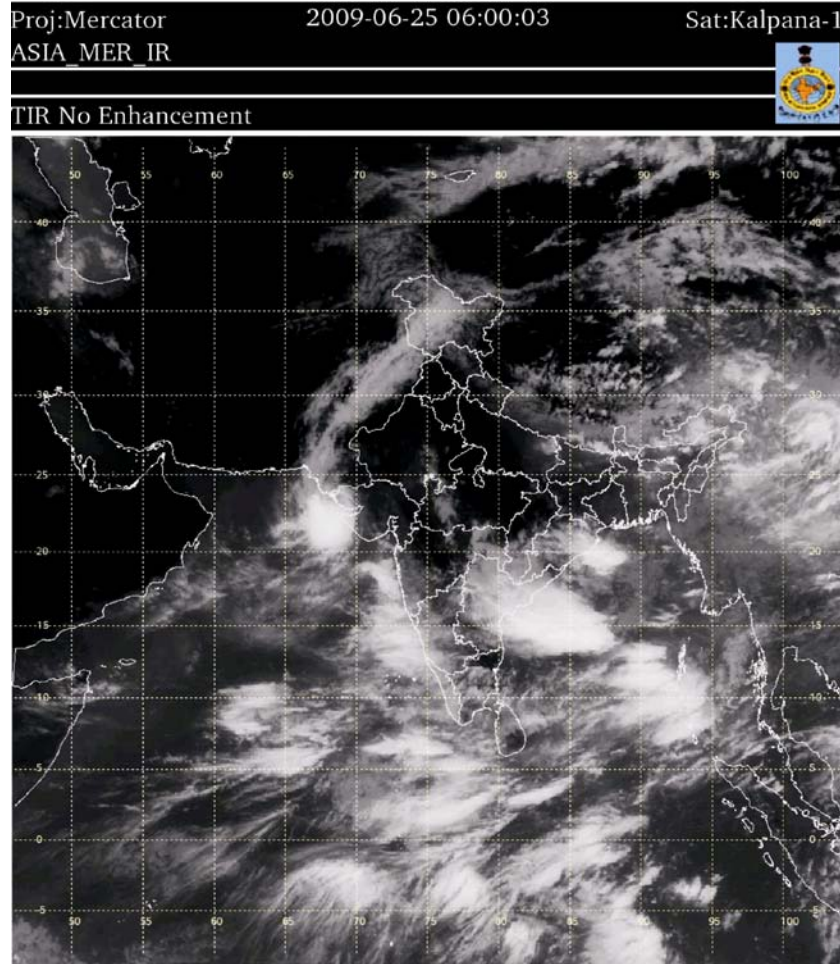


Fig. 6. Satellite imagery of the depression over the east central Arabian sea (25-26 June 2009)

the gushing waters of flooded mangroves burst mud embankments in the extensive delta region, destroying hundreds of thousands of houses. The Sunderbans mangrove forest area, home to the highly endangered Royal Bengal tiger, was fully inundated. The high-speed winds destroyed all communication and transportation infrastructure. The entire Sunderbans biosphere reserve area of 9600 square kilometres suffered extensive damage under the impact of this storm. It also affected Sub-Himalayan West Bengal & Sikkim causing uprooting of trees due to strong wind and land slide and flood due to heavy rain.

The outer bands of the storm also produced torrential rains and high winds in several parts of north coastal

Orissa, with the heaviest rainfall being recorded at Paradip (26 cm) and winds peaked at 90 km/h (56 mph). Numerous trees were uprooted and power lines were downed, causing widespread power outages. High waves produced by the storm inundated coastal villages, forcing residents to evacuate to safer areas. However, there is no report of human death in the state. An estimated 1,000 acres of Orissa cropland were affected due to the system.

The remnants of AILA produced gusty winds and heavy rains in Meghalaya between 25 and 26 of May. Rainfall amounts peaked at 213.4 mm and winds reached 60 km/h. Several homes were damaged in the area and power was cut due to fallen trees and power lines. Several streets were flooded and some homes were reported to have standing water.

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

4.1. Depression over the east central Arabian Sea (23 – 24 June 2009)

4.1.1. Life cycle

An upper air cyclonic circulation between 2.1 & 7.6 km a.s.l. lay over the east central Arabian Sea during 19 - 21. Under its influence a low pressure area formed over the east central Arabian Sea and neighbourhood on 22. It concentrated into a Depression and lay centered at 0000 UTC of 23, near Lat. 18.0° N / Long. 71.5° E. Moving in a northerly direction, it lay centered near Lat. 19.0° N / Long. 71.5° E at 0300 UTC and lay off south Gujarat coast, close to Diu, near Lat. 20.5° N / Long. 71.0° E at 1200 UTC of 23. It crossed south Gujarat coast, near Diu, around 1400 UTC of 23 and lay over Saurashtra, near Lat. 21.5° N / Long. 70.5° E about 100 km east of Porbandar at 0000 UTC of 24. It weakened into a well-marked low pressure area and lay over Saurashtra & Kutch and neighbourhood in the morning of 24.

4.1.2. Satellite cloud features and other observations

The maximum intensity of T 1.5 was reported by Kalpana-1 imageries from 2100 UTC of 22 to 1200 UTC of 23. (Fig. 5).

4.1.3. Other features observed

The lowest Estimated Central Pressure was about 998 hPa. The maximum estimated mean wind speed was 25 kts. The system crossed south Gujarat coast, near Diu, around 1400 UTC of 23 and lay over Saurashtra, about 100 km east of Porbandar at 0000 UTC of 24.

