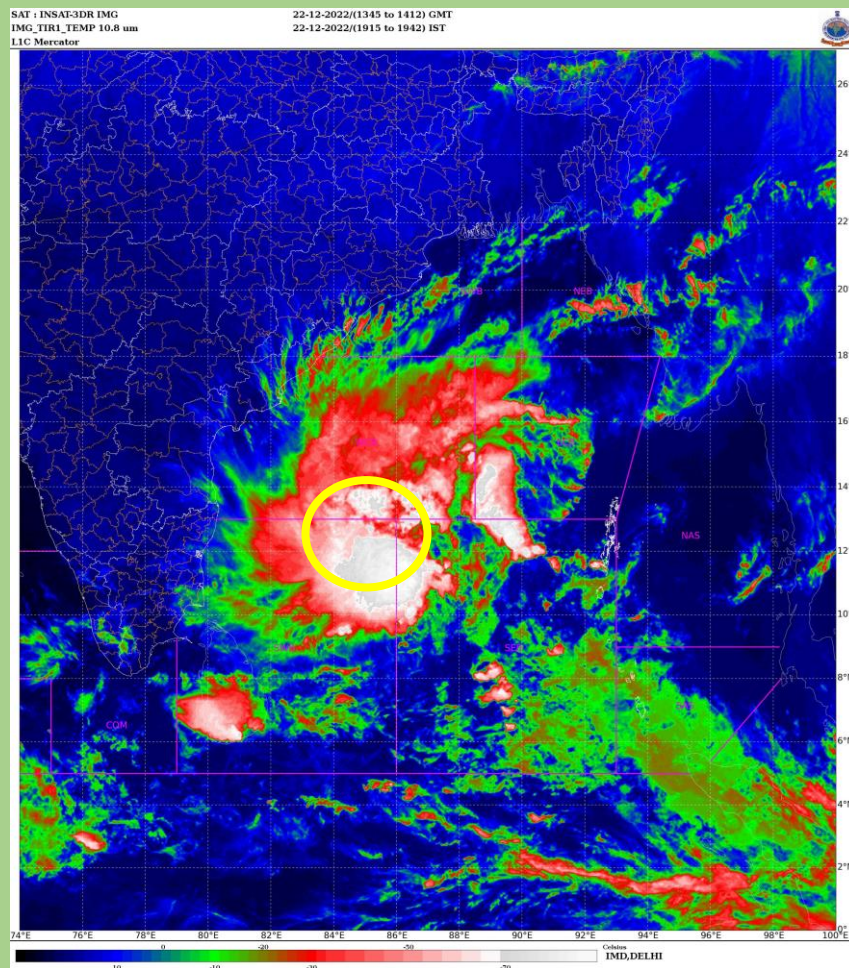




**GOVERNMENT OF INDIA  
MINISTRY OF EARTH SCIENCES  
INDIA METEOROLOGICAL DEPARTMENT**

**Depression over Southwest Bay of Bengal  
(22<sup>nd</sup> – 25<sup>th</sup> December 2022): A Report**



**INSAT-3D enhanced Colored IR imagery based on 1200 UTC of 22<sup>nd</sup> December, 2022**

**Cyclone Warning Division  
India Meteorological Department  
New Delhi  
December, 2022**

# Depression over Southwest Bay of Bengal during 22-25 December, 2022

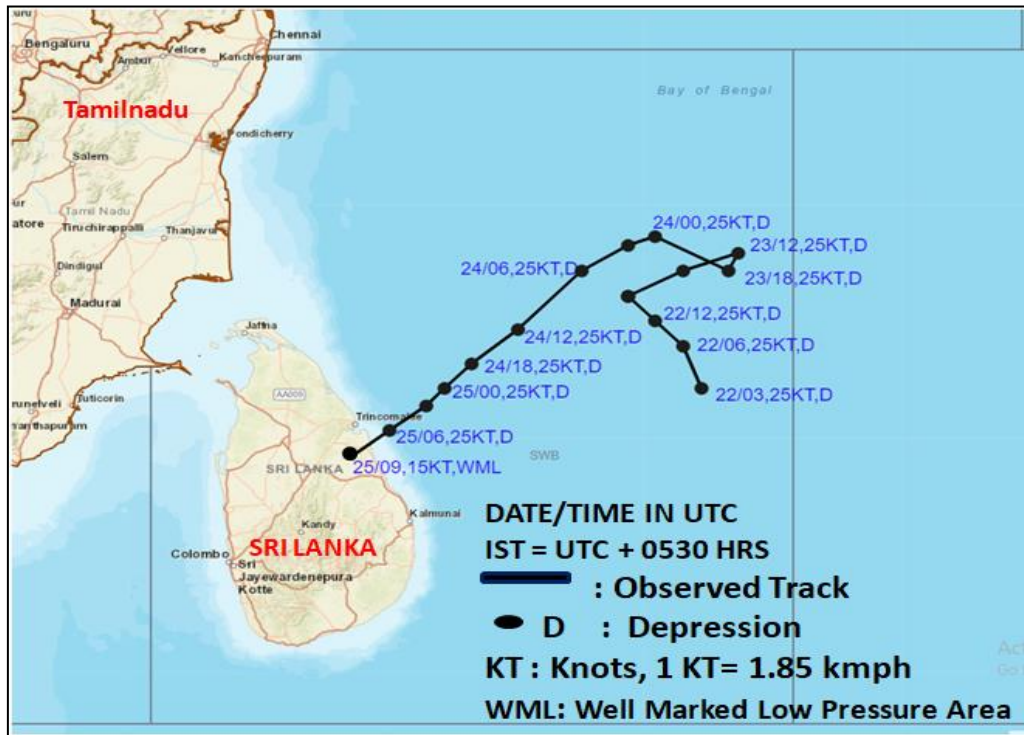
## 1. Introduction

- A low pressure area formed over southeast Bay of Bengal and adjoining equatorial Indian Ocean on 14<sup>th</sup> December afternoon.
- It persisted over the same region during 15<sup>th</sup> to 17<sup>th</sup> December 2022. It moved slowly westwards and lay over central parts of South Bay of Bengal & adjoining East Equatorial Indian Ocean during 18<sup>th</sup> to 20<sup>th</sup> December 2022.
- It became a Well-Marked Low-Pressure area over Southwest Bay of Bengal & adjoining East Equatorial Indian Ocean on 21<sup>st</sup> December 2022 early morning.
- It concentrated into a depression at 0830 hours IST of 22<sup>nd</sup> December over southwest and adjoining southeast Bay of Bengal near latitude 9.0°N and longitude 85.0°E.
- The depression maintained its intensity, initially moved north-northwestwards and then northwestwards and southwest Bay of Bengal near latitude 10.1°N and longitude 84.2°E at 2330 hours IST of 22<sup>nd</sup> December.
- Thereafter, the depression moved slowly and recurved east-northeastwards, made a clockwise loop and then moved west-northwestwards
- At 0530 hours IST of 24<sup>th</sup> December, the depression reached Southwest Bay of Bengal and started to recurve slowly west-southwestwards towards Sri Lanka coast.
- Thereafter, the depression moved nearly west-southwestwards during next 24 hours and reached over Southwest Bay of Bengal and adjoining Sri Lanka coast at 0830 hours IST of 25<sup>th</sup> December.
- Then, the Depression continued to move west-southwestwards, crossed Sri Lanka coast to the south of Trincomalee near latitude 8.35°N and longitude 81.4°E as a depression with maximum sustained wind speed of 45-55 kmph gusting to 65 kmph during 1230 to 1330 hours IST of 25<sup>th</sup> December.
- Thereafter, the system continued to move west-southwestwards and weakened into a well-marked low pressure area over Sri Lanka at 1430 hrs IST of today, the 25<sup>th</sup> December 2022.
- It emerged into Comorin area in the early morning of 26<sup>th</sup> and became a low pressure area over the same region in the forenoon of the same day.
- Continuing to move in the same direction, it became less marked over the Maldives and adjoining Lakshadweep area.
- The best track parameters of the system are presented in table 1 and observed track of the system is presented in Fig. 1.

## 2. Genesis, Intensification and movement

### 2.1 Genesis:

A cyclonic circulation over adjoining Strait of Malacca & Sumatra emerged over South Andaman Sea in the morning of 13<sup>th</sup> December. It persisted over the region with a gradual westward movement. Under the influence of the cyclonic circulation, a Low Pressure Area formed over Equatorial Indian Ocean and adjoining areas of south Andaman Sea & Southeast Bay of Bengal in the afternoon of 14<sup>th</sup> December. Sea surface temperature was about 28-29°C over South BoB and adjoining Equatorial Indian Ocean. Low level relative vorticity was around  $60 \times 10^{-5} \text{ s}^{-1}$  over south Andaman Sea and adjoining areas. Low level convergence and upper-level divergence were about  $10\text{-}15 \times 10^{-5} \text{ s}^{-1}$  and  $15\text{-}20 \times 10^{-5} \text{ s}^{-1}$  respectively over Southeast BoB and adjoining equatorial Indian Ocean. Moderate vertical wind shear of about 15-20 knots was prevailing around system area. Upper tropospheric ridge was running nearly along 12.5°N. under the favorable environmental conditions, the low pressure area persisted over the region till 17<sup>th</sup> December. It moved slowly westward. became well marked low pressure area over Southwest Bay of Bengal & adjoining East Equatorial Indian Ocean on 21<sup>st</sup> December 2022 early morning.



