



Cyclone **TAUKTAE** Forecast

भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

Cyclone Warning System of IMD

Forecast and Early Warning System

Initial conditions
(Observations)

Broad Classification of Observations

Space Based

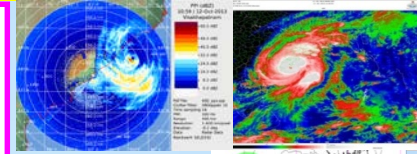
- Geostationary Satellites
- Polar Orbiting Satellites

Upper Air

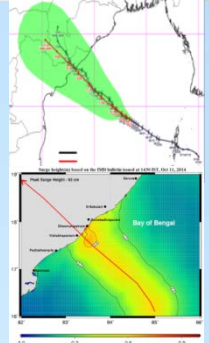
- Pilot Balloon
- RSRW
- Profiler
- Ground Based RADAR
- Aircraft

Surface

- AWS
- ARG
- SYNOP
- BUOYS
- AVIATION
- SHIPS



Action



Ensemble Pred. Model
GEFS(1534/574), UMEPS

Global Models
GFS(T1534/574), Unified Model

Regional Models
WRF (3/2KM), HWRF(18/6/2kms)

Model runs

Forecaster

Decision maker

Numerical forecasts

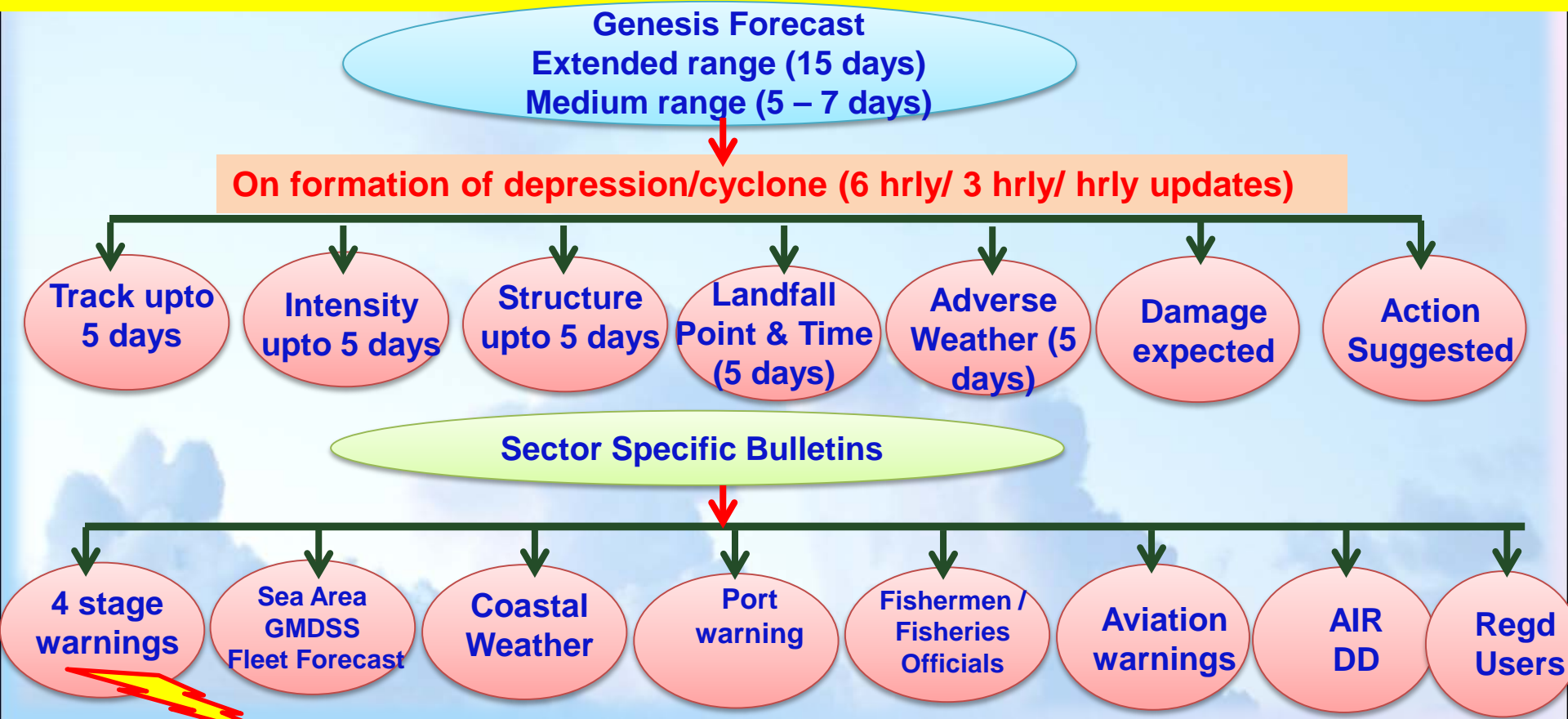
End forecast

Hazard and Risk analysis

- Preparedness
- Early Warning system (EWS)
- Prevention
- Mitigation

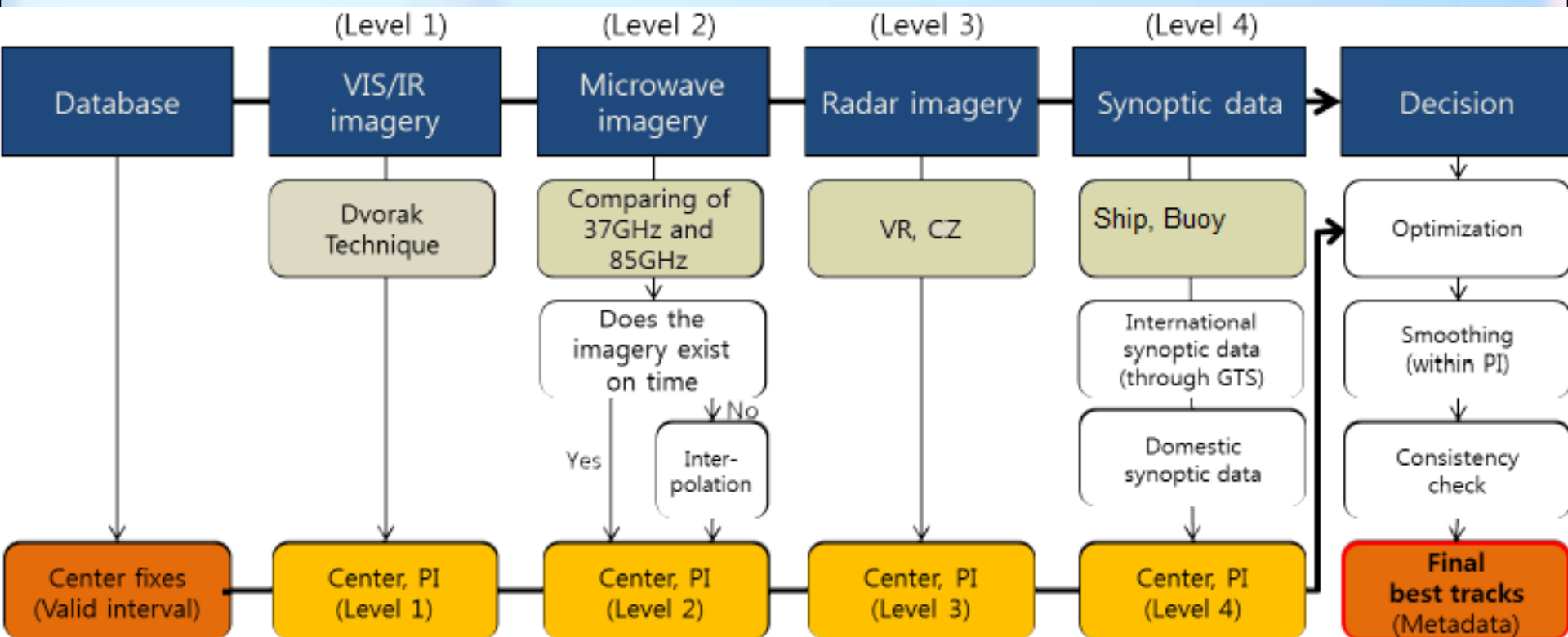
Significant improvement in Forecast and Early warning system with respect to all the above components