4.1.4. Weather and damage caused

Heavy to very heavy rainfall occurred at isolated places in Saurashtra & Kutch on 24.

Some chief amounts of rainfall in centimeters are:

Saurashtra & Kutch

24 June : Veraval & Ankola 17 each, Porbandar 7.

2 people died in Saurashtra due to lightning and 11 people died due to heavy rains in Gujarat.

4.2. Depression over the east central Arabian Sea (25 – 26 June 2009)

4.2.1. Life cycle

The well marked low pressure area over Saurashtra & Kutch and neighbourhood lay over the coastal areas of the same region on 25. It emerged into the northeast Arabian Sea and concentrated into a Depression which lay centered at 0900 UTC of 25 near Lat. 22.5° N / Long. 68.5° E (about 50 km west northwest of Dwarka). Remaining practically stationary, it lay centered over the same region at 1200 UTC. It moved northwards during night and lay centered at 1800 UTC of 25, near Lat. 23.0° N / Long. 68.5° E. Subsequently, it weakened and lay as a well marked low pressure area over Kutch and neighbourhood at 0000 UTC of 26. It further weakened into a low pressure area over the same region on 27 morning and became less marked in the evening. However, the associated upper air cyclonic circulation lay between 1.5 & 4.5 km a.s.l. during 28 June - 1 July and became less marked on 2.

4.2.2. Satellite cloud features and other observations

The maximum intensity of T 1.5 was reported by Kalpana-1 imageries from 0600 UTC to 2100 UTC of 25 (Fig. 6).

4.2.3. Other features observed

The lowest pressure of 995.5 was recorded at Dwarka at 1200 UTC of 25. The maximum estimated mean wind speed was 25 kts.

4.2.4. Weather and damage caused

The system caused fairly widespread rainfall on 25 and scattered rainfall on 27 with isolated heavy to very heavy rainfall over Saurashtra & Kutch.

Some chief amounts of rainfall in centimeters are:

Saurashtra & Kutch

25 June : Kalyanpur 16, Okha 15, Bhanvad 10, Keshod 9, Dwarka & Porbandar 8 each.

27 June : Mangrol 13, Keshod & Bagsra 8 each.

4.3. Deep Depression over the northwest Bay of Bengal (20 – 21 July 2009)

4.3.1. Life cycle

Under the influence of an upper air cyclonic circulation extending up to 7.6 km a.s.l. over the

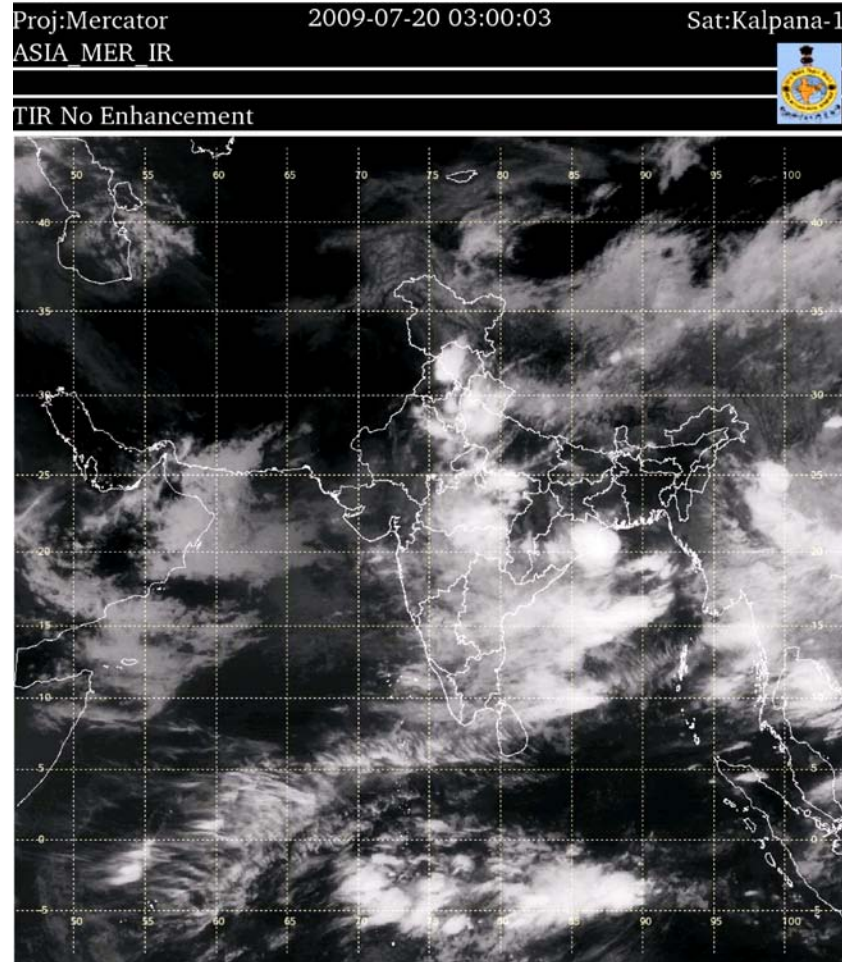


Fig. 7. Satellite imagery of the deep depression over northeast Bay of Bengal (20-21 July 2009)

