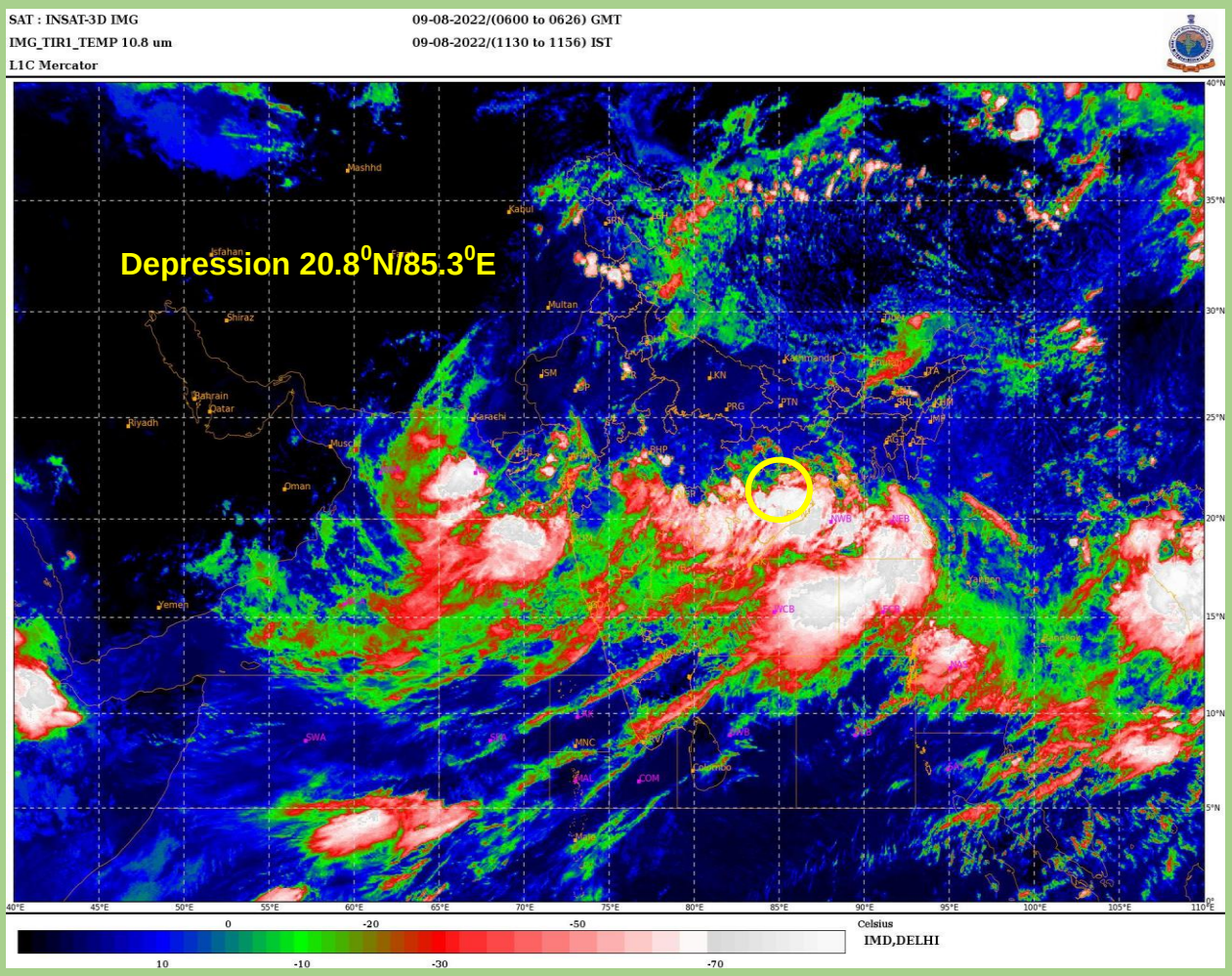
GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
INDIA METEOROLOGICAL DEPARTMENT

Depression over coastal Odisha (9th– 10th August 2022): A Report



INSAT-3D Satellite imagery of Depression over coastal Odisha at 0600 UTC of 9th August, 2022

Cyclone Warning Division

India Meteorological Department

New Delhi

August, 2022

Depression over coastal Odisha during 09th Aug- 10th Aug, 2022

1. Introduction

Under the influence of a cyclonic circulation over northwest Bay of Bengal (BoB) and neighbourhood, a low pressure area formed over northwest BoB off Odisha-West Bengal coasts in the evening (1730 hours IST) of 6th August, 2022. It became a well-marked low pressure area (WML) over northwest & adjoining westcentral BoB off south Odisha & adjoining north Andhra Pradesh coasts in the forenoon (0830 hours IST) of 7th August, 2022. Under favourable environmental conditions, the system concentrated into a depression in the forenoon (0830 hours IST) of 9th August, 2022 over coastal Odisha and neighbourhood about 70 km north-northwest of Bhubaneswar (Odisha). Moving west-northwestwards it weakened into a WML in the morning (0530 hours IST) of 10th August, 2022, over Chhattisgarh and adjoining east Madhya Pradesh. The remnant of the system continued to move west-northwestwards and gradually weaken further into a low pressure area on 11th August.

The best track parameters of the system are presented in table 1 and observed track of the system was presented in Fig. 1.

Fig.1: Observed track of the depression over coastal Odisha (09th - 10th Aug, 2022)
KT: Knots(nautical mile per hour), 1 KT=1.85 kmph, D: Depression

Table1: Best track positions and other parameters of the Depression over coastal Odisha during 9th-10th August, 2022

Date	Time (UTC)	Centre lat.^{0} N/ long.^{0} E		C.I. NO.	Estimated Central Pressure (hPa)	Estimated Maximum Sustained Surface Wind (kt)	Estimated Pressure drop at the Centre (hPa)	Grade
09.08.22	0300	20.8	85.6	-	990	25	4	D
	0600	20.8	85.3	-	990	25	4	D
	1200	21.2	84.2	-	990	25	4	D
	1800	21.5	83.3	-	991	20	3	D
10.08.22	0000	Weakened into a Well-Marked Low Pressure Area over Chhattisgarh and adjoining east Madhya Pradesh.						

2. Brief life history - Genesis Intensification and movement

Under the influence of a cyclonic circulation over northwest BoB and neighbourhood, a low pressure area formed over northwest BoB off Odisha-West Bengal coasts at 1200 UTC of 6th August, 2022. It lay as a well-marked low (WML) pressure area over northwest & adjoining westcentral BoB off south Odisha & adjoining north Andhra Pradesh coasts at 0300 UTC of 7th August, 2022.

The Madden Julian Index (MJO) lay in phase 1 with amplitude less than 1 on 9th August, 2022. It continued in same phase with amplitude remaining less than 1 during next 5 days. The Sea Surface Temperature was around 30^0C over northwest & adjoining westcentral BoB. Low level vorticity increased and was around 100 $x10^{-6}$ s^{-1} to the southeast of well-marked low pressure area over northwest & adjoining westcentral BoB. Low level convergence around 20 $x10^{-5}$ s^{-1} and upper level divergence around 20 $x10^{-5}$ s^{-1} were found west of system over central India. Wind shear was moderate (10-20 knots) over the system area. Under these favourable environmental conditions, the WML concentrated into a depression over coastal Odisha and neighbourhood at 0300 UTC of 9th August, 2022.