Cyclone Forecasting and Warning Process

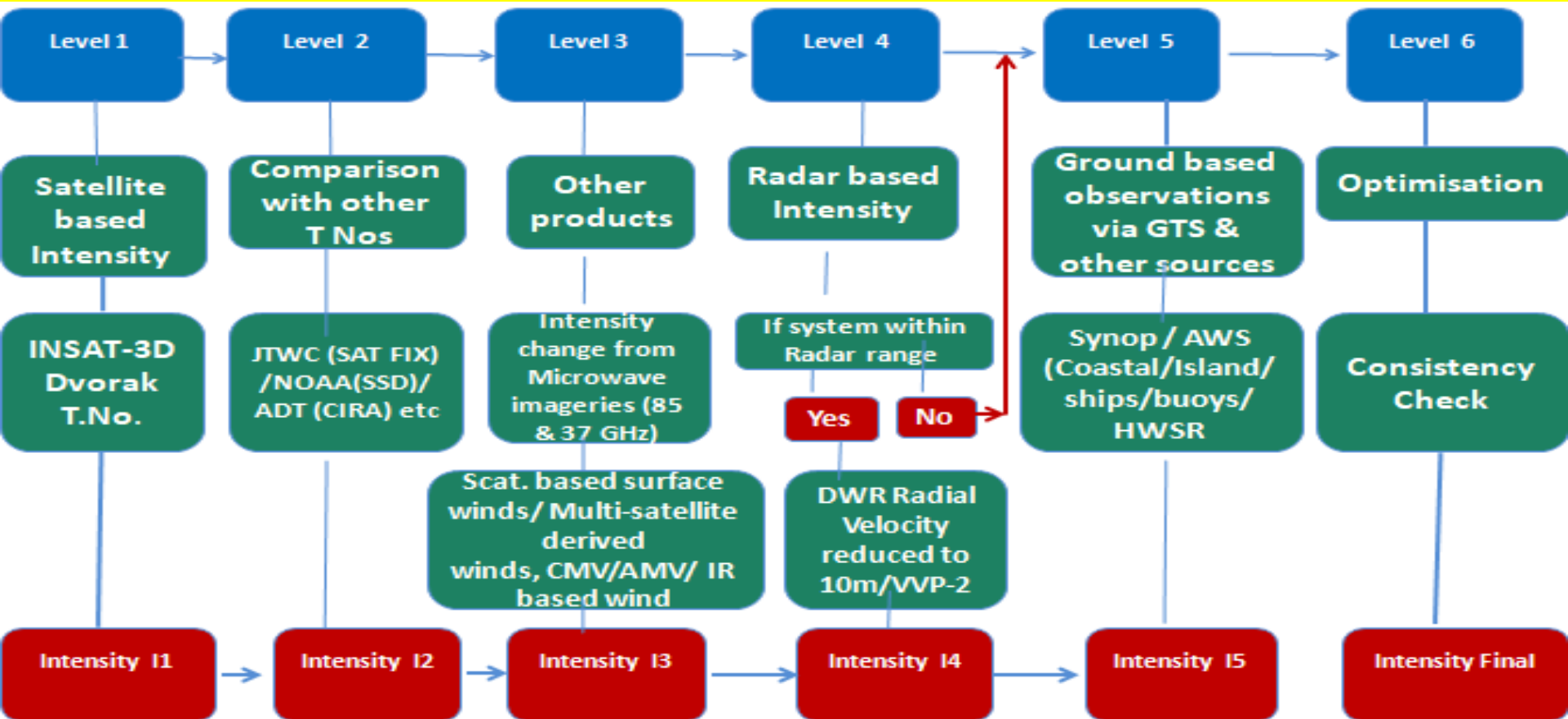


Pre-cyclone watch (Yellow)–72 hrs , Cyclone Alert (Orange)–48 hrs , Cyclone warning (Red)–24 hrs,
Post-Landfall Outlook- 12 hrs before landfall, De-Warning- When Cyclone weakens.

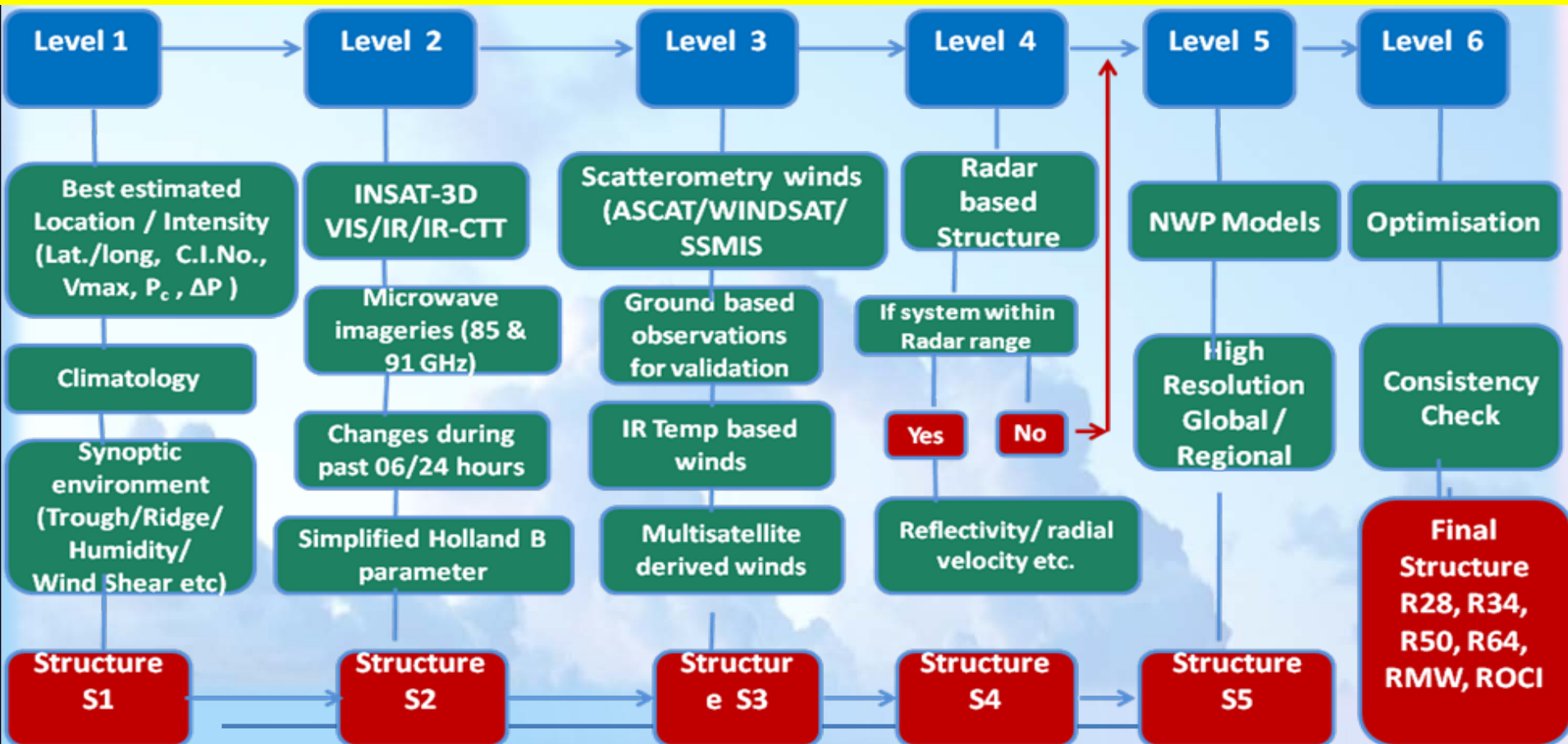
Determination of Centre of Tropical Cyclone