northwest Bay of Bengal off Orissa coast, a low pressure area formed over the northwest Bay of Bengal and adjoining coastal areas of north Orissa and West Bengal on 18 evening. It became well marked over there on 19, subsequently concentrated into a Depression over the northwest Bay of Bengal and lay centered at 0300 UTC of 20, near Lat. 21.0° N / Long. 88.5° E (about 120 km. southeast of Digha). Moving west northwestwards, it intensified into a Deep Depression and lay centered at 1200 UTC of 20, near Lat. 21.0° N / Long. 88.0° E and crossed north Orissa-West Bengal coasts between Balasore & Digha during 1600 - 1700 UTC. Continuing the west northwestward movement, it lay over north Orissa, centered near Lat. 21.8° N / Long. 84.5° E, close to Jharsuguda at 0300 UTC of 21, remained practically stationary and weakened into a Depression by 0600 UTC, further into a well marked low pressure area over north Chhattisgarh and neighbourhood by 0900 UTC and

persisted over the same region in the evening. It lay over east Madhya Pradesh and neighbourhood on 22 morning and as a low pressure area over west Madhya Pradesh and neighbourhood in the evening. It persisted there on 23 and moved over to northwest Madhya Pradesh and adjoining southeast Rajasthan and merged with the monsoon trough on 24. However, the associated upper air cyclonic circulation extending up to lower tropospheric levels persisted there on 24, lay over west Rajasthan and neighbourhood on 25 and became less marked on 26.

4.3.2. Satellite cloud features and other observations

The maximum intensity of T 1.5 was reported by Kalpana-1 imageries from 0300 UTC to 1500 UTC of 20 July (Fig. 7).

4.3.3. *Other features observed*

The lowest Estimated Central Pressure was 988 hPa. The lowest central pressure of 989.8 hPa was recorded at Balasore at 1600 UTC of 20. The maximum estimated mean wind speed was 35 kts. The system moved in a northwesterly to west northwesterly direction and crossed north Orissa-West Bengal coasts between Balasore & Digha during 1600 - 1700 UTC.

4.3.4. *Weather and damage caused*

Southwest monsoon was vigorous in Orissa (on 19 and 21), east Rajasthan (on 22) and West Madhya Pradesh (on 22 and 23). Monsoon was also active in Orissa (on 20), Jharkhand (on 20), east Rajasthan and west Madhya Pradesh (on 23) and east Madhya Pradesh (during 20 to 23). Extremely heavy rainfall occurred at isolated places in Orissa on 19 and west Madhya Pradesh on 22. Heavy to very heavy rainfall also occurred at a few places in Orissa (on 20 & 21), Gangetic West Bengal (on 19 & 20), Jharkhand (on 20), west Madhya Pradesh (on 23), east Madhya Pradesh (on 21 & 22) and east Rajasthan (on 22 & 23).

Some chief amounts of rainfall in centimeters are:

Orissa

19 July : Krishnaprasad 28, Khandapara 27, Hindol 21, Tikabali 20, Puri 19, Tangi 18, Narsinghpur, Rajkanika & Soro 17 each, Daspalla & Kanpur 16 each, Kantamal, Kendrapara & Nimapara 15 each, Tikarpara, Kalinoa & Banpur 14 each, Sonapur, Bhanjnaragar & Kotagarh 13 each, Alipingal & Kakatpur 12 each, Khairamal 11, Chandbali & Belgaon 8 each, Akhuapada, Mundali, Mohana & R. Udaigiri 7 each.

20 July : Bolangir 21, Athamalik 18, Rajkishorenagar 16, Titlagarh 15, Ambabhona 13, Sonapur 12, Khairamal & Mandira Dam 10 each, Koraput & Kakatpur 9 each, Raikhol & Biniki 8 each, Reamal, Dhenkanal & R. Udaigiri. Gop 7 each.

21 July : Binika 22, Sambalpur 21, Bijepur 19, Sohela, Chandbali, Altuma CWC, Hindol, Khandapara & Hirakud 17 each, Paikmal, Kamakshyanagar & Dunguripalli 16 each, Ambabhona & Bargarh 15 each, Angul, Padampur, Bolangir, Khairamal, Ranpur

& Rairakhol 13 each, Rengali, Akhuapada, Jamankira & Naktideul 12 each, Chendipada, Rajkishorenagar, Talcher, Athgarh, Nawapara & Sonapur 11 each, Athmalik, Boudhgarh, Deogarh, Kuchinda & Tensa 10 each, Bonth, Kantamal, Patnagarh, Reamal, Barmul & Hemgiri 9 each, Cuttack, Naraj, Dhenkanal & Nawana 8 each, Nilgiri, Soro, Narsinghpur, Komna & Sundargarh 7 each.

22 July : Ambabhona 11, Udala 8, Paikmal 7.

Gangetic West Bengal

19 July : Contai 8.

20 July : Tantloi 8.

Jharkhand

20 July : Daltonganj 7.

West Madhya Pradesh

22 July : Pachmarhi 28, Bhopal 14, Indore, Hoshangabad & Ujjain 7 each.

23 July : Indore 24, Pachmarhi 17, Ratlam & Shajapur 14 each, Hoshangabad 13, Ujjain 12, Betul & Khandwa 9 each, Bhopal 7.