Thereafter, supported by the environmental conditions and guided by the monsoon trough the system moved nearly west-northwestwards maintaining its intensity till 1200 UTC of 09th August. However, slight weakening trend in the intensity of the system was seen in all the thermodynamic parameters and wind shear also increased over the system area. Consequently, moving further west-northwestwards the system weakened gradually into a well-marked low pressure area over Chhattisgarh and adjoining East Madhya Pradesh at 0000 UTC of 10th August.

3. Monitoring of the depression

India Meteorological Department (IMD) maintained round the clock watch over the north Indian Ocean for the genesis of the system since 02nd August (7 days prior to formation of depression over northwest BoB and adjoining coastal Odisha on 9th August). It was indicated that the low pressure area over northwest BoB off Odisha-West Bengal coasts would move west-northwestwards. The low pressure system was monitored with the help of available satellite observations from INSAT 3D and 3DR and other polar orbiting satellites. At the same time, various numerical weather prediction models of Ministry of Earth Sciences (MoES) institutions and dynamical-statistical models were utilized to predict the genesis, track, landfall and intensity of the cyclone. A digitized forecasting system of IMD was utilized for analysis and comparison of various model guidance, decision making process and warning product generation.

3.1 Features observed through satellite

Satellite monitoring of the system was mainly done by using half hourly INSAT-3D and 3DR imageries. Satellite imageries of international geostationary satellites, high resolution polar orbiting satellites and scatterometer imageries from ASCAT were also considered for monitoring the system. Typical INSAT-3D visible/ IR imageries, enhanced colored imageries and ASCAT (Met-Op A) imageries are presented in **Fig.2**. The organized cloud mass sheared southwestward was tracked and observed during the life cycle of the depression. The detailed sat features are discussed in this section.

At 0300 UTC of 9th August, INSAT 3D imagery indicated scattered to broken low and medium clouds with embedded intense to very intense convection over Odisha, south Chattisgarh, coastal Gangetic West Bengal & northwest BoB. Minimum cloud top temperature (CTT) was -93^{0}C. At 1200 UTC of 9th August, INSAT 3D imagery indicated Scattered to broken low and medium clouds with embedded intense to very intense convection over odisha, chattisgarh, coastal gangetic west bengal & northwest BoB. Minimum CTT was -93^{0}C. At 0000 UTC of 10th August, associated scattered to broken low and medium clouds with embedded intense to very intense convection lay over odisha, chattisgarh, coastal gangetic west bengal & northwest BoB. Associated minimum CTT was -93^{0}C.

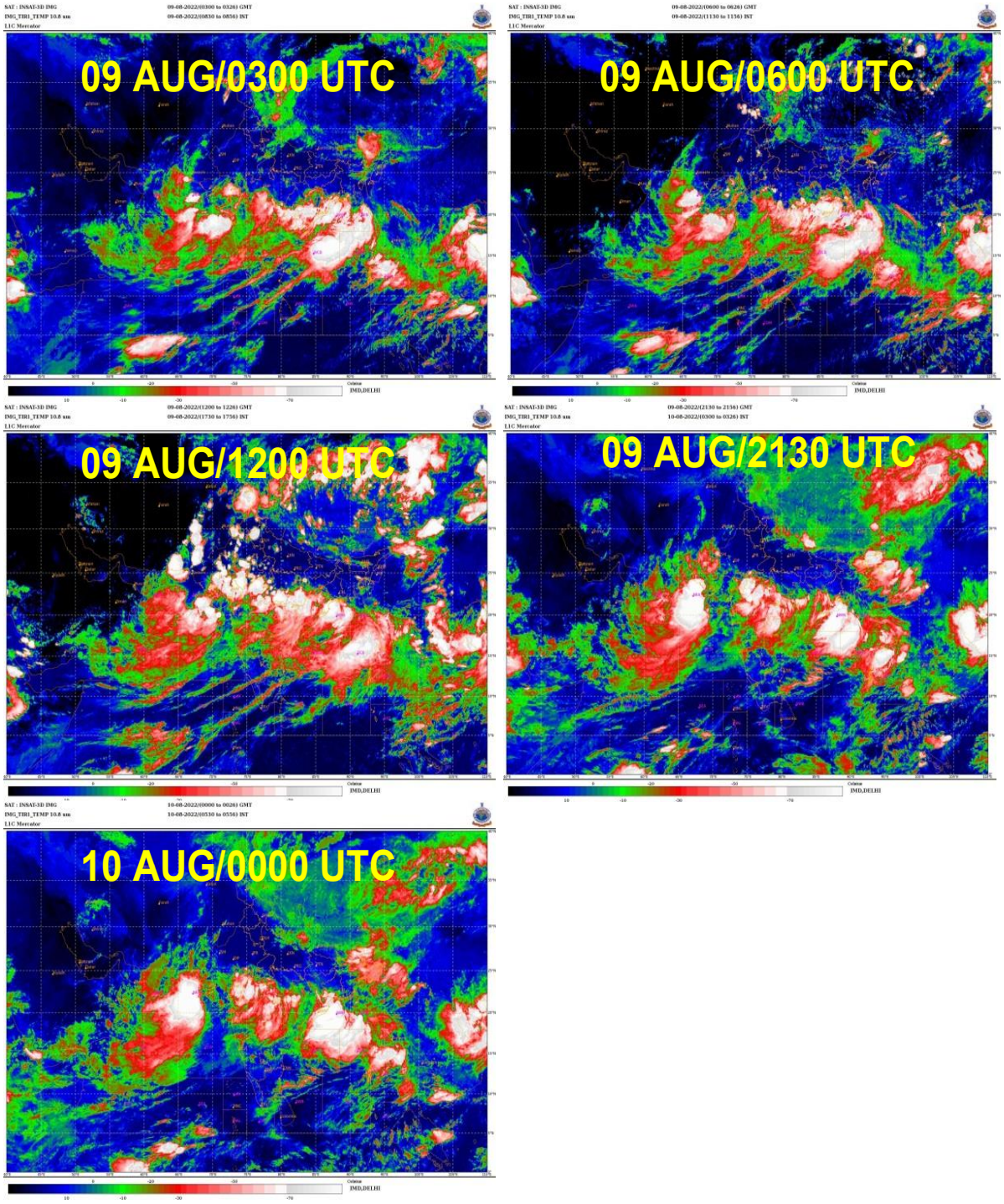


Fig. 2a: INSAT-3D enhanced colored imageries during life cycle of Depression over coastal Odisha during 09th - 10th Aug, 2022