**Fig.1** Observed track of Depression over southwest Bay of Bengal during 22nd to 25th December 2022

**Table 1:** Best track positions and other parameters of the Depression over southwest and adjoining southeast Bay of Bengal during 22 December- 25 December, 2022

Date	Time (UTC)	Centre lat. N/ long. E	C.I. NO.	Estimated Central Pressure (hPa)	Estimated Maximum Sustained Surface Wind (kt)	Estimated Pressure drop at the Centre (hPa)	Grade
22.12.2022	0300	9.0   85.0	1.5	1004	25	4	D
	0600	9.5   84.8	1.5	1004	25	4	D
	1200	9.8   84.5	1.5	1004	25	4	D
	1800	10.1   84.2	1.5	1004	25	4	D
23.12.2022	0000	10.1   84.2	1.5	1004	25	4	D
	0300	10.1   84.2	1.5	1004	25	4	D
	0600	10.4   84.8	1.5	1004	25	4	D
	1200	10.6   85.4	1.5	1004	25	4	D
	1800	10.4   85.3	1.5	1004	25	4	D
24.12.2022	0000	10.8   84.5	1.5	1004	25	4	D
	0300	10.7   84.2	1.5	1004	25	4	D
	0600	10.4   83.7	1.5	1004	25	4	D
	1200	9.7   83.0	1.5	1004	25	4	D
	1800	9.3   82.5	1.5	1004	25	4	D
25.12.2022	0000	9.0   82.2	1.5	1004	25	4	D
	0300	8.8   82.0	1.5	1004	25	4	D
	0600	8.5   81.6	1.5	1004	25	4	D
	0900	Crossed Sri Lanka coast to the south of Trincomalee during 0800-0900 UTC near 8.35N/81.4E and weakened into a well-marked low pressure area over Sri Lanka.					

## 2.2 Intensification & Movement:

Madden Julian Oscillation (MJO) index was in phase 5 with amplitude more than 1. The equatorial waves prediction indicated strong easterly winds (5-7 mps) over south & adjoining central BoB, strong westerly winds (5-7 mps) over south & adjoining east equatorial Indian ocean, low frequency background waves over south BoB prevailed during next 3-4 days, thus favouring enhancement of convective activity over south BoB. The system concentrated into a depression at 0830 hours IST of 22<sup>nd</sup> December over Southwest and adjoining Southeast BoB near latitude 9.0°N and longitude 85.0°E. However, due to increase in vertical wind shear (25-30 knots) ahead of the system beyond north 12°N and east 82°E indicated that the further intensification into a cyclonic storm is not likely.

The environmental flow was vertically sheared northeastward near the system center and the depression initially moved nearly northwestward direction following the steering of the upper-middle tropospheric wind. As the system reached close to the upper-tropospheric ridge, maintaining its intensity it showed slow movement, recurvature towards east-northeast and a clockwise looping between nights of 22<sup>nd</sup> and 23<sup>rd</sup> December. The system thereafter moved west-northwestward again due to change in upper-middle tropospheric steering over the system center. The dynamical parameters (e.g., vorticity, low-level convergence and upper-level divergence) were showing diurnal variation without very much significant change with time.

The environmental features started to show significant changes around the system center from the morning of 24<sup>th</sup> December. The middle and upper tropospheric level relative vorticity showed significant decrease. Gradient wind also showed decreasing trend with a change in the location of maximum from lower tropospheric levels to middle tropospheric levels. The temperature anomaly plots indicated that a cold anomaly appeared in the Middle tropospheric levels. Thus, various dynamical features indicated that the system was losing its warm Core characteristics and the vertical extension of deep convective cloud mass was decreasing gradually. Hence along with the decrease in the vertical extent, the system weakened gradually and the steering level changed from deep layer to middle /lower tropospheric layers. Accordingly, the system was steered southwestwards till 25<sup>th</sup> December morning under the influence of northeasterly winds prevailing over the region in association with the Northeast monsoon.

