

Cyclones and depressions over the north Indian Ocean during 2015*

1. Introduction

During 2015, in all 12 intense low pressure systems formed over the Indian Seas. These include; two Extremely Severe Cyclonic Storms (CHAPALA and MEGH), two Cyclonic Storms (ASHOBAA and KOMEN), and eight Depressions/Deep Depressions. Out of these 12 systems, five systems formed over the Arabian Sea, three over the Bay of Bengal and four over Land. Monsoon Season witnessed the formation of two cyclonic storms ASHOBAA and KOMEN which formed over the Arabian Sea and Bay of Bengal respectively; three deep depressions, one over the Arabian Sea and two over land and three depressions, one over the Bay of Bengal and two over Land. Post-monsoon season was cyclogenetically active with successive formations of two Extremely Severe Cyclonic Storms (CHAPALA and MEGH) over the Arabian Sea and two Deep Depressions, one each over the Bay of Bengal and Arabian Sea.

The tracks/intensity of these systems is given in Fig. 1. A brief history and monthly distribution of the systems is given in Tables 1 and 2 respectively. The relevant ship and buoy observations are given in Table 3. Detailed season wise descriptions of these systems are given below:

2. Details of the systems

2.1. Cyclonic Storm (ASHOBAA) over the Arabian Sea (7 - 12 June, 2015)

2.1.1. A trough of low at mean sea level lay over Lakshadweep area and neighbourhood on 3rd and over southeast Arabian Sea and adjoining Lakshadweep area on 4th and 5th with a cyclonic circulation aloft. It organised into a low pressure area over southeast and adjoining east central Arabian Sea with associated cyclonic circulation extending upto 3.1 kms a.s.l. on 6th and became a well marked low pressure area over the same region on 7th, early morning. It then concentrated into a Depression over east central Arabian Sea and neighbourhood and lay centred near Lat. 14.5° N / Long. 68.5° E, about 690 km southwest of Mumbai and 740 km south southwest of Veraval at 0300 UTC on 7th. Moving north northwestwards it lay centred near Lat. 16.0° N / Long. 68.0° E, about 580 km southwest of Mumbai and 560 km south southwest of Veraval at 1200 UTC of 7th. It

moved north northwestwards and intensified into a Deep Depression and lay centred near Lat. 17.5° N / Long. 67.5° E, about 590 km west southwest of Mumbai & 480 km south southwest of Veraval at 0000 UTC on 8th. It continued to move north northwestwards and intensified into a Cyclonic Storm (ASHOBAA) and lay centred near Lat. 17.9° N / Long. 67.2° E, about 590 km west southwest of Mumbai & 470 km southwest of Veraval at 0300 UTC on 8th. It moved northwestwards and lay centred near Lat. 18.6° N / Long. 66.5° E, about 480 kms southwest of Veraval at 1200 UTC on 8th. It continued to move northwestwards and lay over east central and adjoining northwest and west central Arabian Sea, centred near Lat. 20.0° N / Long. 65.0° E about 570 kms west southwest of Veraval and 640 kms east-southeast of Sur (Oman) at 0300 UTC on 9th. It moved west-northwestwards and lay centred near Lat. 21.0° N / Long. 63.0° E, about 860 kms west of Veraval and 400 kms east-southeast of Sur (Oman) at 1200 UTC on 9th. It moved westwards and lay centred over northwest and adjoining west central Arabian Sea, near Lat. 21.3° N / Long. 61.8° E about, 270 kms southeast of Sur (Oman) and 310 kms east-northeast of Masirah (Oman) at 0300 UTC on 10th. Subsequently moving west southwestwards, it lay over northwest Arabian Sea, near Lat. 21.2° N / Long. 61.1° E, about 235 km, east northeast of Masirah (Oman) at 1200 UTC of 10th. It moved west-southwestwards and lay centred near Lat. 20.8° N / Long. 60.8° E about 200 kms east-northeast of Masirah (Oman) at 0300 UTC on 11th. It moved westwards lay centred near Lat. 20.8° N / Long. 60.0° E about 120 kms east-northeast of Masirah (Oman) at 1200 UTC of 11th. It continued to move westwards and weakened into a Deep Depression, near Lat. 20.8° N / Long. 59.7° E at 1800 UTC of 11th and further weakened into a Depression near Lat. 20.8° N / Long. 59.5° E at 0000 UTC of 12th. It remained practically stationary and lay centred near Lat. 20.8° N / Long. 59.5° E, about 60 kms east-northeast of Masirah (Oman) at 0300 UTC of 12th. It moved slightly west southwestwards and weakened into a well marked low pressure area over the same region on the same evening.

The observational summary is given in Table 1.

2.1.2. Other features observed

The lowest Estimated Central Pressure (ECP) was 990 hPa from 0600 UTC of 9th to 1500 UTC of 10th. The

* Compiled by : S. Sunitha Devi and A. P. Kundale, Weather Forecast Development Division, Pune – 411 005, India.

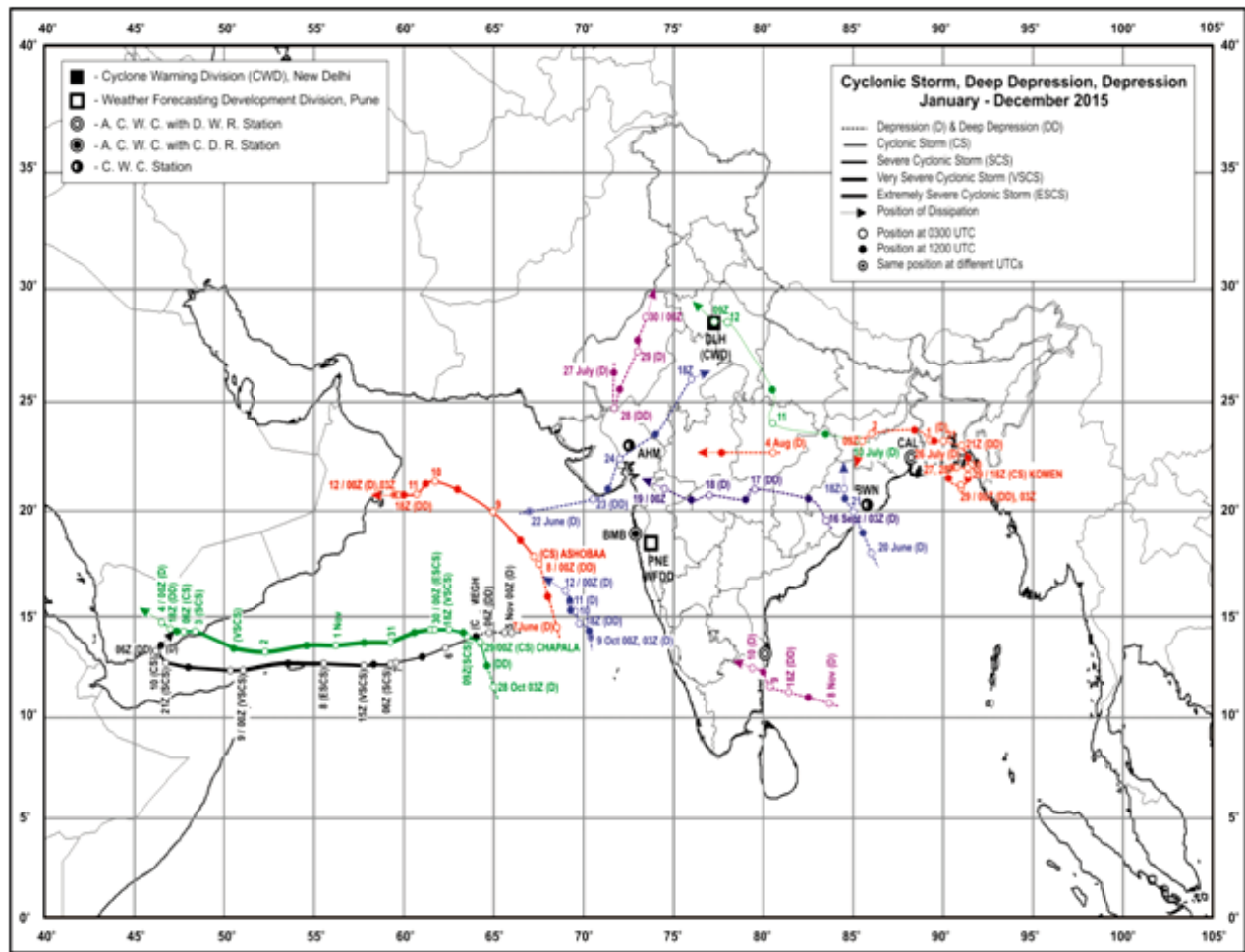


Fig. 1. Tracks of storms and depressions over north Indian Ocean during the year 2015

maximum estimated mean wind speed was 45 kts from 1800 UTC of 9th to 2100 UTC of 10th. The lowest observed pressure of 986.2 hPa was reported by Buoy 23690 (18.5/66.4) at 1200 UTC of 8th, when the system was to the west of the Buoy 23690. The maximum observed mean wind speed of 33 kts was reported by Ship WKPM (12.6/64.4) at 1200 UTC of 9th. The system moved initially northwest, westward and then west southwest and again westward direction.

2.1.3. Weather and damage caused

Heavy to very heavy rainfall occurred at isolated places over Gujarat State. Scattered to widespread rainfall with heavy rainfall occurred at isolated places over the sub-divisions along the west coast.

No damage has been reported due to this system.

Chief amounts of rainfall are :

7 June, 2015

Saurashtra & Kutch	: Bhanvad 4
Konkan & Goa	: Kankavli 9, Lanja, Guhagarh and Devgarh 3 each, Mangaon and Rajapur 2 each
Lakshadweep	: Amini Divi 2

TABLE 1

Brief Summary of cyclonic storms and depressions over the Indian Seas and neighbourhood during 2015

S. No.	Category	Life period	Place / Time of landfall	Lowest estimated / central Pressure (hPa)	Max. wind (Estimated) (kts)	Highest "T" No.
1.	Cyclonic Storm (Ashobaa)	7-12 Jun	Weakened into a well marked low pressure area near Masirah (Oman) at 1200 UTC of 12 th	990	45	3.0
2.	Depression	20-22 Jun	Crossed Odisha coast between Gopalpur and Puri around 2000-2400 UTC of 20 th and Weakened into a well marked low pressure area and lay over Odisha and adjoining areas of Jharkhand & Chhattisgarh on 22 nd morning	990	25	1.5
3.	Deep Depression	22-25 Jun	South Gujarat coast near Diu between 0900 and 1000 UTC of 23 rd and weakened into a well marked low pressure area over northwest Madhya Pradesh and neighbourhood on 25 th morning	988	30	2.0
4.	Land Depression	10-12 Jul	Weakened into a well marked low pressure area over northwest Uttar Pradesh and adjoining areas of Haryana on 12 th evening	994	25	-
5.	Land Depression	27-30 Jul	Weakened into a well marked low pressure area over west Rajasthan and neighbourhood	994	30	-
6.	Cyclonic Storm (Komen)	26 Jul - 2 Aug	Crossed Bangla Desh coast between Hatia and Sandwip between 1400 - 1500 UTC on 30 th and weakened into a well marked low pressure area over Jharkhand and adjoining areas of north Odisha and north Chhattisgarh on 2 nd August	986	40	2.5
7.	Land Depression	4-5 Aug	Weakened into a well marked low pressure area over southwest Madhya Pradesh and neighbourhood on 0000 UTC of 5 th	998	25	-
8.	Land Depression	16-19 Sep	Weakened into a well marked low pressure area over north Madhya Maharashtra & adjoining areas of southwest Madhya Pradesh and Gujarat region	996	30	-
9.	Deep Depression	9-12 Oct	Weakened <i>in situ</i> over the sea over east central and adjoining west central Arabian Sea	1000	30	2.0
10.	ESCS (Chapala)	28 Oct - 4 Nov	Yemen coast to the southwest of Riyan (14.1/48.65) during 0100-0200 UTC on 3 rd November over Yemen	940	115	6.0
11.	ESCS (Megh)	5-10 Nov	Yemen coast near latitude 13.4°N / 46.1°E around 0900 UTC on 10 th over Yemen and neighbourhood	964	95	5.0
12.	Deep Depression	8-10 Nov	North Tamil Nadu coast close to Marakanam (north of Puducherry) near latitude 12.2°N / 80.0°E around 1400 UTC on 9 th	996	30	2.0

8 June, 2015

Gujarat Region : Kaprada 9, Silvassa and Valsad 7 each, Vapi 6, Pardi 5, Madhbun and Nanipalson 4 each

Konkan & Goa : Panjim (Goa) 4, Malvan, Bhira, Marmugoa and Shahapur 3 each

Coastal Karnataka : Karwar and Mangaluru 5 each, Mulki 4, Udupi, Kota,

Mudubidre and Gokarna 3 each

Kerala : Cherthala and Kayamkulam Agri 8 each, Kunnankulam, Kayamkulam and Kannur 7 each, Chengannur, Ponnani, Vaikom and Thiruvananthapuram AP 6 each, Thiruvananthapuram, Alappuzha and Haripad 5 each

Lakshadweep : Agathi and Kavaratti 3 each, Amini Divi 2

TABLE 2
Storms / Depressions statistics 2015

Name of the system	Winter	Pre-monsoon			Monsoon				Post-monsoon			Total
	Jan - Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Over the Bay of Bengal												
Depressions/Deep Depressions	-	-	-	-	1	-	-	-	-	1	-	2
Cyclonic Storms	-	-	-	-	-	1	-	-	-	-	-	1
Severe Cyclonic Storms	-	-	-	-	-	-	-	-	-	-	-	0
Very Severe Cyclonic Storms	-	-	-	-	-	-	-	-	-	-	-	0
Super Cyclonic Storms	-	-	-	-	-	-	-	-	-	-	-	0
Total	-	-	-	-	-	-	-	-	-	-	-	0
Land Depression												
Depressions	-	-	-	-	-	2	1	1	-	-	-	4
Over the Arabian Sea												
Depressions/Deep Depressions	-	-	-	-	1	-	-	-	1	-	-	2
Cyclonic Storms	-	-	-	-	1	-	-	-	-	-	-	1
Severe Cyclonic Storms	-	-	-	-	-	-	-	-	-	-	-	0
Very Severe Cyclonic Storms	-	-	-	-	-	-	-	-	-	-	-	0
Extremely Severe Cyclonic Storms	-	-	-	-	-	-	-	-	1	1	-	2
Super Cyclonic Storms	-	-	-	-	-	-	-	-	-	-	-	0
Grand Total	0	0	0	0	3	3	1	1	2	2	0	12

9 June, 2015

Gujarat Region : Kaprada 13, Nanipalson 8, Dharampur 7, Vansda and Chikhli 4 each

Saurashtra & Kutch : Okha 5, Khambhalia and Jodia 4 each, Tankara and Dhrol ARG 3 each

Konkan & Goa : Malvan 5, Sawantwadi and Canacona 4 each, Kankavli, Vengurla, Mulde - AWS, Quepem and Devgarh 3 each

Coastal Karnataka : Mangaluru AP and Mangaluru AP 8 each, Mulki and Gokarna 6 each, Karwar, Udupi, Mudubidre, Karkala, Bantwal and Mangaluru 5 each, Kollur, Honavar, Ankola and Kumta 4 each

