

3 Deep depression over the Bay of Bengal (16-23 June, 2011)

3.1 Introduction:

A deep depression formed over the north Bay of Bengal on 16th June. Moving northwards, it crossed west Bengal-Bangladesh coast, about 100 km east of Sagar Island between 1100 and 1200 UTC of 16th June. It then continued northward movement for some time, then moved west-northwestwards across Gangetic West Bengal, Jharkhand, north Chhattisgarh and west Madhya Pradesh during 17-23 June and weakened gradually. It weakened into a well marked low pressure area on 23rd June over west Madhya Pradesh. It ushered southwest monsoon over eastern and central India and caused excess rainfall over these regions.

3.2 Genesis:

During onset phase of monsoon, a cyclonic circulation extending upto mid-tropospheric level lay over northwest Bay of Bengal on 12th June 2011. Under its influence, a low pressure area formed over northwest Bay of Bengal on 14th June, which became well marked on 15th June. The favourable conditions like persistent convection over the region and its gradual organisation, low to moderate vertical wind shear(10-20 knots), upper level divergence, low level convergence, increase in relative vorticity at lower levels and higher sea surface temperature (30-32^oC) prevailed from 15th onwards. Also, the Madden Julian Oscillation (MJO) index was lying over phase 5 (northwest Pacific) which is favourable for cyclogenesis. Under these conditions, the well marked low pressure area concentrated into a depression and lay centred at 0000 UTC of 16th June over northwest Bay of Bengal near lat. 21.5^oN and long. 89.0^oE, about 100 km east-southeast of Sagar Island. The sustained maximum wind speed was 25 knots. However, the wind over the southern parts was higher under the influence of the monsoon surge. The organized broken intense to very intense convection lay over north Bay of Bengal to the north of 16^oN. The intensity of the system was estimated as T1.5 as per Dvorak's classification based on Kalpana imageries. The upper tropospheric ridge ran along 23^oN on 16th June.

3.3 Intensity and Movement:

Under the influence of above favourable conditions, the system intensified further into a deep depression at 0600 UTC of 16th June. it moved northward and crossed West Bengal-Bangladesh coast near lat 21.8^oN and long. 89.0^oE, about 100 km east of Sagar Island. It then continued to move northwards for some time over Gangetic West Bengal till 17th morning. It then moved slowly west-northwestwards across Gangetic West Bengal, Jharkhand, north Chhattisgarh, southeast Uttar Pradesh and northwest Madhya Pradesh and weakened gradually. It weakened into a depression at 0600 UTC of 20th June over north Chhattisgarh and neighbourhood and into a well marked low pressure area over west Madhya Pradesh and neighbourhood on 23rd June 2011.

An important feature of the system was abnormal pressure drop at the centre of the system (max 12 hPa) over the land, even though the maximum surface wind speed was reported as 30-35 knots over Gangetic West Bengal. The best track of the system is shown in Fig.3.1. The best track parameters are shown in Table 3.1. The satellite imageries are shown in Fig. 3.2. The DWR, Kolkata imageries are shown in Fig. 3.3-3.4 respectively. The relative vorticity, vertical wind shear and upper level winds are shown in Fig. 3.5(i-viii) based on ECMWF analysis.

Doppler Weather Radar (DWR) , Kolkata was observing the system since 0300 UTC of 15TH June 2011 at every 10 minutes interval. The initial echoes of the system were observed in the form of scattered clouds at about 100–300 km in south, south-southwest (SSW) and southwest (SW) of Kolkata. Convective clouds were increasing in the subsequent observations and at 2300 UTC of 15th June moderate type of clouds were observed with reflectivity about 46 dBz and vertical extension from 6 to 8 km towards SSW and S of Kolkata. The front part of the system hit the coast at about 1106 UTC of 16th June at 108 km SSE of Kolkata. The storm centre was found at 1206 UTC of 16th June at 22.0⁰N /88.6⁰E and its azimuthal position was 125.8⁰/ 80 km from the Radar. Moderate convective clouds of reflectivity about 48 dBZ with vertical extension up to 12-14 km were observed in DWR images. The system got better organized with two spiral bands by 1206 UTC of 16th June. Ill defined eye was observed in DWR images at 0204 UTC of 17th June and clouds of 42 dBZ reflectivity were observed over Kolkata. The intensity of the system increased and clouds of 55 dBZ were observed over Kolkata, (NW) and west-southwest (WSW) of Kolkata at 0558 UTC of 17th June. At 1206 UTC of 17th June almost circular eye was observed at a distance 56 Km NW of Kolkata. The system moved further westward and its position was observed at 0604 UTC of 18th June near to the south of Bankura and its approximate centre was located at Lat. 23.0⁰N/Long. 87.3⁰E. The reflectivity imageries from 160300 UTC to 180600 UTC are shown in Fig 3.3. The track of the systems observed by DWR Kolkata is shown Table 3.2.

Table 3.1: Best track positions and other parameters of the deep depression over the Bay of Bengal during 16 -23 June, 2011

Date	Time (UTC)	Centre lat. ^o N/ long. ^o E	C.I. NO.	Estimated Central Pressure (hPa)	Estimated Maximum Sustained Surface Wind (kt)	Estimated Pressure drop at the Centre (hPa)	Grade
16-06-2011	0300	21.5/89.0	1.5	986	25	6	D
	0600	21.5/89.0	1.5	986	25	6	DD
	The system crossed west Bengal-Bangladesh coast near 21.8 ^o N/89.0 ^o E between 1100 -1200 UTC.						
	1200	22.0/89.0	--	984	30	6	DD
	1800	22.5/89.0	--	984	30	6	DD
17-06-2011	0000	22.5/89.0	--	984	30	8	DD
	0300	22.5/89.0	--	984	30	8	DD
	0600	22.8/88.5	--	978	35	12	DD
	1200	23.0/88.0	--	982	25	10	DD
	1800	23.0/88.0	--	984	25	8	DD
18-06-2011	0000	23.0/87.5	--	984	25	8	DD
	0300	23.0/87.0	--	984	25	8	DD
	0600	23.0/87.0	--	984	25	8	DD
	1200	23.0/87.0	--	984	25	8	DD
	1800	23.0/86.5	--	986	25	8	DD
19-06-2011	0000	23.0/86.0	--	986	25	8	DD
	0300	23.5/85.5	--	987	25	8	DD
	0600	23.5/85.5	--	987	25	8	DD
	1200	23.5/85.0	--	987	25	7	DD

	1800	23.5/84.5	--	987	25	7	DD
20-06-2011	0000	23.5/84.0	--	987	25	7	DD
	0300	23.5/83.5	--	987	25	7	DD
	0600	23.5/83.5	--	990	20	4	D
	1200	24.0/83.0	--	990	20	4	D
	1800	24.0/83.0	--	990	20	4	D
21-06-2011	0000	24.5/82.5	--	990	20	4	D
	0300	24.5/82.0	--	990	20	4	D
	0600	24.5/81.5	--	990	20	4	D
	1200	24.5/81.0	--	990	20	4	D
	1800	24.5/81.0	--	990	20	4	D
22-06-2011	0000	24.5/80.5	--	991	20	4	D
	0300	24.5/80.5	--	992	20	3	D
	0600	24.5/80.0	--	992	20	3	D
	1200	24.5/79.1	--	994	20	3	D
	1800	24.5/78.5	--	992	20	3	D
23-06-2011	0000	The system weakened into a well marked low pressure area over west Madhya Pradesh and neighbourhood.					

Table 3.2: DD track observations on 16 and 17th June 2011 by DWR Kolkata

Date	Time (UTC)	Lat (Deg) North	Long (Deg) East
17.06.2011	0004	22.2	88.8
	0104	22.3	88.7
	0204	22.4	88.5
	0304	22.5	88.4
	0404	22.5	88.3
	0504	22.5	88.3
	0606	22.6	88.2
	0706	22.5	88.2
	0806	22.6	88.1
	0906	22.5	88.1
	1006	22.6	88.0
	1106	22.6	88.0
	1206	22.6	87.9
	1306	22.5	87.7
	1406	22.6	87.6
	1506	22.7	87.4
	1606	22.7	87.3
	1706	22.8	87.3
	1806	22.9	87.2
	1906	22.8	87.2
2006	22.8	87.1	
2106	22.9	87.1	
2206	23.0	87.0	
2306	23.1	87.0	

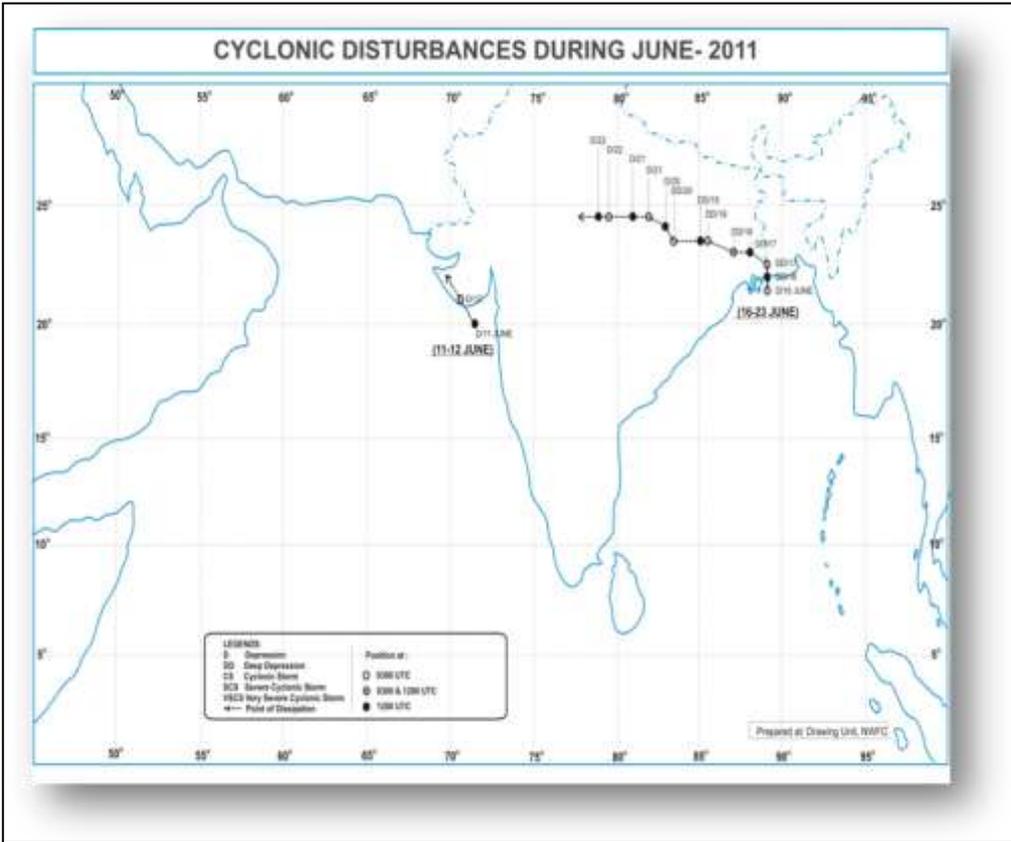


Fig.3.1 Track of the cyclonic disturbances formed over the north Indian Ocean during Month of June, 2011