## 2.3 Landfall & Weakening:

As the system moved towards Sri Lanka coast, it encounter surface friction and decrease in Coriolis Parameter leading to gradual weakening of this system while moving southwestwards across Sri Lanka. The system crossed Sri Lanka coast during noon (1230 -1330 hours IST) of 25<sup>th</sup> December and continued to move southwestwards to become a well-marked low pressure area in the afternoon of the same day over Sri Lanka. In the environmental condition, the Low Level Relative Vorticity decreased ( $\sim 50-60 \times 10^{-6} \text{ s}^{-1}$ ) around the system centre, Low Level Convergence and Upper Level Divergence were about  $15 \times 10^{-5} \text{ s}^{-1}$  &  $30 \times 10^{-5} \text{ s}^{-1}$  to the northeast and southeast of the system centre respectively. The vertical wind shear of 10-20 knots around the system centre and moderate ( $\sim 15-20$  knots) wind shear was prevailing to the west of the system area over Comorin and Lakshadweep.

Moving west-southwestward, the well-marked low pressure area emerged over Comorin area in the early morning of 26<sup>th</sup> December, and weakened into a low pressure area over the same region in forenoon of the same day. Subsequently, the system moved further in the same direction over Southeast Arabian Sea and became less marked over the Maldives and adjoining Lakshadweep area.

## 3. Monitoring of depression over the Southwest Bay of Bengal

India Meteorological Department (IMD) maintained round the clock watch over the north Indian Ocean for the genesis of the system since 8<sup>th</sup> December (7 days prior to the

formation of low pressure area and 2 weeks ahead of the formation of depression) over south Andaman and adjoining southeast BoB once the extended range outlook indicated that a fresh low pressure area will be formed over the region. On 14<sup>th</sup> December (7 days prior to formation of depression on 22<sup>nd</sup> December over southwest and adjoining southeast Bay of Bengal near latitude 9.0°N and longitude 85.0°E), the low pressure area 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 are presented in Fig.2. The organized cloud mass sheared northeastward was tracked and observed during the life cycle of the depression. The detailed sat features are discussed in this section.

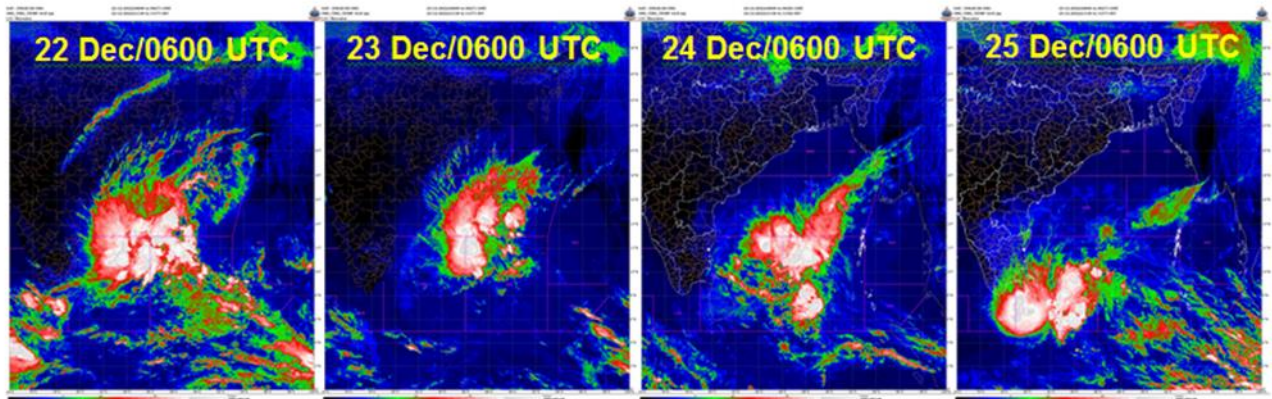
At 0300 UTC OF 22.12.2022 as per INSAT-3D imagery, cloud mass has organised in past 24 hours. Intensity of the system is T 1.5. Associated broken low and medium clouds with embedded intense to very intense convection over southwest adjoining southeast & central Bay of Bengal and south Andaman Sea. Minimum Cloud Top Temperature (CTT) is minus 93 deg C. Multisatellite winds indicates stronger winds in the northeast sector.

At 0300 UTC OF 23.12.2022 as per INSAT-3D imagery, intensity of the system is T 1.5. Associated scattered to broken low and medium clouds with embedded intense to very intense convection lay over south and adjoining central Bay of Bengal between 9.0 & 16.0N and longitude 83.0E & 91.0E. Minimum Cloud Top Temperature is minus 93°C.

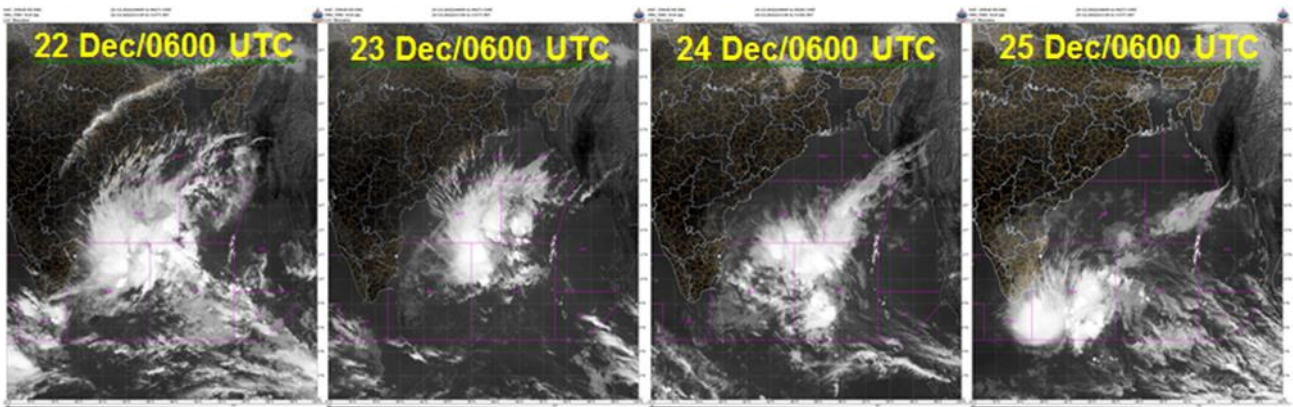
At 0300 UTC OF 24.12.2022 as per INSAT-3D imagery, intensity of the system is T1.5. Associated scattered to broken low and medium clouds with embedded intense to very intense convection lay over south & adjoining central Bay of Bengal between lat 9.0°N TO 15.0°N long 82.0°E TO 90.0°E. Minimum Cloud Top Temperature is minus 93°C

At 0300 UTC OF 25.12.2022 as per INSAT-3D imagery, intensity of the system is T1.0/1.0. The center of the system is poorly defined in satellite imagery. Associated scattered to broken low and medium clouds with embedded intense to very intense convection lay over southwest Bay of Bengal & adjoining Sri Lanka coast between lat 5.0°N to 11.0°N long 80.0°E to 85.0°E. Minimum Cloud Top Temperature is minus 93°C.