East Madhya Pradesh

21 July : Jabalpur 16, Narsinghpur 13.

22 July : Narsinghpur 11, Seoni 8.

East Rajasthan

22 July : Bharatpur & Kota 10 each, Jhalawar 8, Rawat Bhata 7.

23 July : Banswara 8, Rawat Bhata 7.

24 July : Chittorgarh 9, Jhalawar 8.

Heavy rains caused floods in Orissa, Jharkhand and Madhya Pradesh. Large areas of Bhadrak, Cuttack, Ganjam, Kalahandi, Khandamal, Koraput, Keonjhar, Nayagarh and Sundergarh districts of Orissa were submerged. Heavy rains took a toll of 56 persons in Orissa and 870 houses were fully damaged. Rough seas claimed

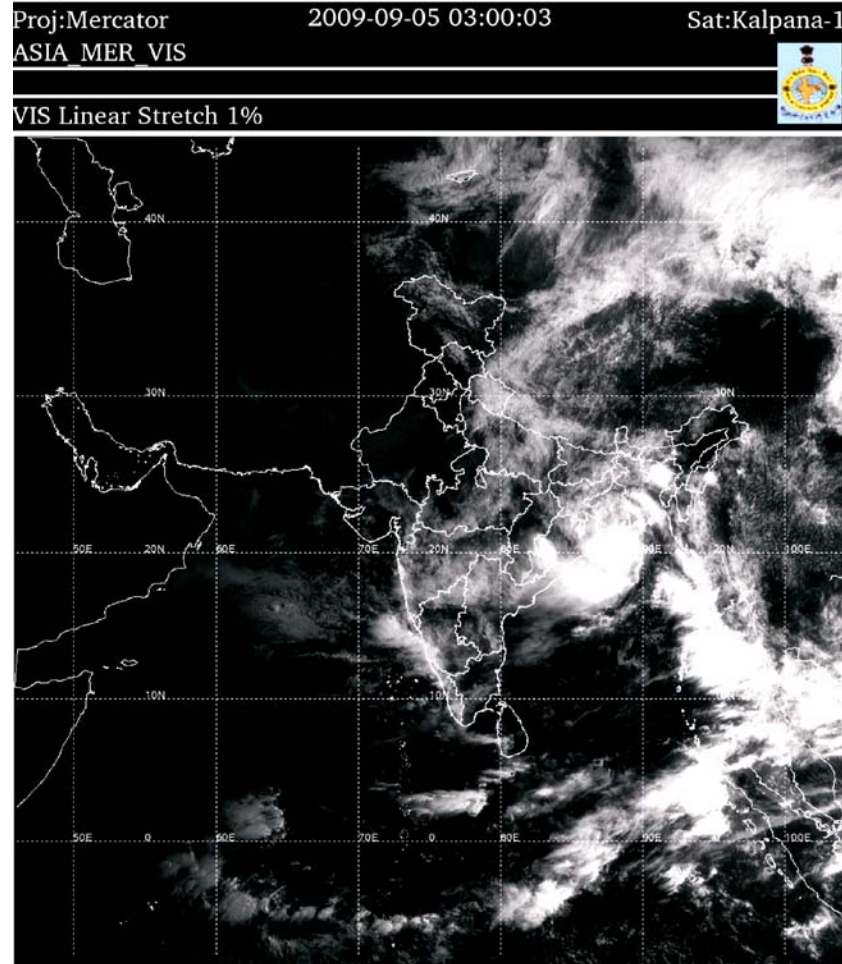


Fig. 8. Satellite imagery of the deep depression over northwest bay of Bengal (5-7 September 2009)

the lives of 4 fishermen in the Bay of Bengal. Many trees were uprooted and road transport was badly affected. In Indore (west Madhya Pradesh) 11 people died due to heavy rain. Crops were also damaged in the flood affected states.

4.4. *Deep Depression over the northwest Bay of Bengal (5 – 7 September 2009)*

4.4.1. *Life cycle*

Under the influence of a cyclonic circulation over the west central Bay of Bengal and neighbourhood, a low pressure area formed over the west central and adjoining northwest Bay of Bengal off Orissa coast on 3. It became well marked over the northwest Bay of Bengal off Orissa coast on 4. Subsequently, it concentrated into a

Depression and lay centered near Lat. 20.5° N / Long. 88.0° E (about 170 km southeast of Balasore) at 0000 UTC of 5. Moving northwestwards, it intensified into a Deep Depression and lay centered at 0300 UTC of 5 near Lat. 21.0° N / Long. 87.5° E (about 70 km southeast of Balasore). Then, it moved northwards and crossed West Bengal coast near Digha between 0700 & 0800 UTC of 5 and lay centered at 1200 UTC, over Gangetic West Bengal, near Midnapore (centered close to Lat. 22.5° N / Long. 87.3° E). It further moved in a northwesterly direction and lay over Jharkhand, centered about 100 km north of Jamshedpur (near Lat. 23.5° N / Long. 86.0° E) at 0300 UTC and about 50 km north of Ranchi (near Lat. 23.9° N / Long. 85.3° E) at 1200 UTC of 6. Subsequently, it moved west northwestwards and lay close to Daltonganj (near Lat. 24.8° N / Long. 83.7° E) in Jharkhand at 0300 UTC of 7. It remained practically

stationary over there and weakened into a Depression at 0900 UTC of 7. It further weakened into a well marked low pressure area and lay over Jharkhand and neighbourhood at 1200 UTC of 7. It moved over to northeast Madhya Pradesh and neighbourhood on 8 and lay over central parts of Madhya Pradesh and neighbourhood on 9. It lay over north Madhya Pradesh and neighbourhood on 10; over west Uttar Pradesh and neighbourhood as a well marked low pressure area in the morning and as a low pressure area in the evening of 11 and became less marked on 12.

4.4.2. *Satellite cloud features and other observations*

The maximum intensity of T 2.0 was reported by Kalpana-1 imageries from 0300 UTC to 0800 UTC of 5 September (Fig. 8).