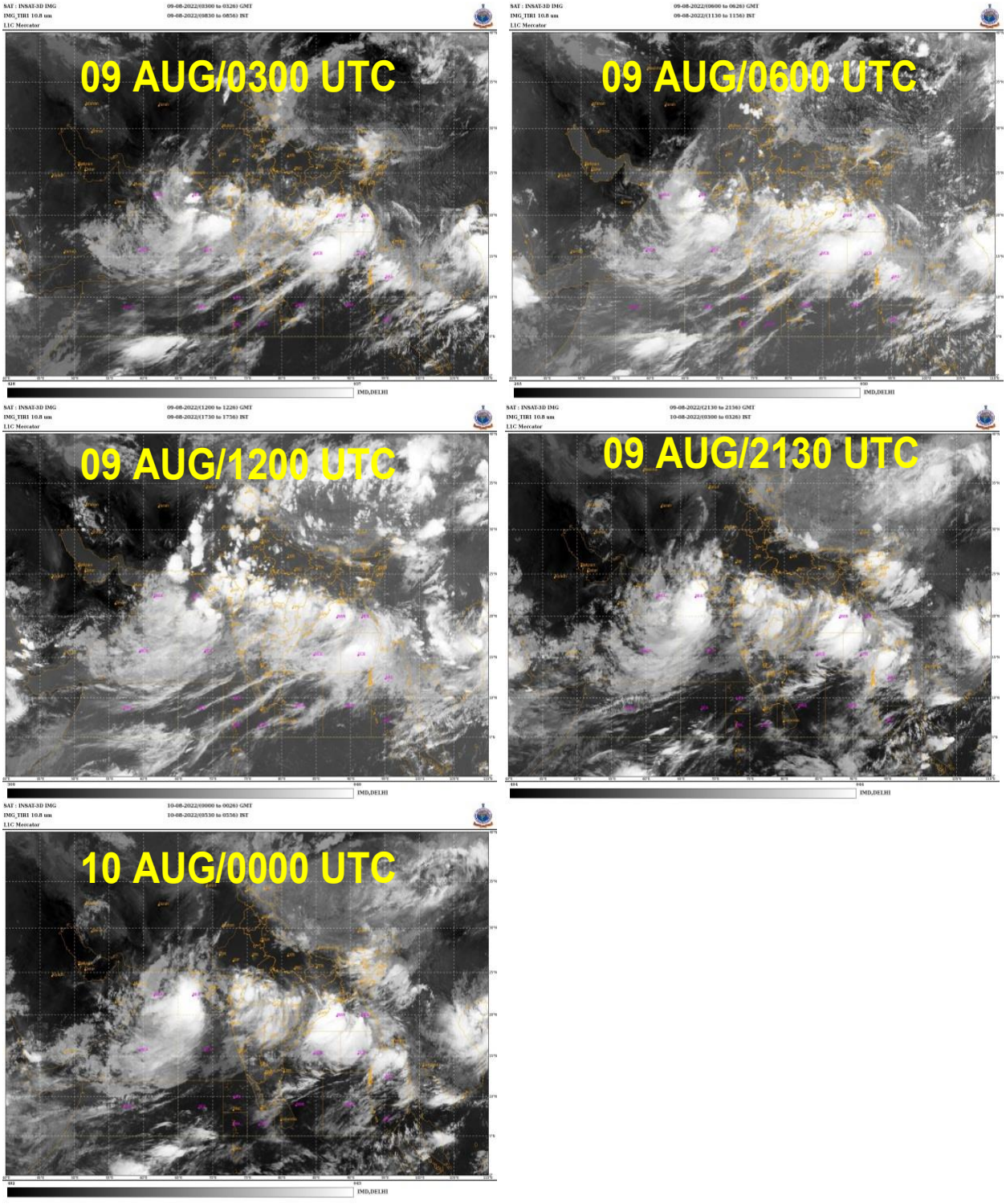


Fig. 2b: INSAT-3D IR imageries during life cycle of Depression over coastal Odisha during 09th- 10th Aug, 2022

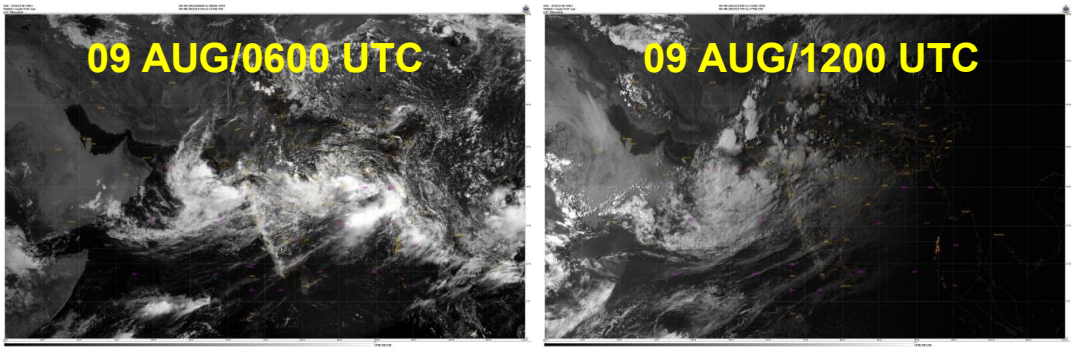


Fig. 2c: INSAT-3D Visible imageries during life cycle of Depression over coastal Odisha during 09th- 10th Aug, 2022