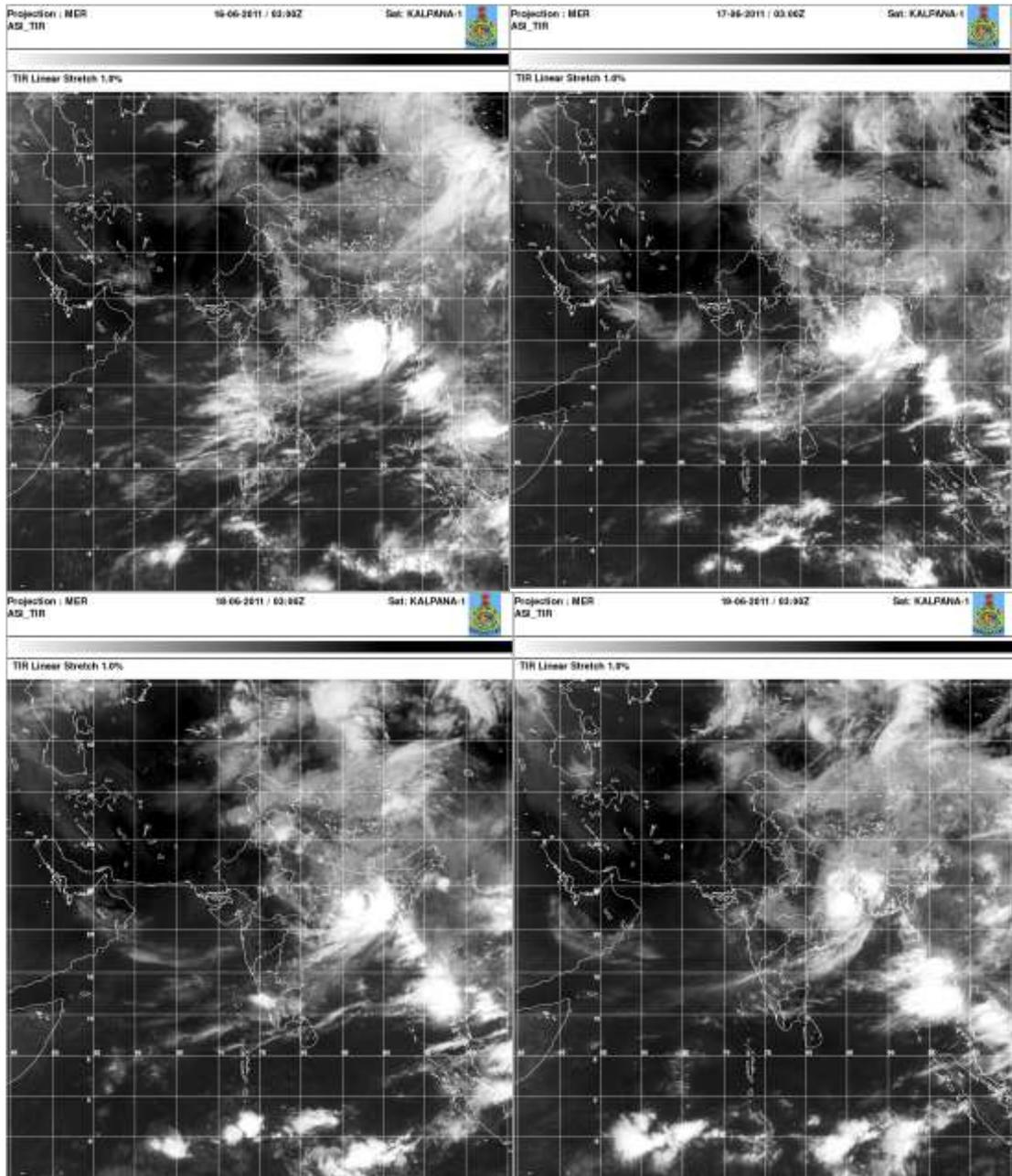


Fig. 3.2 (i) Typical Satellite imageries at 0300 UTC of 16-19 June 2011 in association of the system.

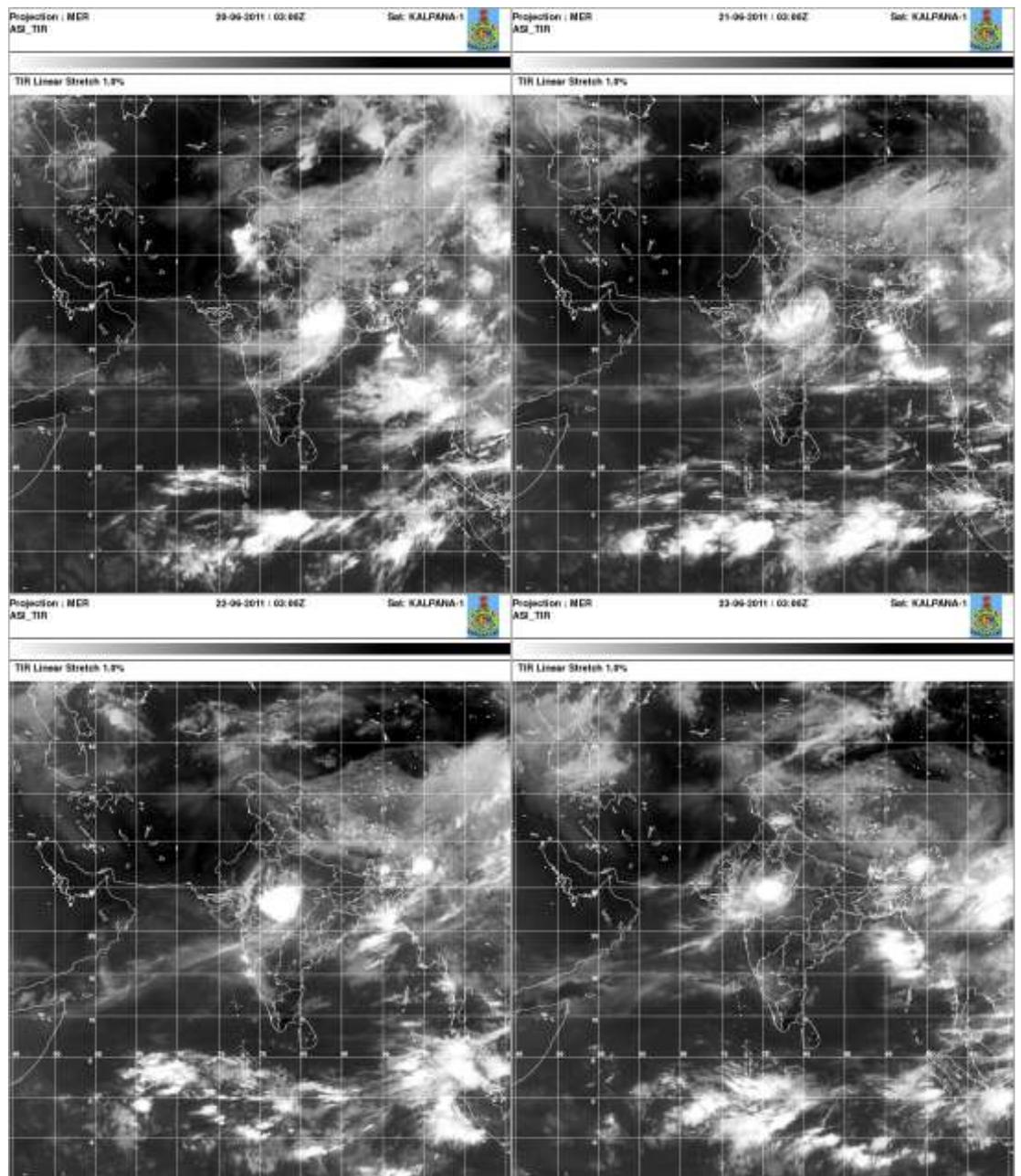
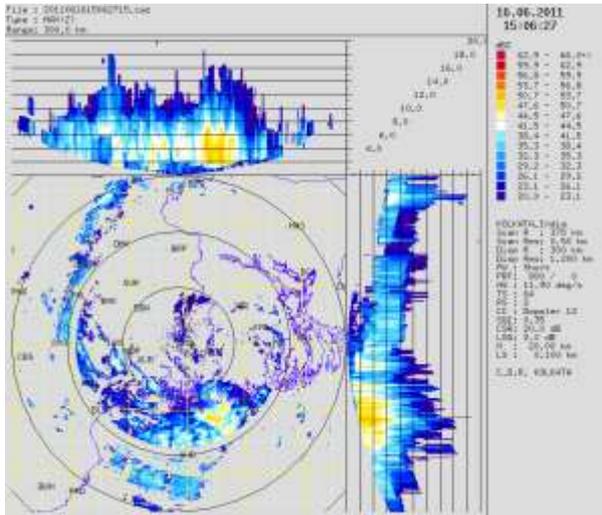
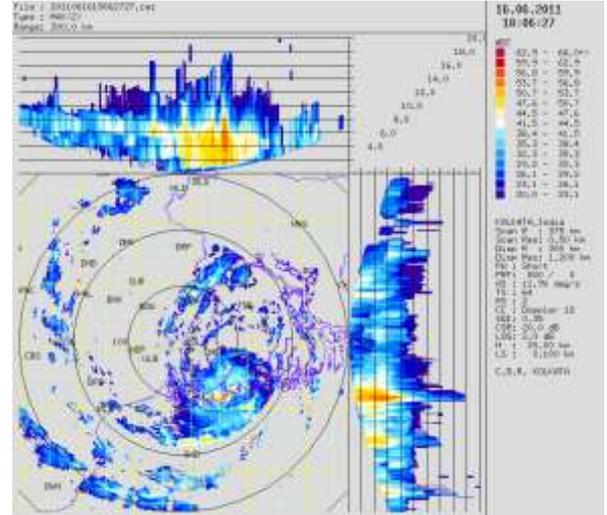


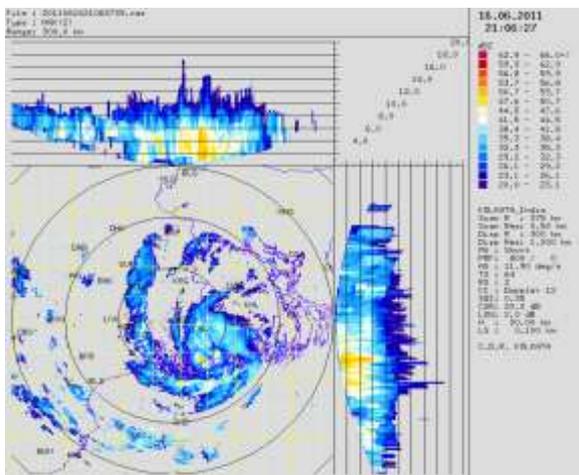
Fig.3.2 (ii) Typical Satellite imageries at 0300 UTC of 20-23 June 2011 in association of the system.