Kerala : Kumarakom, Kannur and Mavelikara 6 each, Alappuzha,

Piravam, Karipur and Cherthala 5 each, Kollam Rly, Taliparamba, Vaikom and Thalasserry 4 each, Perinthalamanna, Enamakal, Konni and Vadakara 3 each

Lakshadweep : Kavaratti 3

10 June, 2015

Gujarat Region : Dangs (Ahwa) 7, Sanand 5, Arnej AWS 4, Dhandhuka 3

Saurashtra & Kutch : Chotila 3

Konkan & Goa : Canacona 6, Marmugoa, Sanguem, Dahanu and Quepem 4 each, Kudal, Dabholim (Goa), Panjim (Goa), Ratnagiri, Devgarh, Mulde - AWS, Mulde Agri, Valpoi, Margao, Dodamarg and Mapusa 3 each

TABLE 3

Ships' Observations during 1st January to 31st December 2015

Call Sign	Date/Time (UTC)	Position of the Ship		Wind		Pressure PPPP (hPa)
		Lat. (°N)	Long. (°E)	Dir. (°)	Speed (Kts)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A) Cyclonic Storm (Ashobaa) over the Arabian Sea (7 - 12 Jun, 2015)						
TBWUK35*	070300	10.3	65.0	320	16	1005.9
ZCBU3	081200	15.4	68.8	190	23	1003.4
A8UB3	081200	12.8	57.6	250	25	1004.0
A8CB7	081200	13.4	55.3	250	20	1003.0
VRMX7	091200	16.7	65.8	230	20	999.0
WKAB	091200	15.4	57.9	240	15	1000.7
A8CH2	091200	12.8	56.2	220	33	1003.0
WKPM	091200	12.6	64.4	250	33	1001.3
BATFR28	100300	18.8	63.3	250	14	-
CQII	101200	20.4	65.4	190	22	1000.5
BATFR28	101200	18.5	65.5	180	23	-
WKPM	101200	15.1	58.4	230	30	995.1
TBWUK50	110300	23.2	62.8	170	15	1002.9
CQII	111200	18.1	59.2	240	31	997.0
A8CB7*	111800	19.1	59.2	270	25	999.0
CQII*	111800	17.6	57.5	220	28	-
DIXJ2*	120000	24.0	59.6	240	25	1001.5
DIXJ2*	123000	23.7	60.5	070	28	1001.4
DIGY2*	126000	18.2	57.3	230	17	1003.2
(B) Cyclonic Storm (Komen) over the Bay of Bengal (26 July - 2 August, 2015)						
AUYQ*	271200	20.8	88.1	320	24	999.6
(C) Extremely Severe Cyclonic Storm (Chapala) over the Arabian Sea (28 October - 4 November, 2015)						
DCCP2*	281200	7.3	54.3	020	4	1009.0
A8CB7	290000	19.0	59.4	080	19	1011.0
BATFR45	290000	10.3	55.4	120	20	1009.2
BATFR45	290300	10.6	56.1	060	11	1010.3
BATFR45	291200	11.5	58.2	350	10	1007.5
WDE8265	291200	16.8	70.2	180	2	1009.8
BATFR45	291800	12.0	59.4	330	13	1008.9
TWWUK75	291800	18.0	67.2	070	22	1011.7
DIGW	291800	18.7	71.9	020	21	1011.0
BATFR45	300000	12.0	61.0	270	16	1005.8
BATFR45	300300	12.0	61.7	240	19	1007.5
ATSS	300300	21.0	66.2	180	2	1009.8
DIGW	300300	18.7	71.9	150	58	1001.3
BATFR45	301200	12.5	63.9	190	16	1008.2
CQCZ	301200	15.3	54.3	090	20	1010.3
BATFR45	310300	15.4	65.3	110	13	1013.0
D5BU7	310300	19.6	64.6	060	14	1013.0
BATFR45	311200	17.4	65.6	070	12	1009.7
BATFR45	010300	19.8	60.0	070	17	1010.6
BATFR45	020300	12.0	49.4	310	12	1008.5
WMPP	021200	12.2	50.2	250	30	1002.5
BATFR45	021200	12.0	51.0	270	27	1003.5
SHIP	030300	12.5	43.2	270	15	1006.3
BATFR45	030300	12.0	53.0	170	13	1011.5
SHIP	030600	12.2	44.6	350	7	1008.9

TABLE 3 (Contd.)

Call Sign	Date/Time (UTC)	Position of the Ship		Wind		Pressure
		Lat. (°N)	Long. (°E)	Dir. (°)	Speed (Kts)	PPPP (hPa)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
BATFR19	030600	11.0	53.6	130	11	1013.4
WMPP	030600	14.7	53.2	100	15	1015.0
9U8797	030600	13.5	42.4	280	10	1010.9
DIXJ2	031200	12.2	61.2	040	12	1010.3
BATFR19	031200	10.2	54.3	110	14	1009.9
WMPP	031200	15.6	53.5	110	3	1012.7
A8PX5*	031800	12.1	45.0	060	15	1011.2
BATFR19*	031800	9.4	55.0	090	16	1013.2
VRGM8*	031800	17.2	56.5	080	12	1016.2
ONAR*	040000	20.5	38.6	350	9	1008.0
BATFR19*	040000	8.2	53.2	080	11	1011.2
(D) Extremely Severe Cyclonic Storm (Megh) over the Arabian Sea (5 - 10 November, 2015)						
AUCE*	050300	6.0	70.0	290	4	1009.6
9HA3488*	050600	16.3	60.7	030	13	1014.0
CQIT*	050600	17.3	58.7	050	10	1016.0
A8507	051200	10.1	65.9	280	10	1009.2
SHIP	060300	17.8	59.9	130	27	1009.9
A8307	061200	13.5	61.7	150	38	1005.0
ONAR	061200	12.2	44.0	-	-	1010.0
DJCE2	061200	12.4	63.9	200	14	1008.1
DGHX	070300	13.2	49.7	030	12	1013.5
9V9403	070600	14.1	16.0	100	23	1014.0
9V8797	070600	15.0	58.3	030	20	1012.7
D5BA9	070600	15.7	54.5	070	10	1014.2
DIHC	070600	13.6	50.5	360	6	1015.3
A8507	071200	14.7	56.3	050	12	1009.3
9V9403	071200	14.4	58.1	060	19	1011.0
D5BA9	071200	16.8	56.0	070	13	1010.3
AMOHK01	080300	12.5	45.6	-	-	1013.0
AMOHK01	081200	13.3	48.0	-	-	1011.3
A8S07	081200	13.6	50.7	050	10	1011.2
9U8797	081200	11.4	66.4	030	12	1011.1
ONAR	090000	14.2	54.1	050	19	1012.0
AMOHK01	090000	13.9	51.6	050	10	1010.8
A8507	090000	12.8	48.2	010	8	1012.0
TBWUK52	090300	16.4	67.6	010	8	1014.1
AMOHK01	090300	14.0	52.5	-	-	1013.1
ONAR	091200	14.2	56.0	-	-	1012.0
A8OU4	092100	13.2	49.7	250	15	1013.0
ONAR	092100	13.9	57.5	040	9	1013.0
C6YAS	100300	17.1	39.7	330	7	1010.0
AMOHK01	100300	12.5	59.6	-	-	1012.8
CQII*	100600	12.0	45.9	040	16	1015.7
ONAR*	100600	13.7	58.8	330	9	1014.0
ONAR*	101200	13.6	59.6	330	13	1011.0

* Observation during Depression/Deep Depression

Coastal Karnataka : Mangaluru AP, Mangaluru AP and Panambur 9 each, Karwar 8, Mangaluru, Subramanya, Mulki and Kota 6 each, Manki, Siddapura and Shirali PTO 5 each

Kerala : Kannur 6, Kudulu and Cheruthazham 5 each, Enamakal, Hosdurg and Ponnani 4 each, Taliparamba, CIAL Kochi, Kunnamkulam and Irinjalakuda 3 each

Lakshadweep : Agathi 2

11 June, 2015

Gujarat Region : Waghai ARG 6, Dhandhuka and Bodeli 2 each

Saurashtra & Kutch : Dhrol ARG 4, Rajkot and Dhrol 3 each

Konkan & Goa : Panjim (Goa) and Dahanu 4 each, Mapusa and Vengurla 2 each

Coastal Karnataka : Mulki 3, Karwar 2

Kerala : Kunnamkulam 9, Thalasserry, Kannur and Vellanikkara 5 each, Mattanur 4

Lakshadweep : Amini Divi and Kavaratti 2 each

12 June, 2015

Gujarat Region : Bodeli 7, Sankheda 6, Khedbrahma 5, Surat 4

Saurashtra & Kutch : Dhari 9, Bhesan 5, Jafrabad, Lathi and Kalavad 3 each

Konkan & Goa : Canacona, Mumbai (SCZ), Dodamarg and Mapusa 8 each, Palghar Agri, Talasari and Mulde - AWS 7 each, Sawantwadi, Mhasla, Harnai and Dabholim (Goa) 6 each, Mulde Agri, Alibag and Devgarh 5 each, Kankavli, Panjim (Goa), Chiplun, Ratnagiri, Khed, Shriwardhan and Marmugoa 4 each

Coastal Karnataka : Karwar 19, Bantwal 13, Ankola 12, Manki 10, Mudubidre 9, Mani and Dharmasthala 8 each, Shirali and Shirali PTO 7 each, Honavar, Kadra, Panambur, Puttur HMS and Uppinangadi 6 each, Karkala, Haliyal, Mangalooru AP and Mangaluru AP 5 each, Gersoppa 4

Kerala : Kochi AP 9, Ernakulam South 8, Aluva PWD, Kannur and Thodupuzha 7 each, Piravam 6, Kozhikode, Quilandi, Kurudamannil, Kanjirappally, CIAL Kochi, Ottapalam and Kodungallur 5 each, Enamakal, Taliparamba and Ponnani 4 each

Lakshadweep : Amini Divi 12, Kavaratti 4, Minicoy 3

2.2. Depression over northwest and adjoining west central Bay of Bengal (20 - 22 June, 2015)

2.2.1. A cyclonic circulation extending between 4.5 & 5.8 kms a.s.l. lay over west central Bay of Bengal off south Odisha - north Andhra Pradesh coasts on 16th. Under its influence, a low pressure area formed over the same region on 17th. It persisted there on 18th. It lay as a well marked low pressure area over west central and adjoining northwest Bay of Bengal off south Odisha - north Andhra Pradesh coasts with associated cyclonic circulation extending upto 7.6 kms a.s.l. tilting southwestwards with height on 19th. It concentrated into a Depression over northwest and adjoining west central Bay of Bengal and lay centred near Lat. 18.0°N / Long. 86.0° E, about 200 kms south of Puri at 0300 UTC of 20th. It moved northwestwards and lay centred near Lat. 19.0° N / Long. 85.5° E, about 150 kms south-southwest of Puri at 1200 UTC of 20th. It continued to move northwestwards and crossed Odisha coast between Gopalpur and Puri around 2000-2100 UTC of 20th and lay over coastal Odisha, centred near Lat. 20.0° N / Long. 85.0° E, about 90 kms southeast of Phulbani at 0300 UTC of 21st. It moved slightly northwestwards and lay centered over interior Odisha, near Lat. 20.5° N / Long. 84.5° E, about 110 kms southeast of Sambalpur at 1200 UTC of 21st. Further moving northwestwards, it weakened into a well marked low pressure area in the morning hours of 22nd and lay over Odisha and adjoining areas of Jharkhand

& Chhattisgarh. It lay as a low pressure area over Gangetic West Bengal and adjoining Jharkhand on 23rd and over Bangla Desh and adjoining Gangetic West Bengal on 24th. It lay over Bangla Desh and neighbourhood on 25th, over southeastern parts of Bangla Desh and neighbourhood on 26th, over Bangla Desh and adjoining Gangetic West Bengal on 27th, over Bihar and adjoining Jharkhand on 28th and over east Uttar Pradesh and adjoining north Madhya Pradesh on 29th & 30th. It became less marked on 1st July.

2.2.2. Other features observed

The lowest observed pressure of 990.5 hPa was reported by Gopalpur at 1200 UTC of 20th, when the system was to its east. The maximum mean wind speed of 39 kts was reported by Ship PEND (17.0/85.0) at 1200 UTC of 20th. The system moved in a northwest ward direction and then weakened into a well marked low pressure area and lay over Odisha and adjoining areas of Jharkhand & Chhattisgarh.

2.2.3. Weather and damage caused

Active to vigorous monsoon activity was observed over Odisha, north coastal Andhra Pradesh and Telangana. No damage has been reported due to this depression.

Chief amounts of 24 hrs Rainfall (more than 5 cm) ending at 0300 UTC from 20th to 21st June 2015 are given below:

20 June, 2015

Odisha : Malkangiri 18, Pottangi and Athgarh 7 each, Soro 6, Banki ARG, Bonth, Rajghat and Dhenkanal 5 each

Telangana : Koida 16, Kunavaram 14, Dummugudem and Mulakalapalle 13 each, Aswaraopeta and Aswapuram 11 each, Manuguru 10, Sathupalle and Burgampadu 9 each, Palawanacha 8, Venkatapuram, Kothagudem, Pinapaka and Julurpad 7 each, Perur and Chandrugonda 6 each, Kaleswaram, Eturnagaram and Tekulapalle 5 each

Coastal Andhra Pradesh : Kakinada, Amalapuram and Visakhapatnam AP 17 each,

Rajahmundry 16, Polavaram 15, Peddapuram and Dowleshwaram 14 each, Tanuku 13, Palakoderu 11, Prathipadu, Narsapur and Visakhapatnam 10 each, Koyyalagudem, Tuni and Tadepalligudem 9 each, Gantyada 8, Bheemavaram, Bheemunipatnam, Gajapathinagaram, Chintalapudi, Chodavaram, Tiruvuru, Yelamanchili, Bondapalle and Chintapalle 7 each

21 June, 2015

Odisha : Jhorigam ARG 33, Umarkote and Malkangiri 21 each, R. Udaigiri 16, Chandahandi ARG 14, Junagarh, Jeypore, Dharmagarh ARG, Mahendragarh, Gudari and Raighar ARG 13 each, Tentulikhunti ARG 12, Gopalpur, Dabugan ARG and Jaipatna 11 each, Nawarangpur, Mohana, Digapahandi ARG, Bissem - Cuttack and Madhabarida 10 each, Nuagada ARG, Chhatrapur, Banki ARG and Berhampur 9 each, Purushottampur, Aska, Koraput and Kashipur 8 each, Similiguda AWS 7, Kaptipada ARG, Rayagada, Gunupur, Jaipur, Udala and Nawana 6 each, Pottangi, Bhanjnar, Kotraguda, Kesinga ARG, Sorada, Jagannath Prasad ARG, Balimundali and Khairamal 5 each

Telangana : Eturnagaram and Shayampet 18 each, Khanapur, Parkal, Gundala and Gudur 17 each, Venkatapuram and Venkatapur 16 each, Chennaraopet, Govindaraopet, Kaleswaram, Mulakalapalle, Mulugu (Arg), Atmakur, Yellandu, Kothagudem and Narsampet 15 each, Mogullapalle and