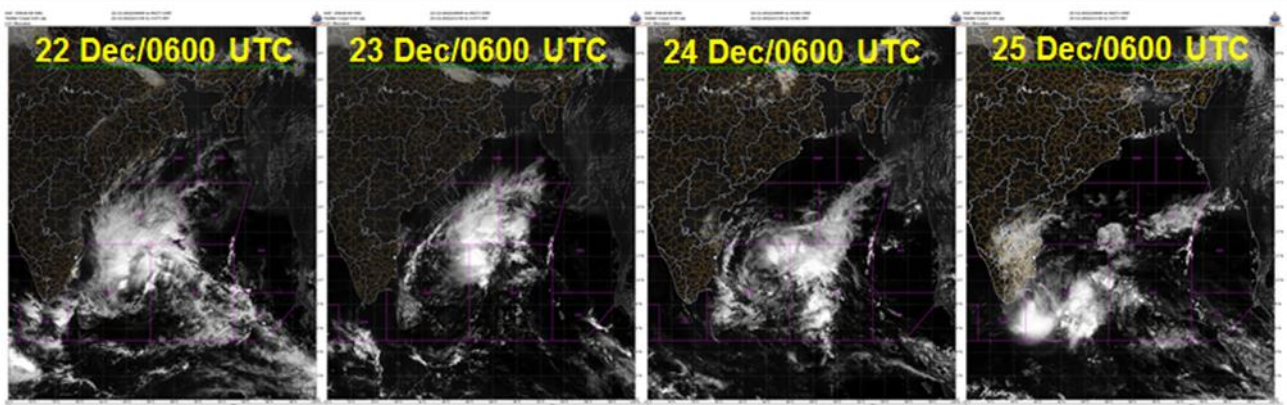
At 0900 UTC OF 25.12.2022 as per INSAT-3D imagery, the system is over land. Associated scattered to broken low and medium clouds with embedded intense to very intense convection lay over Sri Lanka coast between lat 4.0°N to 12.0°N long 76.0°E TO 85.0°E. Minimum Cloud Top Temperature is minus 93°C



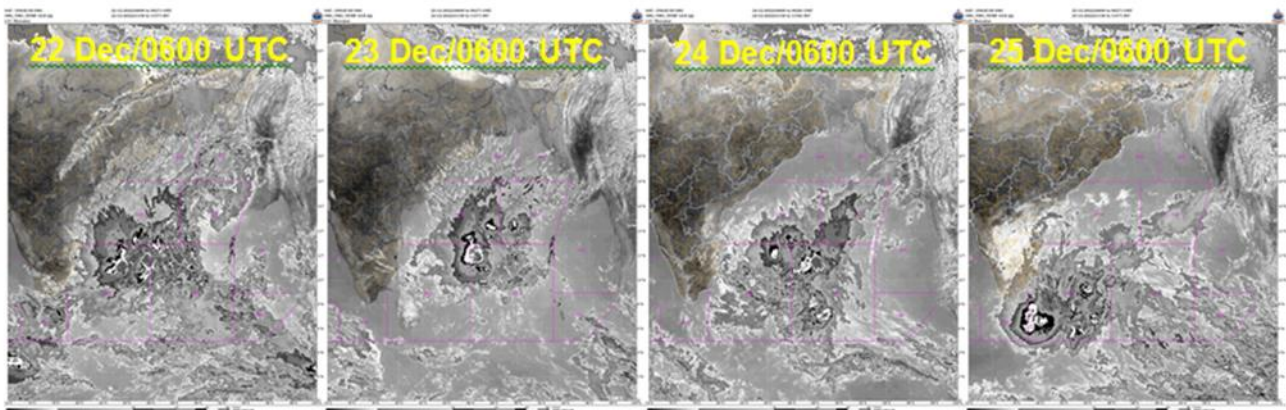
**Fig. 2a: INSAT-3D enhanced colored imageries during life cycle of Depression southwest Bay of Bengal during 22-25 Dec, 2022**



**Fig. 2b: INSAT-3D IR imageries during life cycle of Depression southwest Bay of Bengal during 22-25 Dec, 2022**



**Fig. 2c: INSAT-3D visible imageries during life cycle of Depression southwest Bay of Bengal during 22-25 Dec, 2022**



**Fig. 2d: INSAT-3D BD imageries during life cycle of Depression southwest Bay of Bengal during 22-25 Dec, 2022**

#### 4. Dynamical features

IMD GFS (T1534) mean sea level pressure (MSLP), winds at 10 m, 850, 500 and 200 hPa levels on 0000 UTC of 22<sup>nd</sup> Dec are presented in Fig.3.

