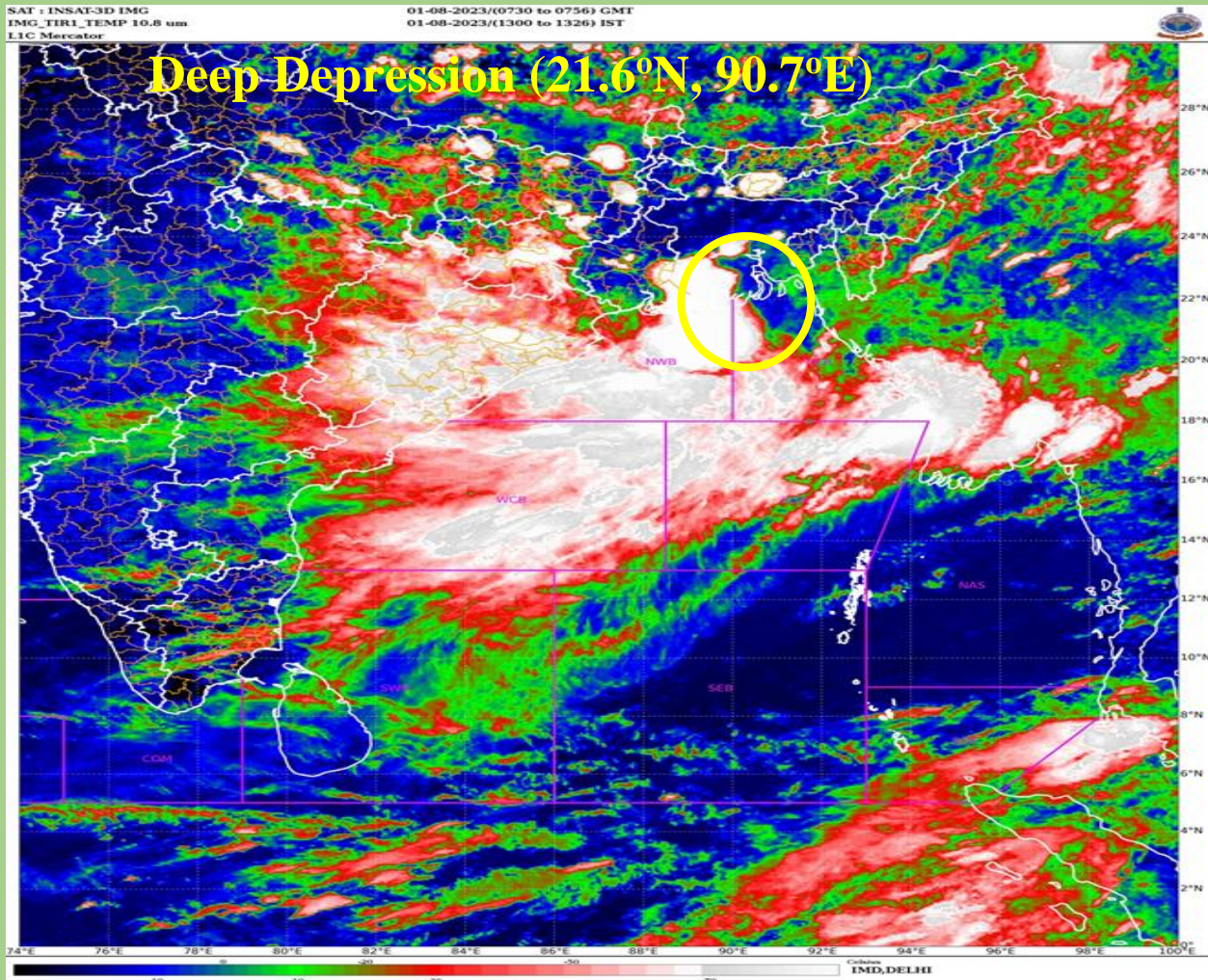




GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
INDIA METEOROLOGICAL DEPARTMENT

**Deep Depression over northeast Bay of Bengal
(01st August – 03rd August 2023): A Report**



INSAT-3D Satellite imagery of Deep Depression over Northeast Bay of Bengal
at 0600 UTC of 1st August, 2023

Cyclone Warning Division
India Meteorological Department
New Delhi
August, 2023

Deep Depression over Northeast Bay of Bengal during 01st August – 3rd August, 2023

1. Introduction

- A cyclonic circulation lay over North Odisha and adjoining Gangetic West Bengal on 29th July. Under its influence, a low pressure area formed over the same region on the same day.
- It moved to northwest Bay of Bengal (BoB) and adjoining areas on 30th July and became well marked Low pressure area over central parts of North BoB on 31st July.
- It concentrated into a depression over central parts of North BoB in the early morning (0530 hrs IST) and into a deep depression over northeast BoB off Bangladesh coast in the forenoon (0830 hrs IST) of 1st August.
- Moving initially northwestwards, it crossed Bangladesh coast near latitude 21.9°N and longitude 90.3°E close to east of Khepupara, during 1530 to 1630 hours IST on 1st Aug 2023, as a deep depression, with maximum sustained wind speed of 55-65 kmph gusting to 75 kmph.
- Thereafter, it moved west-northwestwards across coastal areas of Bangladesh, Gangetic West Bengal and weakened into a depression over Jharkhand during mid-night (2330 hrs IST) of 2nd August.
- Further moving west-northwestwards, it weakened into a well-marked low pressure area over north Chhattisgarh and neighbourhood in the evening (1730 hrs IST) of 3rd August.
- The observed track of the system (depression to depression) is presented in Fig. 1

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

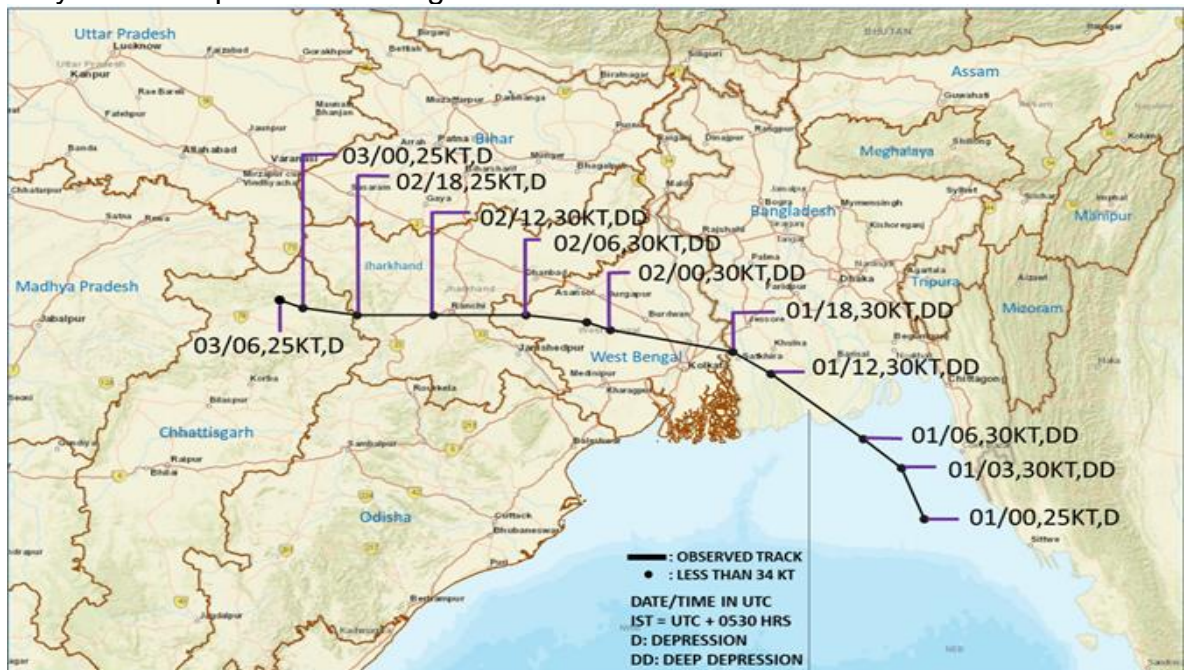


Fig. 1: Observed track of Deep Depression over Northeast Bay of Bengal during 01st August – 03rd August, 2023

Table1: Best track positions and other parameters of the Deep Depression over Northeast Bay of Bengal during 01 August - 03 August, 2023.