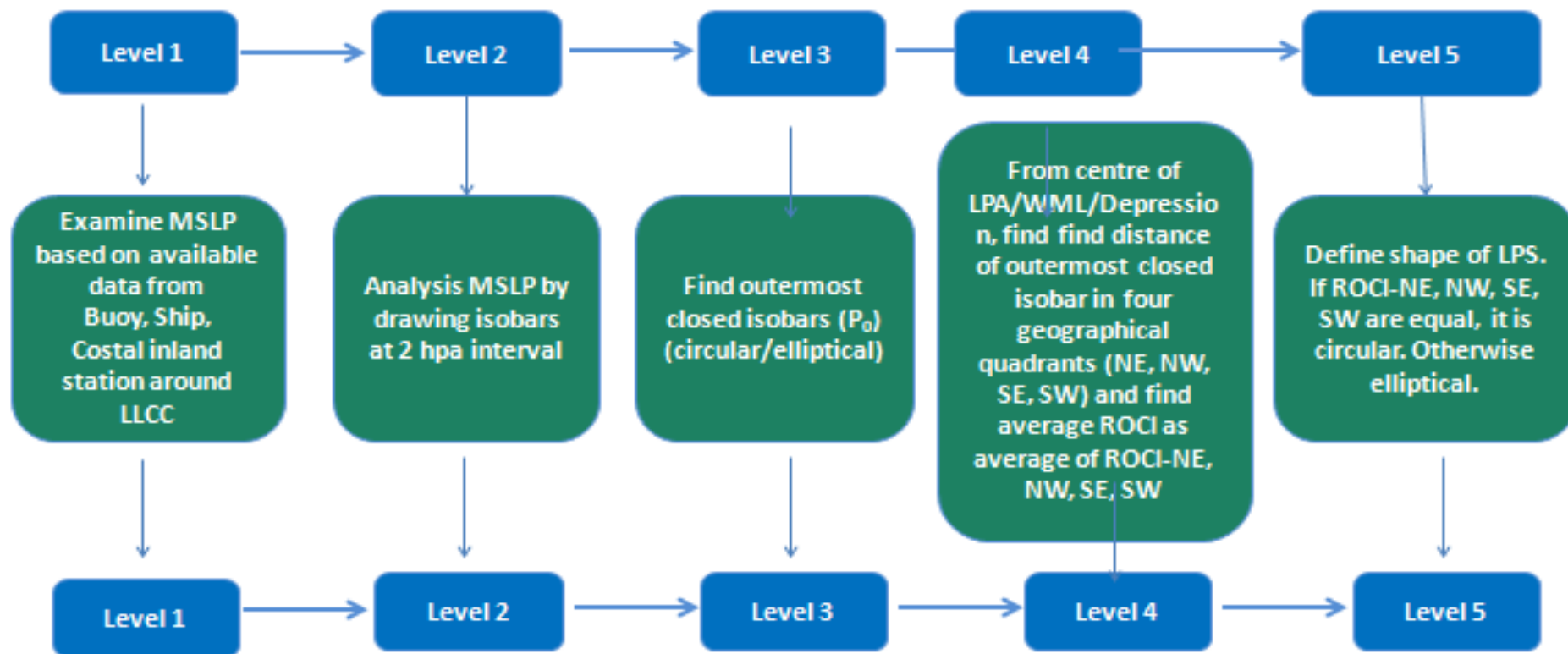
Determination of Intensity of Tropical Cyclone



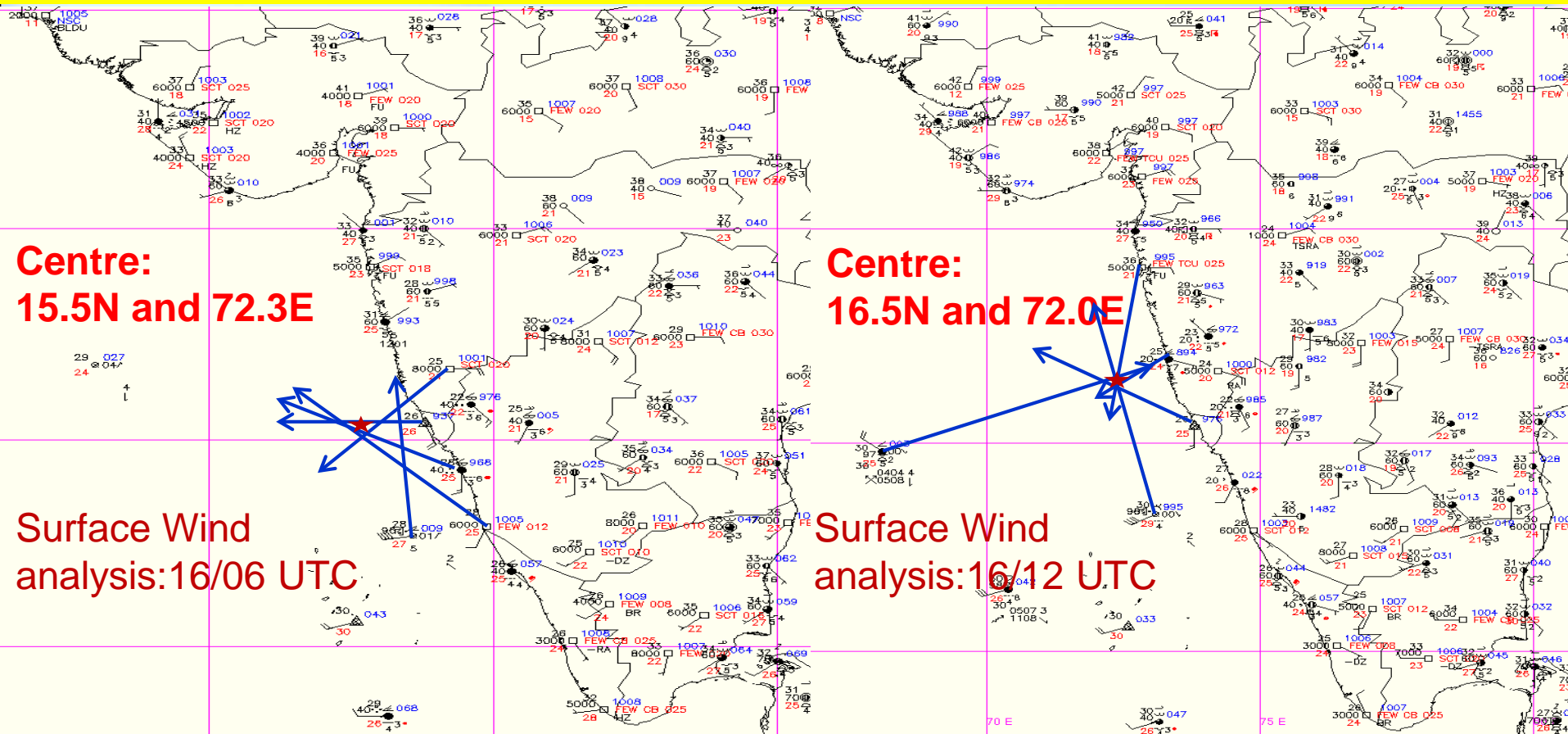
Methodology for TC wind radii monitoring