The system was tracked by DWR Kolkata since 1200 UTC of 4 September.

The front part of the system hit the coast by 0630 UTC at 100 kms distance SSW of DWR Kolkata. At 0630 UTC almost circular eye surrounded by two spiral bands were observed. The system crossed the coast by 0730 UTC.

The maximum radial wind as observed from PPI(V) was in the range of 22 to 26 mps at a height of 0.8 km above ground level at 0700 UTC at a distance of 80 km SW from DWR. The horizontal wind estimated from DWR product VVP_2 is 45 kts at a height of 0.9 km.

4.4.3. *Other features observed*

The lowest central pressure was 986.2 hPa recorded at 0900 UTC of 5 over Digha. The maximum estimated mean wind speed was 30 kts. The system moved in a north to northwesterly direction and crossed West Bengal coast near Digha between 0700 & 0800 UTC of 5.

4.4.4. *Weather and damage caused*

The southwest monsoon was vigorous in Gangetic West Bengal on 6 and in east Madhya Pradesh on 10. Monsoon was active in Gangetic West Bengal (on 5 & 7) and Orissa (on 5, 6 & 9). Extremely heavy rain occurred at isolated places in Gangetic west Bengal on 6 and east Madhya Pradesh on 9. Heavy to very heavy rainfall also occurred in Gangetic West Bengal (from 5 to 7 and 9); in Orissa (from 5 to 9); in Jharkhand (on 6 & 7); in Bihar (on

7); east Uttar Pradesh (from 10 to 12); west Uttar Pradesh (from 8 to 12) and east Madhya Pradesh (from 8 to 10).

Some chief amounts of rainfall in centimeters are:

Gangetic West Bengal

- 5 Sep : Suri 8, Tantloi 7.
 6 Sep : Bangaon 32, Berhampore 21, Midnapore 17, Kalaikunda 16, Diamond Harbour 14, Durgachak 13, Krishnanagar 12, Bagati Magra & Canning Town 10 each, Bankura & Digha 7 each.
 7 Sep : Bankura 14.
 9 Sep : Berhampore 13, Kolkata 12, Krishnanagar 11, Bagati Magra 10, Uluberia & Canning Town 9 each.

Orissa

- 5 Sep : Ambabhona 12, Tikabali 11, Binika 10, Junagarh 9, Bargarh & Soro 8 each, Chandbali, Phulbani, Puri, Baligudi & Rajkanika 7 each.
 6 Sep : Nawana 18, Jaipur, Soro & Nilgiri 10 each, Balasore 9, Rairangapur 8.
 7 Sep : Pipili 13.
 8 Sep : Soro 14, Nilgiri 9.
 9 Sep : Soro 18, Balasore 10, Cuttack, Balimundali.

Jharkhand

- 6 Sep : Chaibasa 13, Jamshedpur 10.
 7 Sep : Ranchi 13, Daltonganj 11.

Bihar

- 7 Sep : Gaya 17, Dehri 8.

East Uttar Pradesh

- 10 Sep : Banda 10.
 11 Sep : Kanpur 18, Barabanki 15, Bindki, Mahilabad 10, Lucknow 9, Fatehpur 8.
 12 Sep : Paliakalan 16, Dhaurahara & Nighasan 12 each, Lakhimpur Kheri & Hanuman Setu 8 each.

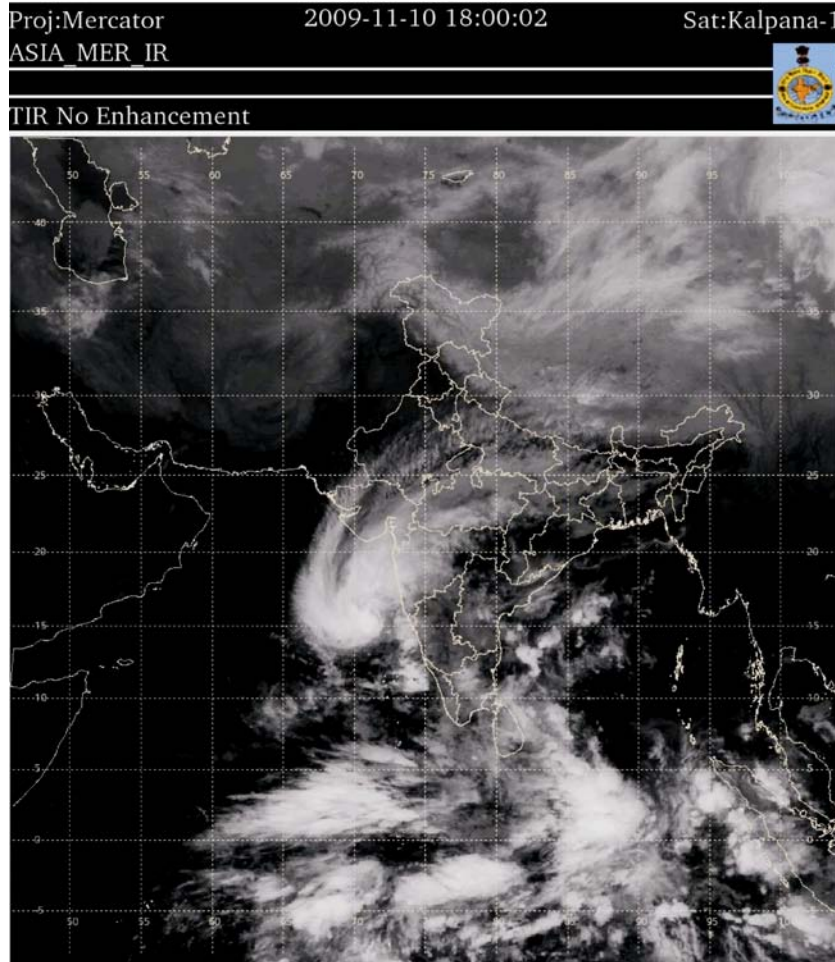


Fig. 9. Satellite imagery of cyclonic storm 'PHYAN'