Date	Time (UTC)	Centre lat. ^o N/ long. ^o E		C.I. NO.	Estimated Central Pressure (hPa)	Estimated Maximum Sustained Surface Wind (kt)	Estimated Pressure drop at the Centre (hPa)	Grade
01.08.23	0000	20.5	91.5		990	25	4	D
	0300	21.2	91.2	2.0	988	30	5	DD
	0600	21.6	90.7		988	30	5	DD
	Crossed Bangladesh coast near latitude 21.9°N and longitude 90.3°E close to east of Khepupara, during 1530 to 1630 IST on 1st Aug 2023, as a deep depression, with maximum sustained wind speed of 55-65 kmph gusting to 75 kmph.							
	1200	22.5	89.5		988	30	5	DD
	1800	22.8	89		988	30	5	DD
02.08.23	0000	23.1	87.4		988	30	5	DD
	0300	23.2	87.1		988	30	5	DD
	0600	23.3	86.3		988	30	5	DD
	1200	23.3	85.1		990	25	4	D
	1800	23.3	84.1		990	25	4	D
03.08.23	0000	23.4	83.4		990	25	4	D
	0300	23.5	83.1		992	20	3	D
	0600	23.5	83.1		992	20	3	D
	1200	Weakened into a well-marked low pressure area over north Chhattisgarh and neighborhood in the evening (1730 hrs IST) of 3 rd August.						

KT: Knots (nautical mile per hour), 1 KT=1.85 kmph, D: Depression, DD: Deep Depression

2. Salient features of the system

- Under the influence of strong easterly winds, enhanced westerly winds and various equatorial waves including Rossby waves (RW) and Kelvin waves (KW) over northeast BoB, the deep depression developed over the region.
- The system moved northwestwards till 1800 UTC (2330 IST) of 01st August and thereafter moved west-northwestwards.
- It crossed Bangladesh coast near latitude 21.9°N and longitude 90.3°E close to east of Khepupara, during 1530 to 1630 hours IST on 1st Aug 2023, as a

deep depression, with maximum sustained wind speed of 55-65 kmph gusting to 75 kmph.

- The life period of the system was 2 days and 12 hours which is normal for depressions over BoB during the year as a whole.

3. Brief life history - Genesis Intensification and movement

3.1 Genesis

Under the influence of the cyclonic circulation over Gangetic West Bengal & adjoining north Odisha, a low pressure (LPA) area formed over north Odisha and adjoining West Bengal coasts in the morning (0530 hrs IST/ 0000 UTC) of 29th July, It lay as a WML over central parts of north BoB at 0000 UTC(0530 hrs IST) of 31st July 2023. Under favorable environmental conditions, it concentrated into a depression over northeast BoB moved north-northwestwards and intensified into a deep depression and lay centred at 0000 UTC (0530 hrs IST) of 01st August, 2023 over the northeast BoB off Bangladesh coast.

3.2 Intensification and movement

At 0300 UTC of 01st August, the Madden Julian Oscillation (MJO) was in phase 1 with amplitude less than 1. Hence MJO was not likely to support convective activity over the BOB region. However, equatorial waves indicated westerly winds (1-3 mps) over central & south BOB and easterly winds (1-3 mps) over north BOB, along with presence of Rossby waves over central BOB. Thus equatorial waves supported cyclogenesis over the BOB region. All these favorable conditions led to intensification of system into a deep depression.

The sea surface temperature (SST) was around 29°C over north BOB. Total Precipitable Water (TPW) imagery indicated warm moist air incursion into the core and around the system area. The Low Level Vorticity was around $150 \times 10^{-6} \text{S}^{-1}$ over eastcentral BOB to the southeast of system centre. Vertically it was extended upto 200 hPa level. Low level convergence was about $30 \times 10^{-5} \text{S}^{-1}$ to the east and $20 \times 10^{-5} \text{S}^{-1}$ to the southwest of system centre. Upper level divergence was around $30 \times 10^{-5} \text{S}^{-1}$ to the southwest and $20 \times 10^{-5} \text{S}^{-1}$ to the southeast of system centre. Vertical wind shear was high about 20-30 knots around system area and over north BOB. Under these conditions, the system intensified into a deep depression.

The system moved west-northwestward and crossed Bangladesh coast near latitude 21.9°N and longitude 90.3°E close to east of Khepupara, during 1000 to 1100 hours UTC on 1st Aug 2023, as a deep depression. It then continued to move west-northwestwards with increase in westerly component.

At 1200 UTC of 1st August, the MJO was in phase 1 with amplitude less than 1. Equatorial waves indicated westerly winds (1-3 mps) over central & south bob and easterly winds (1-3 mps) over north bob, along with presence of rossby waves over central BOB. Thus equatorial waves were likely to support cyclogenesis over the BOB region. Total precipitable water imagery indicated warm moist air incursion into the core and around the system area. The low level vorticity had decreased in past 6 hours and was around $100 \times 10^{-6} \text{S}^{-1}$ over central parts of north BOB. Vertically it was extending upto 200 hPa level. Low level convergence was about $40 \times 10^{-5} \text{S}^{-1}$ to the southwest of system centre over northwest BOB. Upper level divergence was around $10 \times 10^{-5} \text{S}^{-1}$ to the southwest of system centre over northwest BOB and adjoining east India. Vertical wind shear was high about 30-40 knots around system area and along

expected track. System was in a moderately favourable environment and maintained intensity of deep depression till 09 UTC and weakened into a depression at 12 UTC of 2nd August 2023.

It continued to move in the same direction, moved over coastal Bangladesh and neighbourhood and weakened gradually thereafter.

4. Monitoring

India Meteorological Department (IMD) maintained round the clock watch over the north Indian Ocean (NIO) and the system was monitored since 31st July. The system was monitored with the help of available satellite observations from INSAT 3D and 3DR, polar orbiting satellites and available ships & buoy observations in the region. Various numerical weather prediction models run by Ministry of Earth Sciences (MoES) institutions, global models and dynamical-statistical models were utilized to predict the genesis, track, landfall and intensity of the system.

4.1. Features observed through satellite

Satellite monitoring of the system was mainly done by using half hourly INSAT-3D and 3DR imageries. Satellite imageries of other international geostationary satellites, high resolution polar orbiting satellites and scatterometer imageries from ASCAT were also considered for monitoring of the system. Typical INSAT-3D enhanced colored imageries, visible/ IR, brightness temperature and water vapour imageries are presented in **Fig.2 (a) to 2 (d)**. During the life cycle of the system, the clouds were organised in shear pattern. The convective clouds were sheared towards southwest of system centre. At 00 UTC of 1st August, the system intensity was T1.5 and at 0300 UTC of 1st August, intensity of the system was T 2.0. Associated scattered to broken low and medium clouds with embedded intense to very intense convection lay over north adjoining central Bay of Bengal and Odisha. Minimum cloud top temperature (CTT) was -93⁰C.

At 0300 UTC of 2nd August, Associated scattered to broken low and medium clouds with embedded intense to very intense convection lay over Gangetic West Bengal adjoining Jharkhand, Odisha and north Bay Of Bengal & neighbourhood. Minimum cloud top temperature (CTT) was -93⁰C. At 0300 UTC of 3rd August, Associated scattered to broken low and medium clouds with embedded intense to very intense convection lay over north Chhattisgarh, Madhya Pradesh and Vidarbha. Minimum cloud top temperature (CTT) was -93⁰C.