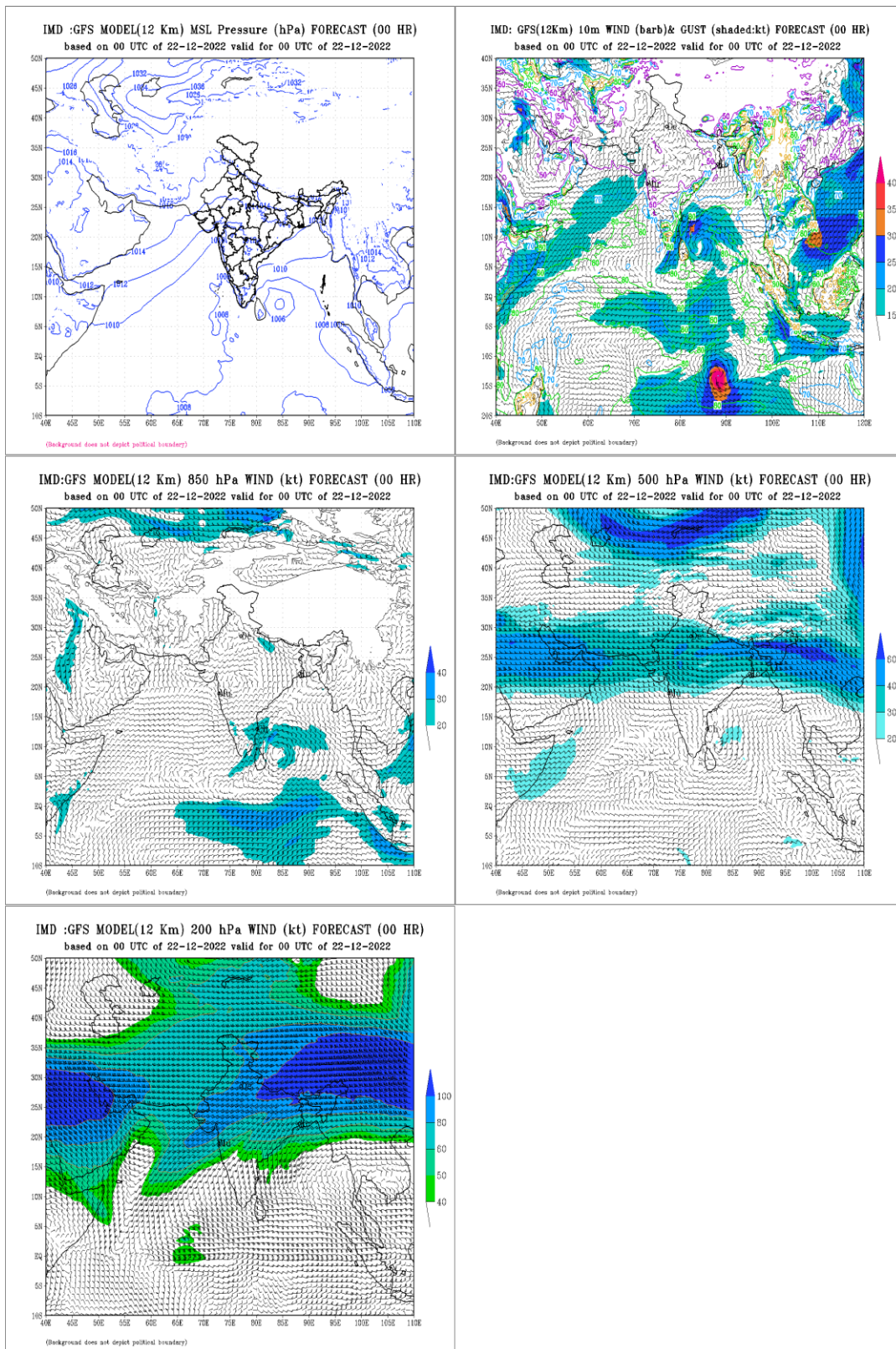
The analysis of meteorological parameters in the Fig 3(a) at 0000 UTC of 22<sup>nd</sup> Dec over Bay of Bengal indicated the depression in mean sea level pressure field. The associated upper-air cyclonic circulations were extended up to the 500 hPa level. The upper-air winds at 200 hPa showed a ridge prevailing in the upper along 12.5°N latitude north of the system. The intensity of the system was captured in the pressure field although wind speed was a bit overestimated.

The Fig.3(b) shows the analyses at 0000 UTC of 23<sup>rd</sup> December. The MSLP and upper-air wind fields show a little weakening of the system with a very little north-northeastward movement of the system. Although in reality the system maintained its intensity with initial northwestwards moved before it recurved north-northeastwards.

The MSLP and wind fields at various pressure levels in Fig.3(c) are representing the system along with its environment at 0000 UTC of 24<sup>th</sup> December. The system again organized showed intensity of depression over the same location of 23<sup>rd</sup> December. But upper-air wind fields at 500 hPa shows variation without clear indication of the cyclonic circulation which depicts the decrease in the vertical extent of the system. Moreover, the wind direction over the system center at 500 hPa became northeasterly-northerly.

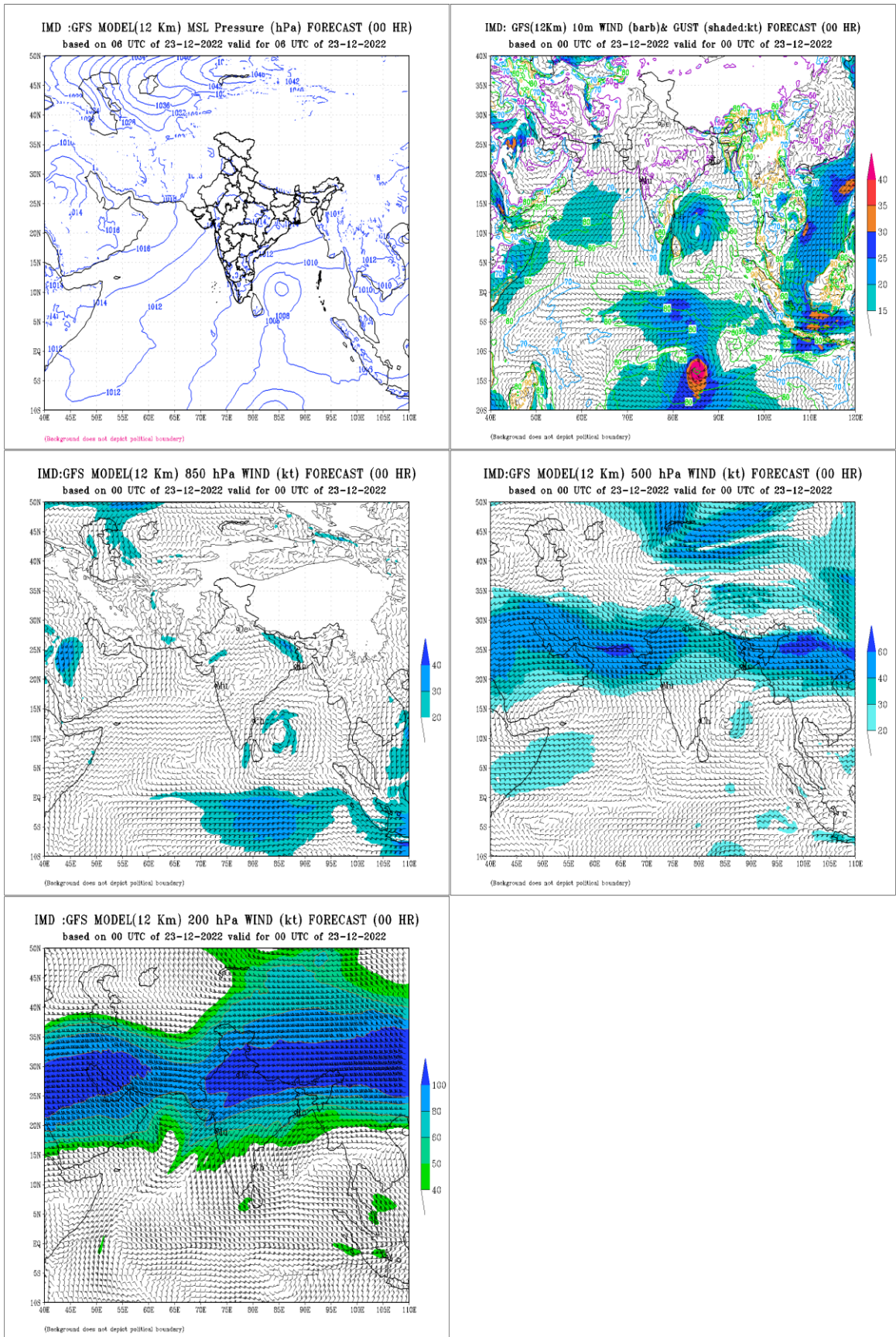
The Fig 3(d) represents model analyses at 0000 UTC of 25<sup>th</sup> December. The MSLP depicted the system over Sri Lanka as well marked low whereas wind field show cyclonic circulation was still over sea area near coast with weakening.