West Uttar Pradesh

- 8 Sep : Narora 8, Sambhal 7.
 9 Sep : Kalpi 8.
 10 Sep : Bijnore 11, Nagina & Nazibabad 10 each,
 Mawana 8.
 11 Sep : Baheri 19, Barielly 11, Nakurand &
 Sharanpur 10 each, Bagpath 9, Hasangang
 & Hamirpur 8 each.
 12 Sep : Shahjahanpur 16, Bisalpur 15, Pawayan
 12, Nagina 10, Moradabad & Philibit 8
 each.

East Madhya Pradesh

- 8 Sep : Umaria 16, Rewa & Sidhi 7 each.
 9 Sep : Narsighpur 29, Jabalpur 21, Sagar 11.
 10 Sep : Khajuraho 8, Damoh 7.

Various rain related incidents claimed 16 lives in Uttar Pradesh. Crop area of 5005 hectare in the three blocks of Balasore was affected in Orissa. More than 1.2 lakh people were rendered homeless due to heavy rains in southern West Bengal.

5. Disturbances formed during the Post-Monsoon Season (October to December)

5.1. Cyclonic Storm (PHYAN) over southeast and adjoining east central Arabian Sea (9 - 12 November)

5.1.1. Life cycle

Under the influence of a trough of low at sea level over Maldives-Lakshadweep, a low pressure area formed over Comorin area and neighbourhood on 6 and became well marked over there on 7. It lay over Lakshadweep area and neighbourhood on 8 & 9 morning. Subsequently, it concentrated into a Depression at 0900 UTC of 9 and lay centered over the southeast and adjoining east central Arabian Sea, near Lat. 11.0° N / Long. 72.0° E (about 70 km west of Amini Divi). It moved northwestwards and lay centered near Lat. 11.5° N / Long. 71.5° E at 1200 UTC of 9. Further moving northwestwards, it intensified into a Deep Depression over the east central Arabian sea and lay centered at 0300 UTC of 10, near Lat. 13.0° N / Long. 70.5° E (about 470 km southwest of Goa). Moving north northeastwards, it lay centered near Lat. 14.5° N / Long. 71.0° E (about 330 km. west southwest of Goa) at 1200 UTC of 10. Subsequently moving northwards, it intensified into Cyclonic Storm (PHYAN) and lay centered at 1800 UTC of 10, near Lat. 15.0° N / Long. 71.0° E (about 300 km west southwest of Goa). Then it moved north northeastwards and lay centered at 0300 UTC of 11, near Lat. 17.0° N / Long. 72.0° E (about 250 km south southwest of Mumbai). Thereafter, it moved northeastwards and crossed Maharashtra coast between Alibag and Mumbai, between 1000 & 1100 UTC of 11. It weakened into a Deep Depression and lay over north Konkan, about 100 km northeast of Mumbai (near Lat. 19.5° N / Long. 73.5° E) at 1200 UTC of 11. Further moving northeastwards, it weakened into a Depression over north Madhya Maharashtra near Nashik (close to Lat. 17.0° N / Long. 72.0° E) at 1800 UTC of 11. It remained practically stationary and further weakened into a well marked low pressure area over the same region at 0000 UTC of 12. It lay as a low pressure area over southwest Madhya Pradesh and adjoining north Madhya Maharashtra at 0300 UTC of 12 and became less marked on 13. However, the associated upper air cyclonic circulation extending up to 1.5 km a.s.l. lay over Gujarat region and neighbourhood on 13 & 14 and became less marked on 15.

5.1.2. Satellite cloud features and other observations

The maximum intensity of T 2.5 was reported by Kalpana-1 imageries from 1800 UTC of 10 to 0800 UTC

of 11 November (Fig. 9). The system made landfall with intensity T 2.5.

5.1.3. Other features observed

The lowest Estimated Central Pressure was 988 hPa. The lowest pressure of 987.9 hPa was reported by Harnai at 0500 UTC of 11. The maximum estimated wind speed was 45 kts. The departmental observatories at Pune, Goa and Colaba reported wind speed of 68 kmph, 63 kmph and 56 kmph respectively. The system initially moved in a northwesterly direction. It then recurved and moved in a northeasterly direction and crossed Maharashtra coast. It moved very fast prior to landfall, covering a distance of nearly 450 km during 0000 UTC to 1200 UTC of 11. Though it crossed as a Cyclonic Storm, it had slightly weakened before landfall. The rapid movement after re-curve could be attributed to the position of the upper tropospheric ridge which ran along Lat. 14.0° N. The system moved north of the ridge line on 11 morning leading to its acceleration in a northeasterly direction.

5.1.4. Weather and damage caused

As per press reports, heavy rain, landslides and wall collapse took a toll of 42 lives. Azhiyar Dam at Pollachi in Coimbatore district was breached due to heavy rain.