Palawancha 14 each, Pinapaka, Bhupalpalle and Mahbubabad 13 each, Manuguru and Nallabelly 12 each, Adilabad, Bayyaram, Tekulapalle, Dummugudem and Chennur 11 each, Kothagudem, Hasanparthy, Julurpad, Huzurabad, Sultanabad and Chandrugonda 10 each, Hanamkonda, Manthani, Aswapuram, Enkuru, Dornakal and Garla 9 each, Karimnagar, Koida, Parvathagiri, Dharmasagar, Julapalle, Sirpur T, Ramagundam, Bheemadevarpalle and Pegadapalle 8 each, Burgampadu, Boath, Dharmapuri, Utnur, Thollada and Asifabad 7 each, Ibrahimpatnam, Kunavaram, Luxettipet, Mallial, Sarangapur, Zaffergadh, Jagtial, Thimmapur, Nirmal and Sathupalle 6 each, Khanpur, Aswaraopeta, Metpalle, Konijerla and Shriramsag Pocha 5 each

Coastal Andhra Pradesh : Ichchapuram 20, Sompeta 12, Kalingapatnam 11, Mandasa, Cheepurupalle, Garividi and Ranastalam 9 each, Palasa 8

2.3. Deep Depression over northeast and adjoining east central Arabian Sea (22 - 25 June, 2015)

2.3.1. A cyclonic circulation lay over northeast Arabian Sea off Gujarat coast and extended between 1.5 & 4.5 kms a.s.l. during 18th- 20th. Under its influence, a low pressure area formed over northeast Arabian Sea off Gujarat coast on 21st. It lay as a well marked low pressure area over northeast and adjoining eastcentral Arabian Sea on the same evening. It subsequently concentrated into a Depression over the same area and lay centred near Lat. 20.0° N / Long. 67.0° E, about 320 kms southwest of Porbandar at 0300 UTC of 22nd. It remained practically stationary and lay centred near Lat. 20.0° N / Long. 67.0° E, at 1200 UTC of 22nd. Then it moved eastnortheastwards, intensified into a Deep Depression over northeast Arabian Sea off south Gujarat coast and lay centred near Lat. 20.5° N / Long. 70.5° E, about 50 kms

west-southwest of Diu at 0300 UTC of 23rd. It moved east-northeastwards and crossed south Gujarat coast near Diu between 0900 and 1000 UTC of 23rd and lay over Saurashtra centred near Lat. 21.0° N / Long. 71.3° E, about 65 kms south-southeast of Amreli at 1200 UTC of 23rd. It moved northeastwards and lay over Saurashtra & adjoining Gujarat Region centered near Lat. 22.4° N / Long. 72.0° E, about 85 kms southwest of Ahmedabad at 0300 UTC of 24th. It then moved east northeastwards and lay over Gujarat region and neighbourhood near Lat. 22.8° N / Long. 72.7° E, about 80 km southeast of Ahmedabad and 40 km north of Vadodara at 0600 UTC of 24th. Further moving east northeastwards, and weakened into a Depression at 1200 UTC of 24th near Lat. 23.5° N / Long. 74.0° E, over Gujarat region and adjoining areas of west Madhya Pradesh and south Rajasthan, about 50 km northwest of Dohad (Gujarat) and 130 km west southwest of Ratlam (west Madhya Pradesh). It weakened into a well marked low pressure area over northwest Madhya Pradesh and neighbourhood in the morning hours of 25th and lay as a low pressure area over northwest Madhya Pradesh and adjoining south Uttar Pradesh at 0300 UTC on 25th and over central parts of north Uttar Pradesh and neighbourhood on 26th. It became less marked on 27th.

2.3.2. Other features observed

The lowest observed pressure of 988.4 hPa was reported by Diu at 1200 UTC of 23rd, when the system was to its north. The maximum mean wind speed of 40 kts was reported by Ship 56LTS (12.7/60.7) at 1200 UTC of 22nd.

2.3.3. Weather and damage caused

Heavy to very heavy rainfall occurred over Gujarat state, Rajasthan and west Madhya Pradesh with extremely heavy rainfall over Saurashtra & Kutch.

This system caused damage to life and property in Gujarat. Death toll crossed 81.

Chief amounts of 24 hrs. Rainfall (5 cm or more) ending at 0300 UTC from 22nd to 24th June 2015 are given below:

22 June, 2015

Gujarat region : Khedbrahma and Umergam 9 each, Nanipalson 7, Vijaynagar 6, Dharoi Colony 5

Saurashtra & Kutch : Rajula 6, Mangrol (J) 5

West Rajasthan : Erinpura Rd 6

East Rajasthan : Devel 12, Dungarpur Tehsil 11, Bhungra 7, Dhambola, Sagwara and Veja 6 each, Garhi 5

West Madhya Pradesh : Indore, Multai, Indore - AWS and Shegaon 7 each, Sendhwa (Med) and Kannod - Arg 6 each, Thikri, Thandla, Pandhana, Jhabua - AWS, Sonkatch and Manasa 5 each

East Madhya Pradesh : Bichhia 7, Sausar 5

23 June, 2015

Gujarat region : Choryasi 17, Olpad 16, Kamrej 14, Valod, Surat and Jalalpor 10 each, Valsad and Nanipalson 9 each, Umergam and Vyara 8 each, Navsari and Umerpada 7 each, Vapi, Mangrol and Bodeli 6 each, Chikhli, Ukai, Gandevi and Madhbun 5 each

Saurashtra & Kutch : Diu 12, Ghogha 11, Jafrabad 10, Talaja and Una 9 each, Mangrol (J), Dwarka and Rajula 7 each, Kodinar, Shihor and Malia 6 each, Mahuva and Talala 5 each

East Rajasthan : Rajsamand 9, Chabra 8, Chhotisadri 6, Arnod, Pachpahar and Manohar Thana 5 each

West Madhya Pradesh : Sehore – AWS 15, Susner 12, Budhni, Depalpur, Tarana, Narsingarh, Badnagar and Khilchipur 9 each, Agar 8, Sonkatch, Nalkheda, Hoshangabad and Khatagaon 7 each, Suvasara and Udaipura 6 each, Shajapur, Shajapur - AWS, Rajgarh, Tonkhurd, Atner, Sarangpur, Ichhavar, Ashta - Arg and Vidisha - AWS 5 each

East Madhya Pradesh : Dindori - AWS 22, Lanji 9

24 June, 2015

East Rajasthan : Shahabad 10, Jagpura 5

Gujarat Region : Dhandhuka ARG, Dhandhuka and Ranpur 8 each, Madhbun and Nanipalson 7 each, Kaprada and Khambhat 6 each, Surat, Silvassa, Songadh and Tarapur 5 each

Saurashtra & Kutch : Una 32, Malia 27, Kodinar 23, Talala 22, Rajula and Diu 19 each, Rajkot 17, Jafrabad 13, Mangrol (J), Khambha and Tankara 12 each, Keshod, Savarkundla, Veraval and Ranavav 11 each, Mahuva, Gondal and Sutrapada 10 each, Botad, Palitana, Chotila and Vanthali 9 each, Khambhalia, Junagadh, Kotdasangani, Mendarda and Porbandar AP 7 each, Bhaunagar, Amreli and Jetpur 6 each, Dhari, Dhoraji, Chuda, Jamkandorna, Lodhika, Okha, Manavadar, Upleta, Bhesan and Paddhari 5 each

East Rajasthan : Shahabad 10, Jagpura 5

East Madhya Pradesh : Chahtarpur - AWS 12, Rajnagar 8, Khajurao 6, Nagode and Nagaon 5 each

2.4. Land Depression over Jharkhand and neighbourhood (10 - 12 July, 2015)

2.4.1. A cyclonic circulation extending upto mid-tropospheric levels lay over north Bay of Bengal and neighbourhood on 5th, over coastal areas of west Bengal and neighbourhood on 6th and over north Bay of Bengal and neighbourhood on 7th. Under its influence, a low pressure area formed over north Bay of Bengal and adjoining coastal areas of Bangla Desh and West Bengal with associated cyclonic circulation extending upto 5.8 kms a.s.l. on 8th. It lay over northern parts of Gangetic West Bengal and adjoining areas of Bihar and Jharkhand with the associated cyclonic circulation extending upto 5.8 kms a.s.l. on 9th. It lay over Jharkhand and adjoining areas of Gangetic West Bengal & Bihar on the same evening. It rapidly concentrated into a Depression and lay over Jharkhand and neighbourhood centered near Lat. 23.1° N / Long. 85.1° E, about 30 kms southwest of

Ranchi at 0300 UTC on 10th. It moved west-northwestwards and lay over north Chhattisgarh and adjoining areas of Jharkhand centered near Lat. 23.5° N / Long. 83.5° E, about 60 Kms northeast of Ambikapur at 1200 UTC of 10th. It continued to move west-northwestwards and lay over northeast Madhya Pradesh and adjoining southeast Uttar Pradesh centered near Lat. 24.0° N / Long. 80.5° E, about 55 kms south-southwest of Satna at 0300 UTC of 11th. It moved northwestwards and lay centred over central parts of south Uttar Pradesh and adjoining north Madhya Pradesh near Lat. 25.5° N / Long. 80.5° E about 80 kms northeast of Khajuraho and 125 kms southwest of Fursatganj at 1200 UTC of 11th. It further moved northwestwards and lay over west Uttar Pradesh and adjoining areas of Haryana centred near Lat. 28.5° N / Long. 78.0° E, about 55 kms east of Delhi at 0300 UTC of 12th and over Haryana and neighbourhood, near Lat. 28.5° N / Long. 77.3° E, close to Delhi at 0900 UTC of 12th. It moved northwestwards and weakened into a well marked low pressure area over northwest Uttar Pradesh and adjoining areas of Haryana on the same evening. It further moved northwestwards and lay as a low pressure area over Punjab and adjoining Haryana with associated cyclonic circulation extending upto 3.1 kms a.s.l. on 13th and became less marked on 13th evening. The associated cyclonic circulation persisted over the same region on 13th and over Haryana and neighbourhood between 1.5 & 5.8 kms a.s.l. on 14th and became less marked on 15th.

2.4.2. Other features observed

The lowest observed Pressure of 991.0 hPa was recorded by Ambikapur at 1200 UTC of 10th July, when the centre of system was very close to it. Gaya reported wind speed of 12 kts on 1200 UTC of 10th July.

2.4.3. Weather and damage caused

Active to vigorous monsoon condition prevailed over Gangetic West Bengal, Odisha, Jharkhand, Uttar Pradesh, Madhya Pradesh and Chhattisgarh with extremely heavy rainfall at isolated places over Gangetic West Bengal, Odisha and Jharkhand.

Chief amounts of 24 hrs rainfall (5 cm or more) ending at 0300 UTC from 10th - 12th July are given below:

10 July, 2015

Gangetic West Bengal	: Deganga 26, Bongaon 25, Katwa and Durgachak 23 each, Sonamukhi ARG and Baruipur 20 each, Tilpara Barrage 17, Salar, Kolkata AP and Bolpur
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16 each, Suri CWC and Diamond Harbour 15 each, Bashirhat, Kolkata and Chinsura 14 each, Purihansa, Basirhat, Nandigram, Kandi and Harinkhola 13 each, Sriniketan 12, Burdwan, Shekhampore ARG, Kalna, Tusuma, Kandi and Dhaniakhali ARG 11 each, Contai, Amtala, Ranaghat, Dhaniakhali, Contai and Bagati (Magra) 10 each, Rajnagar, Labpur, Kharidwar, Kalyani Smo, Mangalkote and Bankura CWC 9 each, Krishnanagar, Berhampore, Barrackpur IAF, Manteswar, Digha, Phulberia and Purulia 8 each, Narayanpur, Simula, Burdawan, Sagardighi, Manmothnagar, Hatwara, Bankura and Jiaganj 7 each, Hetampur, Krishnanagar, Balagarh, Jangipur and Canning Town 6 each, Mankar, Uluberia, Nakshipara, Tamluk AWS, Uluberia, Gheropara, Indus, Joypur, Rampurhat (DRMS) and Sagar 5 each
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Odisha

: Tensa 15, Lahunipara 13, Gurundia ARG 12, Jamankira and Banaigarh AWS 11 each, Kuchinda, Barkote, Laikera and Deogarh 9 each, Nawapara, Rairakhol, Kirmira ARG, Soro and Keiri AWS 8 each, Khariar, Pallahara, Atabira ARG, Bonth, Patnagarh, Bijepur, Joda ARG, Komna, Lakhanpur ARG and Birmaharajpur ARG 7 each, Boudhgarh, Ambabhona, Tarva ARG, Jujumura ARG, Deogaon, Athmalik, Gaisilet ARG, Sonepur, Danagadi ARG, Khairamal and Naktideul 6 each, Batagaon, Champua, Saintala ARG, Panposh, Reamal, Sambalpur, Jharsuguda AP, Kantamal, Bolangir, Joshipur, Altuma CWC, Loisingha ARG, Daitari, Basudevpur AWS, Salebhata
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	ARG, Kankadahad ARG, Chandanpur, Bhadrak AWS, Rajkishorenagar and Burla ARG 5 each		each, Katwa, Joypur, Indus, Krishnanagar, Panagarh AP and Arambagh 5 each
Jharkhand	: Palkot 13, Mandar 12, Ranchi AP 11, Messenjore 10, Moharo, Dumka and Deoghar 9 each, Torpa and Simdega 8 each, Nimdih, Kolebira, Dumri, Jarmindi and Amrapara 7 each, Bishrampur and Madhupur 6 each, Mohanpur, Koner, Raidih, Bokaro, Maheshpur and Giridih 5 each	Odisha	: Sundargarh 26, Balisankara ARG 25, Hemgiri 22, Bargaon 16, Bamra ARG 15, Lakhanpur ARG and Laikera 13 each, Jharsuguda AP 12, Kirmira ARG, Deogaon and Kolabira ARG 11 each, Kuchinda 9, Salepur ARG, Burla ARG and Akhuapada 8 each, Rajgangpur 7, Jamankira, Ambabhona, Junagarh, Sambalpur, Hirakud, Atabira ARG and Jajpur 6 each, Kesinga ARG, Gaisilet ARG, Madanpur Rampur, Bargarh, Bijepur, Mandira Dam, Komna, Rairakhol, Bhavani P. and Balasore 5 each
West Uttar Pradesh	: Bijnor 11, Baheri 10, Sahaswan 9, Garotha and Jalaun 8 each, Bareilly, Bareilly Tehsil and Dataganj 6 each, Orai and Rath 5 each	Jharkhand	: Kolebira 39, Mohanpur 13, Raidih 12, Simdega 9, Pakuria 7, Daltonganj and Palkot 6 each, Mandar 5
West Madhya Pradesh	: Chachoda 14, Seodha (Seondha) and Udaipura 9 each, Pachmarhi and Mungaoli 8 each, Salwani / Silvani 7, Gohad, Morena - AWS and Begumganj 5 each	East Uttar Pradesh	: Ankinghat 10, Rasoolabad, Chhibramau, Kannauj and Hasanganj 7 each, Sultanpur 6, Safipur and Lucknow AP 5 each
East Madhya Pradesh	: Kareli 15, Malanjhand 11, Gadarwara 9, Chindwara - AWS 7, Narsingpur, Bichhia, Jabalpur, Ghansore, Tendukheda and Sohagpur - AWS 6 each, Lakhnadon, Khurai, Nainpur, Dindori - AWS and Maihar 5 each	West Uttar Pradesh	: Narora and Mathura CWC 14 each, Nakur 12, Maudaha 9, Gunnaur 8, Bisauli 7, Anupshahr, Jalesar, Budaun, Bareilly CWC and Saharanpur 6 each, Gautam Buddha Nagar, Bharthana, Bidhuna, Thakurdwara, Chhata and Sahaswan 5 each
Chhattisgarh	: Ambikapur 8, Gandai and Gharghoda 7 each, Mahasamund 6, Bemetara, Janakpur, Gariabund, Mana AP, Korba and Dhamtari 5 each	West Madhya Pradesh	: Biaora 18, Rajgarh 15, Narsingarh, Kolaras, Morena - AWS and Sabalgarh 9 each, Udaipura 8, Isagarh 7, Bhainder, Seodha (Seondha) and Chanderi 5 each
11 July, 2015		East Madhya Pradesh	: Gadarwara and Maihar 10 each, Ajaigarh, Nagode and Kotma 7 each, Satna - AWS, Satna, Khajurao, Malanjhand, Panna - AWS and Jaithari 6
Gangetic West Bengal	: Bolpur and Pingla 16 each, Sriniketan and Mangalkote 14 each, Burdawan 13, Khirpai and Shekhampore ARG 11 each, Burdwan 9, Manteswar 8, Dhaniakhali ARG and Amta 7 each, Sabong, Dhaniakhali, Kanksa BSF and Kalaikunda 6		

	each, Damoh, Damoh - AWS, Anuppur - AWS, Rajnagar, Amarwara, Seoni, Seoni - AWS, Umaria and Umaria - AWS 5 each
Chhattisgarh	: Raigarh 17, Janakpur 12, Janjgir and Pathalgaon 9 each, Manendragarh, Korba and Jashpurnagar 8 each, Baikunthpur, Gharghoda and Bilaspur 7 each, Surajpur, Pali, Kanker and Ambikapur 6 each, Champa, Narayanpur, Kawardha and Ramanujanj 5 each