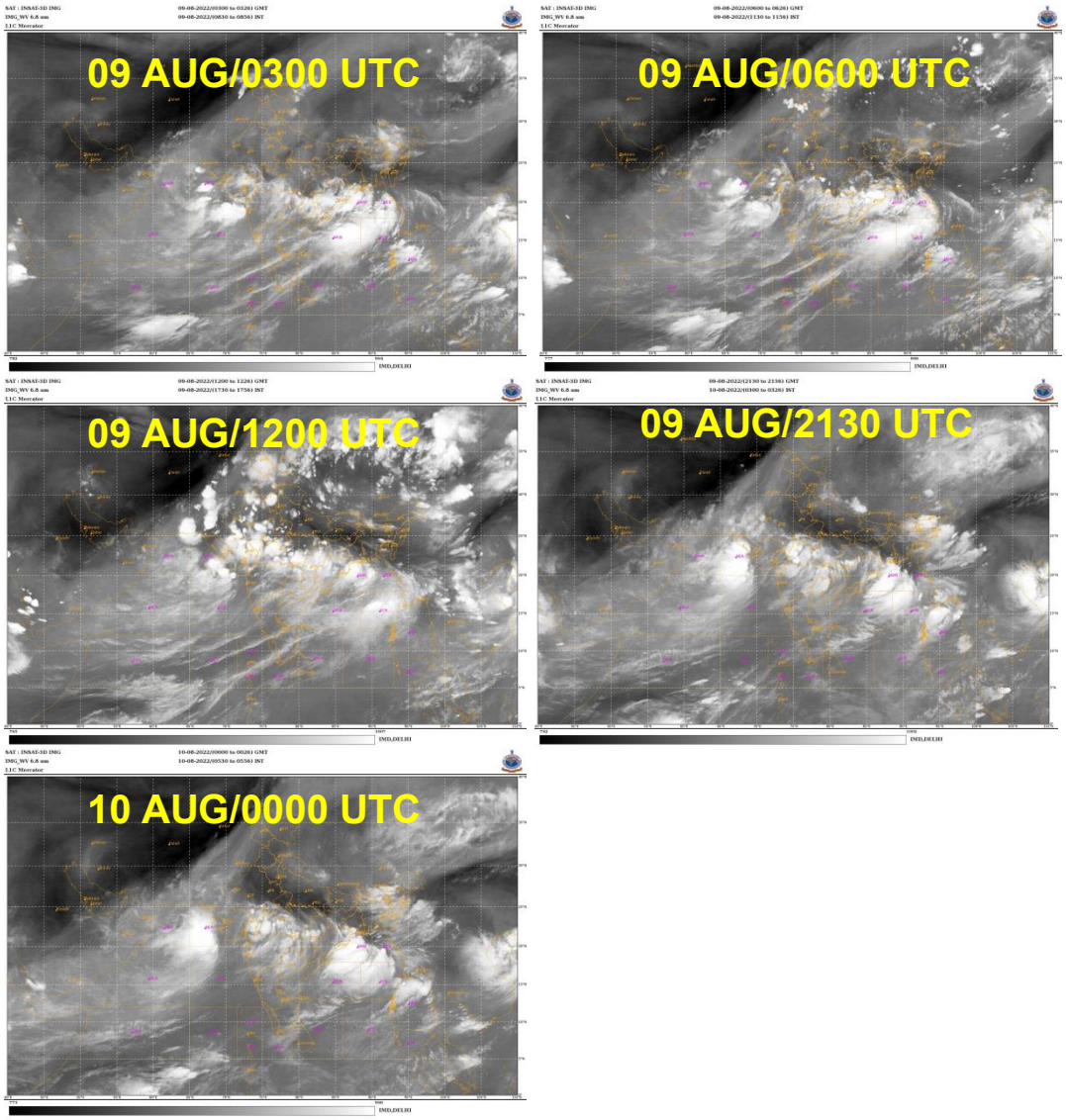


Fig. 2d: INSAT-3D Water Vapour imageries during life cycle of Depression over coastal Odisha during 09th- 10th Aug, 2022

4. Dynamical features

The IMD GFS analysis based on 0000 UTC during 9th to 10th August is presented in Fig. 3. The analysis based on 0000 UTC of 9th August indicated a depression over coastal Odisha and adjoining northwest BoB. The cyclonic circulations upto middle tropospheric levels were seen vertically sheared southwestward with height.

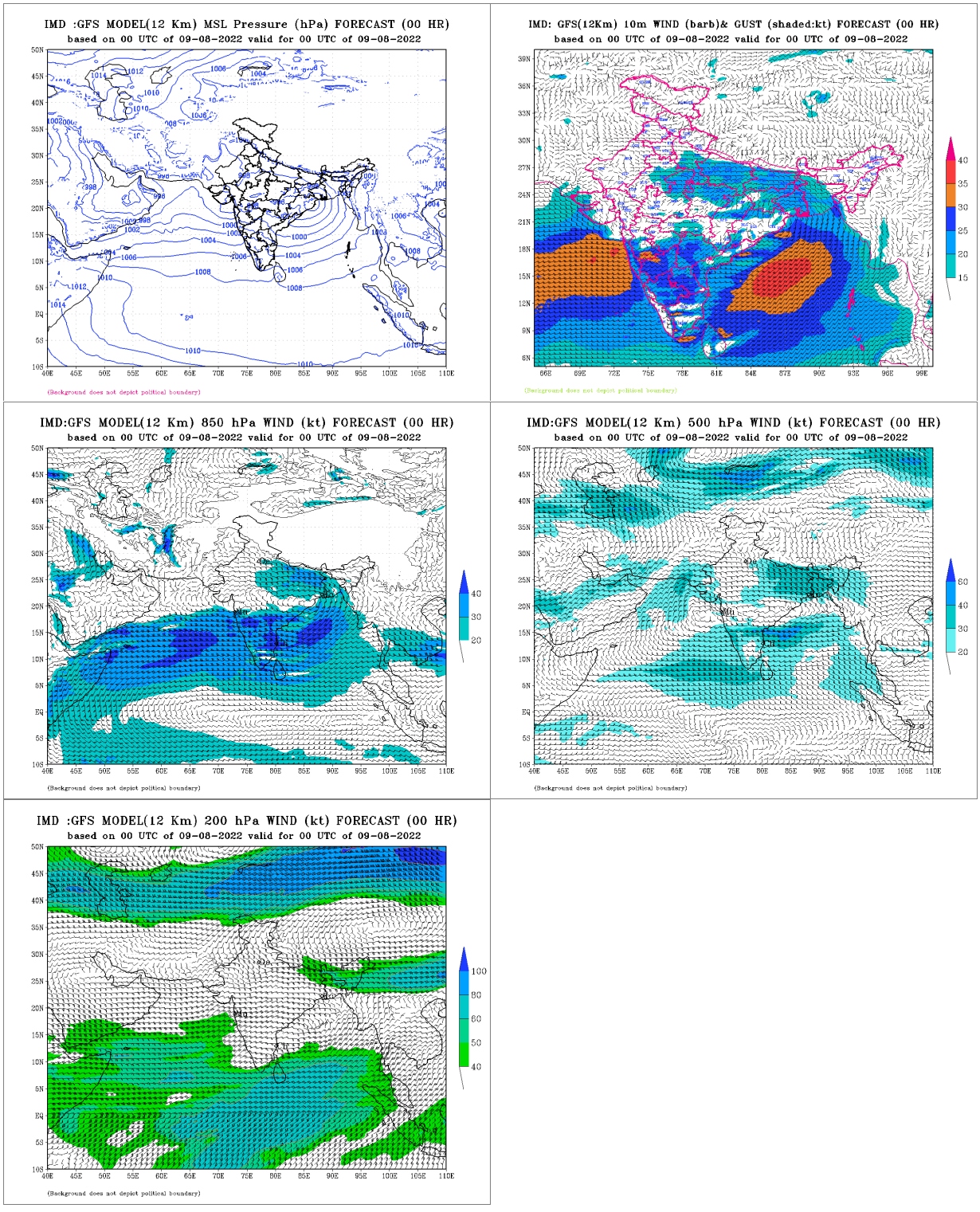


Fig.3 (a): IMD GFS (T1534) mean sea level pressure (MSLP), winds at 10m, 850, 500 and 200 hPa levels based on 0000 UTC of 9th August 2022

The analysis based on 0000 UTC of 10th August indicated that the depression moved west-northwestward over north interior Odisha and adjoining Chhattisgarh and the pattern of isobars depicted weakening of the system in to a well-marked low pressure area. The cyclonic circulations in different pressure levels up to 500 hPa also showed the movement but change in intensity near surface was not reflected in the wind speed.