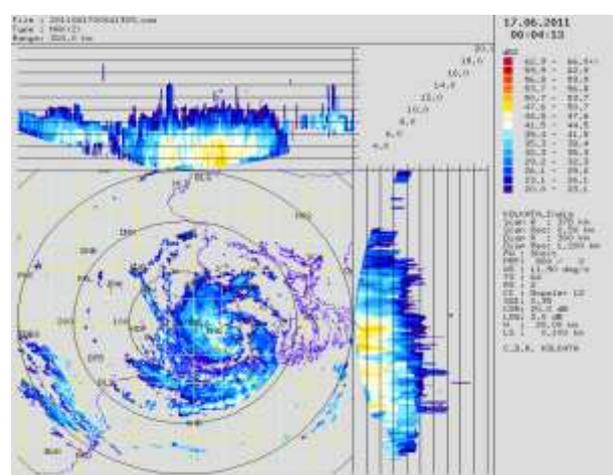
(e) 1500 UTC (16.06.2011)



(f) 1800 UTC (16.06.2011)

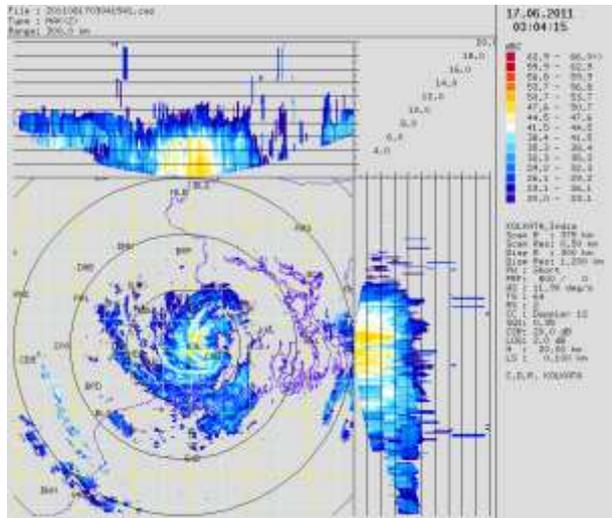


(g) 2100 UTC (16.06.2011)

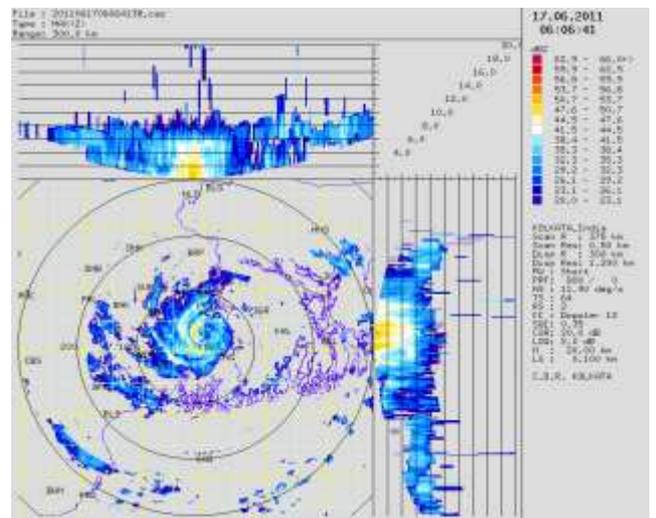


(h) 0000 UTC (17.06.2011)

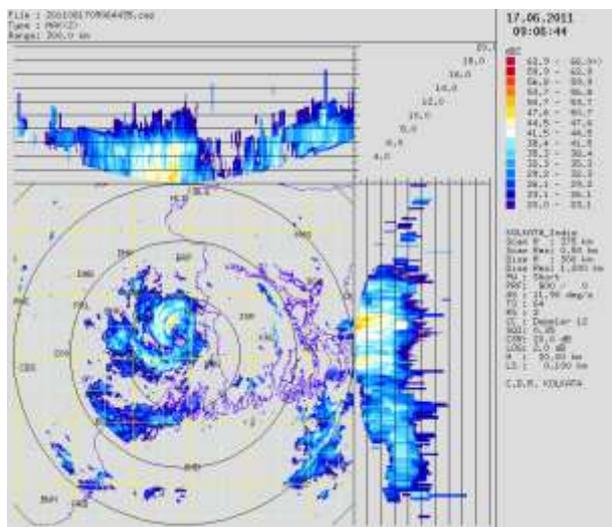
Fig.3.3. (continued) Max Z imageries of Deep Depression (300 km Range) during 16 to 18th June 2011 as observed by DWR, Kolkata.



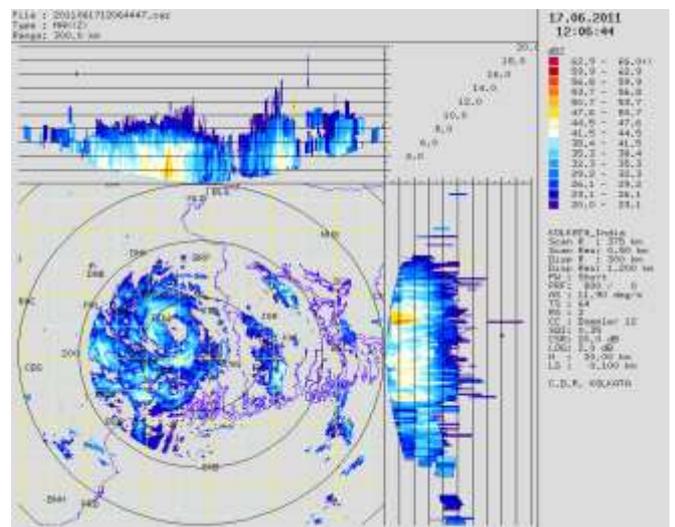
(i) 0300 UTC (17.06.2011)



(j) 0600 UTC (17.06.2011)

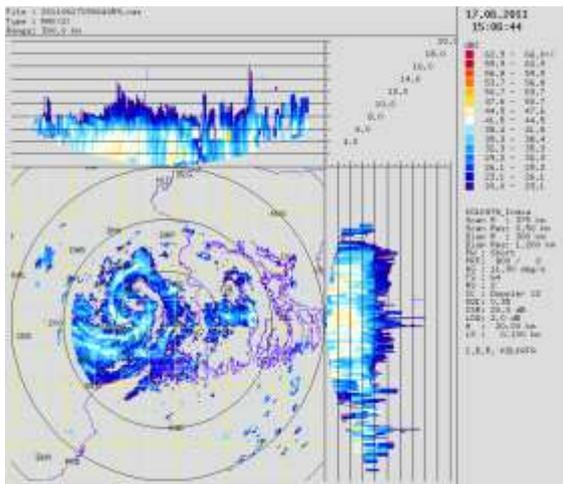


(k) 0900 UTC (17.06.2011)

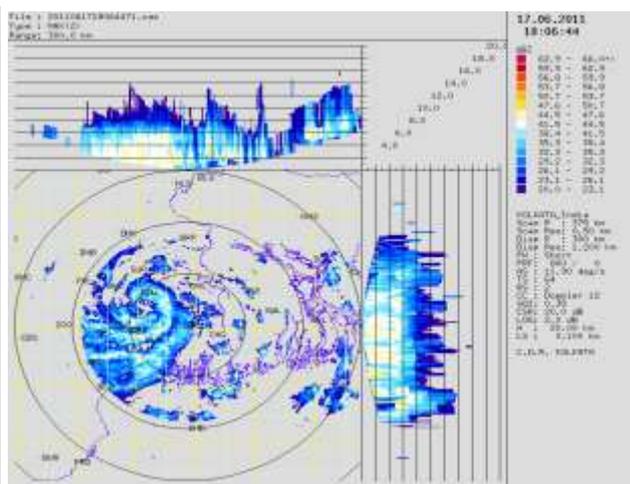


(l) 1200 UTC (17.06.2011)

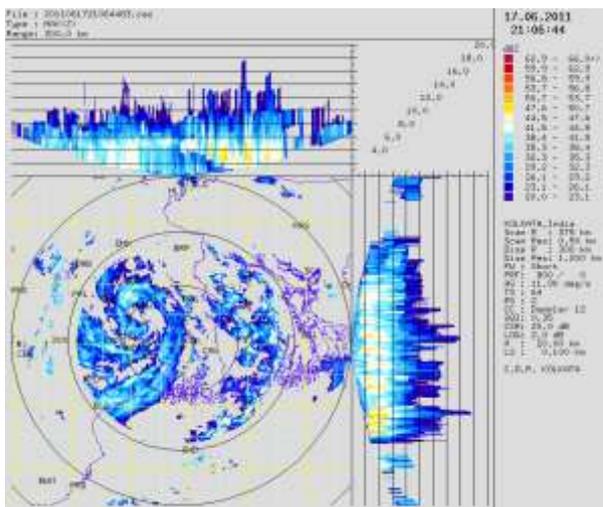
Fig.3.3. (continued) Max Z imageries of Deep Depression (300 km Range) during 16 to 18th June 2011 as observed by DWR, Kolkata.