12 July, 2015

Gangetic West Bengal	: Mangalkote 6, Hetampur 5
Odisha	: -
Jharkhand	: Dumka 9
East Uttar Pradesh	: Hardoi 17, Shahabad 16, Muhammadi and Sandila 15 each, Neemsar 12, Jaunpur Tehsil and Nawabganj Tehsil 11 each, Bara Banki and Malihabad 10 each, Bhatpurwaghat and Sidhauri 9 each, Sultanpur CWC, Sultanpur, Biswan, Sawayajpur, Lucknow AP and Hasanganj 8 each, Sitapur, Misrikh, Varanasi city, Shahganj, Kannauj, Handia, Elgin Bridge and Hardoi Teh 7 each, Rajghat (Vns CWC), Deogaon Lalganj, Musafir Khana, Sirauli Gauspur Tehsil, Allahabad AP, Muhammadbad (G), Lucknow (Hs) and Purwa 6 each, Varanasi AP, Ankinghat, Lucknow (Cr), Gyanpur, Bani, Kaiserganj, Phoolpur Alb, Chhatnag, Fatehpur Tehsil, Karchhana, Meja, Ram Sanehi Ghat Tehsil, Tarabganj, Nighasan and Pratapgarh T 5 each
West Uttar Pradesh	: Moradabad 15, Shajanpur and Shahjapur 14 each,

	Sahaswan and Amroha 13 each, Pawayan, Bareilly and Bareilly Tehsil 12 each, Bareilly CWC 11, Bilari 10, Kasganj 8, Narora, Harpur, Bisalpur, Gunnaur, Shahjahanpur T and Garotha 7 each, Budaun 6, Rampur, Aonla, Sambhal, Bijnor, Mawana, Jalalabad, Anupshahr, Chhata and Nakur 5 each
West Madhya Pradesh	: Gwalior and Dabra 19 each, Biaora 9, Gohad, Khilchipur and Rajgarh 8 each, Narsingarh and Isagarh 7 each, Salwani / Silvani, Udaipura and Ambah 5 each

2.5. *Land Deep depression over southwest Rajasthan and neighbourhood (27 - 30 July, 2015)*

2.5.1. A low pressure area formed over northwest Madhya Pradesh and adjoining east Rajasthan on 24th and persisted there on 25th. It lay as a well marked low pressure area over east Rajasthan and neighbourhood on 26th and over central parts of Rajasthan and neighbourhood on the same evening. It lay over southwest Rajasthan and neighbourhood on 27th. It concentrated into a Depression and lay over southwest Rajasthan & neighbourhood centred near Lat. 26.2° N / Long. 71.8° E, about 100 kms east-southeast of Jaisalmer (Rajasthan) at 1200 UTC on 27th evening. It then intensified into a Deep Depression and lay over southwest Rajasthan and adjoining Gujarat centred near Lat. 24.8° N / Long. 71.8° E, about 110 kms east-southeast of Barmer (Rajasthan) at 0300 UTC on 28th. It remained over the same region and lay centred near Lat. 25.5° N / Long. 72.0° E, about 70 kms south-southeast of Barmer (Rajasthan) at 1200 UTC on 28th. It moved north-northeastwards and weakened into a Depression and lay over west Rajasthan, centered near Lat. 27.2° N / Long. 73.0° E, about 40 kms south-southwest of Bikaner (Rajasthan) at 0300 UTC on 29th. It moved northeastwards and lay over the same region centred near Lat. 27.7° N / Long. 73.0° E about 30 kms south-southeast of Bikaner (Rajasthan) at 1200 UTC of 29th July. It moved northwards and lay over west Rajasthan and neighbourhood centered near Lat. 28.7° N / Long. 73.4° E, about 80 kms north-northeast of Bikaner (Rajasthan) at 0000 UTC on 30th. It further moved north-northeastwards and weakened into a well marked low pressure area over the same region on 30th. It lay as a low pressure area over

northwest Rajasthan and neighbourhood on 30th evening. It persisted over the same region on 31st July, lay over central Pakistan and adjoining west Rajasthan on 1st & 2nd August and over central Pakistan and adjoining northwest Rajasthan on 3rd. It became less marked on 4th.

2.5.2. Other features observed

The lowest observed pressure of 990.8 hPa was reported by Erinpura at 0300 UTC of 28th, when the centre of system was very close to it. The maximum sustained wind speed of 25 kts was reported by New Kandla at 0300 UTC of 28th. The system moved in a north northeasterly direction weakened into a well marked low pressure area west Rajasthan.

2.5.3. Weather and damage caused

Active to vigorous monsoon conditions prevailed over Rajasthan, Gujarat State and west Madhya Pradesh. This deep depression caused heavy to very heavy with extremely heavy rainfall at isolated places of Rajasthan, Gujarat State and west Madhya Pradesh.

Chief amounts of 24 hrs. rainfall (7 cm or more) ending at 0300 UTC from 27th to 30th are given below:

27 July, 2015

West Rajasthan : Gudamalani 33, Raniwada 32, Jaswantpura 29, Bhinmal 22, Bagoda 18, Bali and Chotan 17 each, Sinderi and Sanchore 15 each, Dorimanna and Desuri 13 each, Erinpura Rd. and Sumerpur 12 each, Sayla 11, Bilara 9, Pachpadra, Sedwa and Ramsar 7 each

East Rajasthan : Mount Abu 45, Abu Road 24, Reodar 21, Arthuna 19, Sirohi 15, Galiakot 12, Danpur, Bijoliya, Nayanagar / Beawar, Veja and Bhainsroadgarh 11 each, Chikali, Sheoganj and Kesarpura 10 each, Pindwara, Kanva, Bagidora, Shergarh, Kumbhalgarh, Sallopat, Dungarpur Tehsil and Aspur 9 each, Dhambola, Garhi, Sabla, Sagwara, Sajjangarh, Chambal / R. B. Dam and Nimbahera 8 each, Gangrar, Khushalgarh, Kotda, Ladpura, Bari -Sadri, Kota AP, Loharia and Chittorgarh 7 each

West Madhya Pradesh : Jawad 11, Alirajpur - AWS and Sailana 8 each, Nimach, Manasa, Ratlam, Ratlam - AWS and Jabot 7 each

Gujarat region : Dadiapada ARG and Dhanera 19 each, Vapi 18, Mansa 17, Dahegam, Vijapur and Kankrej 16 each, Valia, Siddhpur and Silvassa 15 each, Dantiwada, Danta and Mangrol 14 each, Vadgam, Himatanagar, Patan, Unjha, Amirgadh, Dharampur, Godhra and Palanpur 13 each, Kaprada, Mahesana, Dangs (Ahwa), Kamrej and Deodar 12 each, Dharoi Colony, Bhiloda, Tharad, Umerpada, Anand and Pardi 11 each, Kalol (G), Jambughoda, Kadana, Daman, Wanakbori, Malpur, Umergam, Khedbrahma, Balasinor, Valsad, Deesa, Olpad, Madhubun and Kapadvanj 10 each, Quant, Tilakwada ARG, Viramgam, Sagbara, Wav, Dhansura, Gandhinagar and Kadi 9 each, Radhanpur, Talod, Karjan, Lunawada, Bavla, Khanpur, Bhabhar, Chhota Udepur, Gandevi ARG, Kamrej ARG, Kathalal and Dediapada 8 each, Chhota ARG, Santrampur, Ahmedabad, Detroj, Vansda, Becharaji, Morva Hadaf, Shahera, Tilakwada, Bodeli, Fatepura, Sinor, Rajpipala, Meghraj, Nanipalson, Bardoli and Umreth 7 each

Saurashtra & Kutch : Junagadh 19, Jodia 17, Dasada 15, Bhesan 14, Junagarh AWS 13, Morbi, Vanthali and Visavadar 12 each, Manavadar 11, Kotdasangani 10, Tankara 9, Amreli 8, Bhuj AP and Kharaghoda 7 each

28 July, 2015

West Rajasthan : Sanchore 24, Raniwada 19, Jalore and Bagoda 18 each, Jaswantpura 16, Gudamalani and Sedwa 9 each, Bhinmal 7

East Rajasthan : Mount Abu 33, Abu Road 13, Reodar 12, Kotda 11, Veja 10, Galiakot and Dungarpur Tehsil 8 each, Gogunda, Ganeshpur and Bari-Sadri 7 each

West Madhya Pradesh : Thandla and Petlawad 10 each, Bhabhra 9, Sailana, Jhabua - AWS and Khachrod 8 each, Ratlam 7

Gujarat region : Dhanera 43, Wav 42, Deesa 40, Bhabhar 35, Kankrej 34, Tharad and Dantiwada 33 each, Radhanpur 32, Deodar 25, Palanpur 22, Umerpada and Patan 21 each, Santalpur 20, Dharoi Colony 19, Siddhpur, Unjha and Vadgam 18 each, Mahesana and Becharaji 16 each, Amirgadh and Vapi 15 each, Dangs (Ahwa), Idar, Gandhinagar, Chanasma, Quant and Vansda 14 each, Danta and Talod 13 each, Silvassa, Ghandinagar AWS, Detroj, Himatanagar, Petlad and Satlasana 12 each, Vadali, Kadi, Dadiapada ARG, Anand, Khedbrahma, Bodeli, Dharampur, Kaprada and Vijapur 11 each, Kheralu, Mansa, Mangrol and Prantij 10 each, Visnagar, Nandod, Sanand, Chikhli, Jetpur Pavi, Kalol (G), Mandal, Umergam, Mc Ahmedabad ARG, Dahegam, Khambhat, Ahmedabad, Rajpipala, Sami and Pardi 9 each, Harij, Dohad, Chhota Udepur and Dhansura 8 each, Naswadi, Vadnagar, Shahera, Gandevi ARG, Tilakwada, Sankheda, Borsad, Daman, Sagbara, Kamrej, Jambughoda, Godhra and Madhbun 7 each

Saurashtra & Kutch : Nakhatrana 31, Bhuj AP 25, Anjar and Rapar 23 each, Morbi and Kandla Airport 19 each, Tankara 18, New Kandla 17, Bhachau 15, Gandhidham 14, Jodia and MaliaMiana 13 each, Lakhpat, Lalpur and

Mundra 12 each, Dasada, Halvad and Dhrangadhra 11 each, Jamnagar IAF, Dhrol ARG, Lakhtar, Chotila, Targhadia AWS and Surendranagar 7 each

29 July, 2015

West Rajasthan : Sanchore and Sedwa 15 each, Marwar Junction 9, Erinpura Rd., Bali, Sumerpur and Pali 7 each

East Rajasthan : Abu Road 41, Mount Abu 32, Kotda 30, Jhadol 19, Devel 18, Girva, Udaipur AP and Gogunda 12 each, Mavli and Veja 10 each, Kherwara and Galiakot 9 each, Udaipur, Dungarpur Tehsil, Bhungra, Chikali, Dhambola, Kanva and Arthuna 8 each, Tatgarh, Sarara, Pindwara, Sheoganj, Shergarh and Salumber 7 each

Gujarat region : Vadgam 49, Deesa 36, Palanpur 32, Amirgadh 31, Dhanera 30, Siddhpur 28, Mahesana, Patan and Dharoi Colony 27 each, Danta and Unjha 25 each, Kadi 23, Idar 21, Radhanpur and Vijaynagar 20 each, Prantij 19, Mansa and Bhabhar 18 each, Vijapur, Deodar and Khedbrahma 17 each, Kalol (G) and Vadali 16 each, Sanand, Himatanagar, Mandal and Harij 15 each, Kheralu 14, Dahegam, Chanasma, Talod and Viramgam 13 each, Dhansura, Detroj and Umerpada 12 each, Vadnagar, Gandhinagar and Visnagar 11 each, Sami, Kathalal, Mahemdavad, Ghandinagar AWS, Modasa and Mc Ahmedabad ARG 10 each, Satlasana, Ahmedabad and Meghraj 9 each, Dascroi 8, Dholka, Lunawada, Kapadvanj, Wanakbori, Dholka ARG, Mahuva, Bayad, Chhota Udepur and Matar 7 each

Saurashtra & Kutch : Bhachau 33, Morbi 23, MaliaMiana and Rapar 21 each, Dasada 19, Nakhatrana 17, Anjar 14, Dhrangadhra and Bhuj AP 13 each, Halvad and Kharaghoda 11 each, Gandhidham and Vanthali 9 each, Mundra, Lakhpat, Lalpur, New Kandla and Tankara 8 each, Kandla Airport and Mangrol (J) 7 each

30 July 2015

West Rajasthan : Marwar Junction and Pali 10 each, Bhinmal, Nokh, Dorimanna and Jaswantpura 9 each, Sojat 8, Bagoda, Phalodi Tehsil, Bhopalgarh and Ramgarh 7 each

East Rajasthan : Mount Abu 12, Sirohi 10, Bhim, Dungarpur Tehsil and Tatgarh 9 each, Pindwara 8, Abu Road, Deogarh, Asind and Hurda 7 each