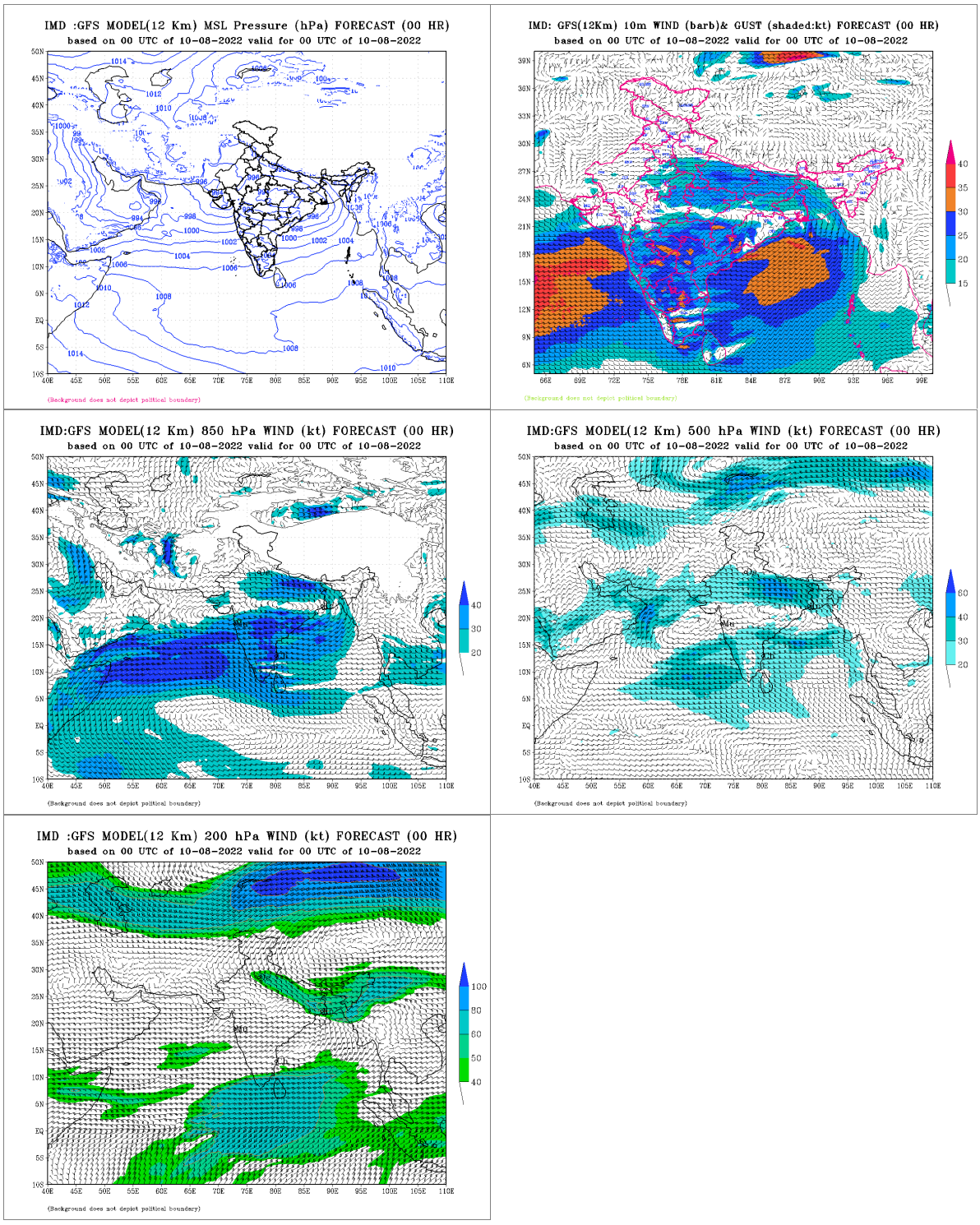


Fig.3 (b): IMD GFS (T1534) mean sea level pressure (MSLP), winds at 10m, 850, 500 and 200 hPa levels based on 0000 UTC of 10th August 2022

5. Realized Weather:

Rainfall associated with the depression based on IMD-NCMRWF GPM-gauge merged analyses and station-wise rainfall are depicted in Fig 4a & 4b respectively.

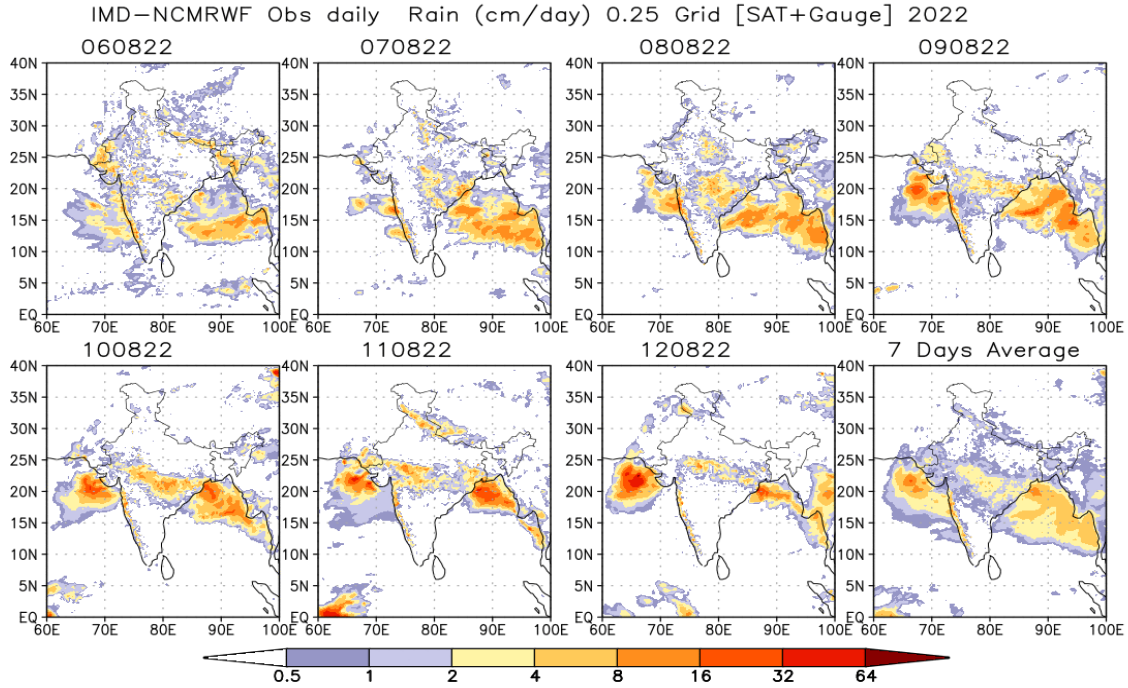


Fig.4a: IMD-NCMRWF GPM-gauge merged rainfall during 6th-12th August 2022 weekly average rainfall (cm/day)