Overall, the system movement was represented well in the GFS analyses with a reasonable evolution in the intensity.

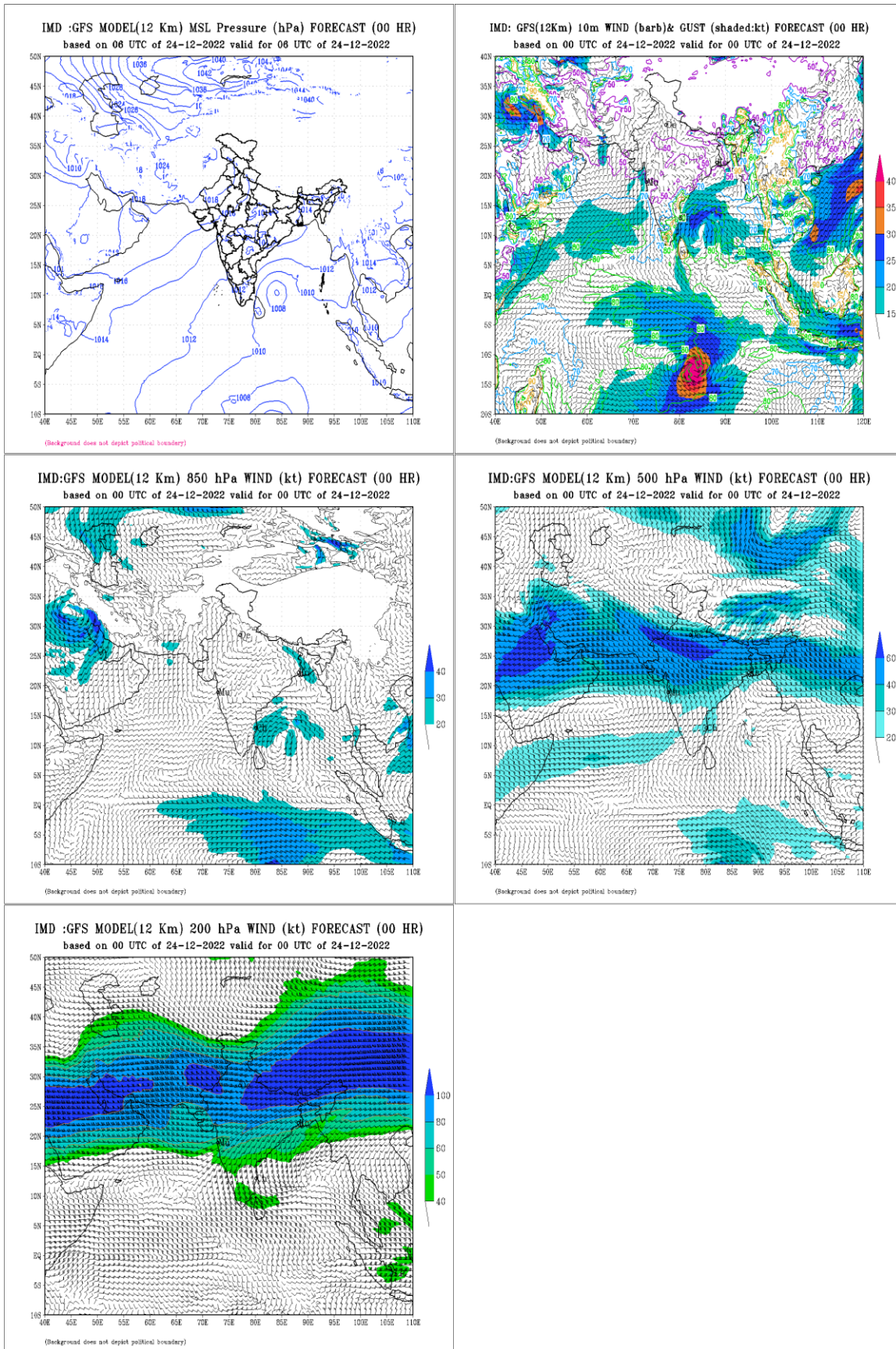


**Fig 3(a): IMD GFS (T1534) mean sea level pressure (MSLP), winds at 10m, 850, 500 and 200 hPa levels based on 0000 UTC of 22<sup>nd</sup> December 2022**