Widespread rainfall activity occurred in Konkan & Goa, Madhya Maharashtra and Marathwada during 10 to 12 November. Fairly widespread rainfall also occurred over south Gujarat region on 11. Heavy to very heavy falls occurred at isolated places in Maharashtra State excluding Vidarbha and coastal Karnataka on 12. Some chief amounts of rainfall in centimeters are:

Konkan & Goa

11 Nov : Canacona & Marmagoa 8 each, Dabolim 7, Panjim 6, Mapusa 5.

12 Nov : Madangad 11, Sudhagad 10, Dapoli, Harnai & Mhasala 9 each, Shriwardhan 7.

Madhya Maharashtra

11 Nov : Lohegaon 13, Mahabaleswar, Bhor, Paud & Vadagaon Maval 10 each, Wai & Pune 9 each, Ghodegaon 8, Chandwad, Satara, Uran, Islampur & Akola 7 each, Shirur, Kandalbavda, Karad, Kelvan, Pernem, Dodamarg & Chandgad 6 each, Shahuwad, Saswad, Velhe, Rajgurunagar, Shirali, Sinner, Shrigonda, Ajra & Khed 5 each.

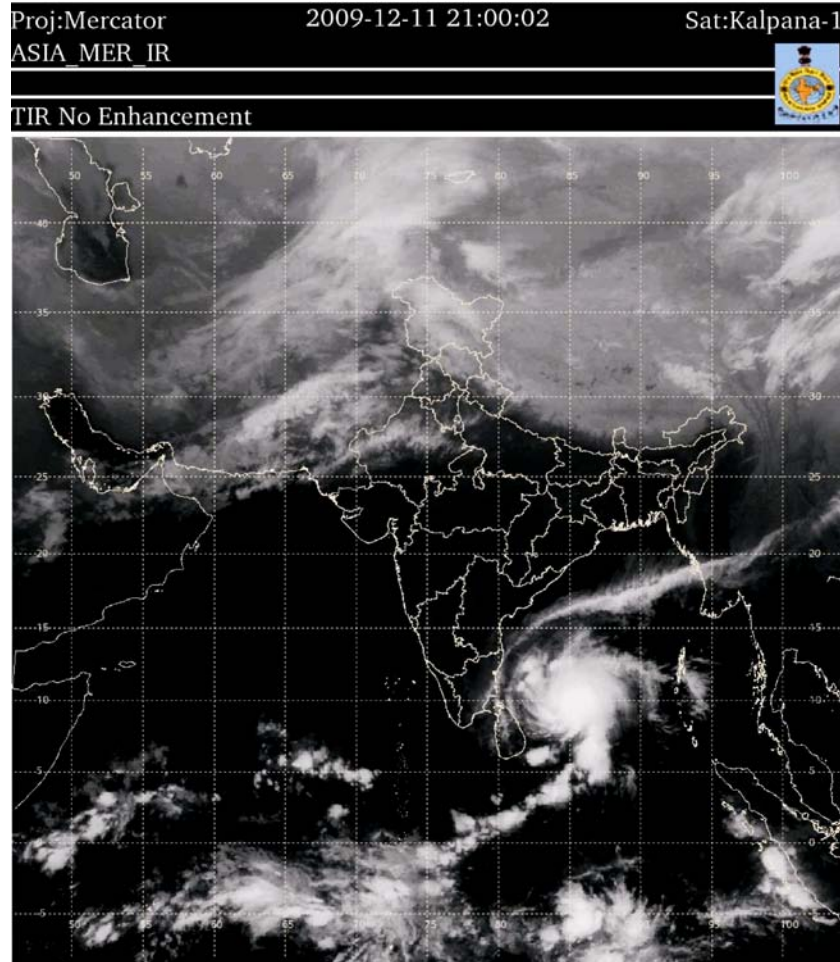


Fig. 10. Satellite imagery of cyclonic storm 'WARD'

12 Nov : Chandwad 17, Akola 14, Sinnar, Yeola & Nandgaon 13 each, Ghodegaon 12, Mahabaleshwar & Mandangad 11 each, Kopergaon & Sudhagad 10 each, Malegaon, Chiplun, Mhasala, Chopda, Edalabad, Erandol, Pachora, Harnai, Kalvan, Khandala & Paud 9 each, Srirampur, Shirpur & Vadgaon Maval 8 each, Bahadgaon, Srivardhan, Niphad, Soegaon & Kalvan 7 each, Mangaon, Poladpur, Vijapur, Igatpuri, Satna & Kankavali 6 each, Nasik, Aurangabad, Mahad, Pen, Kannad, Khaldabad, Sillod, Jafferabad, Khed, Saswad, Navapur, Dindori, Baramati, Sawantwadi, Kalyan, Murvad & Shahapur 5 each.

Marathwada

12 Nov : Soegaon: 8.

Coastal Karnataka

12 Nov : Bantawal 8.

Apart from the above, during the formative stage of this system, as it was making a northward drift in the Arabian Sea, moist maritime air from the Bay of Bengal traversed across Tamil Nadu. This resulted in very heavy to extremely heavy rainfall over the windward side of Western Ghats. An exceptionally heavy rainfall of 82 cm was reported by 'Ketti' in Tamil Nadu.

Some chief amounts of rainfall in centimeters are:

9 Nov : Coonoor 34, Udhagamandalam 18, Kottagiri & Kodaikanal 17 each, Ketti 14, Shenkotta 13.

10 Nov : Ketti 82, Coonoor 31, Kottagiri 27, Udhagamandalam, 19, Kundha Bridge 15.

As per press reports, the cyclonic storm PHYAN took 15 lives (including 11 sailors) in Maharashtra. Thousands of houses were partially damaged in the coastal districts of Sindhudurg, Ratnagiri, Thane and Raigad. Many trees and electrical poles were uprooted. Massive damage to property was also reported. Grape, cotton, Mango and Cashew farms were ruined. Crops worth crores of Rupees were damaged due to heavy rain.