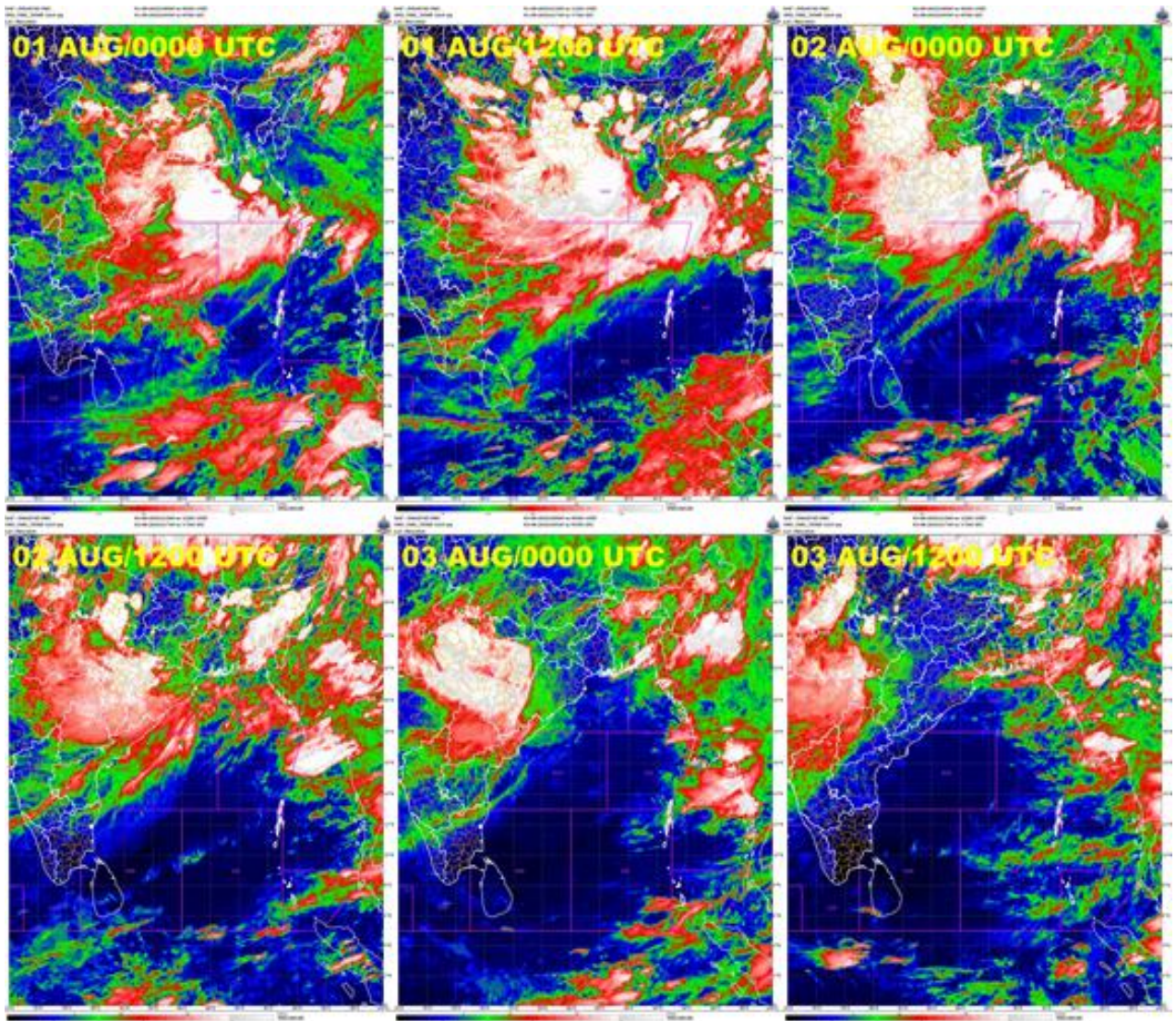


Fig.2(a): INSAT-3D enhanced colored imageries during life cycle of Deep Depression over northeast Bay of Bengal during 01 Aug-03 Aug, 2023

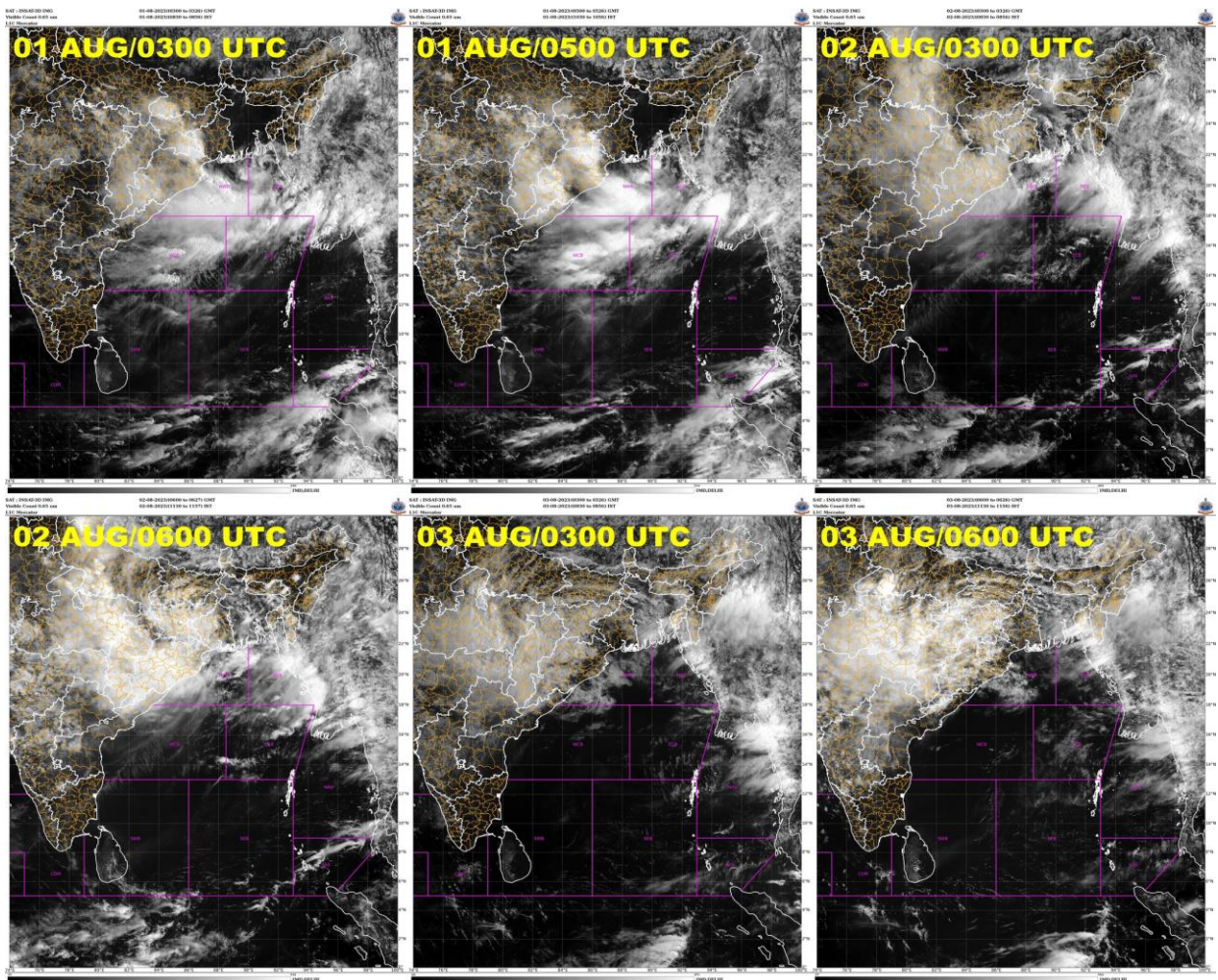


Fig.2 (b): INSAT-3D Visible imageries during life cycle of Deep Depression over northeast Bay of Bengal during 01 Aug-03 Aug, 2023