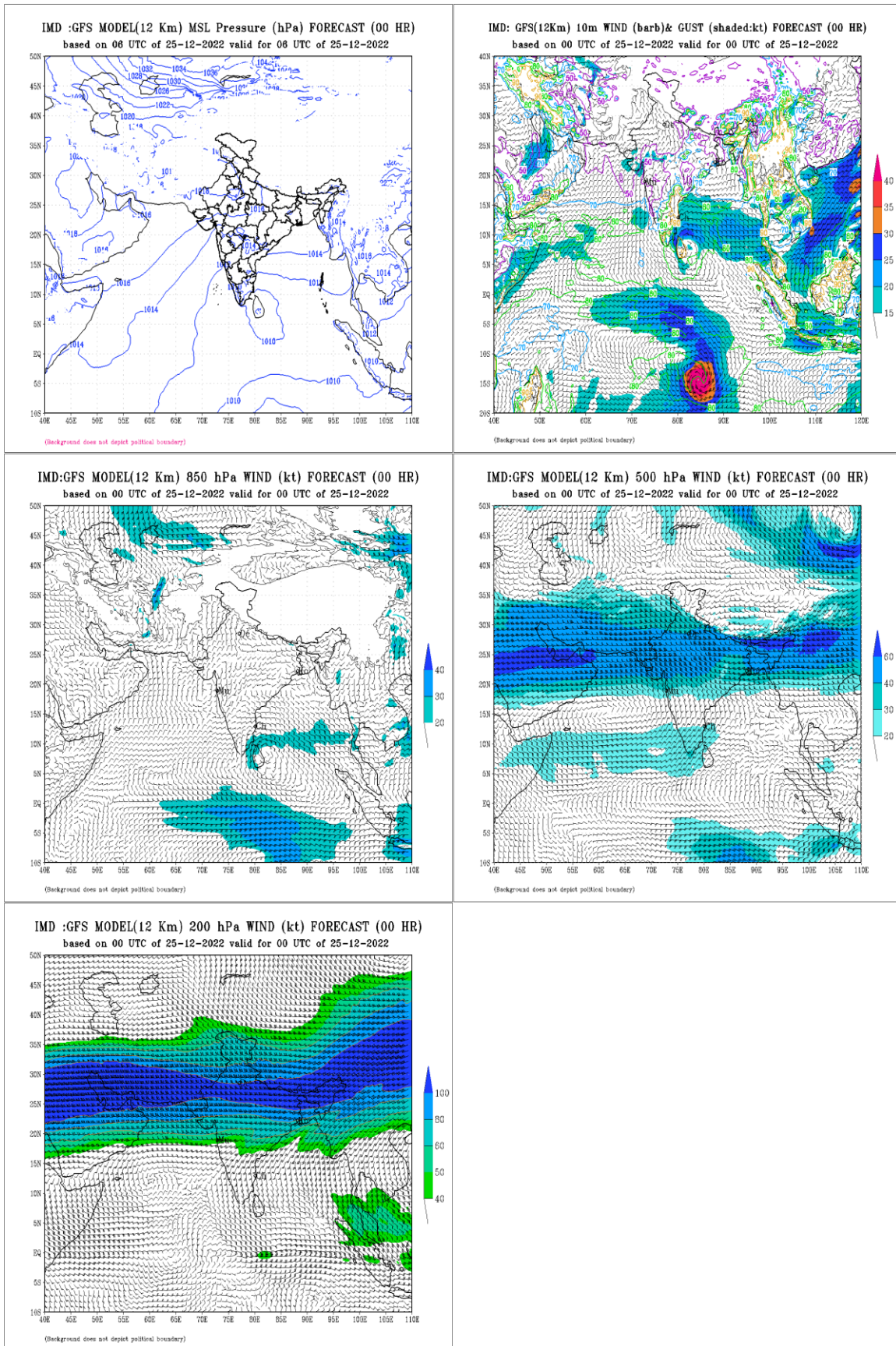




**Fig 3(b): IMD GFS (T1534) mean sea level pressure (MSLP), winds at 10m, 850, 500 and 200 hPa levels based on 0000 UTC of 23<sup>rd</sup> December 2022**



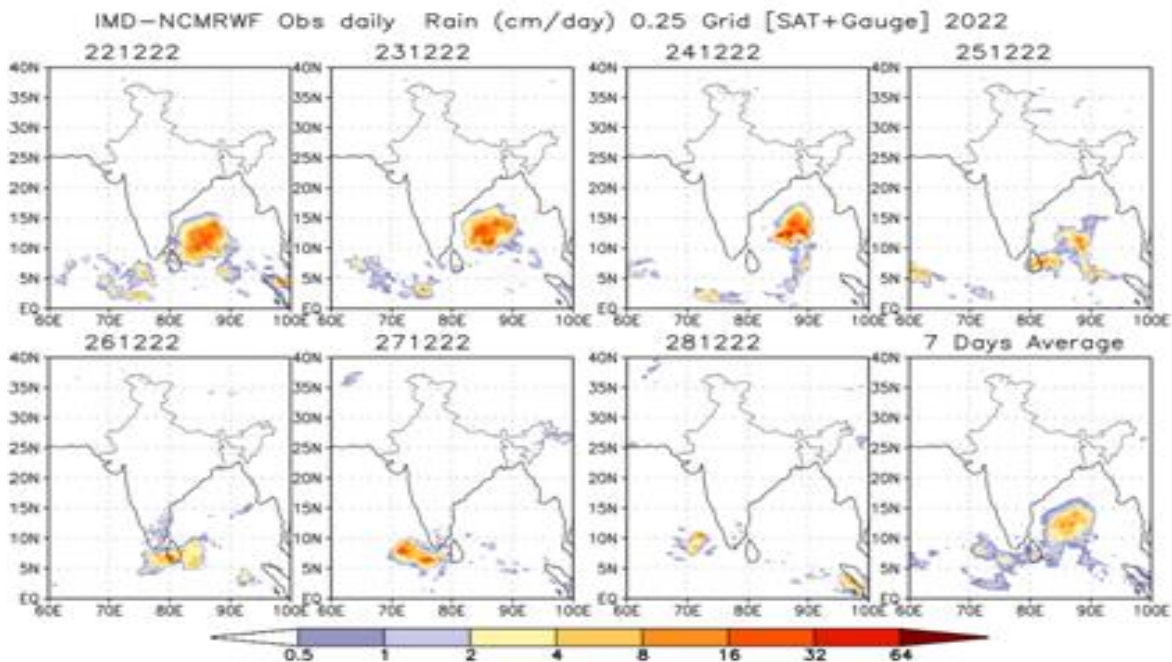
**Fig 3(c): IMD GFS (T1534) mean sea level pressure (MSLP), winds at 10m, 850, 500 and 200 hPa levels based on 0000 UTC of 24<sup>th</sup> December 2022**



**Fig 3(d): IMD GFS (T1534) mean sea level pressure (MSLP), winds at 10m, 850, 500 and 200 hPa levels based on 0000 UTC of 25<sup>th</sup> December 2022**

## 5. Realized Weather

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



**Fig.4: IMD-NCMRWF Rain gauge and satellite merged rainfall plots during 22<sup>nd</sup> Dec. – 28<sup>th</sup> Dec, 2022 weekly average rainfall (cm/day)**

Fig. 4 represents daily observed and weekly average rainfalls distribution for the week over Indian region. The spatial distribution of rainfall during 22<sup>nd</sup> to 28<sup>th</sup> December clearly show the rainfall belts over Sputh India, Southwest Bay of Bengal, Southeast Arabian Sea and north Sri Lanka region due to the depression. It also indicates higher rainfall activity in the northern sector of the system.

### 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
<b>22.12.2022/ 0300 UTC</b>	<ul style="list-style-type: none"> <li>• Light to moderate rainfall at many places with heavy rainfall at isolated places is likely over south coastal Tamil Nadu on 25th &amp; 26th December 2022.</li> <li>• Light to moderate rainfall at a few places with heavy rainfall at isolated places is likely over south Kerala on 26th December 2022.</li> </ul>	Only light to moderate rainfall were reported in the concern area ON 22, 23 and 25, 26 Dec. On 24 <sup>th</sup> Dec. no Significant amount of Rainfall was observed. So
<b>23.12.2022/ 0300 UTC</b>	<ul style="list-style-type: none"> <li>• Light to moderate rainfall at many places with heavy rainfall at isolated places is likely over south coastal Tamil Nadu on 25th &amp; 26th December 2022.</li> <li>• Light to moderate rainfall at a few places with heavy rainfall at isolated places is likely over south Kerala on</li> </ul>	