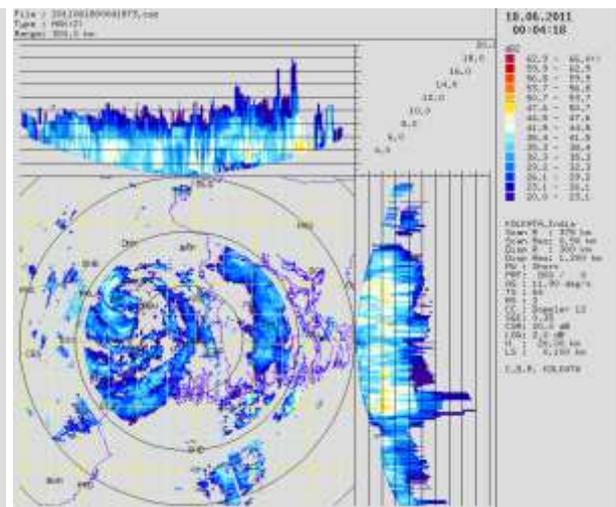
(m) 1500 UTC (17.06.2011)



(n) 1800 UTC (17.06.2011)

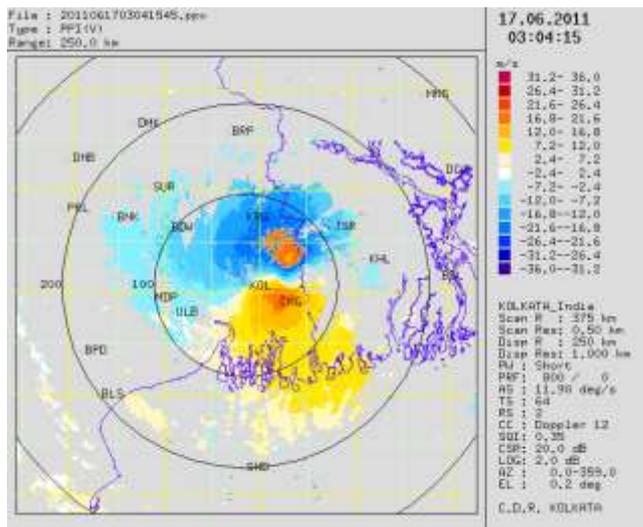


(o) 2100 UTC (17.06.2011)

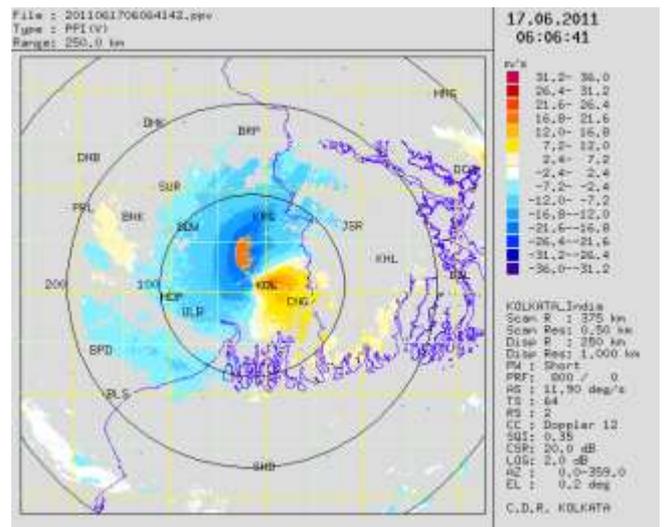


(p) 0000 UTC (18.06.2011)

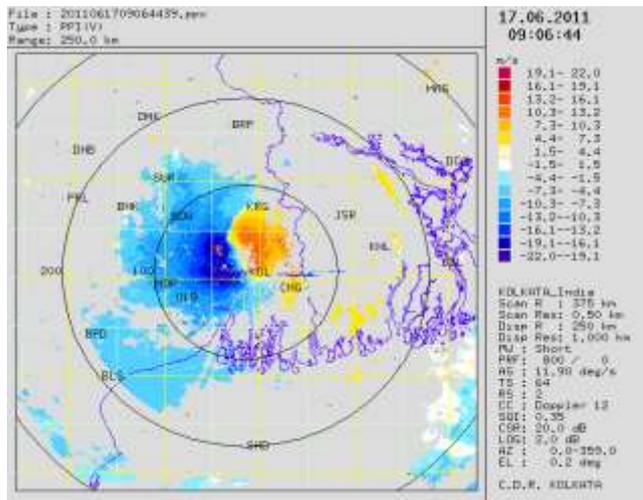
Fig.3.3. (continued) Max Z imageries of Deep Depression (300 km Range) during 16 to 18th June 2011 as observed by DWR, Kolkata.



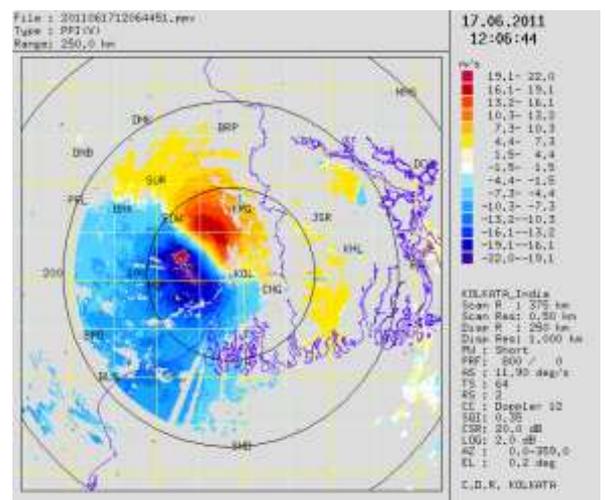
(a) 0300 UTC (17.06.2011)



(b) 0600 UTC (17.06.2011)

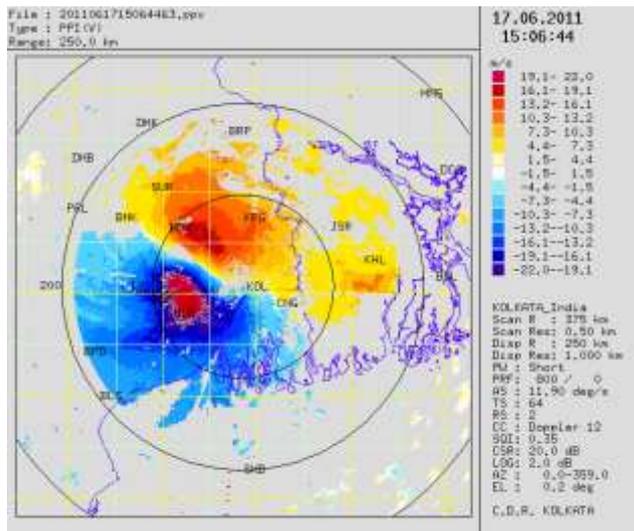


(c) 0900 UTC (17.06.2011)

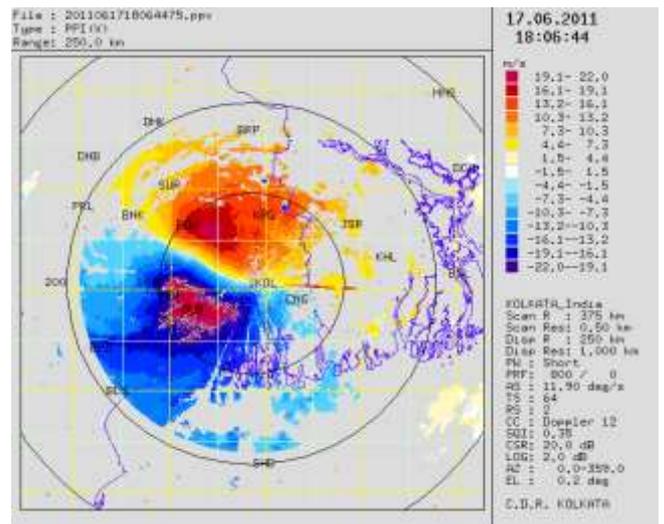


(d) 1200 UTC (17.06.2011)

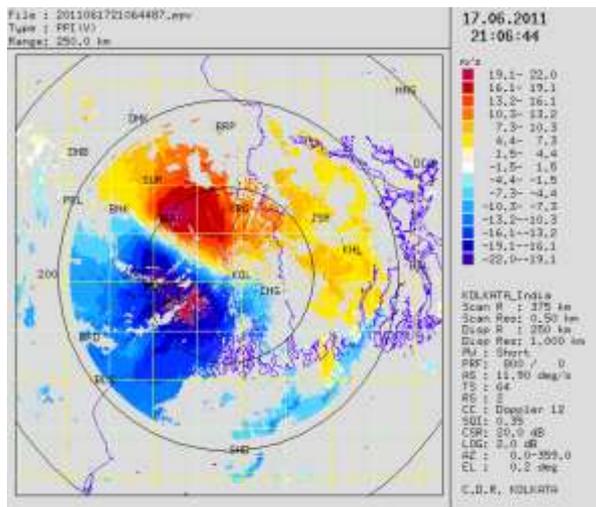
Fig.3.4 (continued) PPI_V imageries of deep depression (250 km Range) during 17th & 18th June 2011, as observed by DWR, Kolkata



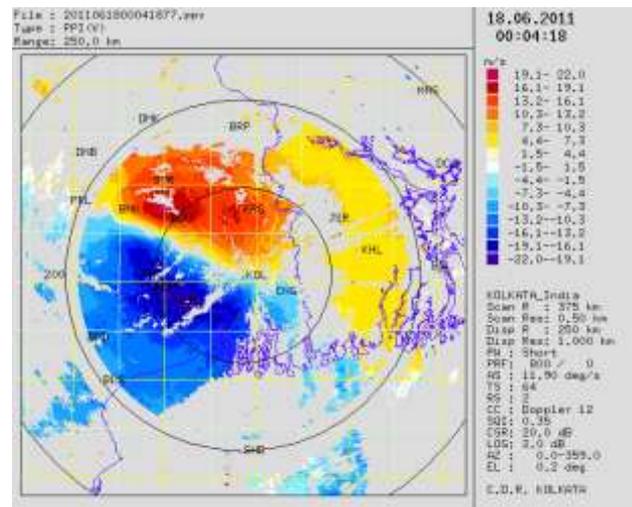
(e) 1500 UTC (17.06.2011)



(f) 1800 UTC (17.06.2011)



(g) 2100 UTC (17.06.2011)



(h) 0000 UTC (18.06.2011)

Fig.3.4. (continued) PPI_V imageries of deep depression (250 km Range) during 17th & 18th June 2011, as observed by DWR, Kolkata