5.2. Cyclonic Storm (WARD) over southwest and adjoining southeast Bay of Bengal (10 - 15 December 2009)

5.2.1. Life cycle

Under the influence of trough of low at sea level, a low pressure area formed over the southwest and adjoining southeast Bay of Bengal on 8 and became well marked over southwest Bay of Bengal and neighbourhood on 10 morning. It concentrated into a Depression and lay centred at 0900 UTC of 10, over the southwest and adjoining southeast Bay of Bengal near Lat. 6.5° N / Long. 85.0° E and remained practically stationary over there at 1200 UTC. Moving northwestwards it intensified into a Deep Depression at 0000 UTC of 11 (centred near Lat. 7.0° N / Long. 84.5° E) and remained practically stationary over there at 0300 UTC. Subsequently, it moved northwards and intensified into Cyclonic Storm (WARD) and lay at 0900 UTC of 11, near Lat. 8.5° N / Long. 84.5° E. It remained practically stationary at 1200 UTC of 11. Further moving northwards, it lay centred at 0300 UTC of 12, near Lat. 10.0° N / Long. 84.5° E. Thereafter, it moved westwards and lay centred at 1200 UTC of 12, near Lat. 10.0° N / Long. 83.5° E. Drifting southwards, it weakened into a Deep Depression and lay centred at 1800 UTC of 12 near Lat. 9.5° N / Long. 83.5° E. Moving westwards, it lay over the southwest Bay of Bengal centred near Lat. 9.5° N / Long. 83.0° E at 0300 UTC of 13. It further drifted southwards and lay centred near Lat. 9.0° N / Long. 83.0° E at 1200 UTC of 13 and near Lat. 8.5° N / Long. 81.5° E, close to Trincomali (Sri Lanka) at 0300 UTC of 14. It crossed north Sri Lanka coast near Trincomali between 0800 & 0900 UTC of 14, weakened into a Depression and lay centred over north Srilanka near Lat. 8.5° N / Long. 81.0° E at 0900 UTC of 14 and lay practically stationary over there at 1200 UTC.

Moving westwards it lay centred near Lat. 8.5° N / Long. 80.5° E over north Sri Lanka at 0000 UTC of 15 and further weakened into a well marked low pressure area over Sri Lanka and neighbourhood in the morning of 15 and into a low pressure area in the evening. It lay over Gulf of Mannar and adjoining north Srilanka and coastal Tamil Nadu on 16 morning and became less marked in the evening.

5.2.2. Satellite cloud features and other observations

The system was continuously tracked by satellite even after crossing the coast. The maximum intensity of T 3.0 was reported by Kalpana – 1 imageries from 2100 UTC of 11 to 0800 UTC of 12 (Fig. 10).

DWR Chennai : The system centre was at a distance more than 500 kms from DWR Chennai, throughout its course. Neither the “EYE” nor the SPIRAL bands could be seen from Chennai RADAR.

5.2.3. Other features observed

The lowest Estimated Central Pressure was 996 hPa. The maximum estimated wind speed was 45 kts. The system initially moved in a northerly direction. It then moved in a southwesterly direction and finally in a westerly direction and crossed north Sri Lanka near Trincomalee between 0800 and 0900 UTC of 14 December 2009. It weakened into a Deep Depression over the sea before landfall.

5.2.4. Weather and damage caused

Northeast monsoon was vigorous in Tamil Nadu on 16. Heavy to very heavy rainfall occurred at many places on 16 and at isolated places on 13, 15 and 17.

Some chief amounts of rainfall in centimeters are:

13 Dec : Sriperumbudhur & Vallam 8 each, Poonamalle 7.

15 Dec : Sirkali 14, Tarangambadi, Rameshwaram & Karaikal 11 each, Kollidam & Vedaranyam 10 each, Mayiladuthurai & Chidambaram 9 each, Kodavasal, Thiruthuraiipoondi & Valangaiman 7 each.

16 Dec : Mayiladuthurai 15, Vallam 14, Needamangalam 13, Thozhudhur, Karaikal, Thiruthuraiipoondi &

Nagapattinam 12 each, Kattumannarkoil, Orathanadu, Muthupet & Tarangambadi 11 each, Cuddalore, Chembarambakkam, Parangipettai, Vanur, Nannilam, Thiruvarur, Sirkali & Arakonam 10 each, Tiruttani, Poondi, Chidambaram, Adiramapattinam, Thanjavur, Kodavasal, Mannargudi, Kollidam & Tondi 9 each, Chennai, Ramakrishnarajupet, Tamaraiykkam, Puducherry Airport, Thiruvaidaimarudhur, Thiruvaiyaru & Sholingur 8 each, Pallipattu, Cholavaram, Redhills, Sethiyathope, Ulundurpet, Kumbakonam, Madukkur, Papanasam, Pattukottai, Valangaiman, Aranthangi, R.

S. Mangalam, Ramanathapuram & Sathanur dam Ariyalur 7 each.

17 Dec Orathanadu & Vallam 11 each, Alangudi 10, Parangipettai 9, Peravairani, Vedaranyam & Tirumayam 8 each, Tozhudur, Arimalam, Cheyyar & Arantangi 7 each.

As per press reports, normal life was disrupted in coastal Tamil Nadu due to incessant rains. Continuous rains also inundated several low lying areas and gusty winds uprooted trees.