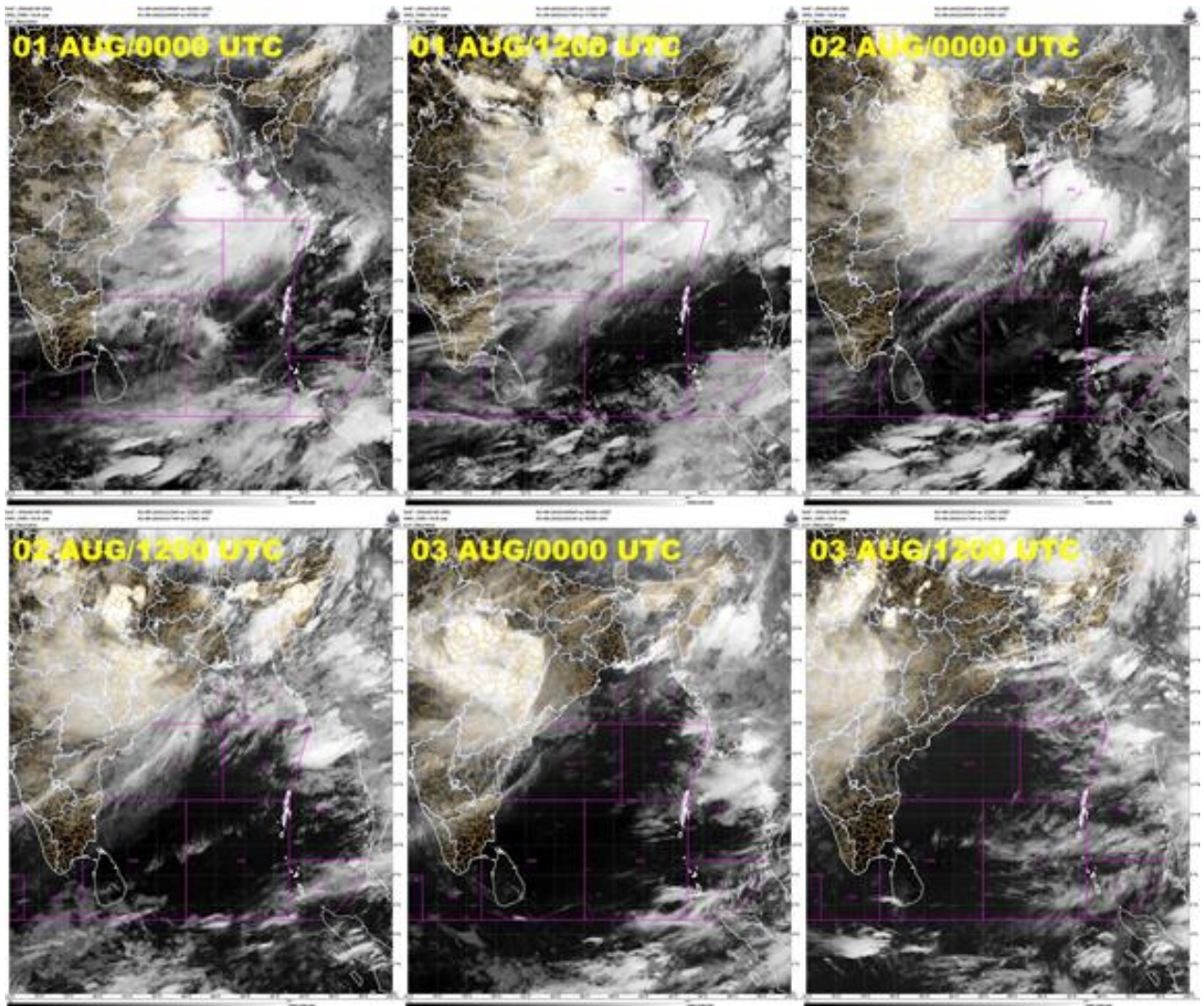


Fig.2(c): INSAT-3D IR imageries during life cycle of Deep Depression over northeast Bay of Bengal during 01 Aug-03 Aug, 2023

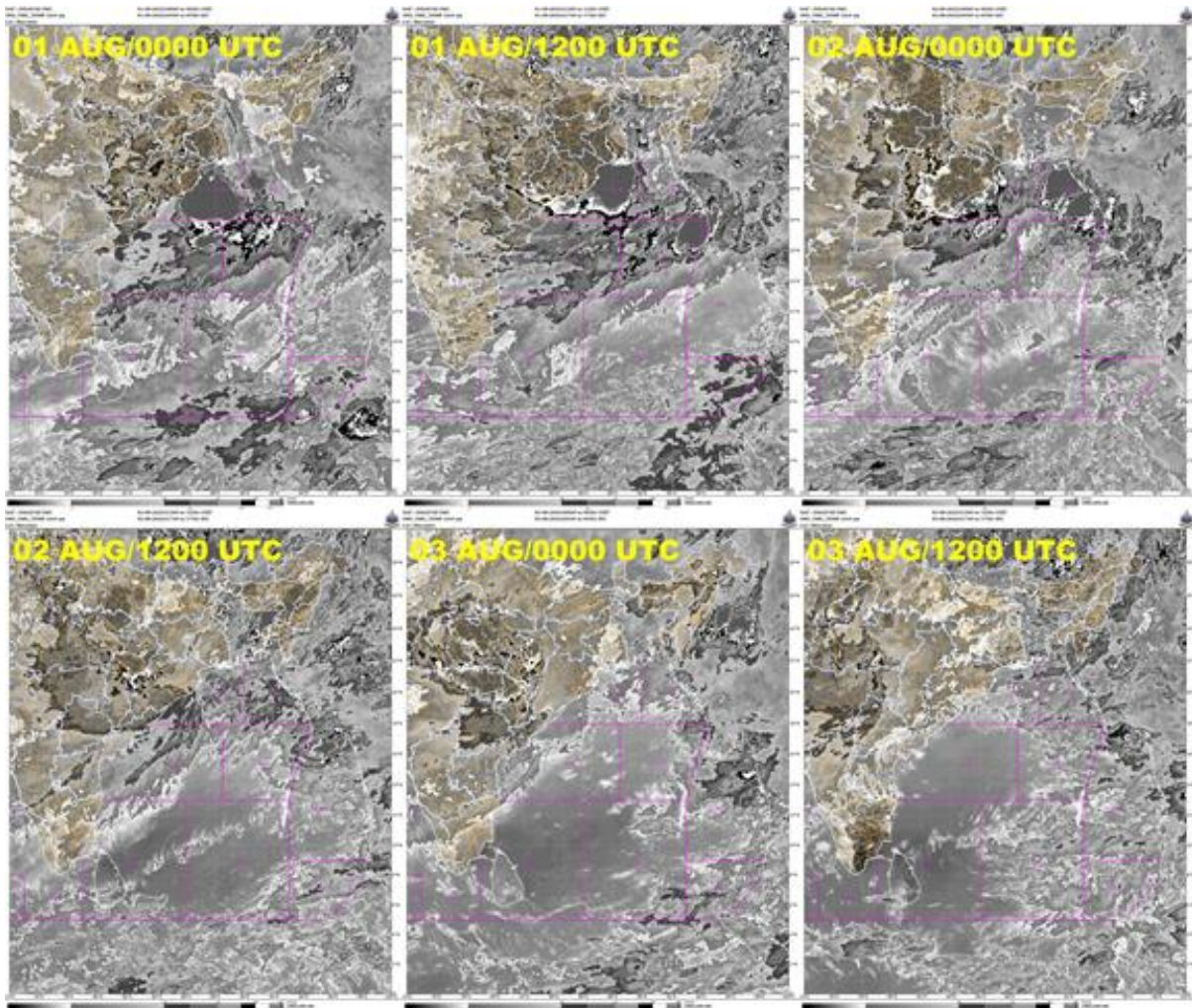


Fig.2 (d): INSAT-3D Brightness Temperature imageries during life cycle of Deep Depression over northeast Bay of Bengal during 01 Aug-03 Aug, 2023

5. Dynamical Features

IMD GFS (T1534) daily analyses of mean sea level pressure (MSLP) at 0000 UTC, winds at 10 m & 850, 500 and 200 hPa levels from 1st August to 3rd August are presented in **Fig. 3(a) to 3(c)** respectively.