Gujarat region : Deodar 14, Vadali 10, Amirgadh, Idar and Bhiloda 9 each, Santalpur, Siddhpur, Khedbrahma, Palanpur and Harij 8 each, Vijaynagar and Unjha 7 each

2.6. Cyclonic storm (KOMEN) over the Bay of Bengal (26 July - 2 August, 2015)

2.6.1. A cyclonic circulation extending upto 5.8 kms a.s.l. lay over northeast Bay of Bengal and neighbourhood on 25th. Under its influence, a low pressure area formed over northeast Bay of Bengal and adjoining areas of Bangla Desh & Gangetic West Bengal on the same evening. It rapidly concentrated into a Depression over northeast Bay of Bengal and adjoining coastal areas of Bangla Desh & West Bengal and lay centred near Lat. 22.0° N / Long. 90.8° E, about 60 kms southeast of Patuakhali (Bangla Desh) at 0000 UTC and remained practically stationary ay 0300 UTC of 26th. It moved slightly westwards and lay centered near Lat. 22.0° N / Long. 90.5° E, close to Khepupara (Bangla Desh) at 1200 UTC on 26th. It remained practically stationary over the same area upto 28th evening. It moved southeastwards and intensified into a Deep Depression and lay over northeast Bay of Bengal and adjoining areas of Bangla Desh,

centered near Lat. 21.0° N / Long. 91.0° E, about 160 kms south-southwest of Chittagong (Bangla Desh) at 0000 UTC on 29th. It remained practically stationary over the same region at 0300 UTC on 29th. It remained practically stationary and lay over the same region centred near Lat. 21.5° N / Long. 91.4° E about 100 kms south-southwest of Chittagong (Bangla Desh) at 1200 UTC on 29th July. It moved northwestwards and intensified into a Cyclonic Storm 'KOMEN' and lay over the same region centered near Lat. 21.6° N / Long. 91.4° E about 95 kms south-southwest of Chittagong (Bangla Desh) and about 300 kms east-southeast of Kolkata at 1800 UTC on 29th. Moving northwards, it lay over the same region centered near Lat. 22.0° N / Long. 91.4° E about 80 kms southwest of Chittagong (Bangla Desh) and about 300 kms east-southeast of Kolkata at 0300 UTC on 30th. It moved northwestwards and lay centred close to Bangla Desh coast near Lat. 22.4° N / Long. 91.4° E about 20 kms east of Hatia (Bangla Desh) at 1200 UTC on 30th. It moved northwards and crossed Bangla Desh coast between Hatia and Sandwip during 1400 to 1500 UTC on 30th. It then moved nearly northwards, weakened into a Deep Depression and lay over Bangla Desh centred near Lat. 23.0° N / Long. 91.0° E at 2100 UTC on 30th. Subsequently, it moved west-northwestwards and centred near Lat. 23.1° N / Long. 90.0° E, about 85 kms east-southeast of Jessore (Bangla Desh) at 0000 UTC on 31st. It remained practically stationary over the same region at 0300 UTC on 31st July. It then moved west northwestwards, weakened into a Depression and lay over Bangla Desh centered near Lat. 23.1° N / Long. 89.5° E about 35 kms east of Jessore (Bangla Desh) at 1200 UTC on 31st. It continued to moved westwards and lay over Bangla Desh centered near Lat. 23.2° N / Long. 89.2° E, close to Jessore at 0300 UTC on 1st August. It moved west northwestwards and lay over Gangetic West Bengal and adjoining Bangla Desh centred near Lat. 23.8° N / Long. 88.4° E about 30 kms south-southeast of Behrampore (West Bengal) at 1200 on 1st Aug. It moved westwards and lay over Jharkhand and adjoining Gangetic West Bengal centred near Lat. 23.8° N and Long. 86.7° E, about 70 km northwest of Bankura at 0000 UTC on 2nd. It moved west-southwestwards and lay over Gangetic West Bengal and adjoining Jharkhand centred near Lat. 23.5° N / Long. 86.0° E, about 70 kms east-northeast of Ranchi at 0300 UTC on 2nd. It moved south-southwestwards and weakened into a well marked low pressure area over Jharkhand and adjoining areas of north Odisha and north Chhattisgarh on same evening.

2.6.2. Other features observed

The highest maximum wind speed has been estimated as 40 knots. However, Teknaf (Bangladesh) reported 55 knots (in the southeastern sector of the CS,

Komen) in the early hours of 30th July for a short period. It reported 76 kmph (40 kts) at 0600 UTC of 30th July. Maungdaw (48061) and Sittwe (47062) which lay to the southeast of the centre of the cyclonic storm reported maximum wind of 67 kt at 2300 UTC and 58 kt at 0400 UTC of 30th July respectively which may be due to the squall in association with the cyclonic storm. The lowest estimated central pressure has been 986 hPa. The MSLP of about 986.9 hPa was reported at Cox Bazar on 30th at 0300 UTC. The MSLP of about 986.5 hPa has been reported from southeastern coast of Bangladesh, when the CS was moving northward close to that coast.

2.6.3. Weather and damage caused

Active to vigorous monsoon conditions with heavy to very heavy rainfall at isolated places prevailed over Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal and Odisha with extremely heavy rain over Jharkhand.

This condition triggered floods which claimed 69 lives in Gangetic west Bengal and 5 in Odisha. It affected five lakh people. Landslides claimed 20 lives in Manipur.

Chief amounts of 24 hrs rainfall (4 cm or more) ending at 0300 UTC from 26th July to 2nd August, 2015 are given below:

26 July, 2015

Nagaland-Manipur- : Sabroom 6
Mizoram-Tripura

Gangetic West Bengal : Dhaniakhali ARG 10, Nandigram, Manmothnagar and Canning Town 9 each, Kharagpur (I.I.T), Dhaniakhali, Uluberia, Kansabati Dam, Uluberia and Harinkhola 8 each, Bagati (Magra) 7, Sagar, Mangalkote, Ranibandh, Amta and Kolkata AP 6 each, Joypur, Kharidwar, Chinsura, Burdwan, Diamond Harbour, Phulberia and Tusuma 5 each, Baruipur, Tamluk AWS, Barrackpur IAF, Kalyani Smo and Digha 4 each

Odisha : Mandira Dam and Khandapara 9 each, Kuchinda 8, Danagadi ARG, Derabis ARG and Panposh 7 each, Banki ARG, Keiri AWS, Kantapada ARG,

Jamsolaghat, Pipili, Gunupur and Chendipada 6 each, Alipingal, Kendrapara, Garadapur ARG, Satyabadi ARG, Daspalla, Paradip, Keongjharharh, Jagatsinghpur AWS, Laikera, Thakurmunda, Kaniha ARG, Khairamal, Paralakhemundi and Tangi 5 each, Swam - Patna, Bhubaneshwar AP, Cuttack, Balipatna ARG, Bhograi, Raghunathpur ARG, Tigriria ARG, Chandbali, Puri, Joda ARG, Batagaon, Kirmira ARG, Digapahandi ARG, Nimpara, Rajgangpur, Naktideul, Pattamundai, Nuagada ARG, Akhuapada, Jharsuguda AP, Naraj and Rairakhol 4 each

Jharkhand : Barkisuriya and Maithon 4 each

27 July, 2015

Nagaland-Manipur- : Sabroom 9, Belonia 5
Mizoram-Tripura

Gangetic West Bengal : Bankura CWC 14, Kansabati Dam, Phulberia and Bankura 10 each, Kharidwar 9, Narayanpur and Ranibandh 6 each, Kolkata AP, Burdawan, Kanksa BSF and Panagarh AP 5 each, Diamond Harbour, Manmothnagar, Tusuma, Mangalkote, Manteswar, Indus, Kolkata, Simula and Labpur 4 each

Odisha : Lahunipara 17, Jamankira 15, Deogarh 12, Banaigarh AWS and Keiri AWS 11 each, Tensa and Rengali 10 each, Naktideul, Reamal, Chendipada, Barkote and Chandanpur 9 each, Batagaon, Karanjia, Kujanga ARG and Kaniha ARG 8 each, Marsaghai ARG, Swam -Patna, Joda ARG, Ghatagaon, Chandbali, Pallahara and Rairakhol 7 each, Angul, Jaipatna, Korei ARG, Tihidi

ARG, Bangiriposi and Gurundia ARG 6 each, Boudhgarh, Rajkanika, Rajgangpur, Jajpur, Akhuapada, Bari ARG, Kuchinda, Hindol, Daitari, Anandpur and Basudevpur AWS 5 each, Derabis ARG, Keongjhargarh, Thakurmunda, Bamra ARG, Bhograi, Kankadahad ARG, Mahanga ARG, Joshipur, Balasore, Champua, Banarpal ARG, Bhadrak AWS, Kolabira ARG, Garadapur ARG and Kirmira ARG 4 each

Jharkhand : Nimdih and Chandil 8 each, Jamshedpur 7, Jamshedpur AP 5, Mohanpur 4

28 July, 2015

Nagaland-Manipur- : Amarpur 7
Mizoram-Tripura

Gangetic West Bengal : Purihansa 24, Tusuma 13, Hatwara and Purulia 12 each, Simula 11, Kharidwar and Contai 9 each, Phulberia and Kashipur 7 each, Tamluk AWS and Asansol CWC 5 each, Sagar, Kansabati Dam, Ranibandh, Manmothnagar and Digha 4 each

Odisha : Tiring 23, Rairangpur 21, Balikuda ARG 19, Tirtol ARG 18, Dhamnagar ARG, Paradip, Binjharpur ARG and Salepur ARG 17 each, Kujanga ARG, Korei ARG and Marsaghai ARG 16 each, Kendrapara, Raghunathpur ARG, Garadapur ARG, Jagatsinghpur AWS, Banki ARG, Swam - Patna, Jajpur, Pattamundai and Jenapur 15 each, Akhuapada, Joshipur and Karanjia 14 each, Nawana, Bonth, Derabis ARG and Chandanpur 13 each, Bari ARG, Mahanga ARG, Danagadi ARG and Daitari each; 11 - Bhuban ARG and Anandpur 12 each, Thakurmunda 10, Alipingal,

Tihidi ARG, Hindol, Kantapada ARG and Ghatagaon 9 each, Mandira Dam, Betanati ARG, Sukinda and Kakatpur 8 each, Kaniha ARG, Rajkanika and Bangiriposi 7 each, Keongjhargarh, Kankadahad ARG, Astaranga ARG, Champua, Rengali and Nilgiri 6 each, Bhadrak AWS, Nischintakoili ARG, Udala, Angul, Basudevpur AWS, Niali ARG, Talcher, Jamsolaghat, Cuttack, Balipatna ARG and Jaipur 5 each, Jhumpura, Baripada, Balimundali, Rajgangpur, Banarpal ARG, Tigiria ARG, Kaptipada ARG, Soro, Batagaon, Altuma CWC, Naktideul and Chandbali 4 each

Jharkhand : Jamshedpur 25, Jamshedpur AP 20, Ghatsila 10, Putki and Topchanchi 9 each, Nimdih and Nandadih 8 each, Chandil, Dumka and Dumri 7 each, Kharsema 6, Bokaro 5, Gobindpur, Dhanbad, Madhupur, Maithon and Rajdhanwar 4 each

29 July, 2015

Gangetic West Bengal : Uluberia 21, Tamluk AWS 19, Contai 14, Nandigram 12, Amta, Dhaniakhali ARG and Contai 11 each, Harinkhola 10, Labpur and Dhaniakhali 9 each, Narayanpur and Sriniketan 8 each, Sagar and Bolpur 7 each, Bagati (Magra), Manteswar, Kalna, Nakshipara and Digha 6 each, Durgachak, Krishnanagar and Kharagpur (I.I.T.) 5 each, Balagarh, Sabong, Pingla, Diamond Harbour, Arambagh, Midnapore CWC, Midnapore and Joypur 4 each

Odisha : Chandanpur 16, Rairangpur and Bhograi 13 each, Bangiriposi 12, Nawana 10,

Jaleswar 7, Jamsolaghat 6, Samakhunta AWS, Balikuda ARG and Rajghat 5 each, Astaranga ARG and Bhuban ARG 4 each

Jharkhand : Ghatsila 15, Dhanbad 10, Sarath 8, Dumka 7, Moharo 6, Gobindpur 5, Maithon, Papunki and Putki 4 each

30 July, 2015

Gangetic West Bengal : Manteswar 20, Harinkhola 19, Amta 17, Arambagh and Sagar 12 each, Salar 11, Sagardighi, Amtala, Nandigram, Dhaniakhali ARG and Burdwan 9 each, Murarai, Contai, Narayanpur and Mangalkote 8 each, Nalhati, Contai, Durgachak, Burdawan and Indus 7 each, Labpur, Khirpai and Pingla 6 each, Kandi, Balagarh, Uluberia, Digha, Uluberia, Rampurhat (Drms), Jangipur, Debagram, Kalna, Sonamukhi ARG, Dhaniakhali and Ranaghat 5 each, Kandi, Katwa, Bolpur, Sriniketan, Nakshipara and Gheropara 4 each

Odisha: : Jaleswar and Rajghat 2 each, Balasore, Betanati ARG and Nh5 Gobindpur 1 each

Jharkhand : Maheshpur and Pakuria 3 each, Pakur 2, Rajmahal and Hiranpur 1 each

31 July, 2015

Nagaland-Manipur- : Sabroom 6
Mizoram-Tripura

Gangetic West Bengal : Digha and Hetampur 8 each, Murarai, Tantloi and Asansol CWC 6 each, Kandi, Dhaniakhali ARG and Suri CWC 4 each

Odisha : Bhogra 8, Rajghat 4

Jharkhand : Maheshpur 17, Dumka and Jarmindi 15 each, Moharo and Sarath 9 each, Giridih, Topchanchi, Jamtara and Messenjore 7 each, Papunki, Madhupur, Balumath, Tilaiya and Nandadih 5 each, Koderma, Maithon, Pathalgada, Tundi, Putki, Pakuria and Barkisuriya 4 each

1 August, 2015

Nagaland-Manipur- : Thoubal AWS and Imphal 9
Mizoram-Tripura : each, Kamalpur, Serchip (Hydro) and Belonia 5 each

Gangetic West Bengal : Deganga 21, Contai 16, Bashirhat 15, Basirhat and Khirpai 14 each, Kolkata, Indus, Kolkata AP and Joypur 13 each, Contai 11, Barrackpur IAF, Mohanpur and Chinsura 10 each, Pingla, Burdwan, Midnapore CWC, Midnapore, Canning Town. and Baruiapur 9 each, Arambagh, Durgapur, Burdawan, Bongaon, Phulberia and Amta 8 each, Hetampur, Uluberia, Dhaniakhali ARG, Asansol CWC, Kanksa BSF, Kalyani Smo, Suri CWC, Panagarh AP, Tusuma, Tilpara Barrage, Mangalkote, Mankar and Bankura CWC 7 each, Diamond Harbour, Purihansa, Balagarh, Bagati (Magra), Nandigram, Kharagpur (I.I.T), Kansabati Dam, Manteswar and Bankura 6 each, Ranibandh, Dhaniakhali, Rampurhat (Drms), Kashipur, Sabong, Tamluk AWS, Shekhampore ARG, Sagar, D. P. Ghat, Rajnagar, Jhargram, Narayanpur, Kalaikunda and Kharidwar 5 each, Labpur, Nalhati, Bolpur, Durgachak, Salar, Sagardighi, Sriniketan, Ranaghat, Katwa, Amtala and Kandi 4 each