Determination of shape and size



Surface Observations—Centre based on surface wind



Satellite Technique:

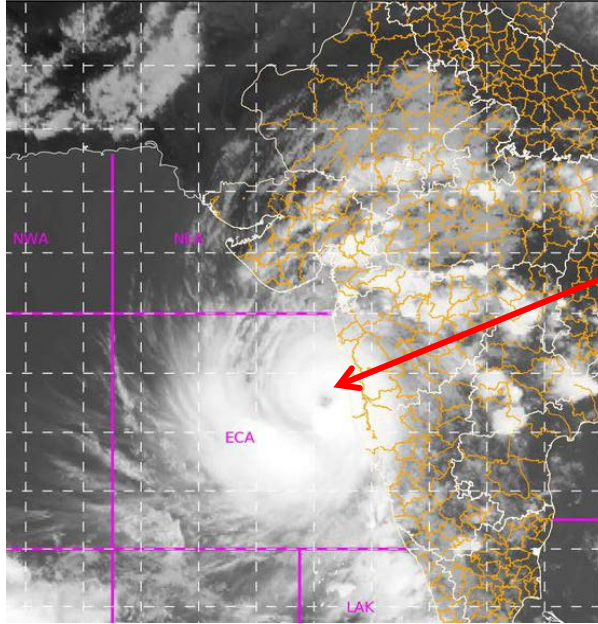
Step 1: Locating the centre of the system at 1200 UTC of 16 May 2021

Location History

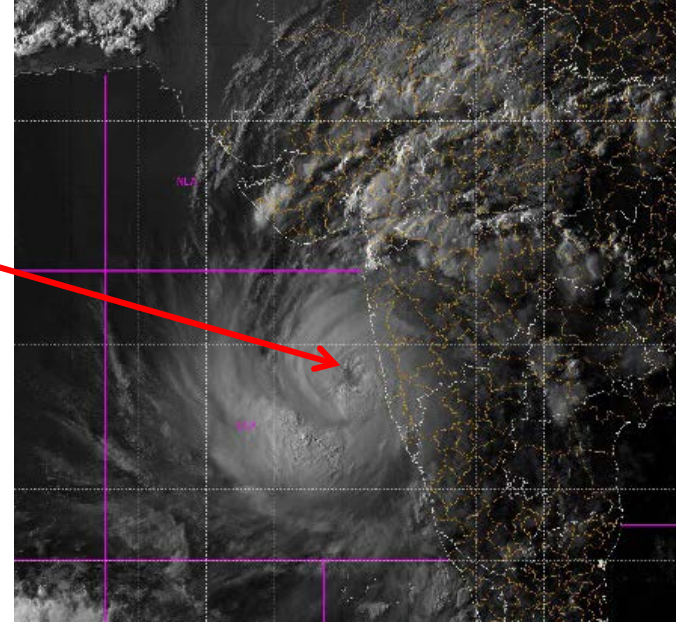
Date and Time (UTC)	Centre Position
16.05.2021 0000	72.7 E – 15.0 N
16.05.2021 0300	72.7 E – 15.4 N
16.05.2021 0600	72.7 E – 15.8 N
16.05.2021 0900	72.7E – 16.3N