The MSLP analysis field indicated a depression over northeast BoB near 20.5°N/91.5°E. Actually the system was located near 21.2°N/91.2°E at 0300 UTC. Thus, GFS captured the genesis with slight displacement of the centre in the initial conditions on 1st August.

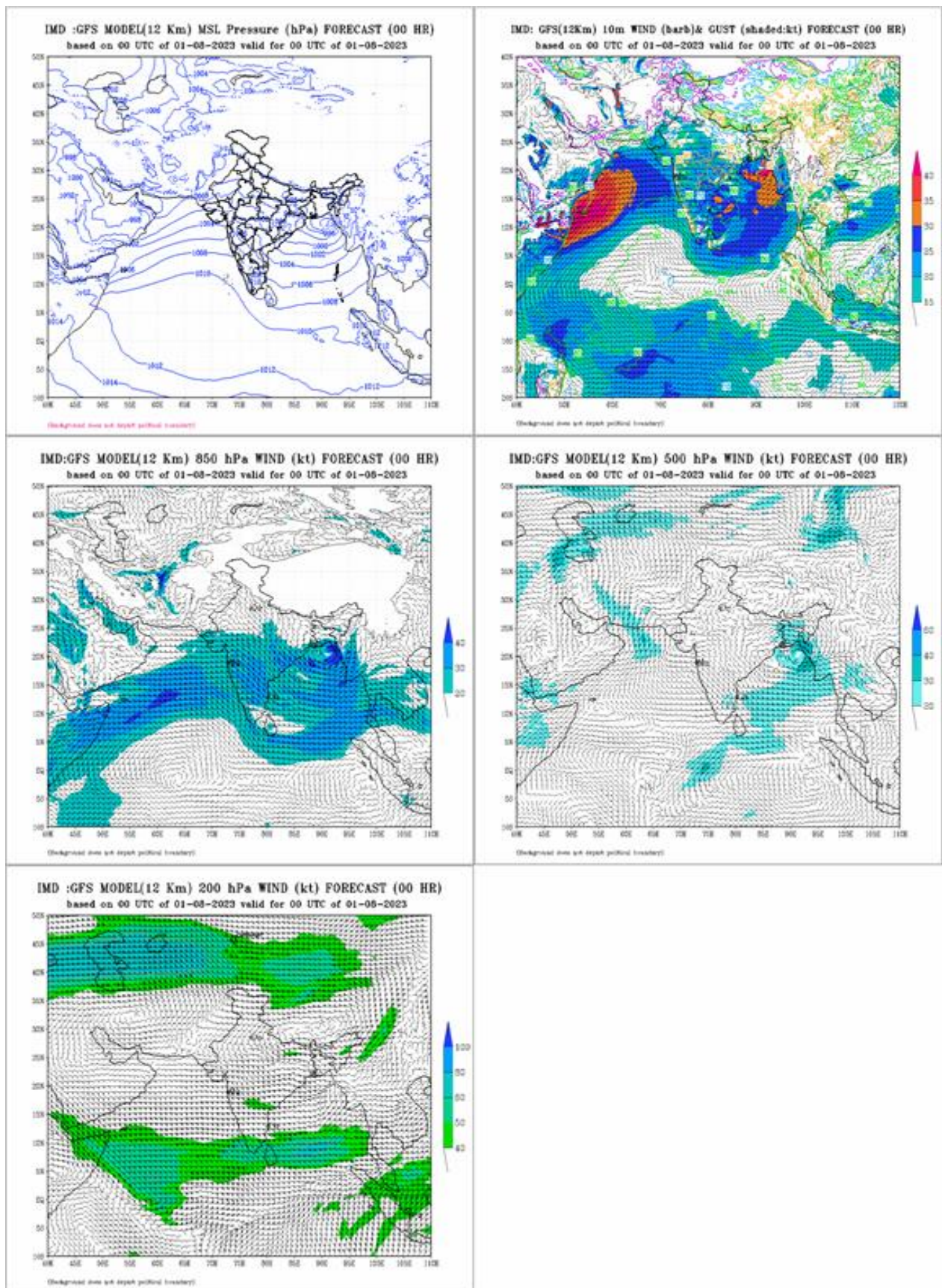


Fig. 3(a): IMD GFS (T1534) mean sea level pressure (MSLP), winds at 10m, 850, 500 and 200 hPa levels based on 0000 UTC of 01st Aug 2023

At 0000 UTC of 2nd August, the MSLP analysis field indicated deep depression over Gangetic West Bengal near 23.1°N/87.2°E. Actually the system was located near 23.1°N/87.2°E at 0000 UTC. The east-southeasterly winds in upper levels indicated west-northwestwards movement of the system.

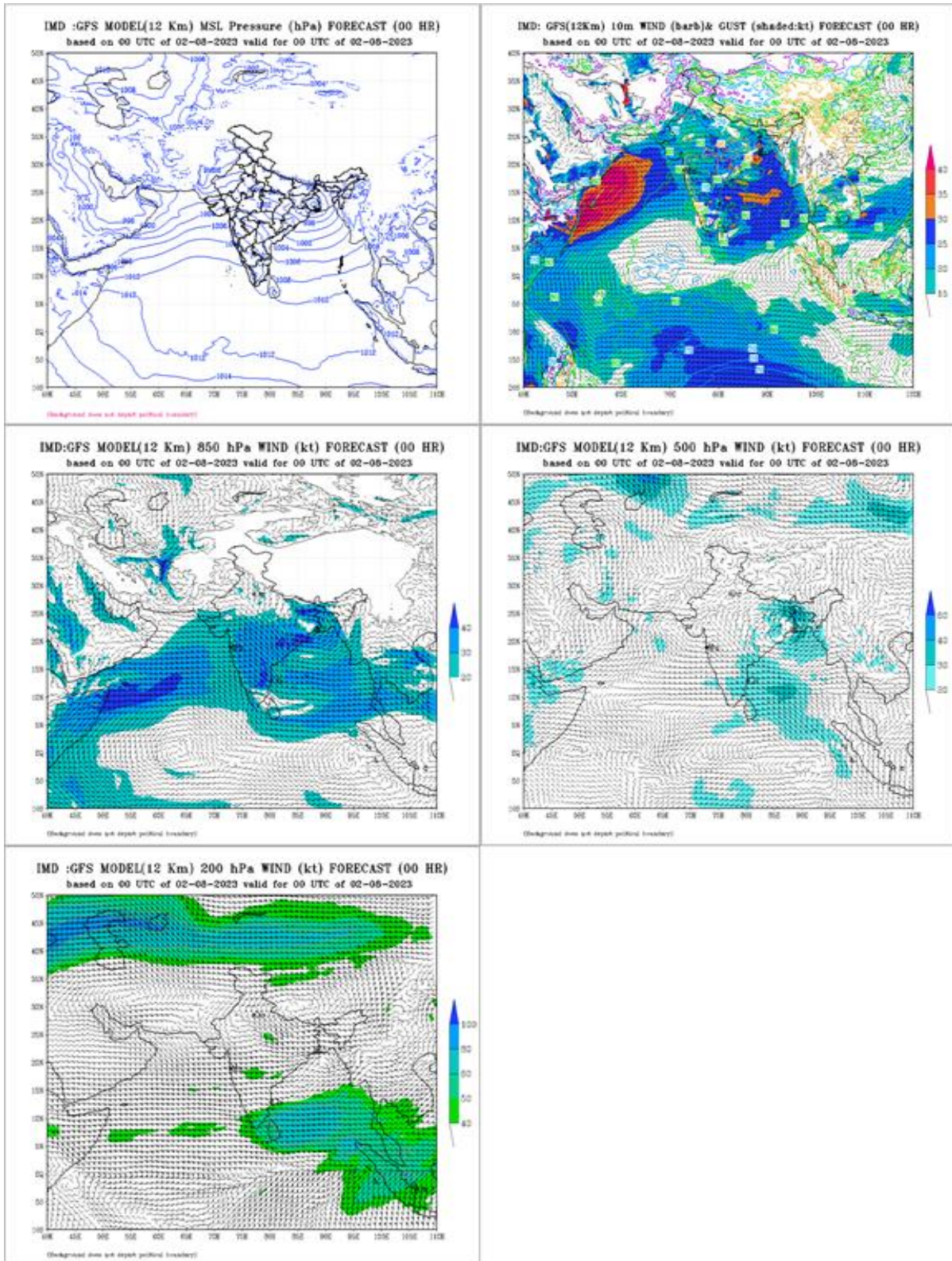


Fig. 3(b): IMD GFS (T1534) mean sea level pressure (MSLP), winds at 10m, 850, 500 and 200 hPa levels based on 0000 UTC of 2nd Aug 2023