Odisha : Salepur ARG 6, Barkote, Altuma CWC and Naktideul 5 each, Deogarh,

	Kamakhyanagar, Boudhgarh, Jamankira and Banaigarh AWS 4 each
Jharkhand	: Dumri 13, Hazaribagh 9, Panki, Kuru and Messenjore 8 each, Daltonganj and Sarath 7 each, Bagodar I, Satgaon, Bishrampur and Ghatsila 6 each, Manatu, Barkisuriya, Maithon, Koner, Koderma, Tilaiya, Jamtara, Mandar, Lohar - Daga, Panchet and Maheshpur 5 each, Ranchi AP, Ramgarh, Jaridih, Rajdhanwar, Hindgir and Jarmindi 4 each

	Barkisuriya and Barhi 10 each, Mandar 9, Rajdhanwar, Jarmindi, Pathalgada, Dhanbad, Hindgir and Tenughat 8 each, Lohar-Daga, Moharo, Chatra, Bokaro, Papunki, Giridih, Hazaribagh, Dumri, Jamtara, Sarath, Jaridih and Koderma 7 each, Messenjore, Palkot, Balumath, Maheshpur and Dumka 6 each, Tilaiya, Ranchi AP, Ormangi, Pakuria, Nandadih, Panchet, Tundi, Kuru, Kolebira and Maithon 5 each, Chakradharpur 4
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2 August, 2015

Gangetic West Bengal	: Mangalkote 11, Burdawan, Arambagh, Narayanpur and Burdwan 9 each, Mankar and Kashipur 8 each, Joypur, Sriniketan, Murarai, Harinkhola and Bankura CWC 7 each, Bankura, Rampurhat (Drms), D. P. Ghat and Gheropara 6 each, Jhalda, Canning Town., Purihansa, Hatwara, Kanksa BSF, Kalaikunda, Bolpur, Durgapur and Kharidwar 5 each, Phulberia, Jhargram, Uluberia, Katwa, Dhaniakhali ARG, Sonamukhi ARG, Labpur, Nalhati, Kalyani Smo, Tusuma, Indus, Suri CWC, Midnapore CWC, Salar, Khirpai, Midnapore and Kalna 4 each
Odisha	: Khairamal 10, Jujumura ARG and Tirtol ARG 8 each, Kantapada ARG 7, Phulbani, Harabhanga and Angul 6 each, Rajkishorenagar, Boudhgarh, Tikabali, Alipingal, Paradip, Kalinga, Salepur ARG, Naktideul and Birmaharajpur ARG 5 each, Sambalpur, Athgarh, Athmalik, Tikarpara, Bhubaneswar AP, Barmul and Rairangpur 4 each
Jharkhand	: Deoghar, Putki and Koner 11 each, Ramgarh, Mohanpur,

2.7. Land Depression over east Madhya Pradesh and adjoining Chhattisgarh (4-5 August)

2.7.1. After dissipation of cyclone 'KOMEN', a well marked low pressure area formed over Jharkhand and adjoining areas of north Odisha and north Chhattisgarh on 2nd. It moved southwestwards and lay over north Chhattisgarh and adjoining north Odisha and Jharkhand with an associated cyclonic circulation extending upto mid tropospheric levels upto 3rd and over north Chhattisgarh and adjoining southwest Bihar, southeast Uttar Pradesh and east Madhya Pradesh on 4th evening. It concentrated into a Depression and lay over east Madhya Pradesh and adjoining Chhattisgarh centred near Lat. 22.7° N and Long. 80.5° E, about 75 kms southeast of Jabalpur at 0300 UTC on 4th. It moved westwards and lay over central parts of Madhya Pradesh centred near Lat. 22.7° N and Long. 77.8° E, close to Hoshangabad at 1200 UTC on 4th. It weakened into a well marked low pressure area and lay over southwest Madhya Pradesh and neighbourhood at 0000 UTC on 5th. It lay over central parts of Madhya Pradesh with an associated cyclonic circulation extending upto mid tropospheric levels on 5th. It weakened into a low pressure area over the same region until the afternoon of 5th and persisted there till the evening. It became less marked on 6th. However the associated cyclonic circulation lay over east Madhya Pradesh and neighbourhood and extending between 1.5 & 5.8 kms a.s.l. on 6th and over north Chhattisgarh and neighbourhood and extending upto 3.1 kms a.s.l. during 7th - 10th. It became less marked on 11th.

2.7.2. Other features observed

The lowest observed pressure of 994.9 hPa, was reported by Hoshangabad and Damoh at 1200 UTC of 4th. The maximum sustained wind speed of 16 kts was reported by Indore at 1200 UTC of 4th.

2.7.3. Weather and damage caused

Active monsoon conditions with heavy to very heavy rainfall at isolated places prevailed over Madhya Pradesh, Vidarbha and Chhattisgarh.

Chief amounts of 24 hrs rainfall (5 cm or more) ending at 0300 UTC from 4th August are given below:

4 August, 2015

Madhya Pradesh : Pachmarhi 21, Betul, Betul - AWS, Udaipura and Sardarpur 10 each, Bhainsdehi 9, Chanderi, Chicholi and Kolaras 8 each, Pichhore and Multai 7 each, Nusrulgunj - Arg 6, Narsingarh, Shajapur, Shajapur - AWS, Begumganj, Atner, Ichhawar, Ganjbasoda and Ashoknagar - AWS 5 each

East Madhya Pradesh : Amarwara and Balaghat - AWS 15 each, Narsingpur 13, Seoni, Seoni - AWS, Gotegaon and Chindwara - AWS 12 each, Keolari and Katangi 11 each, Lakhnadon, Mandla - AWS and Bichhia 10 each, Jabalpur, Gadarwara and Kareli 9 each, Malanjkhanda, Deori, Nainpur and Patan 8 each, Dindori - AWS 7, Garhakota, Umariya, Umariya - AWS, Ghansore, Rehli, Tikamgarh, Waraseoni and Tikamgarh - AWS 6 each, Amarkantak, Sagar, Sagar - AWS and Pushparajgarh 5 each

Vidarbha : Tumsar, Wardha and Gondia 6 each, Saoner, Tirora, Tiroda (Arg), Ashti, Dhamangaon Rlwy, Nagpur AP and Salekasa 5 each

Chhattisgarh : Bemetara 12, Korba 10, Katghora 9, Pali 8, Raigarh 7, Sarangarh, Mungeli, Pallari / Palari and Saraipali 6 each, Simga, Pendra, Bhopalpatnam, Janjgir and Gandai 5 each

2.8. Land Deep depression over south Odisha and neighbourhood (16-19 September)

2.8.1. A cyclonic circulation extending upto mid tropospheric level lay over west-central Bay of Bengal & neighbourhood during 7th -11th. Under its influence, a low pressure area formed over west-central & adjoining northwest Bay of Bengal on 12th and persisted over the same area on 13th & 14th. It lay as a well marked low pressure area over west-central & adjoining northwest Bay of Bengal off north Andhra Pradesh - south Odisha coasts on 15th and over south Odisha & neighbourhood on 16th. Associated cyclonic circulation extended upto 7.6 kms a.s.l. during 12th - 16th. The well marked low pressure area over south Odisha & neighbourhood concentrated into a Depression and lay centered at 0300 UTC of 16th September over south Odisha and neighbourhood near Lat. 19.6° N/ Long. 83.5° E. It moved west-northwestwards and lay centered at 1200 UTC of 16th September 2015 over south Odisha and adjoining Chattisgarh near Lat. 20.5° N / Long. 82.5° E about 70 kms northwest of Titlagarh and 130 kms southeast of Raipur. It continued to move west-northwestwards and intensified into a Deep Depression and lay centered over Vidarbha and adjoining areas of south Chhattisgarh near Lat. 21.0° N / Long. 79.5° E about 50 kms east-southeast of Nagpur at 0300 UTC on 17th. It moved nearly westwards and lay centred over Vidarbha & neighbourhood near Lat. 20.5° N / Long. 79.0° E about 50 kms east of Wardha at 1200 UTC on 17th. It further moved nearly westwards and weakened into a Depression and lay centred over Vidarbha & neighbourhood near Lat. 20.7° N / Long. 77.0° E close to Akola at 0300 UTC on 18th. It moved nearly westwards and lay centred over west Vidarbha & neighbourhood near Lat. 20.5° N / Long. 76.0° E close to Buldhana at 1200 UTC on 18th. It nearly moved west-northwestwards and lay centred over north Madhya Maharashtra & neighbourhood near Lat. 21.0° N / Long. 74.5° E about 50 kms north of Malegaon and 160 kms southeast of Vadodara, at 0000 UTC of 19th. It further moved westwards and weakened into a well marked low pressure area over north Madhya Maharashtra & adjoining areas of southwest Madhya Pradesh and Gujarat region at 0300 UTC on 19th. It lay over south Gujarat and neighbourhood on 19th evening. It lay as a low pressure area over Saurashtra & neighbourhood on 20th, over Saurashtra & Kutch and neighbourhood on 21st, over northwest Rajasthan and neighbourhood on 22nd and became less marked in the same evening.

2.8.2. Other features observed

The system moved initially westnorthwestwards and then westward direction and weakened into a well marked low pressure area. The lowest observed pressure

of 982.6hPa, was reported by Washim at 1200 UTC of 18th when the centre of system was close to the Washim. The maximum sustained wind speed of 10 kts was reported by Kalingapattanam at 0600 UTC of 16th when the system was northwest of Kalingapattanam.

2.8.3. Weather and damage caused

Active to vigorous monsoon conditions prevailed over Odisha, south Gujarat Region, Maharashtra state and Chhattisgarh. This deep depression caused heavy to very heavy rainfall over Odisha, Maharashtra State and Chhattisgarh with extremely heavy rainfall at isolated places over Odisha and south Gujarat Region.

This system caused flood in Odisha which claimed 2 death and 25,000 affected by rain, landslides and road & rail traffic.

Chief amounts of 24 hrs rainfall (5 cm or more) ending at 0300 UTC from 16th to 18th are given below:

16 September, 2015

Odisha : Tentulikhunti ARG 28, Muniguda ARG 26, Jaipatna 23, Bhavani P. and Narla ARG 22 each, Jhorigam ARG, Ambadola and Koraput 21 each, Chandahandi ARG and Nawarangpur 19 each, Lanjigarh 18, Madanpur Rampur, Kotagarh and Sorada 17 each, Junagarh, Similiguda AWS, Daringibadi, Madhabarida and Bissem - Cuttack 15 each, Jeypore and Kshipur 14 each, Kotraguda and Nuagada ARG 13 each, Gudari, Kesinga ARG, Pottangi and Dabugan ARG 12 each, Raikia ARG, Belaguntha ARG, Bhanjnagar and Tikabali 11 each, Kalinga 10, Mohana, Belgaon, Titlagarh, Dharmagarh ARG, Khariar, Kaptipada ARG, Umarkote, Tikarpara, Kosagumda and Rayagada 9 each, R. Udaigiri, Raighar ARG, G Udayagiri AWS, K Nuagaon ARG, Phiringia ARG, Gunupur, Komna and Sinapali ARG 8

each, Balimundali, Boden ARG, Aska, Baliguda, Jagannath Prasad ARG, Barmul, Nayagarh, Ranpur, Bolangir, Daspalla and Udala 7 each, Mahendragarh, Odagaon ARG, Saintala ARG, Turekela, Betanati ARG, Nawana, Patnagarh, Digapahandi ARG, Tarva ARG and Purushottampur 6 each, Belpada ARG, Gania ARG, Tangi, Cuttack, Bari ARG, Nimpara, Nilgiri, Khandapara, Nawapara, Bolagarh ARG, Paralakhemundi, Puri and Bangiriposi 5 each

Konkan & Goa : Ratnagiri 11, Canacona 10, Panjim (Goa) and Mapusa 9 each, Ponda 8, Sanguem and Malvan 7 each, Kudal, Quepem and Lanja 6 each, Kankavli, Marmugoa, Mormugao and Sangameshwar Devrukh 5 each

Madhya Maharashtra : Mahabaleshwar 6, Gaganbawada 5

Vidarbha : Balapur 9, Chamorshi 7, Sadakarjuni 6, Chimur, Mul, Saoli, Akola (AWS) and Mulchera 5 each, Sindkhed Raja, Chikhli, Motala, Babulgaon, Kalmeshwar, Bhamragad, Risod and Akola 4 each, Sangrampur, Buldhana, Warora, Narkhed ARG, Etapalli, Ahiri, Korpana, Malkapur, Nandura, Wani, Gadchiroli, Buldhana (AWS), Deoli, Dhanora and Patur 3 each, Sakoli, Shegaon, Ashti, Katol, Saoner, Jalgaon Jamod, Yeotmal, Malegaon, Gondpipri, Sindewahi, Daryapur, Bhadravati, Bhiwapur, Digras, Maregaon, Narkheda and Bramhapuri 2 each, Pandherikawara, Pauni, Tiwsa, Darwha, Manora, Amgaon, Samudrapur, Khamgaon, Deolgaon Raja, Kamptee, Lonar, Kurkheda, Ballarpur, Deori, Zarizamni,

Lakhani, Korchi, Nagbhir, Arvi, Mehkar, Tirora, Salekasa, Chandur Rlwy, Wardha, Kuhi, Arni, Ner and Tiroda (Arg) 1 each

Chhattisgarh : Deobhog 16, Balod 11, Bhanupratappur 9, Dhamtari, Jagdalpur and Kanker 7 each, Mana AP, Raipur and Mahasamund 6 each, Gariabund 5

17 September, 2015

Odisha : Jhorigam ARG 13, Umarkote and Raighar ARG 12 each, Junagarh 10, Boden ARG and Patnagarh 8 each, Belaguntha ARG, Khariar, Malkangiri and Kalinga 7 each, Rayagada, Belpada ARG, Paikmal, Sinapali ARG, Chandahandi ARG and Dabugan ARG 6 each, Bhavani P., Tikabali and Tentulikhunti ARG 5 each

Konkan & Goa : Karjat Agri and Chiplun 7 each, Matheran, Ratnagiri and Bhira 6 each, Mormugao, Alibag, Shriwardhan, Guhagar and Murud 5 each

Vidarbha : Sadakarjuni 14, Korpana, Amgaon, Goregaon and Mul 12 each, Deori, Kurkheda, Lakhani, Korchi, Bhadravati and Salekasa 11 each, Bramhapuri, Saoli, Rajura and Desaiganj 10 each, Ahiri, Sakoli and Gondpipri 9 each, Lakhandur, Chamorshi, Gondia AP, Gondia, Chandrapur, Armori and Arjuni Morgaon 8 each, Pauni, Nagbhir and Dhanora 7 each, Sindewahi and Sironcha 6 each, Bhandara, Gadchiroli, Tirora, Wani, Warora, Chimur, Mohadi and Buldhana 5 each

Chhattisgarh : Sukma 21, Kanker 17, Mahasamund 14, Dongargarh and Balod 11 each, Ambagarh