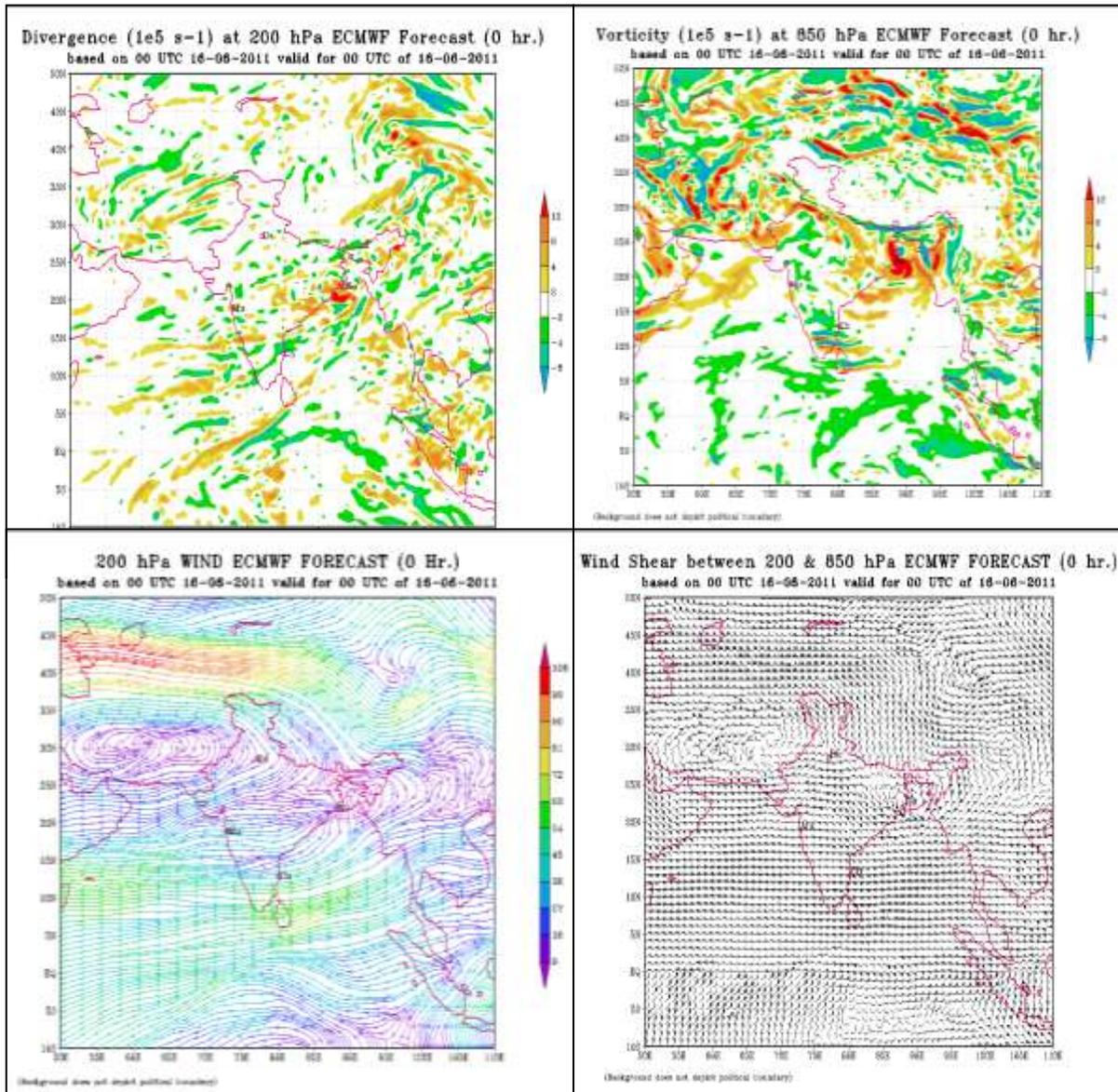


Fig. 3.5 upper level divergence at 200 hPa level (ii) low level relative vorticity at 850 hPa level (iii) wind at 200 hPa level (iv) vertical wind shear of horizontal wind between 200 & 850 hPa level based on the ECMWF model analysis of 0000 UTC of 16th June 2011.

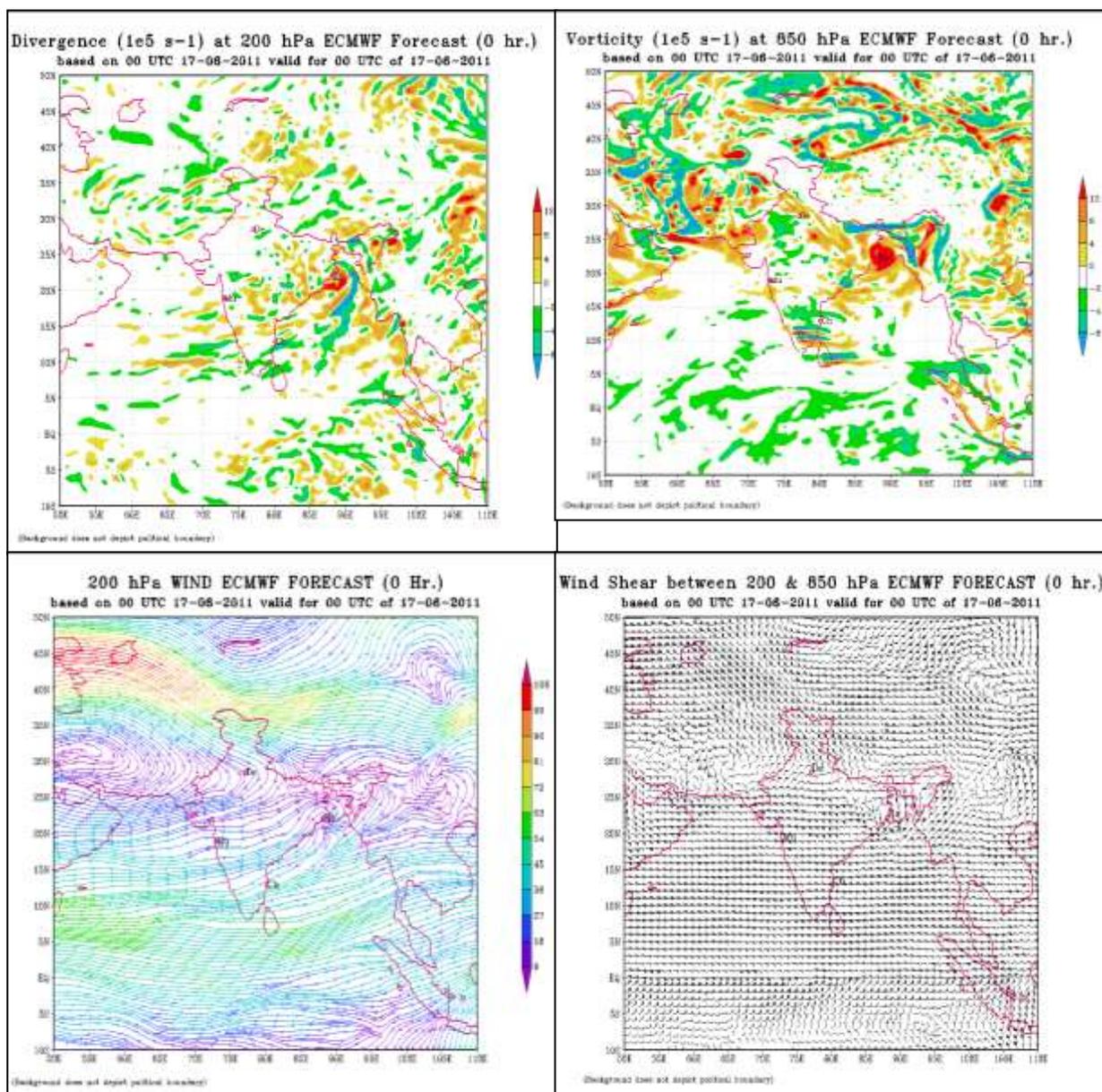


Fig. 3.5 (continued) upper level divergence at 200 hPa level (ii) low level relative vorticity at 850 hPa level (iii) wind at 200 hPa level (iv) vertical wind shear of horizontal wind between 200 & 850 hPa level based on the ECMWF model analysis of 0000 UTC of 17th June 2011.

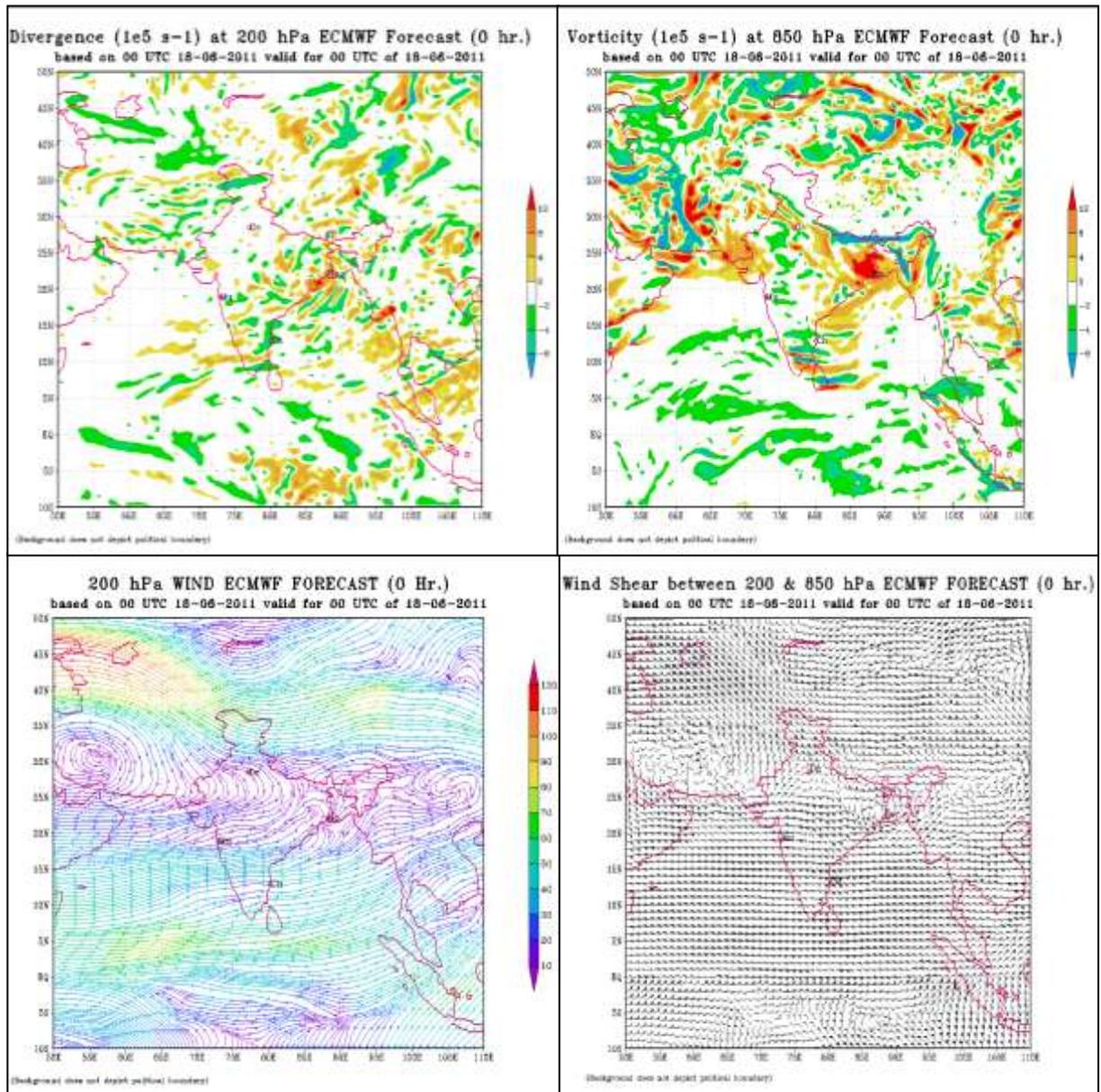


Fig. 3.5 (continued) upper level divergence at 200 hPa level (ii) low level relative vorticity at 850 hPa level (iii) wind at 200 hPa level (iv) vertical wind shear of horizontal wind between 200 & 850 hPa level based on the ECMWF model analysis of 0000 UTC of 18th June 2011.