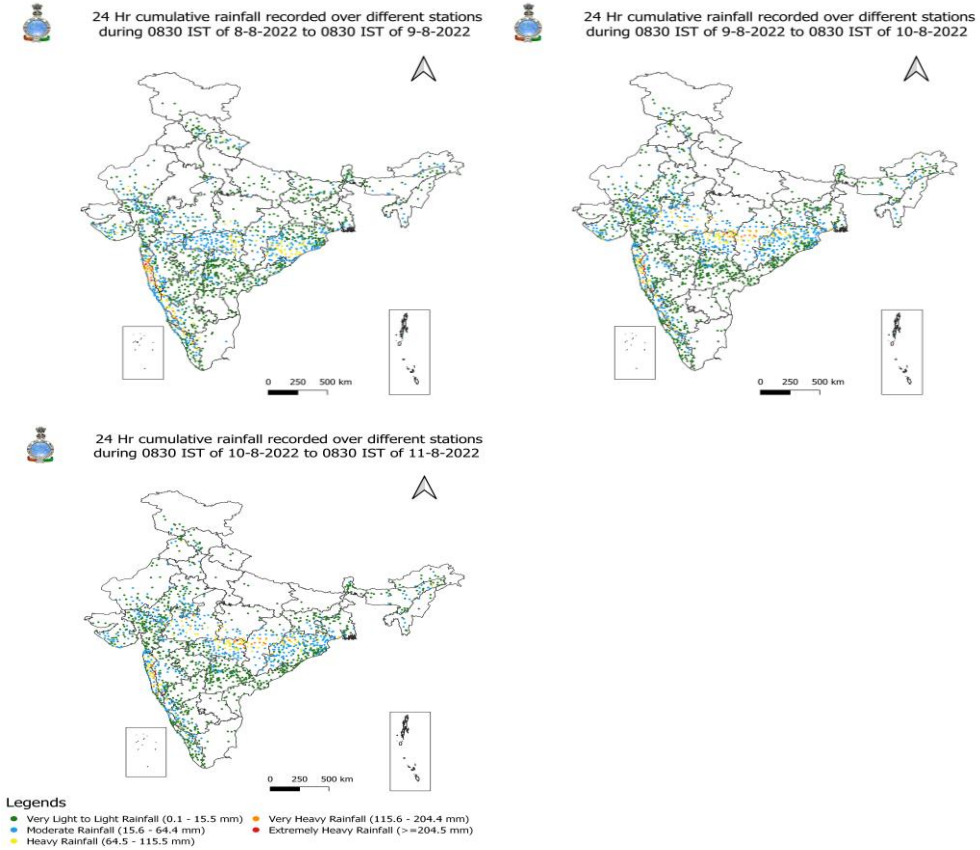


Fig.4b: Daily 24 hr cumulative rainfall distribution recorded over different stations of IMD during 09th to 11th August, 2022

Fig. 4a represents daily observed and weekly average rainfalls distribution for the week over Indian region. The spatial distribution of rainfall during 8th to 11th August clearly show the rainfall belts over Odisha, Chhattisgarh, Madhya Pradesh and adjoining Madhya Maharashtra & Telangana due to the depression. It also indicates higher rainfall activity in the southern sector of the system. The spatial distribution of the station-wise daily observed rainfall exceeding heavy rainfall along with moderate rainfall is shown in Fig. 4b. The heavy rainfall at different stations occurred over the same region mentioned above along the path of the depression.

5.1 Rainfall forecast verification

The forecast for heavy to extremely heavy rainfall are verified with the 24 hours accumulated rainfall at various stations exceeding 7 cm.

Date/Time of issue of forecast	forecast	Verification
7 August 0300 UTC	**7th August:-** Heavy to very heavy rainfall at a few places with extremely heavy rainfall at isolated places is very likely over Odisha; heavy to very heavy rainfall at isolated places is very likely over coastal Andhra Pradesh & Yanam and Telangana and heavy rainfall at isolated places is very likely over Chhattisgarh and Rayalaseema. **8th August:-** Heavy to very heavy rainfall at a few places with extremely heavy rainfall at isolated places are very likely over Telangana; heavy to very heavy rainfall at isolated places is very likely over Odisha and Chhattisgarh, and heavy rainfall at isolated places is very likely over coastal Andhra Pradesh & Yanam and Gangetic West Bengal. **9th August:-** Heavy to very heavy rainfall with extremely heavy falls at isolated places is likely over Odisha, Chhattisgarh and Telangana; heavy to very heavy rainfall at isolated places is likely over Gangetic West Bengal, East Madhya Pradesh, Vidarbha Marathwada and Madhya Maharashtra and heavy rainfall at isolated places is likely over Jharkhand and Coastal Andhra Pradesh & Yanam,. **10th August:** Heavy to very heavy rainfall at a few places with extremely heavy falls at isolated places is likely over Madhya Maharashtra and Gujarat region; heavy	**8th August:** **Odisha:-**Barmul 23, Padmapur 18, Tikabali 14, R Guda 14, Jaipatna, Nuagada, Raikia, Hindol 12 Each, Astaranga, Puri, Brahmagiri, Sankheimundi, Daspalla 11 Each, Ranpur, Sonepur, Satyabadi 10 Each, Naugaon, Dharakote, Odagaon, Kendrapara , Pipili, Aska, Polsara, Kendrapada, Daringibadi Each, G Udayagiri, Bhapur, Aul, Kakatpur, Chandbali, Gania, Kotpad, Bolagarh, Kalinga, Narsinghpur, Mundali 8 Each, Sorada, Banki, Chakapad, Khandapara, Marsaghai, Akhuapada, Khajuripada, Dhenkanal and Tentulikhunti 7 cm Each **Coastal Andhra Pradesh & Yanam:**-Koyyalagudem 8, Palasa 7, **Telangana:-**Aswaraopeta, Wankdi 9 Each, Aswaraopet(A), Thollada, Manthani, Julurpad, Kotapalle 8 Each, Mulug, Bejjur, Kothaguda, Kothagudem, Bijjur, Peddapalle and Palakurthi 7 cm Each. **9th August:** **Odisha:-** Dabugan 23, Kotpad,