Chowki, Narayanpur and Bhanupratappur 9 each, Raipur and Kondagaon 8 each, Mana AP, Rajnandgaon, Durg, Deobhog, Pendra and Dondilohara 7 each, Dongargaon and Gariabund 6 each, Arang, Bilaspur, Dhamtari, Bemetara and Katghora 5 each

18 September, 2015

Marathawada : Sillod 16, Mahur 11, Himayatnagar 10, Bhokardan, Jalna, Hingoli - Hyd, Kallamnuri, Phulambri, Sengaon, Hadgaon and Aurangabad AP 9 each, Partur, Kinwat, Parbhani and Dhalegaon - FMO 8 each, Soegaon, Kannad, Ambad and Selu 7 each, Khultabad, Jintur and Jafrabad 6 each, Vasmat, Ghansawangi, Paithan and Gangapur 5 each

Konkan & Goa : Sanguem 10, Quepem, Margao, Mulde Agri and Mulde - AWS 7 each, Marmugoa, Mormugao, Dabholim (Goa), Kankavli and Sawantwadi 6 each, Kudal, Ponda, Vengurla, Devgarh and Canacona 5 each

Madhya Maharashtra : Sindkheda 18, Gidhade - FMO 15, Shahada 13, Jalgaon, Jamner and Dahigaon - FMO 12 each, Shirpur 11, Malegaon and Sinnar 9 each, Pachora and Kalvan 8 each, Nandurbar, Yaval, Erandol and Sakri 7 each, Girnadam - FMO, Dhule, Igatpuri, Niphad and Chopda 6 each, Nandgaon, Raver, Navapur, Chalisgaon, Bodwad, Amalner, Muktainagar / Edalabad and Dindori 5 each

Marathwada : Sillod 16, Mahur 11, Himayatnagar 10, Bhokardan, Jalna, Hingoli - Hyd, Kallamnuri, Phulambri, Sengaon, Hadgaon and

Aurangabad AP 9 each, Partur, Kinwat, Parbhani and Dhalegaon - FMO 8 each, Soegaon, Kannad, Ambad and Selu 7 each, Khultabad, Jintur and Jafrabad 6 each, Vasmal, Ghansawangi, Paithan and Gangapur 5 each

Vidarbha : Pandherikawara and Korpana 16 each, Deolgaon Raja and Wani 15 each, Zarizamni 14, Maregaon, Sindkhed Raja, Buldhana, Nandgaonkazi and Bhadravati 13 each, Akot, Darwaha, Lonar, Umerkhed, Digras, Joiti, Ner, Mahagaon and Ghatanji 12 each, Buldhana (AWS), Mehkar, Washim and Manora 11 each, Arni, Hinganghat, Yeotmal, Ballarpur, Warora, Washim (AWS) and Wardha 10 each, Kuhi, Ralegaon, Risod, Motala, Chandur Rlwy and Kalamb 9 each, Shegaon, Bhandara (AWS), Amraoti, Mauda, Mangrulpir and Chikhli 8 each, Tiwsa, Akola (AWS), Khamgaon, Malegaon, Chikhaldia, Karanjlad, Sangrampur, Samudrapur, Telhara, Chandrapur, Jalgaon Jamod and Selu 7 each, Daryapur, Patur, Batkuli, Balapur, Akola, Deoli, Bhandara and Dhamangaon Rlwy 6 each, Mohadi, Anjangaon, Arvi, Babulgaon, Rajura, Barshitakli, Deori, Saoner, Chandur Bazar, Hingna, Malkapur, Dharni, Kalmeshwar, Kharangha, Nandura, Sindewahi and Nagpur AP 5 each

formed over east central and adjoining southeast Arabian Sea in the early morning of 8th. It lay as a well marked low pressure area over the same region with the associated cyclonic circulation extending upto mid tropospheric levels on 8th. It concentrated into a Depression and lay over east central Arabian Sea centred near Lat. 14.0° N / Long. 70.3° E about 410 kms west-southwest of Goa and 630 kms south-southwest of Mumbai at 0000 UTC on 9th. It remained practically stationary over the same region and lay centred near Lat. 14.0° N / Long. 70.3° E at 0300 UTC on 9th. It moved northwards and lay over east central Arabian Sea centred near Lat. 14.3° N / Long. 70.2° E about 400 kms west-southwest of Goa and 600 kms of south-southwest of Mumbai at 1200 UTC on 9th. It moved northwestwards, intensified into a Deep Depression and lay over east central Arabian Sea centred near Lat. 14.7° N / Long. 69.9° E, at 1800 UTC on 9th. It moved northwestwards and lay over east central Arabian Sea centred near Lat. 15.1° N / Long. 69.5° E, about 460 kms west-southwest of Goa and 550 kms of south-southwest of Mumbai at 0300 UTC on 10th. It moved slightly northwestwards and lay over east central Arabian Sea centred near Lat. 15.2° N / Long. 69.3° E, about 490 kms west-southwest of Goa and 560 kms of south-southwest of Mumbai at 1200 UTC on 10th. It continued to move northwards, weakened into a Depression and lay over east central Arabian Sea centred near Lat. 15.6° N / Long. 69.2° E, about 490 kms west of Goa and 520 kms of south-southwest of Mumbai at 0300 UTC of on 11th. It moved northwards and lay centred near Lat. 15.9° N / Long. 69.2° E, about 500 kms west-northwest of Goa and 520 kms southwest of Mumbai at 1200 UTC on 11th. Then it moved west-northwestwards and lay centred near Lat. 16.1° N / Long. 69.0° E, about 520 kms west-northwest of Goa and 510 kms southwest of Mumbai at 0000 UTC on 12th. Further moved slightly west-northwestwards it weakened into a well marked low pressure area over the same region in the morning hours on 12th. It weakened into a low pressure area and lay over east central and adjoining west central Arabian Sea on 13th. It became less marked on 14th. However, associated cyclonic circulation extending upto 3.1 kms a.s.l. lay over west central Arabian Sea and neighbourhood on 14th October.

2.9.2. Other features observed

2.9. Deep Depression over east central Arabian Sea (9 - 12 October, 2015)

2.9.1. A cyclonic circulation extending upto 0.9 km a.s.l. lay over Lakshadweep area and neighbourhood on 5th and over southeast Arabian Sea and adjoining east central Arabian Sea extending upto mid tropospheric levels on 6th - 7th. Under its influence, a low pressure area

The lowest observed pressure of 998.6 hPa was reported by Bajpe at 0000 UTC of 9th October, when the system was north to the Bajpe. The maximum observed mean wind speed was 20 kts reported by Buoy 23097 (14.0/68.0), when the system was to the northwest of Buoy 23097 at 1200 UTC of 12th October. The system moved in northwest direction.

2.9.3. *Weather and damage caused*

No damage was reported by this system.

Isolated to scattered rainfall occurred over parts of Konkan & Goa and coastal Karnataka.

Chief amounts of 24 hrs rainfall (1 cm or more) ending at 0300 UTC from 9th to 12th October, 2015 are given below:

9 October, 2015

Konkan & Goa : Dodamarg 5, Pernem 1

Coastal Karnataka : Mangaluru 1

10 October, 2015

Coastal Karnataka : Manchikere 3, Mani 2,
Siddapura, Dharmasthala,
Kumta, Shirali PTO 1

11 October, 2015

Coastal Karnataka : Puttur Hms 2, Uppinangadi,
Mani 1

Konkan & Goa : Mokhada - FMO & Ambernath
1 each

12 October, 2015

Konkan & Goa : Matheran, Karjatagri &
Bhiwandi 4 each; Sudhagad
Pali, Wada, Shahapur & Pen 3
each, Jawhar, Kalyan &
Murbad 2 each, Poladpur,
Mokhada - FMO, Vikramgad,
Khalapur & Sangameshwar
1 each

2.10. *Extremely Severe Cyclonic Storm 'CHAPALA' over Arabian Sea (28 October - 4 November, 2015)*

2.10.1. A trough of low at mean sea level lay over southeast Arabian Sea and adjoining Laskhadweep area on 22nd, over southeast Arabian Sea and neighbourhood with

a cyclonic circulation aloft extending upto 0.9 km a.s.l. on 23rd and over southeast and adjoining southwest Arabian Sea with the cyclonic circulation aloft extending upto 0.9 km a.s.l. on 24th & 25th. It organised into a low pressure area over the same region with an associated cyclonic circulation extending upto mid tropospheric levels on 26th. It lay as a well marked low pressure area over the same region with associated cyclonic circulation extending upto mid tropospheric levels on 27th. Then it concentrated into a Depression and lay over southeast Arabian Sea and adjoining areas of southwest & central Arabian Sea, centred near Lat. 11.5° N / Long. 65.0° E about 1200 kms southwest of Mumbai and 1320 kms southeast of Salalah (Oman) at 0300 UTC on 28th October. Moving north northwestwards, it intensified into a Deep Depression over east central and adjoining west central and south Arabian Sea and lay centred at 1200 UTC of 28th, near Lat. 12.5° N / Long. 64.7° E. It continued to move north-northwestwards and further intensified into a Cyclonic Storm, 'CHAPALA' and lay over eastcentral and adjoining westcentral and south Arabian Sea centered near Lat. 13.7° N / Long. 64.3° E, about 1080 kms southwest of Mumbai and about 1150 kms east-southeast of Salalah (Oman) at 0000 UTC on 29th. It then moved northwestwards and lay over eastcentral and adjoining westcentral and south Arabian Sea, centred near Lat. 13.8° N / Long. 64.2° E, about 1090 kms southwest of Mumbai and about 1140 kms east-southeast of Salalah (Oman) at 0300 UTC of 29th. It moved west-northwestwards and intensified into a Severe Cyclonic Storm and lay over west central and adjoining eastcentral Arabian sea at 0900 UTC on 29th October 2015 centered near Lat. 14.0° N / Long. 63.5° E. It further moved west-northwestwards and lay over west central and adjoining eastcentral Arabian sea at 1200 UTC on 29th October 2015 centered near Lat. 14.1° N / Long. 63.3° E, about 1150 kms west-southwest of Mumbai and about 1040 kms east-southeast of Salalah (Oman). It further intensified into a Very Severe Cyclonic Storm and lay over westcentral Arabian Sea centred near Lat. 14.3° N / Long. 62.5° E at 1800 UTC of 29th. Then it moved westwards and further intensified into an Extremely Severe Cyclonic Storm and lay over westcentral Arabian Sea, centred near Lat. 14.3° N / Long. 61.8° E at 0000 UTC on 30th. It further moved westwards and lay over westcentral Arabian Sea, centred near Lat. 14.3° N / Long. 61.5° E, about 1320 kms west-southwest of Mumbai and 850 kms east-southeast of Salalah (Oman) at 0300 UTC on 30th. It moved west-southwestwards and lay centred near Lat. 14.1° N / Long. 60.6° E about 1410 kms west-southwest of Mumbai and 770 kms east-southeast of Salalah (Oman) at 1200 UTC on 30th. It further moved west-southwestwards and lay centred near Lat. 13.8° N / Long. 59.2° E, about 1560 kms west-southwest of Mumbai and 650 kms southeast of Salalah (Oman) at

0300 UTC on 31st. It moved westwards and lay centered near Lat. 13.8° N / Long. 57.9° E, about 1690 kms west-southwest of Mumbai and 540 kms southeast of Salalah (Oman) at 1200 UTC on 31st October. It moved west-southwestwards and lay centered near Lat. 13.6° N / Long. 56.1° E, about 430 kms south-southeast of Salalah (Oman), 740 kms east-southeast of Riyan (Yemen) and 260 kms east-northeast of Socotra Island (Yemen) at 0300 UTC on 1st November. It moved westwards and lay centered near Lat. 13.6° N / Long. 54.6° E, about 380 kms south - southeast of Salalah (Oman), 590 kms east-southeast of Riyan (Yemen) and 130 kms north-northeast of Socotra Island (Yemen) at 1200 UTC on 1st. It moved west-southwestwards and lay centered near Lat. 13.2° N / Long. 52.2° E, about 470 kms south-southeast of Salalah (Oman), 350 kms southeast of Riyan (Yemen) and 190 kms west-northwest of Socotra Island (Yemen) at 0300 UTC on 2nd. It moved west-northwestwards, weakened into a Very Severe Cyclonic Storm and lay over Gulf of Aden and adjoining westcentral Arabian Sea centered near Lat. 13.4° N / Long. 50.5° E, about 180 km southeast of Riyan (Yemen) and about 550 km southwest of Salalah (Oman) at 1200 UTC of 2nd. It further moved west-northwestwards, crossed Yemen coast to the southwest of Riyan, near Lat. 14.1° N / Long. 48.5° E, during 0100-0200 UTC on 3rd November as a Very Severe Cyclonic Storm. It then continued to move west-northwestwards, weakened into a Severe Cyclonic Storm and lay over Yemen centred near Lat. 14.2° N / Long. 48.4° E about 100 km southwest of Riyan (Yemen) at 0300 UTC on 3rd. It moved west-northwestwards and weakened into a Cyclonic Storm and lay centered near Lat. 14.2° N / Long. 47.8° E about 100 kms east-southeast of Ataq (Yemen) at 0600 UTC on 3rd. It further moved westwards and lay centered near Lat. 14.2° N / Long. 47.3° E about 60 kms south-southeast of Ataq (Yemen) at 1200 UTC of 3rd. It then moved west-northwestwards, weakened into a Deep Depression and lay centred near Lat. 14.3° N / Long. 47.0° E, about 25 kms south-southeast of Ataq (Yemen) at 1800 UTC of 3rd. It further moved northwestwards and weakened into a Depression and lay centred near Lat. 14.8° N / Long. 46.5° E about 50 kms northwest of Ataq (Yemen) at 0000 UTC on 4th Nov. It further weakened and lay as a well marked low pressure area over Yemen on 4th November at 0300 UTC.

2.10.2. Other features observed

The lowest estimated central pressure has been 940 hPa. The estimated maximum sustained surface winds (MSW) were 115 knots during 0900 - 2100 UTC of 30th October. However, at the time of landfall, the ECP was 984 hPa and MSW was 65 knots (very severe cyclonic storm) due to weakening of the system over Gulf of Aden. The lowest observed pressure of 1000.4 hPa was reported

by Buoy 23668 (13.5/61.6) at 0300 UTC of 30th October, when the centre of system was close to the Buoy 23668. The maximum observed mean wind speed was 58 kts reported by Ship DIGW (18.7/71.9), when the system was at southeast of Ship DIGW (18.7/71.9) at 0300 UTC of 30th October. The system moved initially northwest then westward direction.

2.10.3. Weather and damage caused

During the initial stage of formation of the system, on 28th, rainfall belt was oriented along NE-SW and the rainfall maximum was observed to the northeast of the system centre. Subsequently, with the organisation of the system, convection became more and more organised and rainfall was symmetric about the centre on 31st. Rainfall of the order of 25-30 cm was realised near the core of the system on 28th and about 30-45 cm was realised in the wall cloud region during 29th October to 3rd November.

Rainfall activity increased along the west coast.

As per media and press report, ESCS Chapala claimed at least five lives and caused widespread damage as it brushed past Socotra Island of Yemen. More than 50,000 people in Yemen, including about 18,000 on Socotra, were displaced because of Cyclone Chapala.

Chief amounts of 24 hrs rainfall (more than 1 cm) ending at 0300 UTC of 28th October - 4th November 2015 are given below.