Determination of Centre at 1200 UTC of 16 May 2021

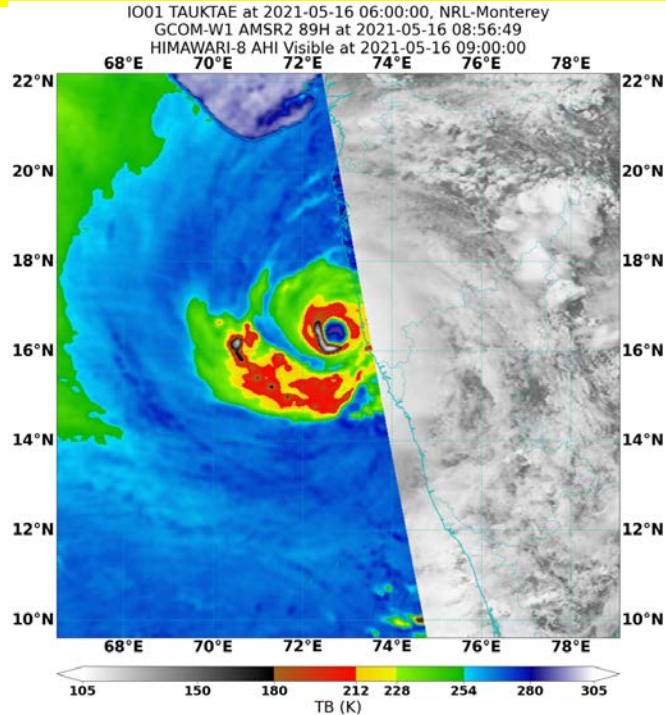


EYE

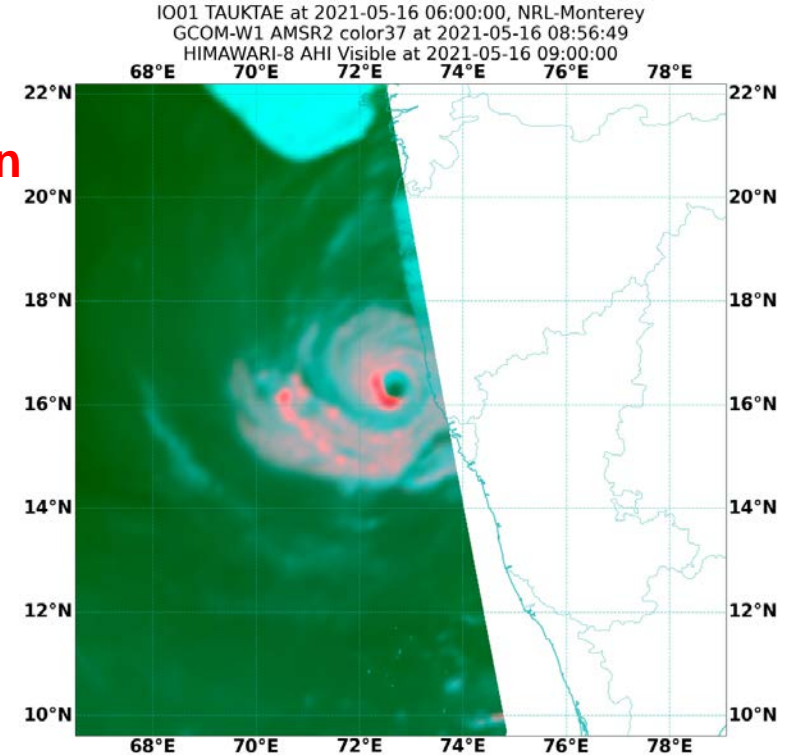


- Presence of Eye in IR as well as Visible makes the centre clear at 72.5E 16.9N

Latest Microwave imagery 0856Z



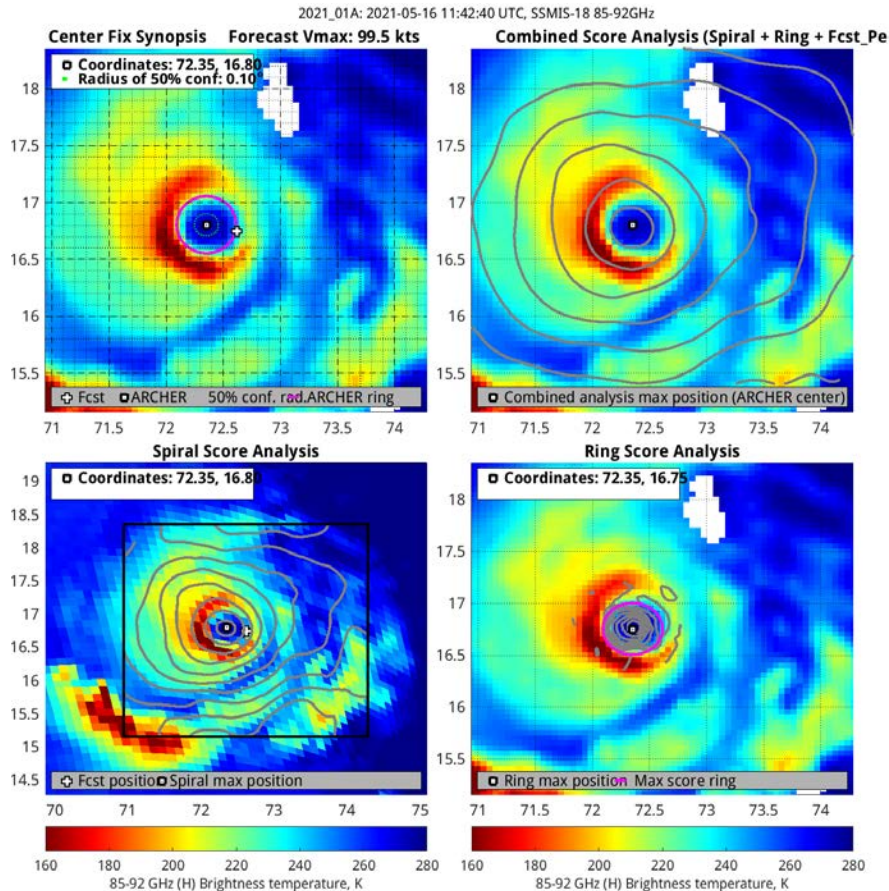
Eye
Centre position
72.8E 16.2N



35 H exposes eye indicating cloud free region at the lower levels

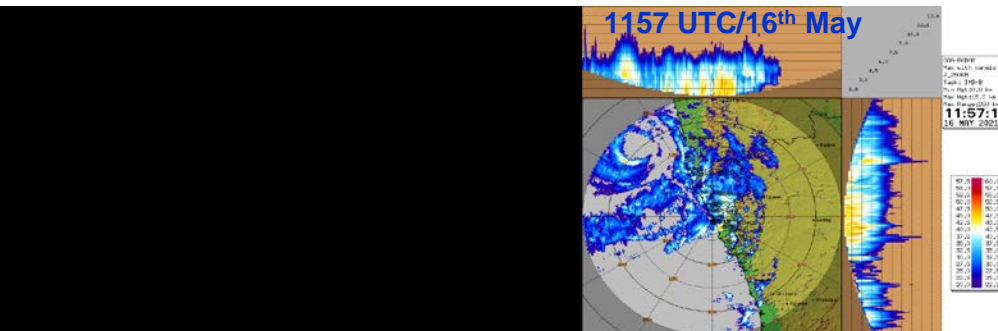
85H clearly shows eye with surrounding intense convective eye wall along with banding feature embedded with intense convective cells

ARCHER :Automated Rotational Center Hurricane Eye Retrieval Based on microwave imagery



- **16 MAY 2021 1142UTC**
- **Position: 72.35E 16.80 N**
- **Eye wall structure surrounding the centre is clearly observed with more intense convection in South-west sector of the system centre.**
- **Eye size is roughly 0.4°**
- **Radius of 50% confidence: 0.1° is indicative of high level of confidence in the centre position.**

Observations from DWR Goa at 1200 UTC of 16th May



Time: 16/05/2021 1730 IST

1.	Name of the Station	DWR GOA
2.	Date & Time of observation (UTC)	16/05/2021 1200 Z
3.	Name of Cyclone	<u>Tauktas</u>
4.	Information about the Eye of the Cyclone	
	a) Is the Eye Visible	Visible
	b) Shape of the Eye	Broken Circle
	c) Diameter of the Eye (km)	48.5 km
	d) Estimation of centre of the cyclone based on Eye/Spiral band observation	16.7175 N & 72.4735 E (Approx) Dist:- 198.6 km from the radar. Azimuth:- 313.9
	e) Echo top (20 dBZ level) of rain bearing clouds around the cyclone within 100 km radius	12.6 km
	f) Maximum radar reflectivity (dBZ) in eye wall and Spiral band region, its height (km) and position (azimuth and distance from the radar)	44.50 dBZ, 2.0 km (Height), Azimuth: 303.7 Distance: 183.8 km
	g) Maximum reflectivity at any other area (spiral/ streamers etc)	49.50 dBZ/5.6 km (Height)/174.1 deg/39.0 km Max ref/height/bearing/range
	h) Maximum radial velocity in eye wall and Spiral band region observed (mps), its height (km) and its position (azimuth and distance from the Radar)	50.08 mps/3.1 km/325.2 deg./198.3 km From Radar
	i) Maximum velocity in any other area (spiral / streamers / rain shields etc)	29.98 mps/0.6 km/233.2 deg./68.2 km From Radar
5.	Tendency of the Cyclone	
	a. Intensity (Increasing/Decreasing)	
	b. Duration for which the information on movement pertains to	01 hours 1100 UTC of 16/05/2021 to 1200 UTC of 16/05/2021
	c. Direction of Movement	NNW
	d. Estimated speed of Movement	20.00 kmph
6.	Any other Significant Feature	Light to Moderate rainfall likely at many places in U. Kannada, Udupi, Shimoga, Dharwad, Kolhapur, Sangli. Heavy to intense rainfall spells likely at most places over North Goa and South Goa districts. Gusty winds with speed of 80-90 km/hr likely over Goa.
7.	Confidence	High

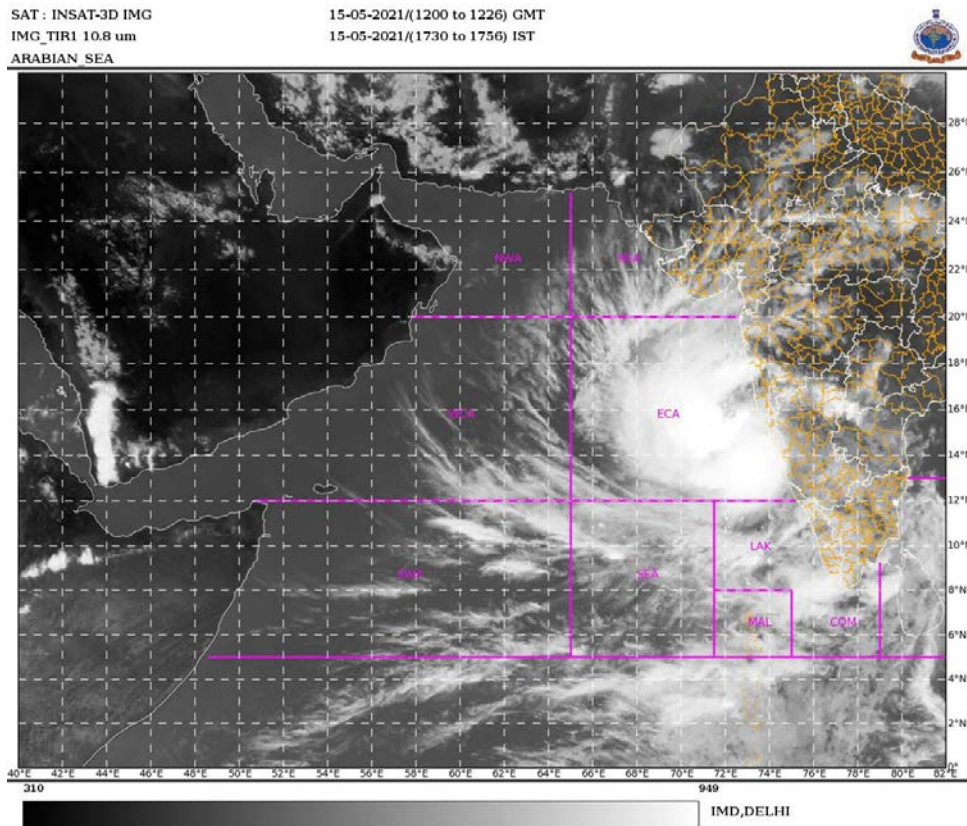
Date	Centre	Eye
16/11	16.6/72.6 (High confidence)	Visible
16/12	16.7/72.5 (High confidence)	Visible