	<p>26th December 2022.</p> <ul style="list-style-type: none"> <li>• Light to moderate rainfall at a few places with heavy rainfall at isolated places is likely over Lakshadweep Islands on 27th December 2022.</li> </ul>	<p>during the period we have no heavy or very heavy rainfall during the period.</p>
<p><b>24.12.2022/ 0300 UTC</b></p>	<ul style="list-style-type: none"> <li>• Light to moderate rainfall at many places with heavy rainfall at isolated places is likely over south coastal Tamil Nadu on 25<sup>th</sup> &amp; 26<sup>th</sup> December 2022.</li> <li>• Light to moderate rainfall at a few places with heavy rainfall at isolated places is likely over south Kerala on 26<sup>th</sup> December 2022.</li> <li>• Light to moderate rainfall at many places with heavy rainfall at isolated places is likely over Lakshadweep Islands on 27<sup>th</sup> December 2022.</li> </ul>	
<p><b>25.12.2022/ 0300 UTC</b></p>	<ul style="list-style-type: none"> <li>• Light to moderate rainfall at many places with heavy rainfall at isolated places is likely over south coastal Tamil Nadu on 25<sup>th</sup> &amp; 26<sup>th</sup> December 2022.</li> <li>• Light to moderate rainfall at a few places with heavy rainfall at isolated places is likely over south Kerala on 26<sup>th</sup> December 2022.</li> <li>• Light to moderate rainfall at many places with heavy rainfall at isolated places is likely over Lakshadweep Islands on 27<sup>th</sup> December 2022.</li> </ul>	

## 6. Damage due to the system

No damage was reported in association with this system.

## 7. Operational Forecast Performance

- The forecasts in the extended range outlook issued on 8<sup>th</sup> December for week 2 (16.12.2022–22.12.2022) indicated likely to development of a low pressure area over southeast BoB during middle of week. The outlook issued on 15<sup>th</sup> December for week 1 (16.12.2022– 22.12.2022) indicated the low pressure area over Southeast Bay of Bengal & adjoining East Equatorial Indian Ocean to move gradually westwards and intensify marginally into a well marked low pressure area over the same region during next 12 hours. Continuing to move westwards, it would maintain its intensity over South Bay of Bengal till morning of 17th December 2022 and weaken thereafter.
- The forecast in extended range outlook issued on 22<sup>nd</sup> December for week 1 (23.12.2022– 29.12.2022) indicated that the depression over southwest Bay of Bengal would move north-northwestwards till 23<sup>rd</sup>/0530 hours IST and recurve west-southwestwards thereafter reaching Comorin Area around 26<sup>th</sup>/0530 hours IST. Thereafter, it would move west-northwestwards towards Southeast Arabian Sea.
- The daily tropical weather outlook issued at 1130 hours IST of 14th December, 2022 indicated formation of low pressure area over Southeast Bay Of Bengal & adjoining Equatorial Indian Ocean at 0830 hours IST of 15th December, 2022.
- Actually, the Low Pressure Area formed over Equatorial Indian Ocean and adjoining areas of south Andaman Sea & Southeast Bay of Bengal at 1430 hrs IST of the 14th December, 2022. It moved West-Northwestwards and intensified into a well marked Low Pressure Area over southwest BoB and adjoining EIO at 0530 hrs IST the 21st December, 2022. The WML moved northwestwards and concentrated into a

Depression over southwest and adjoining southeast Bay of Bengal at 0830 hours IST of 22nd December

- In the first bulletin issued on 22nd December at 0830 hours IST, it was indicated that the depression would continue to move north-northwestwards during next 24 hours and thereafter gradually recurve west-southwestwards towards Comorin area across Sri Lanka.
- The national bulletin issued on 23rd December at 1430 hours IST, predicted that the depression would continue to move slowly, make a loop over the same region and then move west-southwestwards towards Comorin area across Sri Lanka.
- Thus, the track, initial movement intensification/weakening of the system were well predicted by IMD/RSMC New Delhi.

### 8. Bulletins issued by IMD

IMD issued regular bulletins to WMO/ESCAP Panel member countries including Sri Lanka, National & State Disaster Management Agencies of Andaman & Nicobar, Tamil Nadu, Puducherry, Andhra Pradesh, Kerala, Lakshadweep, general public and media. Regular Bulletins every six hourly were issued since formation of depression over Southwest BoB. In addition, RSMC New Delhi also issued Press Release and SMS to registered users.

Bulletins issued by Cyclone Warning Division of IMD in association with the system are given in Table 2

**Table 2: Bulletins issued by Cyclone Warning Division, IMD, New Delhi**

S. No	Bulletins	No. of Bulletins	Issued to
1	National Bulletin	18	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, Administrator, Andaman & Nicobar Islands, Chief Secretary: Tamil Nadu, Puducherry, Andhra Pradesh, Kerala, Lakshadweep
2	RSMC Bulletin	18	1. IMD's website 2. All WMO/ESCAP member countries through GTS and E-mail. 3. Indian Navy, IAF by E-mail
3	Facebook /Twitter	Frequently	Highlights uploaded on facebook/twitter since formation of Depression.
4	SMS	221344	Sent to Concern authorities in Delhi, Sent to general public and fishermen, Sent to farmers and fishermans of Odisha, Andhra Pradesh, Tamil nadu, Puducherry, Kerala, Lakshadweep and Andaman Nicobar.

## 9. Summary

A low pressure area formed over southeast Bay of Bengal and adjoining equatorial India Ocean on 14th December morning, persisted over the same region during 15th to 17th December 2022. Then it moved slowly westwards and lay over central parts of South Bay of Bengal & adjoining East Equatorial Indian Ocean during 18th to 20th December 2022. It became a Well-Marked Low-Pressure area over Southwest Bay of Bengal & adjoining East Equatorial Indian Ocean on 21st December 2022 early morning. It concentrated into a depression at 0830 hours IST of 22nd December over southwest and adjoining southeast Bay of Bengal. Thereafter, the depression moved slowly and recurved east-northeastwards made a clockwise loop and then moved west-northwestwards. At 0530 hours IST of 24th December, the depression reached Southwest Bay of Bengal and started to recurve slowly west-southwestwards towards Sri Lanka coast. Thereafter, the depression moved nearly west-southwestwards during next 24 hours and reached over Southwest Bay of Bengal and adjoining Sri Lanka coast at 0830 hours IST of 25th December. Then, the Depression continued to move west-southwestwards, crossed Sri Lanka coast to the south of Trincomalee near latitude 8.35°N and longitude 81.4°E as a depression with maximum sustained wind speed of 45-55 kmph gusting to 65 kmph during 1230 to 1330 hours IST of 25th December. Thereafter, the system continued to move west-southwestwards and weakened into a well-marked low pressure area over Sri Lanka at 1430 hrs IST of the 25th December 2022. It emerged into Comorin area in the early morning of 26th and became a low pressure area over the same region in the forenoon of the same day. Continuing to move in the same direction, it became less marked over the Maldives and adjoining Lakshadweep area.

## 10. 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.

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