	to very heavy rainfall at isolated places over Madhya Pradesh, Saurashtra & Kutch, Vidarbha, Chhattisgarh, Odisha and Gangetic West Bengal; and heavy rainfall at isolated places over Jharkhand, Marathawada and Telangana. **11th August:** Heavy to very heavy rainfall at a few places with extremely heavy falls likely at isolated places over Gujarat state and Madhya Maharashtra; heavy to very heavy rainfall at isolated places over West Madhya Pradesh and East Rajasthan; and heavy rainfall at isolated places over East Madhya Pradesh, Vidarbha and Chhattisgarh.	Papadahandi,Pottangi, Kosagumda 15 Each, Junagarh, Nawarangpur 14 Each, Mathili 13, Aska, Kalampur, Dharakote 11 Each, Nawarangpur , Malkangiri, Narla 10 Each, Nandahandi, Borigumma 9 Each, Jaipatna, Bhawanipatna, R.Udaigiri 8 Each, Lanjigarh, Dharmagarh, Similiguda ,Koksara, Kotagarh, Tentulikhunti 7 Each. **Chhattisgarh:-** Katekalyan 36, Bastanar, Bijapur 20 Each, Chhindgarh 18, Usoor , Pakhanjur 15 Each, Darbha, Gidam, Konta 14 Each, Lohandiguda 12, Tokapal, Kuakonda, Dantewara, Jagdalpur 10 Each, Sukma, Bhairamgarh, Deobhog 9 Each, Durg, Balrampur 8 Each, Bhopalpatnam 7 **Coastal Andhra Pradesh & Yanam:-** Chintapalle 10 **Telangana:-** Bijjur 11, Bejjur 10, Julurpad , Asifabad, Perur 9 Each, Venkatapuram, Peddapalle, Sathupalle, Asifabad, Venkatapur 8 Each, Gandeed, Doma, Eturnagaram, Jammikunta, Rudrur(A) , Tadwai, Aswaraopeta 7 Each. **10th August:** **Odisha:-** Kosagumda , Bhapur 16 Each, Chhatrapur, Nuagada, Sankheimundi 14 Each, Patrapur, Ganjam 13, Kukudahandi 12, Berhampur, Sheragada, Ambadola , Banki, Narla, Digapahandi, Kotagarh 11 Each, Kotpad, Muniguda, Khandapara, Belgaon, Purushottampur, Bhawanipatna, Madanpur Rampur, Dhenkanal 10 Each, Mohana, Dabugan, R.Udaigiri, Dharakote 9 Each, Daspalla, Phiringia, Aska, Kotraguda, Lanjigarh, Soro, Bhanjnagar, Sinapali, Bhubaneswar Aero, Dharmagarh,
8 August 0300 UTC	**8th August:** Heavy to very heavy rainfall at a few places with extremely heavy rainfall at isolated places is very likely over Odisha, Telangana and Madhya Maharashtra; heavy to very heavy rainfall at isolated places is very likely over Chhattisgarh, Vidarbha, East Madhya Pradesh and Marathwada and heavy rainfall at isolated places is very likely over coastal Andhra Pradesh & Yanam and Rayalaseema. **9th August:** Heavy to very heavy rainfall with extremely heavy falls at isolated places is very likely over Odisha and Madhya Maharashtra; heavy to very heavy rainfall at isolated places is very likely over Chattisgarh, Telangana, East Madhya Pradesh, Vidarbha and Marathwada and heavy rainfall at isolated places is very likely over Gangetic West Bengal, Coastal Andhra Pradesh & Yanam, west Madhya Pradesh and East Rajasthan. **10th August:** Heavy to very heavy rainfall at a few places with extremely heavy falls at isolated places is likely over Madhya Maharashtra and Gujarat state; heavy to very heavy rainfall at isolated places is likely over Madhya Pradesh, Vidarbha, Chhattisgarh and Odisha; and heavy rainfall at isolated places is likely over Jharkhand, Gangetic West Bengal, Marathawada	

	and East Rajasthan. **11th August:** Heavy to very heavy rainfall at isolated places is likely over Madhya Pradesh, Vidarbha, Chhattisgarh, Madhya Maharashtra and Gujarat State; and heavy rainfall at isolated places is likely over East Rajasthan, Jharkhand, Odisha and Gangetic West Bengal.	Titlagarh 8 Each, Gudari , Hindol, Sorada, Komna, Bolangir, Bissem Cuttack, Khajuripada, Polsara, Deogaon(District: Bolangir), Mundali, Gania, Kodala, Th Rampur, Kesinga 7 Each **Vidarbha:-** Bhandara 14, Bramhapuri 13, Sadakarjuni, Washim, Narkheda 10 Each, Armori, Mulchera, Bhiwapur 9 Each, Mohadi , Desaiganj 8 Each, Kuhi, Saoli , Gadchiroli, Gondpipri, Pauni, Dhanora, Mul, Malegaon, Bhamragad, Nagbhir, Lakhani, Deori, Ahiri 7 Each, **Chhattisgarh:-** Bhairamgarh 16, Bakavand 10, Katekalyan 10, Arang 9, Darbha, Pakhanjur, Mana Raipur Ap, Dhamtari 8 Each, Gurur, Magarlod, Nagari, Bijapur, Bastanar 7 Each **Telangana:-** Wankdi 9, Kerameri 7 **East Madhya Pradesh:-** Amarwara , Lakhnadon 7 Each **Madhya Maharashtra:-** Radhanagari 20, Mahabaleshwar Imd Obsy 19, Gaganbawada 18, Shahuwadi 15, Lonavalaagri 14, Chandgad 11, Ajra, Velhe 8 Each, Chopda, Patan, Kagal 7 Each. **11th August:** **Odisha:-**Jamankira 15, Lakhanpur 14, Sambalpur 13, Dhankauda 12, Bijepur, Burla, Angul 11 Each, Raighar, Reamal, Th Rampur, Naktideul, Banki, Salebhatta, Hirakud, Chendipada, Dunguripalli, Banarpal 9 Each, Bhadrak , Sinapali, Karlamunda, Ambabhona, Thakurmunda, Bamra , Jharbandh, Laikera, Jujumura, Saintala 8 Each, Athmalik, Rairakhol, Daspalla, Bhandaripokhari, Sohela, Jajpur, Kamakhyanagar, Barmul,
9 August 0300 UTC	**9th August:** Heavy to very heavy rainfall with extremely heavy falls at isolated places is very likely over Odisha, Vidarbha and Chhattisgarh; heavy to very heavy rainfall at isolated places is very likely over Madhya Pradesh and heavy rainfall at isolated places is very likely over Gangetic West Bengal, north Coastal Andhra Pradesh & Yanam, Telangana and Marathwada. **10th August:** Heavy to very heavy rainfall at isolated places is likely over Madhya Pradesh, Madhya Maharashtra, Vidarbha, Chhattisgarh, Odisha and Gujarat region and heavy rainfall at isolated places is likely over Jharkhand, Gangetic West Bengal and East Rajasthan. **11th August:** Heavy to very heavy rainfall at isolated places is likely over Madhya Pradesh and Gujarat State; and heavy rainfall at isolated places is likely over East Rajasthan, Madhya Maharashtra, Vidarbha, Chhattisgarh, Jharkhand, Odisha and Gangetic West Bengal.	
10 August 0300 UTC	**10th August:** Heavy to very heavy rainfall at isolated places is likely over Madhya Pradesh, Madhya Maharashtra, Vidarbha, Chhattisgarh, Odisha and Gujarat region and heavy rainfall at isolated places is likely over Jharkhand, Gangetic West Bengal and East Rajasthan. **11th August:** Heavy to very heavy rainfall at isolated places is likely over Madhya Pradesh and Gujarat State; and heavy rainfall at isolated places is likely over East Rajasthan, Madhya Maharashtra, Vidarbha, Chhattisgarh,	