At 0000 UTC of 3rd August, the system was seen over north Chhattisgarh and neighbourhood near 23.4°N/83.4°E. Actually, the system lay near 23.4°N/83.4°E.

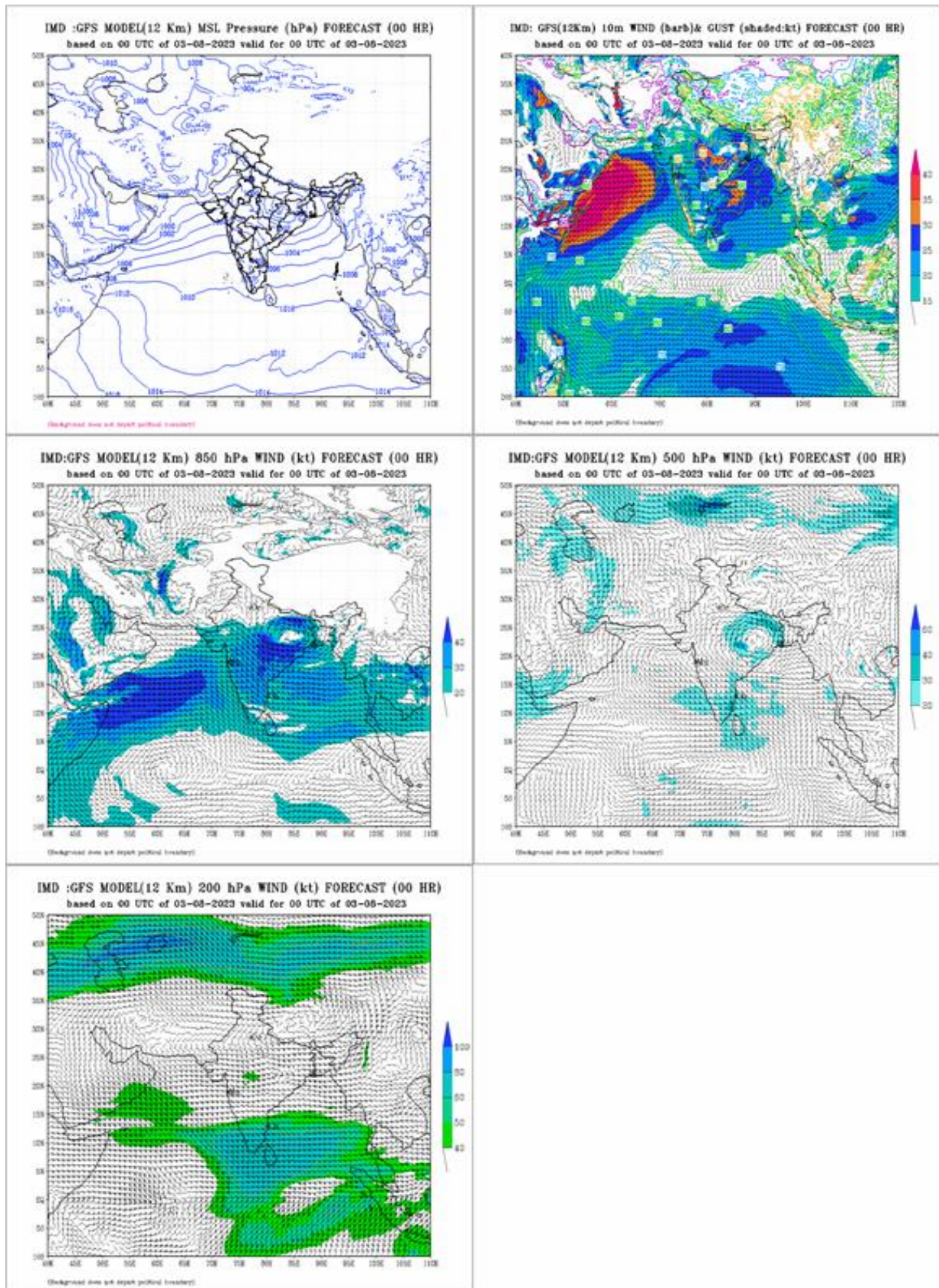


Fig. 3(c): IMD GFS (T1534) mean sea level pressure (MSLP), winds at 10m, 850, 500 and 200 hPa levels based on 0000 UTC of 3rd Aug 2023

ASCAT winds during 01st and 3rd August are shown in figure 4. It indicated the cyclonic circulation at surface level, strong winds associated with depression on 01st August over northeast Bay of Bengal. Shifting of strong winds to the northwest Bay of Bengal during 2nd & 3rd August indicates the system movement.

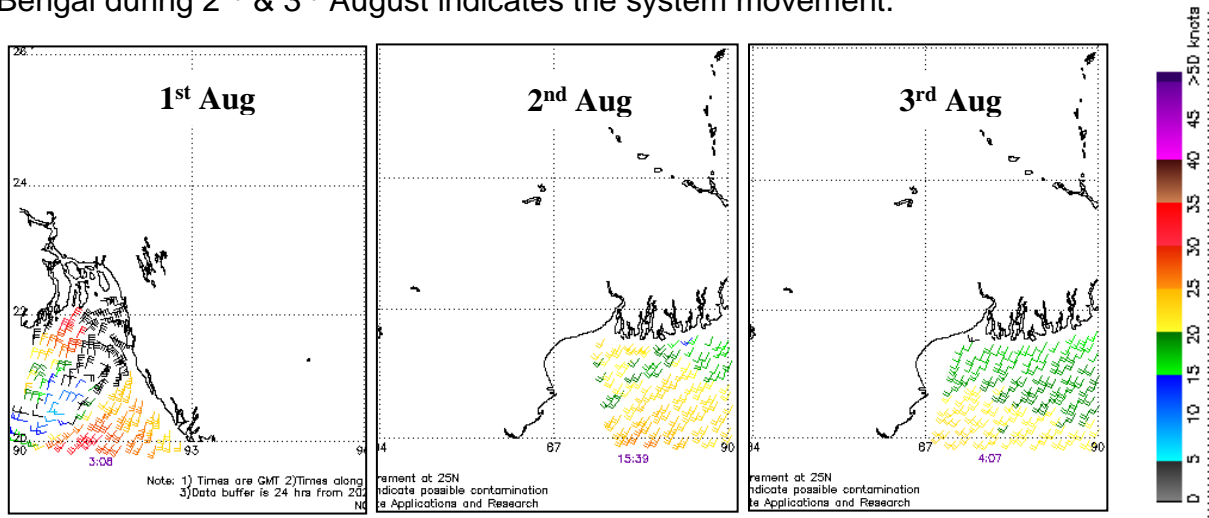


Fig. 4: ASCAT wind on 01st – 2nd Aug 2023

6. Realized Weather

Rainfall associated with the deep depression based on IMD-NCMRWF satellite gauge merged data are depicted in Fig 5. It is seen that light to moderate rainfall occurred at isolated places & heavy to very heavy rainfall at isolated places over costal Odisha, costal Andhra Pradesh & West Bengal on 1st August. Light to moderate rainfall at a few places with heavy to very heavy rainfall at isolated places occurred over Madhya Pradesh, Bihar, Jharkhand, Chhattisgarh and Odisha on 2nd August.