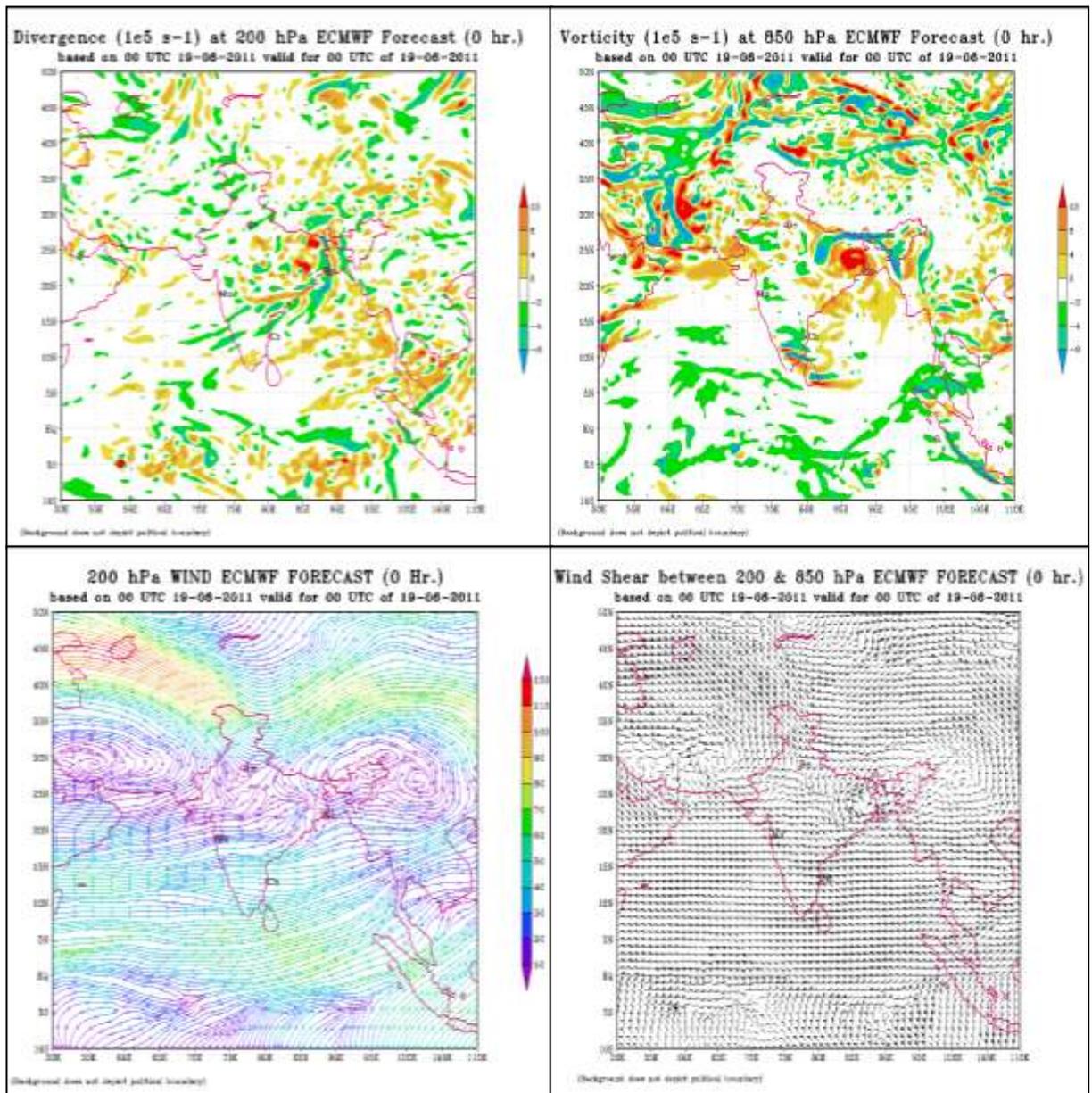


Fig. 3.5 (continued) upper level divergence at 200 hPa level (ii) low level relative vorticity at 850 hPa level (iii) wind at 200 hPa level (iv) vertical wind shear of horizontal wind between 200 & 850 hPa level based on the ECMWF model analysis of 0000 UTC of 19th June 2011.

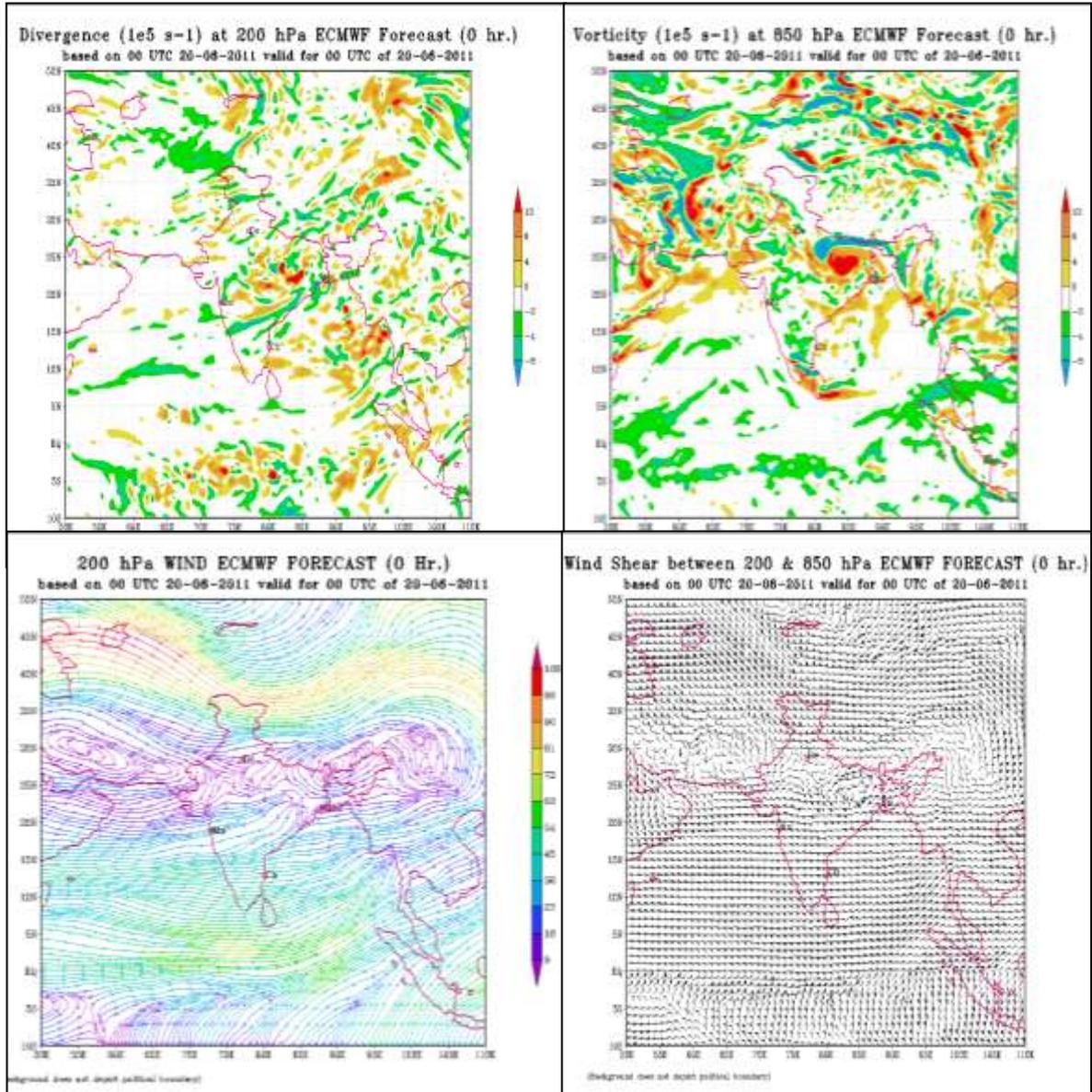


Fig. 3.5(continued) upper level divergence at 200 hPa level (ii) low level relative vorticity at 850 hPa level (iii) wind at 200 hPa level (iv) vertical wind shear of horizontal wind between 200 & 850 hPa level based on the ECMWF model analysis of 0000 UTC of 20th June 2011.

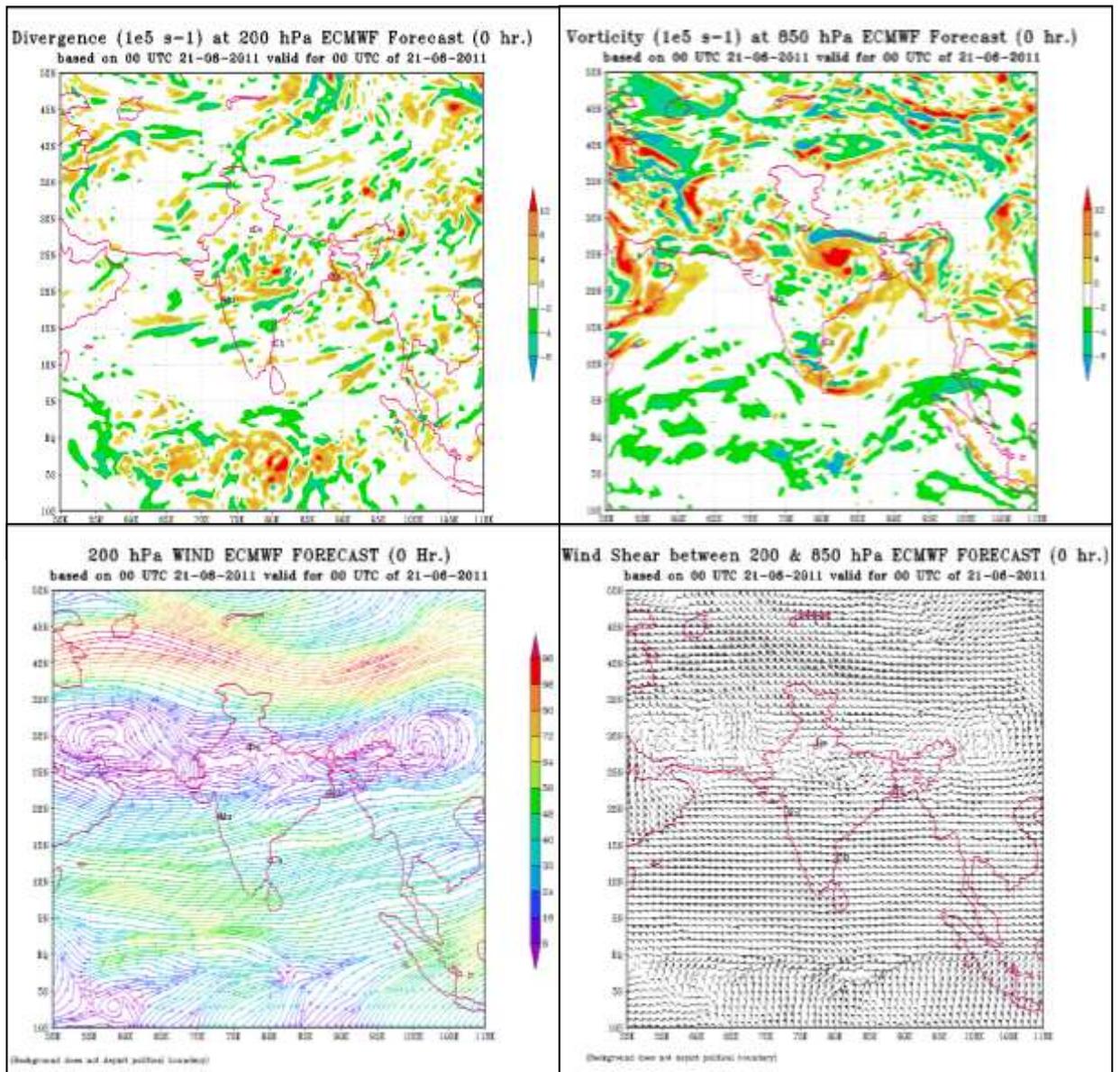


Fig. 3.5 (continued) upper level divergence at 200 hPa level (ii) low level relative vorticity at 850 hPa level (iii) wind at 200 hPa level (iv) vertical wind shear of horizontal wind between 200 & 850 hPa level based on the ECMWF model analysis of 0000 UTC of 21st June 2011.