	Jharkhand, Odisha and Gangetic West Bengal.	Chandikhol 7 Each. **East Madhya Pradesh:-** Gadarwara 17, Barghat 16, Sausar, Mohkheda 12 Each, Bichhua 11, Kirnapur, Tirodi, Lalburra, Chindwara-Aws 10 Each, Chand, Birsa, Kurai 9 Each, Chauri , Lanji , Kareli , Umreth 8 Each, Waraseoni , Pandhurna , Seoni , Baihar 7 Each. **West Madhya Pradesh**:- Hatpiplaya 15, Sonkatch , Timarni , Bareli 13 Each, Agar, Khilchipur 12 Each, Betul, Kolar, Indore, Khirkiya, Badi, Barod 11 Each, Babai (Makhan Nagar), Bankhedi , Depalpur, Rajgarh, Godadongri 10 Each, Multai, Barwaha, Shahpur, Sultanpur, Harda, Gautampura 9 Each, Zirapur, Bhopal Arera Hills, Udaipura, New Harsud, Dolariya, Goharganj, Dhar, Pipariya, Sohagpur, Bagli, Petlawad, Pachmarhi 8 Each, Raoti , Bhimpur , Khargone, Mahidpur , Ratlam-Aws , Udainagar , Budhni , Sailana , Nagda , Jharda , Ghatiya , Alot , Narmadapuram 7 Each.

6. Damage due to the system

No damage was reported in association with this system.

7. Operational Forecast Performance

- First information about likely formation of a cyclonic circulation around over central parts of BoB around 2nd August was given in the extended range outlook issued on 28th July. A cyclonic circulation formed over westcentral and adjoining southwest BoB on 2nd August.
- The daily tropical weather outlook issued at 1130 hours IST of 5th August indicated low probability (1-33%) of formation of depression over BoB during 9th-10th August.
- Actually, low pressure area/well marked low pressure area formed over northwest BoB off Odisha-West Bengal coasts on 7th & 8th August respectively and depression formed over coastal Odisha and neighbourhood on 9th August.
- In the first bulletin issued on 9th August at 1300 hours IST, it was indicated that the depression would continue to move west-northwestwards thereafter. It's remnant cyclonic circulation moved west-northwestwards and weakened into Low Pressure Area on 10th August.

- Thus, the track, movement and intensification/weakening of the system were well predicted by IMD/RSMC New Delhi.

8. Bulletins issued by Cyclone Warning Division, New Delhi

- **Track & intensity forecast:** IMD continuously monitored, predicted and issued bulletins containing track & intensity forecast till the system weakened into a low pressure area. The above forecasts were issued from the stage of depression onwards along with the cone of uncertainty in the track forecast every six hours.
- **Warning and advisory through social media: Daily** updates (every six hourly or whenever there was any significant change in intensity/track) were uploaded on face book and tweeter regularly during the life period of the system from 9th morning onwards, updates were posted on facebook and tweeter.
- **Warning and advisory for marine community:** The six hourly bulletins under Global Maritime Distress Safety System (GMDSS) were issued by the Marine Weather Services Division at New Delhi and bulletins for maritime interest were issued by Area cyclone warning centres of IMD at Kolkata and Cyclone warning centres at Bhubaneshwar to ports, fishermen, coastal and high sea shipping community.
- **Fishermen Warning:** Regular warnings for fishermen were issued.
- **Diagnostic and prognostic features of Depression:** The prognostics and diagnostics of the systems were described in the RSMC bulletins.

Statistics of bulletins issued by RSMC New Delhi in association with this system are given in Table 2.

Table 2 : Bulletins issued by RSMC New Delhi

S.N	Bulletin type	No. of Bulletins	Issued to
1	National Bulletin	5	1. IMD's website, RSMC New Delhi website 2. FAX and e-mail to Control Room Ministry of Home Affairs & National Disaster Management Authority, Cabinet Secretariat, Minister of Science & Technology, Headquarter Integrated Defence Staff, Director General Doordarshan, All India Radio, National Disaster Response Force, Chief Secretary, Government of West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Puducherry, Gujarat, Maharashtra, Chhatisgarh, Jharkhand, Telangana, Madhya Pradesh
2	RSMC Bulletin	5	1. IMD's website 2. WMO/ESCAP member countries through GTS and E-mail.
3	GMDSS Bulletins	5	1. IMD website, RSMC New Delhi website 2. Transmitted through WMO Information System (WIS) to Joint WMO/IOC Technical Commission for Ocean and Marine Meteorology (JCOMM)
4	Warnings through SMS	Frequently	Nil
5	Warnings	Daily	Cyclone Warnings were uploaded on Social networking sites

	through Social Media		(Face book and Tweeter) since inception to weakening of system (every six hourly).

11. Summary:

Under the influence of a cyclonic circulation over northwest BoB and neighbourhood, a low pressure area formed over northwest BoB off Odisha-West Bengal coasts in the evening at 1200 UTC of 6th August, 2022. It lay as a well marked low pressure area over northwest & adjoining westcentral BoB off south Odisha & adjoining north Andhra Pradesh coasts in the forenoon at 0300 UTC of 7th August, 2022. Under favourable environmental conditions, it concentrated into a depression and lay centered over coastal Odisha and neighbourhood about 70 km north-northwest of Bhubaneswar (Odisha) in the at forenoon at 0300 UTC of 9th August, 2022. It continued to move west-northwestwards thereafter and weakened into a Well Marked Low Pressure Area at 0000 UTC of 10th August, 2022, over Chhattisgarh and adjoining east Madhya Pradesh. The remnant continued to move west-northwestwards and gradually weaken into a low pressure area on 11th August morning. Due to the formation of the depression, the active monsoon conditions prevailed over the country and as it moved west-northwestwards heavy to extremely heavy rainfall occurred at various locations over Odisha, Chhattisgarh, Madhya Pradesh and adjoining Madhya Maharashtra & Telangana region during 8th to 11th August 20222.

12. Acknowledgement:

India Meteorological Department (IMD) and RSMC New Delhi duly acknowledge the contribution from all the stake holders and disaster management agencies who contributed to the successful monitoring, prediction and early warning service of the system. We acknowledge the contribution of all sister organisations of Ministry of Earth Sciences including National Centre for Medium Range Weather Forecasting Centre (NCMRWF), Indian National Centre for Ocean Information Services (INCOIS), National Institute of Ocean Technology (NIOT), Indian Institute of Tropical Meteorology (IITM) Pune, research institutes including IIT Bhubaneswar, and Space Application Centre, Indian Space Research Organisation (SAC-ISRO) for their valuable support. The support from various Divisions/Sections of IMD including Area Cyclone Warning Centre (ACWC) Mumbai, Cyclone Warning Centre (CWC) Thiruvananthapuram & Ahmedabad, Meteorological Centre (MC) Bengaluru. The contribution from Numerical Weather Prediction Division, Satellite and Radar Division, Surface & Upper air instruments Divisions, New Delhi and Information System and Services Division at IMD was also duly acknowledged.