Determination of location and intensity at 16/1200UTC

Centre	Lat./Long.
IMD Sat	16.9/72.5
Microwave	NA
ASCAT	NA
ADT	16.78/72.6
JTWC	16.79/72.47
SATCON	16.78N - 72.67 E
ARCHER/ 1142 UTC	16.80 N - 72.35E
CIRA	16.7/72.5
RADAR	16.7/72.5
IMD Previous forecast based	16.5/72.4
IMD FINAL at 1200 UTC	16.7/72.5

Step 2: Satellite Technique

Intensity estimation at 16 May 2021/1200UTC

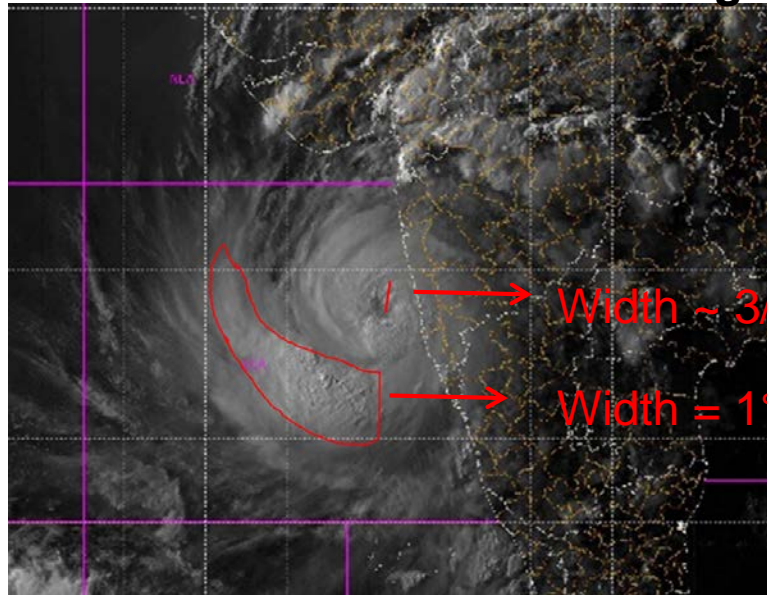


Location and Intensity History

Date and Time (UTC)	Centre Position	T No.	Confidence
16.05.2021 0000	72.7 E – 15.0 N	T 4.0	LOW (Only IR)
16.05.2021 0300	72.7 E – 15.4 N	T 4.0	HIGH (Microwave)
16.05.2021 0600	72.7 E – 15.8 N	T 4.5	HIGH (Eye)
16.05.2021 0900	72.7E – 16.3N	T 4.5	HIGH (EYE + microw)

Step2: Decision on pattern for Intensity estimation

16TH MAY 2021 1200 UTC VIS imagery



Presence of ragged eye indicates **EYE** pattern

Measurements as per the EYE pattern

Embedded distance : about 80 km = E5.0

Eye adjustment : Ragged eye = -1

Banding feature : 1 degree width = 0.5

Hence $CF = E + E_{adj} = 5 + (-1) = 4.0$

$BF = 0.5$

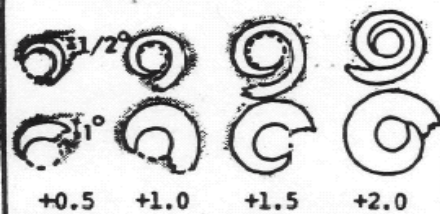
$DT = CF + BF = 4.0 + 0.5 = 4.5$

Embedded Distance	> 1°	= 1°	= 3/4°	= 1/2°	= 1/4°	Banding Eyes		
Average Band Width						1 1/4°	3/4°	1/4°
	E7	E6	E5	E4	E3	E5	E4	E3

Eye Adjustment Rules:

- Poorly defined or ragged eyes: Subtract 1/2 for E ≤ 4.5 and 1 for E ≥ 5.
- Large eyes: Limit T-no. to T6 for round, well-defined eyes, and to T5 for large ragged eyes.
- For MET ≥ 6, .5 or 1 may be added to DT for well defined eye in smooth CDO when DT < MET.

Banding Feature Additions:

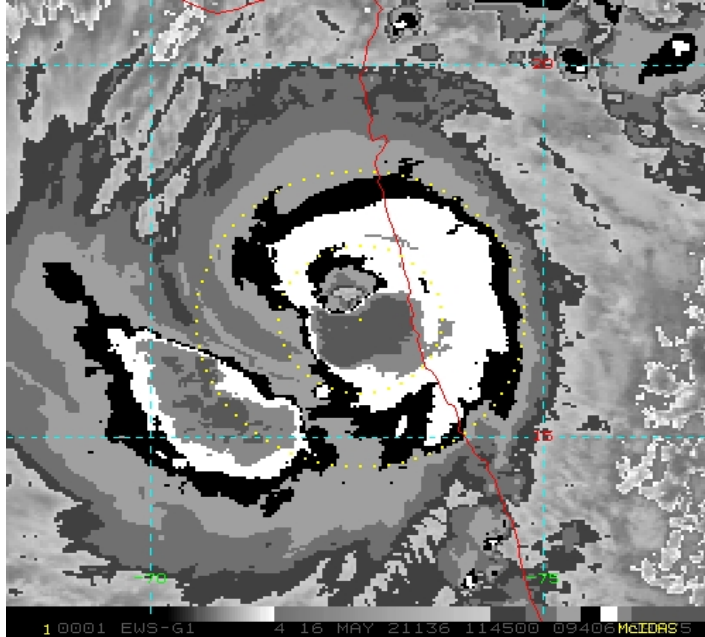


$$CF = E + E_{adj}$$

BF

Enhanced Infra-red based analysis

16TH MAY 2021 1200 UTC EIR imagery



Narrowest width more than 0.4 surrounded by Light grey shade > E5.0

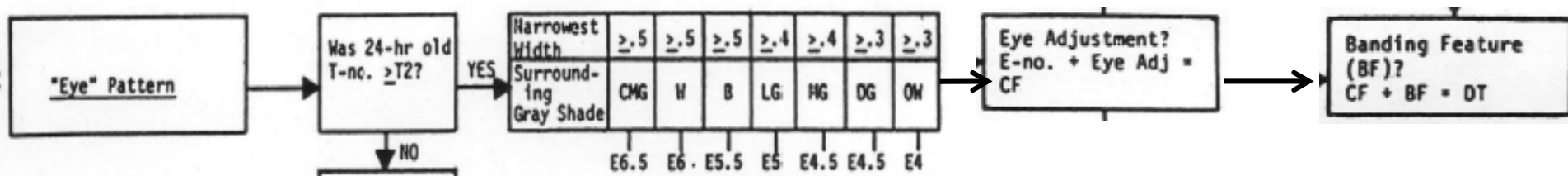
Eye adjustment : Ragged eye > -1

Banding feature : 1 degree width > 0.5

Hence $CF = E + E_{adj} = 5 + (-1) = 4.0$

$BF = 0.5$

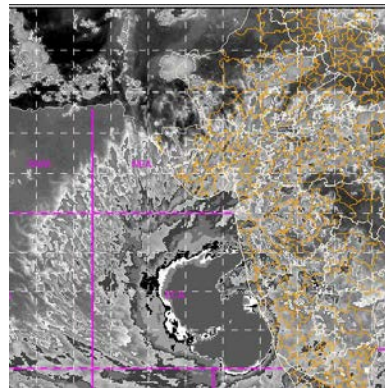
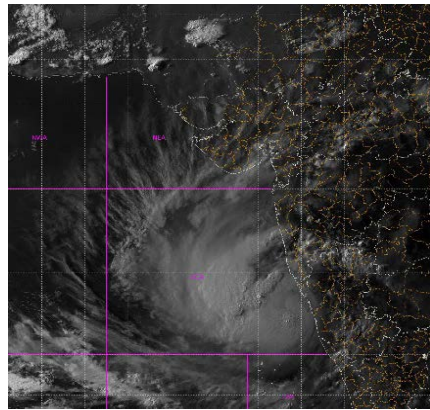
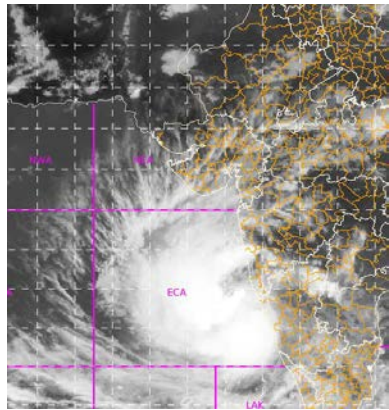
$DT = CF + BF = 4.0 + 0.5 = 4.5$



TAUKTAE : 24hr change analysis for measurements of

Model Expected T No

15TH MAY 2021 1200 UTC



Changes observed over 24 hrs

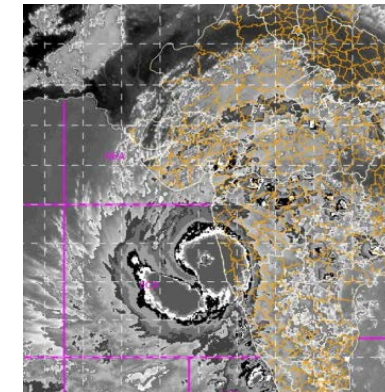
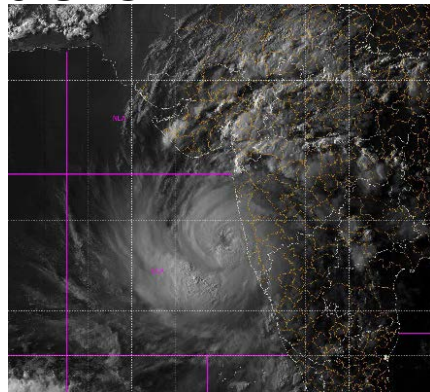
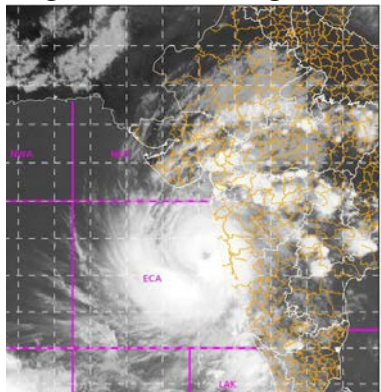
Emergence of Eye feature

Distinct Banding feature

Increase in outflow

Indicative of steady growth

16TH MAY 2021 1200 UTC



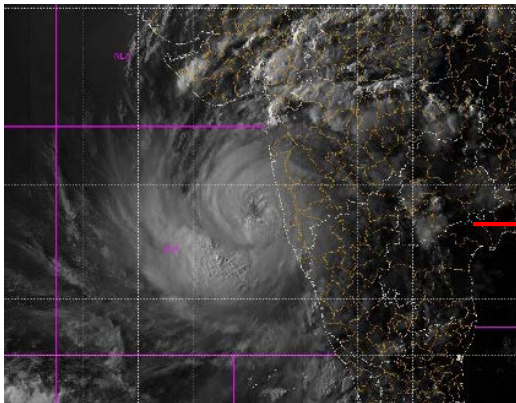
24 hrs old T number = 3.5

Hence **MET = 24 hrs old T no + 1**

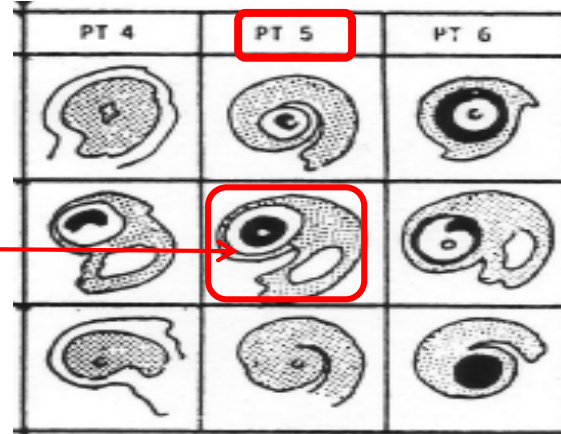
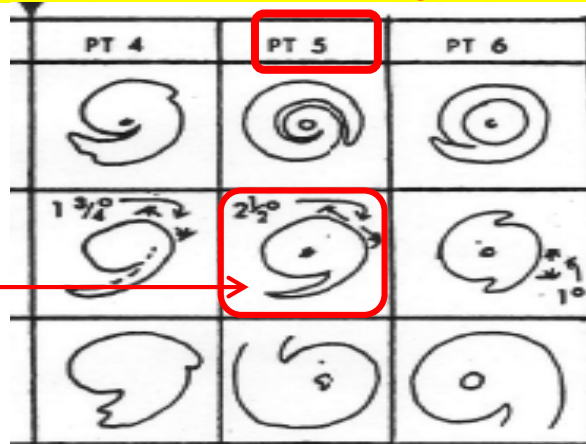
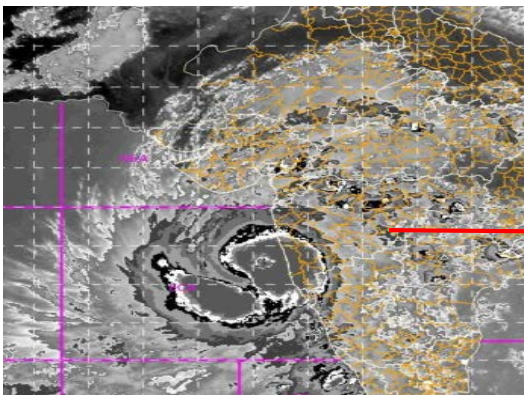
MET = 3.5 + 1 = 4.5

Pattern Analysis Best pattern match yields PT = 5.0

VISIBLE



Enhanced IR



Presence of Ragged eye at the centre and pointed banding feature

SPECIAL BULLETIN 16TH MAY 2021

TCIN50 DEMS 161200

A. TROPICAL DISTURBANCE (TAUKTAE)

B. 16/1200Z

C. 16.9N

D. 72.5E

E. **T 4.5/ 4.5/ D1.0/ 24HRS**

F. INSAT-3D / 3DR / F18 SSMIS

G. VIS / IR / MICROWAVE

H. REMARKS: THE SYSTEM HAS MOVED NORTH-NORTH WEST IN LAST 3 HOURS. RAGGED EYE IS OBSERVED. EYE TEMPERATURE MINUS 37 DEG C. CLOUD WALL TEMP MINUS 93 DEG C.

MICROWAVE IMAGE OF F-18 SSMIS AT 0940 UTC EXPOSES THE CENTRE WITH CLOUD FREE REGION AND SHOWS INTENSE CONVECTION IN THE WESTERN SECTOR OF THE SYSTEM CENTRE.