28 October, 2015

Kerala	: Vadakara 5, Chittur 3, Kozhikode 2, Ambalavayal, Kannur and Manjeri 1 each
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29 October, 2015

Kerala	: Thodupuzha 8, Peermade To 5, Kozha and Ottapalam 4 each, Piravam, Ambalavayal, Neyyattinkara and Kuppady 3 each, Nedumangad, Vythiri, Kollamkode, Thiruvananthapuram, Vadakkancherry, Pattambi and Kunnankulam 2 each, Aryankavu, Kozhikode, Kudulu, Myladumpara Agri, Irikkur, Mananthavady, Kollam Rly, Thrithala, Kanjirappally, Kottayam, Mannarkad and Kodungallur 1 each
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2.11. *Extremely Severe Cyclonic Storm 'MEGH' over Arabian Sea (5 - 10 November, 2015)*

2.11.1. A cyclonic circulation lay over Sri Lanka and adjoining areas of southwest Bay of Bengal extending upto 4.5 kms a.s.l. on 29th, over Sri Lanka and adjoining Comorin area on 30th, over Comorin area and neighbourhood extending upto 5.8 kms a.s.l. on 31st October, over Lakshadweep and neighbourhood extending upto 4.5 kms a.s.l. on 1st November and over east-central Arabian Sea off Karnataka coast extending upto 3.1 kms a.s.l. on 2nd - 3rd. Under its influence, a low pressure area formed over east-central and adjoining southeast Arabian Sea on the 3rd evening. It lay as a well marked low pressure area over east-central Arabian sea and neighbourhood with an associated cyclonic circulation extending upto 5.8 kms a.s.l. on 4th. It concentrated into a Depression and lay over eastcentral Arabian Sea centered near Lat. 14.1° N / Long. 66.0° E, about 920 km southwest of Mumbai and 1310 km east southeast of Salalah (Oman) at 0000 UTC of 5th. It moved westwards and lay over eastcentral Arabian Sea centred near Lat. 14.1° N / Long. 65.6° E, about 950 km southwest of Mumbai and 1280 km east southeast of Salalah (Oman) at 0300 UTC of 5th. It moved westwards and intensified into a Deep Depression over eastcentral Arabian Sea centred near Lat. 14.1° N / Long. 64.8° E, about 1020 kms southwest of Mumbai and 1200 kms east-southeast of Salalah (Oman) at 0600 UTC of 5th. Continuing to move westwards, it intensified into a Cyclonic Storm 'MEGH' and lay over central Arabian Sea centred near Lat. 14.0° N / Long. 64.0° E, about 1090 kms southwest of Mumbai and 1120 kms east-southeast of Salalah (Oman) at 1200 UTC of 5th. It moved west-southwestwards and lay over westcentral Arabian Sea centred near Lat. 13.5° N / Long. 62.2° E, about 920 kms east-northeast of Socotra Island (Yemen) and 1270 kms southwest of Mumbai at 0300 UTC of the 6th. It moved west-southwestwards and lay over westcentral Arabian sea centred near Lat. 13.0° N / Long. 61.0° E, about 770 km east-northeast of Socotra Island (Yemen), 1430km west-southwest of Mumbai and 860 km east-southeast of Salalah (Oman) at 1200 UTC of 6th. It further moved westwards and lay over westcentral Arabian Sea centred near Lat. 12.8° N / Long. 59.6° E, about 620 kms east-southeast of Socotra Island (Yemen) and 1580 kms southwest of Mumbai and 750 kms east-southeast of Salalah (Oman) at 0300 UTC of 7th. Further moving west-southwestwards it intensified into a Severe Cyclonic Storm and lay over westcentral and adjoining southwest Arabian Sea, centred near Lat. 12.7° N / Long. 59.2° E at 0600 UTC of 7th. It then moved west-southwestwards and lay over westcentral and adjoining southwest Arabian Sea centred near Lat. 12.7° N / Long. 58.4° E, about 470 kms east of Socotra Island

(Yemen) and 1710 kms west-southwest of Mumbai and 660 kms east-southeast of Salalah (Oman) at 1200 UTC of 7th. It further moved westwards and intensified into a Very Severe Cyclonic Storm and lay over westcentral and adjoining southwest Arabian Sea, centred near Lat. 12.6° N / Long. 57.9° E, about 430 kms east of Socotra Island (Yemen), 1750 kms west-southwest of Mumbai and 640 kms southeast of Salalah (Oman) at 1500 UTC of 7th. It moved westwards and further intensified into an Extremely Severe Cyclonic Storm and lay over westcentral and adjoining southwest Arabian Sea, centred near Lat. 12.7° N / Long. 55.5° E, about 180 kms east of Socotra Island (Yemen) and 510 kms south-southeast of Salalah (Oman) at 0300 UTC of 8th. It moved westwards and lay over westcentral and adjoining southwest Arabian Sea centred near Lat. 12.7° N / Long. 53.5° E at 1200 UTC of 8th. It moved west-southwestwards and weakened into a Very Severe Cyclonic Storm and lay over westcentral and adjoining southwest Arabian Sea, centred near Lat. 12.3° N / Long. 51.0° E, about 320 kms west of Socotra Island (Yemen) and 620 kms south-southwest of Salalah (Oman) at 0000 UTC of 9th. It moved westwards and lay over westcentral and adjoining southwest Arabian Sea, centred near Lat. 12.3° N / Long. 50.3° E, about 380 kms west-southwest of Socotra Island (Yemen) and 650 kms south-southwest of Salalah (Oman) at 0300 UTC of 9th. Moving further westwards it weakened into Severe Cyclonic Storm and lay over Gulf of Aden centred near Lat. 12.7° N / Long. 46.8° E at 2100 UTC of 9th. Further moving west northwestwards it weakened into Cyclonic Storm centred near Lat. 13.1° N / Long. 46.2° E at 0300 UTC and as a Deep Depression over Gulf of Aden centred near Lat. 13.3° N / Long. 46.1° E at 0600 UTC of 10th. It then recurved northeastwards and crossed Yemen coast near Lat. 13.4° N / Long. 46.1° E around 0900 UTC of 10th. After landfall the Deep Depression moved eastnortheastwards and weakened into a Depression and lay over coastal Yemen centred near Lat. 13.6° N / Long. 46.5° E at 1200 UTC of 10th and thereafter it weakened into a well marked low pressure area over Yemen and neighbourhood at 1800 UTC.

2.11.2. *Other features observed*

The lowest ECP was 964 hPa from 0600 UTC to 0900 UTC of 8th. The maximum estimated mean wind speed was 95 kts from 0600 UTC to 0900 UTC of 8th. The lowest observed pressure of 1005.0 hPa and maximum observed mean wind speed of 38kts was reported by Ship A8307(13.5/61.7) at 1200 UTC of 6th, when the centre of system was very close to Ship A8307. The system moved initially northwest and then westward direction.

2.11.3. *Weather and damage caused*

No damage has been reported due to this system.

2.12. *Deep Depression over southwest Bay of Bengal (8 - 10 November, 2015)*

2.12.1. A cyclonic circulation lay over Equatorial Indian Ocean and adjoining southwest Bay of Bengal extending upto 3.1 kms a.s.l. on 4th and over southwest Bay of Bengal and neighbourhood on 5th and 6th. It lay as a low pressure area over southwest and adjoining southeast Bay of Bengal with associated cyclonic circulation extending upto 4.5 kms a.s.l. on 7th and as a well marked low pressure area over southwest Bay of Bengal and neighbourhood in the evening of 7th. It concentrated into a Depression and lay over southwest Bay of Bengal, centred near Lat. 10.7° N/Long. 83.7° E, about 400 kms southeast of Chennai, 440 kms east-southeast of Puducherry, 420 kms east of Karaikal and 480 kms east-northeast of Jafna (Sri Lanka) at 0300 UTC of 8th. It moved west-northwestwards and intensified into a Deep Depression and lay over southwest Bay of Bengal, centred near Lat. 11.2° N / Long. 81.4° E, at 1800 UTC of 8th. It further moved west-northwestwards and lay over southwest Bay of Bengal, centred near Lat. 11.6° N / Long. 80.3° E, about, 60 kms east-southeast of Puducherry, 150 kms southeast of Chennai at 0300 UTC of the 9th. Then it moved northwards and lay over southwest Bay of Bengal centred near Lat. 12.1° N / Long. 80.0° E very close to north Tamil Nadu coast near north Puducherry at 1200 UTC of 9th. Moving westwards, it crossed north Tamil Nadu coast close to Marakanam (north of Puducherry) near Lat. 12.2° N / Long. 80.0° E around 1400 UTC of 9th and lay centred near Lat. 12.4° N / Long. 79.6° E at 0000 UTC of 10th. It then moved westwards and weakened into a Depression and lay over north Tamil Nadu centred near Lat. 12.4° N / Long. 79.3° E, about 80 kms east of Tirupattur and 60 kms south-southeast of Vellore at 0300 UTC of 10th. It moved slowly westwards and weakened into a well marked low pressure area at 0600 UTC and lay over north Tamil Nadu and neighbourhood on 10th afternoon. It weakened into a low pressure area and lay over north Tamil Nadu and adjoining south interior Karnataka in the evening of 10th & became less marked on 11th. However, the associated cyclonic circulation extending upto 5.8 kms a.s.l. lay over Kerala and neighbourhood on 12th.

2.12.2. *Other features observed*

The lowest ECP was 996 hPa from 0600 UTC to 1200 UTC of 9th. The maximum estimated mean wind

speed was 30 kts from 1800 UTC of 8th to 0000 UTC of 10th. At 0600 UTC of 9th, the system centre was located about 40-50 km southsoutheast of Puducherry. The lowest MSLP of 997.5 hPa was recorded at Puducherry and the ECP was 996 hPa. At 1200 UTC of 9th, the system was located about 30 km east-northeast of Puducherry with 996 hPa MSLP over Puducherry and ECP also about 996 hPa. However, Puducherry recorded the lowest MSLP of 991.7 hPa at 0900 UTC (1430 IST) of 9th.

As the system was located very close to the coast when the system maintained the intensity of a deep depression, wind speeds recorded by hourly coastal observations 8 provided the crucial input for determination of MSW during the time of landfall. Highest wind speed of 25 knots has been recorded by Puducherry observatory at 0000 and 0500 UTC of 9th. The maximum observed mean wind speed of 25 kts was also reported by Buoy 23099 (13.1/80.3) at 0300 UTC of 9th. The system moved initially west-northwest, northwards and then westward direction.

2.12.3. *Weather and damage caused*

Heavy rain at a few places with very heavy rain at isolated places occurred over south interior Karnataka and coastal Andhra Pradesh. Heavy to very heavy rain at a few places with extremely heavy rain occurred at isolated places over Rayalseema and Tamil Nadu.

As the system caused extremely heavy rainfall, it caused extensive inland flooding over coastal districts of north coastal Tamil Nadu. About 31 deaths were reported in Tamil Nadu and Puducherry in association with the damages caused by the system (flood related casualties and due to wall collapses in kutch houses).

Chief amounts of 24 hrs rainfall (more than 5 cm) ending at 0300 UTC of 8 - 10 November 2015 are given below.

8 November, 2015

Coastal Andhra Pradesh : Gudur 7

Rayalseema : Tirumalla AP 5

Tamil Nadu : Manimutharu 9, Nagapattinam, Ambasamudram 8 each,

Maniyachi, Lower Kothaiyar ARG 7 each, Cheranmahadevi, Nanguneri, Radhapuram, Rameswaram 6 each, Coonoor PTO, Coonoor, Karaikal, Thenkasi, Ramnad Nicra, Palayamkottai 5 each

9 November, 2015

Coastal Andhra Pradesh : Udayagiri, Tada, Sullurpeta & Shar 6 each

Rayalseema : Tirumalla AP 12, Satyavedu 8, Puttur, kodur & Srikalahasti 7 each, Nagari Pakala Thottambedu 6 each, Tirupati AP, Palasamudram 5 each

Tamil Nadu : Karaikal & Chennai 17 each, Nagapattinam & Cuddalore 14 each, Puducherry 13, Tiruttani 5

10 November, 2015

Coastal Andhra Pradesh : Venkatagiri 24, Gudur 20, Rapur 19, Atmakur 17, Podalakur (Arg) 12, Nellore & Vinjamur 10 each, Tada 8, Kaveli, Shar, Udayagiri & Sullurpeta 7 each

Rayalseema : Tirumalla Ap 30, Kodur 22, Ananthrajpeta ARG 20, Pullampeta & Kalakada 15 each, Chittoor 14, Palamaner, Pakala & Mandapalle 13 each, Rajampet & Arogyavaram 12 each, Gurramkonda, Thottambedu, Santhipuram, trupati AP, Penagaluru & Palasamudram 11 each, Srikalahasti, Satyavedu, Punganur, Kuppam & Nagari 10 each, Royachoti, Venkatagiri Kota & Chinnamandem 9 each, Puttur & Thambalapalle 6 each, Utukuru AP, Lakkireddipalle, Kadiri, Nambulipulikunta & Tanakal 5 each

Tamil Nadu & Puducherry : Neyveli AWS 48, Panruti 35, Sethiarthopu & Chidambaram 34 each, Parangipettai 33, Yercaud 25, Chidambaram AWS 24, Thirukoyilur 21, Virudhachalam, Uthangarai, Ambur & Sathanur Dam 19 each; Vilupuram, Alangayam, Vaniaymbadi, Alangayam & Vilupuram 18 each, Pappireddipatti 17, Uthiramerur 16, Kallakkurichchi, Pennagaram, Barur, Sankarapuram & Anaikaranchatram (Kollid) 15 each, Penucondapuram, Shoolagiri & Palacode 14 each, Pallipattu, Krishnagiri, Kancheepuram, Omalur & Pochampalli 13 each, Gingee & Salem 12 each, Marandahalli, Ulundurpet, Hosur, Hogenekal, Cuddalore, Ponneri, Chengalpattu & Vellore 11 each, Tindivanam Trangambadi (or) Tranqueb, Vazhapadi, Rasipuram, Anjatti, Gudiyatham, Melalathur & Kaveripakkam 10 each, Puzhal ARG, Kalavai AWS, Thiruvallangadu, R. K. Pet, Denkanikottai, Chembarabakkam, Tiruvallur, Rayakottah, Thali & Red Hills 9 each, Mettur, Thamaraiyakkam, Attur, Mangalapuram, Cholavaram & Sriperumbudur 8 each, Poonamallee, Sirkali, Poonamalle ARG, Chennai city, Ennore AWS, Tambaram, Thammampatty, Tozhudur, Madavaram AWS, Arakonam & Perambalur 7 each, Vanur, Sholingur, K.M.Koil, Venbavur, Chettikulam, Srimushnam, Thuraiyur, Kelambakkam, Puducherry & Tiruttani 6 each, Wallajah, Jayamkondam, Chembarabakkam ARG, Sankaridurg, Chennai AP, Padalur, Ariyalur, Thalavadi & Sendurai 5 each

South interior
Karnataka

: Chamarajanagar PTO 18,
Yelandur, Kolar Gold Field &
M. M. Hills 7 each,
Chamarajanagar & Chintamani

PTO 6 each, Hoskote,
Bengaluru City & Gudibande
5 each