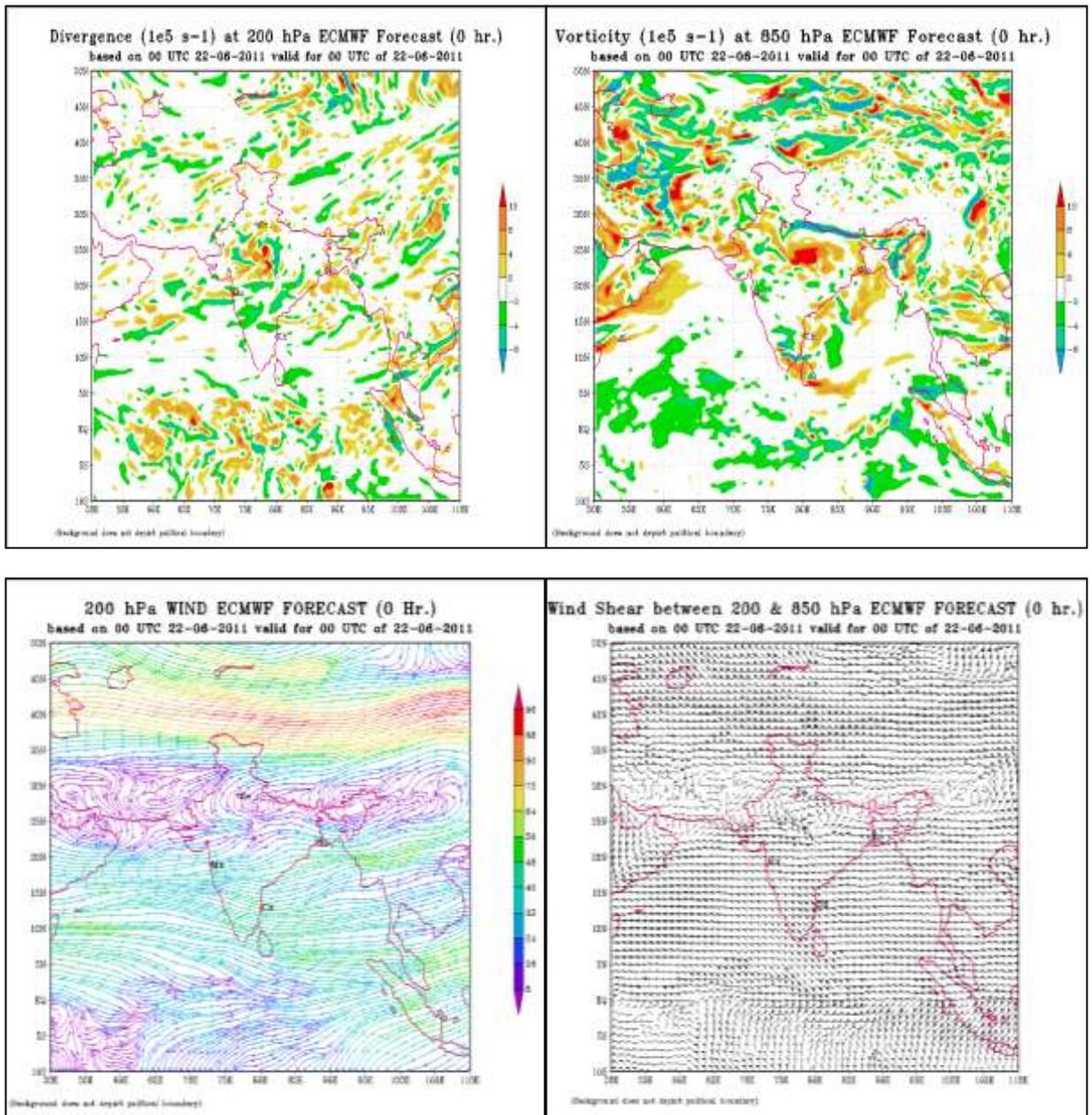


Fig. 3.5 (continued) upper level divergence at 200 hPa level (ii) low level relative vorticity at 850 hPa level (iii) wind at 200 hPa level (iv) vertical wind shear of horizontal wind between 200 & 850 hPa level based on the ECMWF model analysis of 0000 UTC of 22nd June 2011.

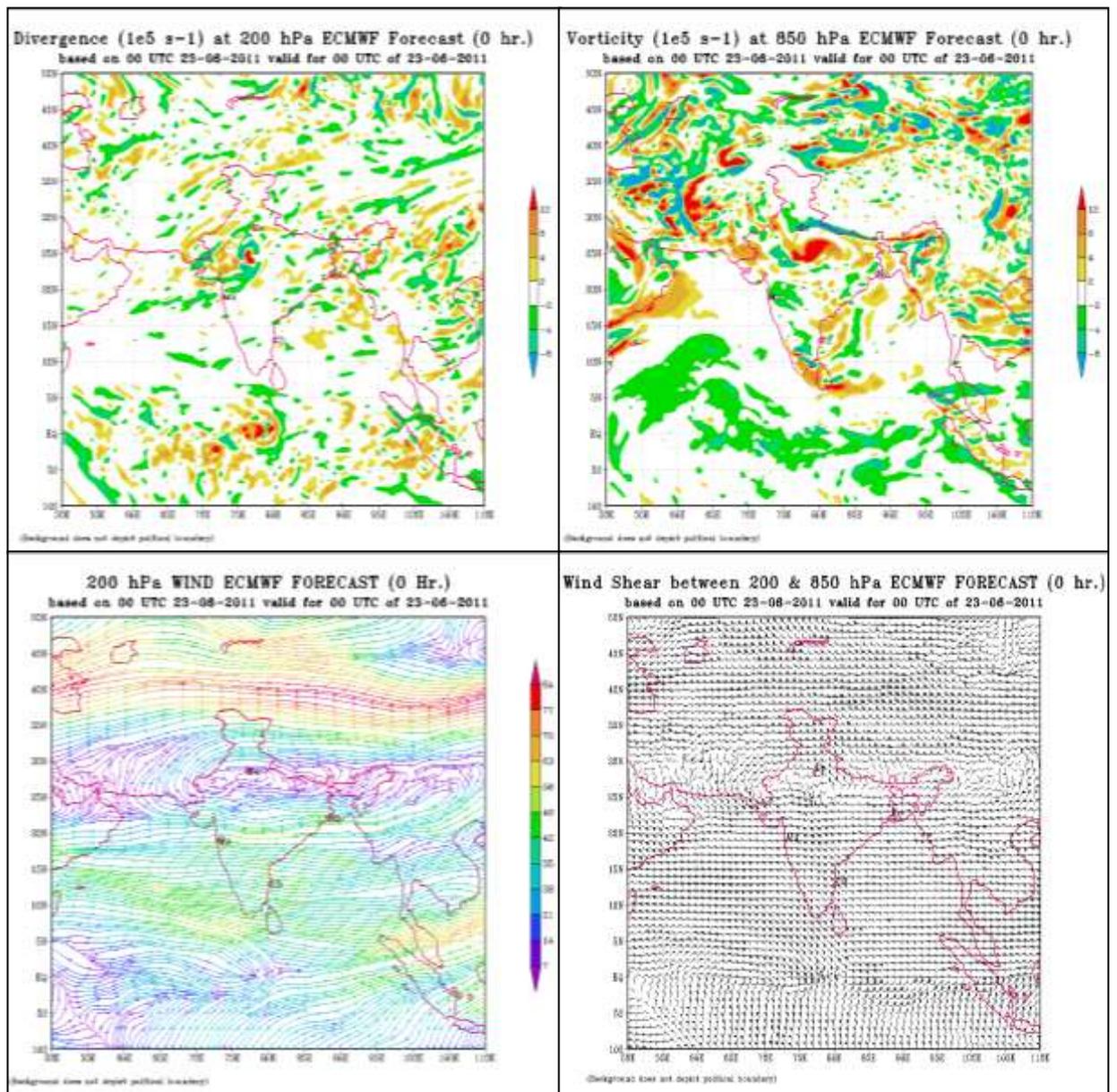


Fig. 3.5 (continued) upper level divergence at 200 hPa level (ii) low level relative vorticity at 850 hPa level (iii) wind at 200 hPa level (iv) vertical wind shear of horizontal wind between 200 & 850 hPa level based on the ECMWF model analysis of 0000 UTC of 23rd June 2011.

3.4. Estimated Central Pressure and maximum wind

The maximum radial wind as observed from PPI (V) was 25 mps at a height of 0.5 km above ground level at 1806 UTC of 17th June at a distance 60-65 km west-southwest of DWR Kolkata. The maximum horizontal wind estimated from VVP_2 product is 40 knots at height 1.2, 2.4, 2.7 & 3.0 km within 50 km radius of Kolkata at 1836 UTC of 17th June 2011. The maximum sustained surface wind (MSW) was reported as 35 knots by an AWS to the northeast of Kolkata around 0600 UTC of 17th June. The estimated MSW was thus 30-35 knots with lowest ECP of 978 hPa (Table 3.1)

3.5. Realised Weather:

Rainfall:

Under the influence of the system, widespread rainfall with isolated heavy to very heavy falls occurred over Orissa, Gangetic West Bengal Jharkhand, Chattisgarh, Madhya Pradesh, Bihar and Uttar Pradesh. The significant amount of 24 hours cumulative rainfall (>7 cm) recorded at 0300 UTC of date are as follows:

16-6-2011:

Orissa:

Chandbali and Hindol 12 each; Chendipada, Champua, Rajkanika, Keonjhar and Kakatpur 9 each; Jaleswar and Jaipur 8 each; Naktideul, Paradip, Rajghat, Thakurmunda and Bhubaneswar 7 each.