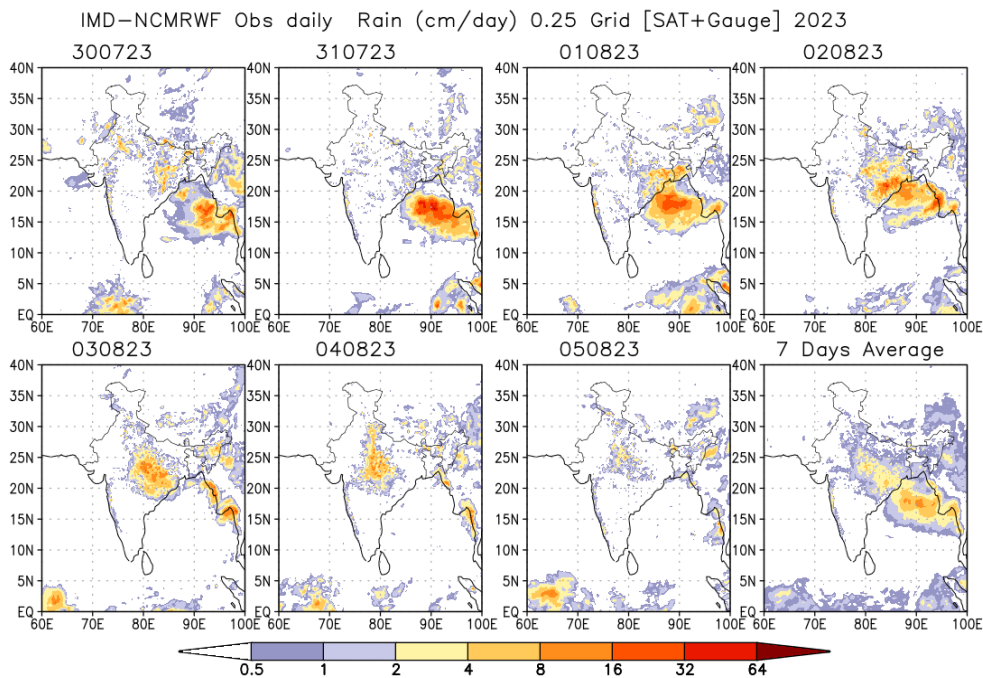


Fig. 5: IMD-NCMRWF Rain gauge and satellite merged rainfall plots ending at 0300 UTC of 30th Jul to 5th Aug, 2023 (cm/day)

5.1 Rainfall forecast verification

The forecast for heavy to extremely heavy rainfall episodes in association with the system are verified with the 24 hours accumulated rainfall realized at various stations. The details of the day-wise verification are given in Table -2.

Table 2: Day wise daily 24 hours cumulative rainfall forecast verification with station observations

Date/Base Time of observation	24 hr Heavy rainfall warning ending at 0300 UTC of next day	Realised 24-hour heavy rainfall (≥ 7 cm) ending at 0300 UTC of date
01.08.2023 / 0830	<p>Odisha: Isolated heavy to extremely heavy rainfall over north Odisha on 1st, isolated heavy to very heavy rainfall on 2nd and isolated heavy rainfall on 3rd August.</p> <p>Gangetic West Bengal: Isolated heavy to very heavy rainfall over Gangetic West Bengal and isolated extremely heavy rainfall over coastal districts on 1st and isolated heavy to very heavy rainfall on 2nd August.</p> <p>Jharkhand: Isolated heavy to very heavy rainfall on 1st and 2nd August.</p> <p>Chhattisgarh: Light to moderate rainfall at most places with isolated heavy to very heavy rainfall over north Chhattisgarh during 1st and 2nd August.</p> <p>Bihar: Isolated heavy to very heavy rainfall during 1st and 02nd August.</p>	<p>1st August: Bhubaneswar-26, Satyabadi-11, Kantapada-10, Tihidi-10, Bhuban-10, Bhandaripokhari-9, Puri-9, Chandbali-9, Pipili-9, Jatni-9, Cuttack-8, Rairangpur-8, Rajkanika-8, Barpalli-7, Lahunipara-7, Banki-7, Udala-7, Gop-7, Tigiria-7</p> <p>2nd August, 2023 Boudhgarh-39, Jujumura-36, Rairakhol-35, Karanjia-30, Sharpada-28, Birmaharajpur-27, Thakurmunda-26, Ullunda-26, Athmalik-23, Rajkishorenagar-23, Binika-23, Agalpur-22, Phiringia-22, Khairamal-22, Joshipur-22, Sonapur-21, Dunguripalli-21, Raruana-21, Baliguda-21, Sukruli-21, K Nuagaon-21, Phulbani-21, Salebhatta-20, Madanpur Rampur-19, Kirmira-19, Kolabira-19, Kusumi-19, Telkoi-19, Jamda-19, Bijepur-19, Khaira-19, Tensa-17, Bolangir-17, Swam-Patna-17, Gaisilet-17, Ambadola-17, Kantamal-16, Oupada-16, Pallahara-16, Bangamunda-16, Laikera-16, Tarva-16, Belgaon-15, Keonjhar-15, Angul-15, Kaptipada-15, Barpalli-15, Daitari-15, Chakapad-15, Talcher-15, Banspal-15, Bhawanipatna-15, Bhuban-15, Bahalda-15, Soro-14, Harabhanga-14, Naktideul-14, Komna-14, Balasore-14,</p>
02.08.2023 / 0830	<p>Odisha: Isolated heavy to very heavy rainfall over Odisha and isolated extremely heavy rainfall also likely over north Odisha on 2nd August. Heavy rainfall at isolated places is likely on 3rd August.</p> <p>Gangetic West Bengal:</p>	

	<p>Isolated heavy rainfall over Gangetic West Bengal on 2nd August.</p> <p>Jharkhand: Isolated heavy to very heavy rainfall on 2nd August.</p> <p>Bihar: Isolated heavy rainfall on 2nd August.</p> <p>Chhattisgarh: Isolated heavy to very heavy rainfall over Chhattisgarh on 2nd & 3rd August and extremely heavy rainfall over north Chhattisgarh on 2nd August. Heavy rainfall at isolated places is likely on 4th August.</p> <p>East Madhya Pradesh: Isolated heavy to very heavy rainfall during 2nd to 4th and extremely heavy rainfall on 2nd & 3rd August. Heavy rainfall at isolated places is likely on 5th August.</p> <p>West Madhya Pradesh: Isolated heavy to very heavy rainfall on 2nd & 3rd and extremely heavy rainfall on 3rd August. Heavy rainfall at isolated places is likely on 4th August.</p> <p>East Uttar Pradesh: Isolated heavy to very heavy rainfall on 2nd & 3rd August and heavy rainfall during 4th to 6th August.</p>	<p>Kotagarh-14, Bhograi-13, Khajuripada-13, Chendipada-13, Nh5 Gobindpur-13, Sohela-13, Tikabali-13, Hindol-13, Rajghat-13, Gudvela-13, Kantapada-12, Loisingha-12, Narla-12, Ghatagaon-12, Padmapur-12, Basudevapur-12, Padampur-12, Raikia-12, Danagadi-12, Joda-12, Lanjigarh-12, Hatadihi-11, Rengali-11, Bijatala-11, Rasagovindapur-11, Jamankira-11, Champua-11, Udala-11, Remuna-11, Jenapur-11, Ghasipura-11, Kalinga-11, Deogaon (District: Bolangir)-11, Rairangpur-10, Parjang-10, Jhumpura-10, Turekela-10, Bahanga-10, Nawana-10, Jharbandh-10, Sukinda-10, Anandpur-10, Reamal-10, Tikarpara-9, Muruda-9, Golamunda-9, Paikmal-9, Bargarh-9, Bonth-9, Nilgiri-9, Karlamunda-9, Kesinga-9, Harichandanpur-9, Kankadahad-9, Altuma-9, Kamakhyanagar-9, Batagaon-9, Gop-9, Titlagarh-9, Gondia-8, Tiring-8, Banarpal-8, Patnagarh-8, Jajpur-8, Daringibadi-8, Chandikhol-8, Jajpur Pto-8, Korei-8, Bari-8, Dharmagarh-8, Nawapara-8, Bangiriposi-8, Ambabhona-7, Sinapali-7, Th Rampur-7, Saintala-7, G Udayagiri-7, Barmul-7, Barkote-7, Banaigarh-7, Gania-7, Khariar-7, Betanati-7, Bhandaripokhari-7, Junagarh-7, Banki-7, Lahunipara-7, Boden-7, Akhuapada-7, Kotraguda-7, Belpada-7, Bhadrak-7, Atabira-7, Jaipur-7, Samakhunta-7, Balipatna-7</p>
03.08.2023 / 0830	<p>East Madhya Pradesh: Heavy to very heavy rainfall at a few places on 3rd & 4th and isolated extremely heavy rainfall on 3rd August. Heavy rainfall at isolated places is likely on 5th August.</p> <p>West Madhya Pradesh: Heavy to extremely heavy rainfall at isolated places on 3rd August. Heavy rainfall at isolated places is likely on 4th August.</p>	<p>3rd August, 2023 Kutra-20, Panposh-19, Rourkela-18, Mandiradam-17, Rajgangapur-16, Baragaon-15, Binika-14, Nawana- 13, Lephripara-12, Dharakote-12, Karlamunda-11, Birmaharajpur-10, Narsinghpur-10, Kantamal-10,</p>

	<p>Chhattisgarh: Isolated heavy to very heavy rainfall over north Chhattisgarh on 3rd and heavy rainfall at isolated places on 4th August.</p> <p>South Uttar Pradesh: Isolated heavy rainfall during 3rd to 6th August.</p> <p>Vidharbha: Isolated heavy rainfall on 3rd August.</p>	<p>Rampur-10, Kirmara-10, Bamra-10, Balishankara-10, Dhankauda-9, Hemgiri-9, Lakhanpur-9, Gania-9, Deogaon-9, Barmul-9, Athamalik-9, Lamataput-9, Kanhia-9, Padampur-9, Padmapur-9, Tangarpali-9, K. Nuagaon-9, Nandapur-9, Sundergarh-8, Jharsuguda-8, Komna-8, Lathkata-8, Sambalpur-8, R.K.Nagar-8, Bhapur-8, Harabhanga-7, Naktideul-7, Jharbandh-7, Banarpal-7, Patnagarh-7, Nuagaon-7, Gudvela-7, Banspal-7, Titilagarh-7, Talcher-7 Burla-7, Batagaon-7</p>
--	---	--

7. Damage due to the system

No damage was reported in association with this system.

8. Operational Forecast Performance

- The daily Tropical Weather Outlook issued on 31st July indicated that the depression would form and move northwestwards during subsequent 12 hours.
- The first bulletin issued on formation of depression on 1st August indicated that the system is likely to intensify further into a Deep Depression and move northwestwards and cross Bangladesh coast near Khepupara around evening of 1st August (1200 UTC). It was predicted that it would move west-northwestwards across Gangetic West Bengal during subsequent 24 hours and the same was realized.
- Thus, it is seen that all parameters including the track, intensity and landfall point were well predicted by IMD/RSMC New Delhi.

9. Bulletins issued by IMD

- **Track, intensity and landfall forecast:** IMD continuously monitored, predicted and issued bulletins containing track & intensity forecast from the stage of depression till the system weakened into a low pressure area. The forecast of these parameters were issued from the 1st August onwards along with the cone of uncertainty for every six hours.
- **Adverse weather warning bulletins:** The tropical cyclone forecasts along with expected adverse weather like heavy rain were issued with every six hourly update to central, state and district level disaster management agencies including MHA NDRF, NDMA for all Odisha, Uttar Pradesh, Chhattisgarh, Madhya Pradesh, Jharkhand, West Bengal and Bihar. The bulletins also contained the suggested action for disaster managers and general public in particular for fishermen. These bulletins were also issued to Defence including Indian Navy & Indian Air Force, NDRF, Indian Coast Guard, ports, Shipping, Fishery, Railways, Surface Transport & Aviation Authorities.

- Warning graphics: The graphical display of the observed and forecast track with cone of uncertainty was disseminated by email and uploaded in the RSMC, New Delhi website (<http://rsmcnewdelhi.imd.gov.in/>) regularly. The adverse weather warnings related to heavy rain were also presented in graphics along with colour codes in the website.
- Warning and advisory for marine community: The special 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 centre of IMD at Kolkata & Chennai and Cyclone Warning Centres at Visakhapatnam to ports, fishermen, coastal and high sea shipping community.
- Fishermen Warning: Regular warnings for fishermen for deep sea of BoB and the states of Orissa, West Bengal and Andhra Pradesh were issued since 1st August onwards.
- Warning and advisory through social media: Daily updates (every six hourly or whenever there was any significant change in intensity/track) were uploaded on facebook and tweeter regularly during the life period of the system from 9th morning onwards, updates were posted on facebook and tweeter.
- Diagnostic and prognostic features of Depression: The prognostics and diagnostics of the system were described in the RSMC bulletins.

Statistics of bulletins issued by RSMC New Delhi in association with this system are given in Table 3.

Table 3: Bulletins issued by Cyclone Warning Division, IMD, New Delhi

S N	Bulletins	No. of Bulletins	Issued to
1	National Bulletin	14	1. IMD's website 2. FAX and e-mail to Control Room NDM, Ministry of Home affairs, Control Room NDMA, Cabinet Secretariat, Minister of Sc. & Tech, Secretary MoES, DST, HQ Integrated Defence Staff, DG Doordarshan, All India Radio, DG-NDRF, Director Indian Railways, Indian Navy, IAF, Chief Secretary: Madhya Pradesh, Uttar Pradesh, Chhattisgarh, Jharkhand and Odisha.
2	RSMC Bulletin	7	1. IMD's website 2. All WMO/ESCAP member countries including Bangladesh through GTS and E-mail. 3. Indian Navy, IAF by E-mail
3	GMDSS Bulletins	6	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	SMS to (i) disaster managers at national level and concerned states (every time when there was change in track, intensity and landfall characteristics) by IMD Headquarters, (ii) to General Public registered through RSMC website

			by IMD Headquarters and RMC Kolkata office (iii) to fishermen through INCOIS network.
5	Warnings through Social Media	Daily	Warnings were uploaded on Social networking sites (Facebook and Twitter) since inception to weakening of system (every six hourly).

10. Summary

A low pressure area formed over the northwest BOB and adjoining Odisha & West Bengal coast on 30th July (0300 UTC/ 0830 IST). It lay as well marked low pressure area (WML) over central parts of north BOB at 0000 UTC(0530 IST) of 31st July 2023. Under favorable environmental conditions it concentrated into a depression over northeast BOB at 0000 UTC(0530 IST) of 1st August, 2023 and further intensified into a deep depression over the same region at 0300 UTC(0830 IST) of 1st August, 2023. It crossed Bangladesh coast near close to east of Khepupara, during 1530 to 1630 hours IST of 1st Aug 2023. It continued to move in the same direction, moved over coastal Bangladesh and neighbourhood and weakened gradually thereafter into a WML over north Chhattisgarh and neighborhood in the evening (1730 hrs IST) of 3rd August. No damage was reported in association with this system. The system was well monitored since 30th July 2023.

11. 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), Kolkata, Cyclone Warning Centre (CWC) Visakhapatnam and Bhubaneswar. 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.