17-6-2011

Gangetic West Bengal:

Canning 10; Digha; Durgachak and Uluberia 7 each.

Orissa:

Sukinda 25; Tensa 18; Jenapur 12; Bhograi 11; Pallahara, Pattamundai, Akhuapada and Jaleswar 9 each; Joshipur, Kendrapara and Rajkanika 8 each; Dhenkanal, Jaipur, Madanpur Rampur Chandbali 7 each.

18-6-2011:

Gangetic West Bengal:

Mohanpur 27; Bankura 23; Kalakunda 21; Purihansa 17; Barackpur and D.P. Chat 16 each; Kolkata Alipur, Kolkata Dum Dum Midnapore (PT) and Midnapore (CWC) 15 each; Contai Kharidwar and Tusuma 14 each; Asansol, Bagati, Burdwan, Kansabati dam and Panagarh

13 each; Durgapur 12; Harinkhola, Simulia, and Digha 10 each; Uluberia and Gheropara 9 each; Durgachak 8; Diamond Harbour and Sriniketan 7 each.

Orissa:

Baripada, jamsolaghat and Bhograi 14 each; Rairangpur and Bangiriposi 13 each; Tining, Jaleswar and Chandanpur 11 each; sukinda 10; Rajghat 9; Rairakhol, Joshipur, Rajkishorenagar and Athmalik 7 each.

Jharkhand:

Ghatsila 13; Kuru and Panchet 10 each; Maithon 9; Ranchi 8; Lohar-daga, Gumla, Dhanbad, and Jamshedpur 7 each.

19-6-2011:

Gangetic West Bengal:

Bankura 16; Berhampore and Bankura 13 each; Phulberia, Tusuma Kharidwar and Kansabati dam 11 each; Asansol 10 Purihansa and Tantloi 9 each; Durgapur and Suri 8 each; Panagarh IAF, simulia and DP Ghat 7 each.

Jharkhand:

Ramgarh and Putki 17 each; Ranchi AP and jsamshedpur aero 16 each; Tenughat and Jamshedpur 15 each; Jamtara 14; Papunki 13; Balumath and Hindgir 11 each; Nandagih, Moharo, hariharganj and Messenjore 9 each; Barkisuriya and Daltonganj 7 each.

Bihar:

Sherghati 15; Gaya 9; Arwal 7.

20-6-2011:

Orissa :

Tensa 8; Rajkishorenagar 7.

Jharkhand:

Lohar-daga and Raidih 17 each; Kuru 16; Nandadih 13; Gumla, Daltonganj and Balumath 10 each; Ranch AP 8; Hindgir 7.

Chhattisgarh:

Ambikapur 13; Ramanujganj 11; Baikunthpur 9.

Bihar:

Arwal 10; Bihar and Palmerganj 9 each; Bhabhua 8; Indrapuri, Patna, Chenari, Kursela and Dehri 7 each.

East Uttar Pradesh:

Robertsganj 12; Chunar 11; Churk and Muhammadbad 10 each; Dudhi and Jaunpur 9 each; Rajghat, Deogaon Lalganj, Ghazipur, Gonda and Zamania 7 each.

21-6-2011

Gangetic West Bengal: Basirhat 11.

East Uttar Pradesh:

Ankinghat 11; Gyanpur, Karwi, sultanpur, Muhammadabad 9 each; Patti, and Bikpur 8 each; Mahul Phulpur, Haidargarh and Chhatnag 7 each.

Chhattisgarh:

Janakpur 17; Manendragarh 10; Baikunthpur 8.

East Madhya Pradesh:

Rewa and Sidhi 16 each; Satna 15; Singrauli 13; Khurai 11; Kotma and Dindori 10 each; Umariya 9; Anuppur 8; Jabalpur Ajaigarh and Khajuraho aero 7 each.

22-6-2011

East Madhya Pradesh:

Damoh 28; Buxwaha 21; Hatta 20; Garhakota 18; Sagar 16; Ghamspre 14; Rehli and Gotegaon 13 each; Kaneli 12; Khurai 11; Rajnagar 10; Narsinghpur and Jabalpur 9 each; Khajuraho and Amarwara 8 each; Panna, Tikamgarh, Keolari and Lakhnadon 7 each.

West Madhya Pradesh:

Mungaoli 16; Chanderi 13; Kuwai 11; Lateri and Benumganj 9 each; Pichhore 8; Ganjbasoda, Vidisa, Datia, Pachmarhi and Sironj 7 each.

23-6-2011:

East Madhya Pradesh:

Sagar 1; Khurai 14; Garhakota 12.

West Madhya Pradesh:

Guna 34; Ashoknagar 29; Ganjbasoda 20; Mungaoli 19; Sironj 18; Begumganj 17; Chanderi 16; Isagarh and Lateri 15 each; Biiara 13; Narsingarh 11; Bhanpur, Rajgarh, Pichhore,

F/C Date	Sub-Division	F/C Valid for 24 hrs.	F/C Valid for 48 hrs.	Realized wx during 24 hrs.	Realized wx during 48 hrs.
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Kolaras, Udaipura, Salwani 9 each; Vidisha, Khilchipur and Garoth 8 each; Sheopur, Sailana, Manasa, Shivpuri, sarangpur and Ratlam 7 each.

East Rajasthan:

Baran 29; Baran 25; Kanwas 22; Kishanganj and Sangod 21 each; Atru and Anta 19 each; Chhabara 18; Chipaboard 17; Mangrol 15; Khanpur and Shahbad 14 each; Jhalawar, Asnawar and Jhalawar 13 each; Iklera, and Manoharthana 11 each; Bakani and Pratapgarh 10 each; Patan keshorai, Degod, Ramganjmandi, Mandana, Begu and Kota Airport 9 each; Jhalrapatan, Ladpura, Kota, Deoli, Kekri, Jhazpur, Newai and Bhainjsroadgarh 8 each; Kotri Nimbahera, vanasthali, Mandalgarh, Pirawa, Telera, Pachpahar, Malpura and Chechat 7 each.

Maximum Sustained Wind (MSW):

The MSW of 30-35 kmph prevailed over Gangetic West Bengal on 17th June, 2011.

3.6 Damage:

Due to the system, the following damage has been reported

West Bengal:

1. Loss of lives: 7 due to landslide, house damage and boat mishap.
2. House Damaged: 1200 mud walled houses in Midnapur district.
3. 12 Villages were inundated in north 24 Praganas due to collapse of river embankment.

Jharkhand:

Loss of Lives: 10 persons

Loss of property:

It caused heavy damage to houses and crops. Trees were uprooted and power supply was disrupted. The national highway number 75 from Ranchi to Chaibasa was badly affected and Jolo bridge collapsed.

Orissa: No damage reported

3.7 Warnings:

The following warnings issued in connection with the deep depression.

- (i) No. of national bulletins issued to disaster management agencies: 30
- (ii) No. of Special Tropical Weather Outlook for WMO/ESCAP Panel member countries: 5

The verification of heavy rainfall warning is given in table 2.3.

The Verification of squally wind warnings issued by IMD is given in Table 3.4

Table 3.3 Verification of heavy rainfall warnings issued in association with deep depression during 16-23 June, 2011

16.06.11	N.Orissa	SCT H-VH	SCT H-VH	SCT H-VH	SCT H-VH
	S.Orissa	ISOL H-VH	ISOL H-VH	SCT H-VH	SCT H-VH
	Jharkhand	SCT H-VH	SCT H-VH	-	SCT Hvy.
	Chattisgarh	ISOL H-VH	ISOL H-VH	-	-
	Gangetic WB	ISOL H-VH	ISOL H-VH	ISOL H.	-
17.06.11	Gangetic WB	SCT H-VH	SCT H-VH	SCT H-VH	SCT H-VH
	N.Orissa	SCT H-VH ISOL EH	SCT H.- VH	SCT H-VH	-
	S.Orissa	SCT H-VH	SCT H-VH	SCT H-VH	-
	Jharkhand	SCT H- VH	SCT H- VH	SCT H- VH	SCT H-VH
	Chattisgarh	ISOL H-VH	ISOL H-VH	-	-
18.06.11	Vidarbha	ISOL H-VH	ISOL H-VH	-	-
	N.Orissa	SCT H-VH	-	-	-
	Jharkhand	SCT H-VH	-	SCT H- VH	SCT H- VH
	East MP	ISOL H-VH	-	-	SCT H- VH/ ISOL EX H
	Vidarbha	ISOL H-VH	-	-	-
	Chattisgarh	ISOL H-VH	ISOL H-VH	-	ISOL H- VH
	Bihar	-	-	ISOL H-VH	ISOL H- VH
19.06.11	East UP	-	-	-	ISOL H- VH
	Jharkhand	SCT H- VH	-	SCT H- VH	-
	N.Orissa	ISOL H- VH	-	-	-
	Gangetic WB	ISOL H- VH	-	-	-
	Bihar	ISOL H- VH	-	ISOL H- VH	-
20.06.11	East UP	ISOL H- VH.	-	ISOL H- VH.	-
	Chattisgarh	ISOL H- VH.	-	ISOL H- VH	-
	East MP	ISOL H- VH	-	SCT H- VH	-
	Jharkhand	ISOL H.- VH	-	-	-
	N.Orissa	ISOL H- VH	-	SCT H- VH	-
	Bihar	ISOL H- VH.	-	ISOL H	-
21.06.11	East UP	ISOL H- VH	-	ISOL H- VH	-
	N.Chattisgarh	ISOL H- VH.	-	-	-
	East MP	ISOL H- VH.	-	SCT H- VH	-
	South UP	ISOL H- VH	-	-	-
	West MP	ISOL H	ISOL H	ISOL H- VH	SCT H- VH
22.06.11	Vidarbha	ISOL H	ISOL H	-	-
	West MP	SCT H- VH	-	-	-
23.06.11	East MP	ISOL H	ISOL H	ISOL H-VH	ISOL VH
	West MP	ISOL H- VH	-	-	-
	Gujarat	ISOL H- VH	-	-	-
	East Rajasthan	ISOL H- VH	-	SCT H- VH	-

Legend:

H: Heavy (7-12 cm), VH: Very Heavy (13-24 cm), Ex H: Extremely Heavy (≥ 25 cm)

ISOL: Isolated (25% or less numbers stations reporting heavy rain)

SCT; Scattered (25-50% of stations reporting heavy rain)

Table 3.4 verification of squally wind warning issued by IMD

F/C Date	Sub-division	F/c valid for 24 hrs Wind speed	Realized wind speed during 24 hrs.
16-06-2011	Gangetic West Bengal	45-55 kmph	Wind with speed of 55-65 kmph prevailed over GWB and speed of 40-45 kmph prevailed over north Orissa and Jharkhand.
	North Orissa	45-55 kmph	
17-06-2011	Gangetic West Bengal	40-50 kmph	
	North Orissa	40-50 kmph	