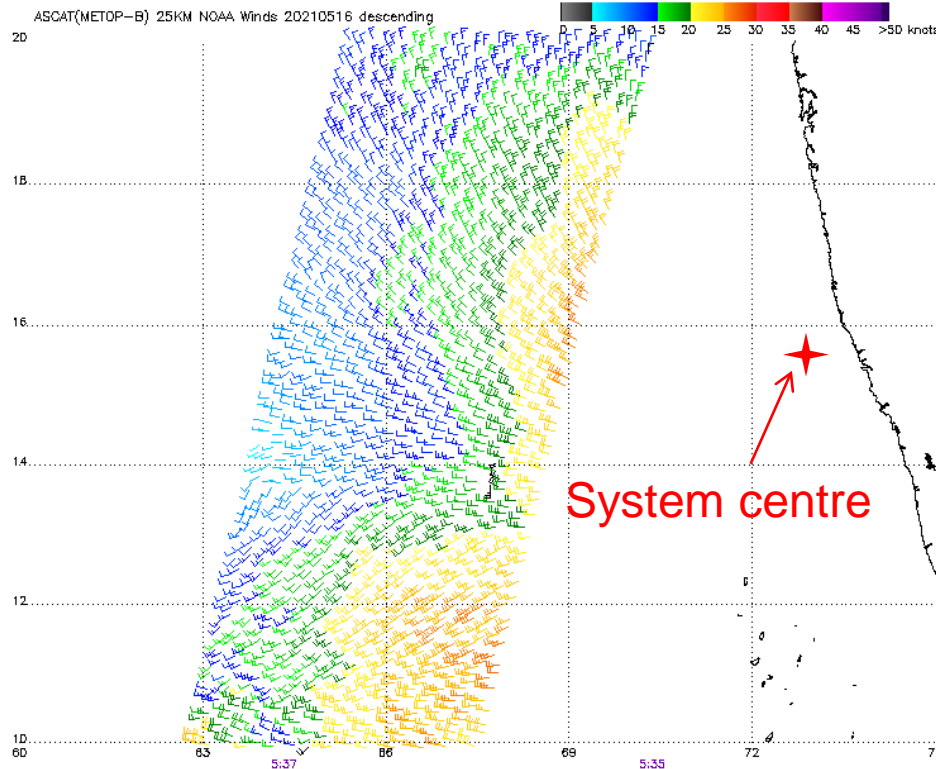
ANOTHER INTENSE CONVECTIVE CLOUD BAND LIES IN THE SOUTH-WEST SECTOR OF THE SYSTEM. THE TRANSLATIONAL SPEED OF THE SYSTEM HAS SLIGHTLY INCREASED AND IS NOW ABOUT 25KMPH IN LAST 3 HOURS.

E NO 5.0 EYE ADJUSTMENT -1.0 BF 0.5 YIELDS A DT = 4.5 MET 4.5 AND PT 5.0. FT BASED ON DT.

I. ADDITIONAL POSITIONS: Microwave 0940 UTC 72.35E 16.80 N

ASCAT

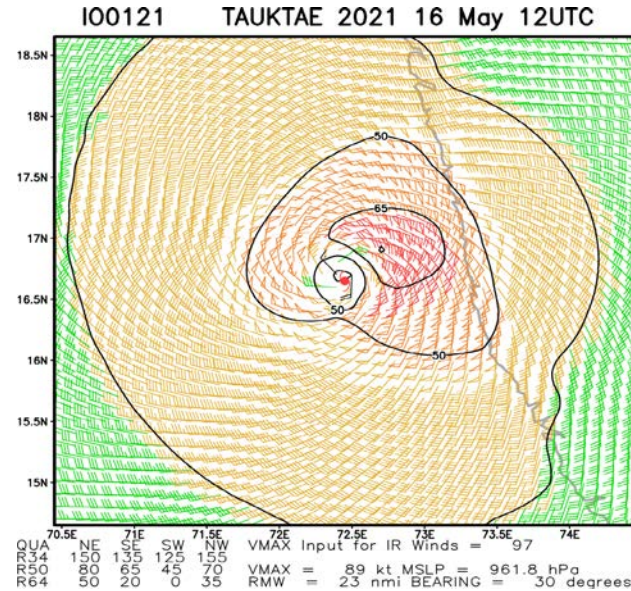
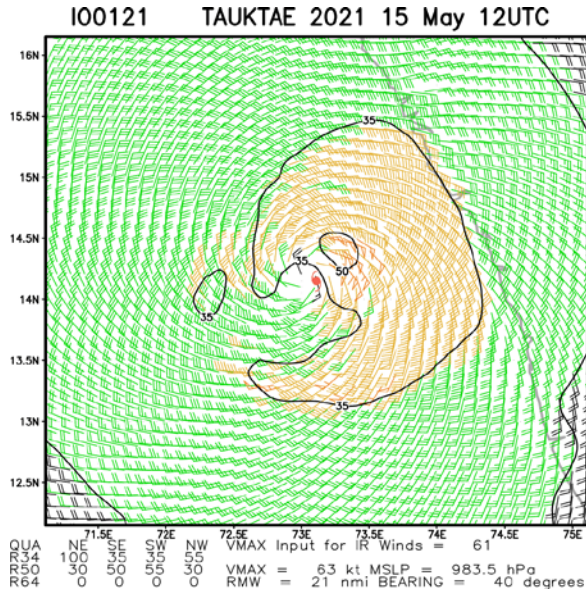
Morning Passes did not cover the system



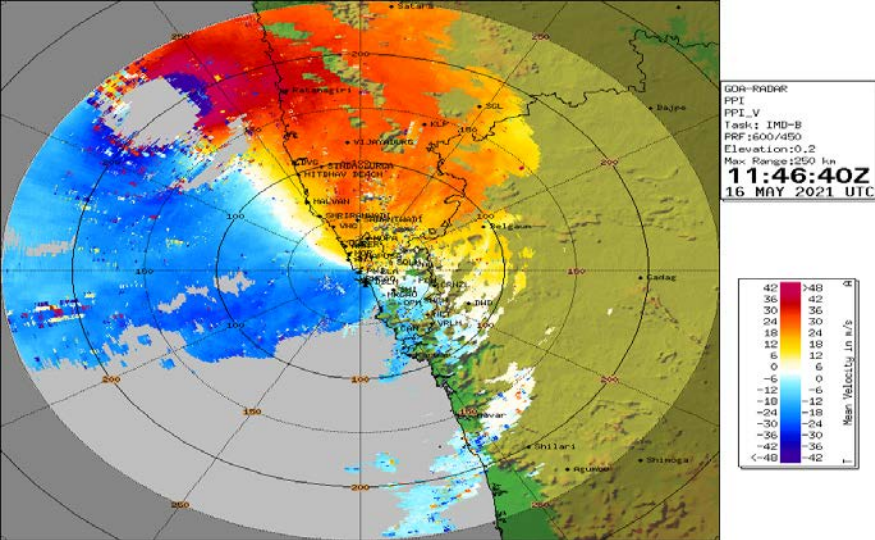
Note: 1) Times are GMT 2) Times along bottom correspond to measurement at 15N
3) Data buffer is 22 hrs from 20210516 4) Black wind barbs indicate possible contamination
NOAA/NESDIS/Center for Satellite Applications and Research

- Squally winds of 20-25 kts are observed as far as 4° away in the north western sector.
- Secondary maxima associated with the intense cloud band in the SW sector is also observed with winds reaching 20-25 kts in the south -west sector.

Multisat Surface winds at 16/1200UTC



- Multisat winds from CIRA indicate **increase in maximum sustained winds from 50kts to 65kts**
- The **winds now cover a larger area** in the NE sector of the system.
- Winds of around 40 kts are **observed even over the land mass** in the eastern sector of the system
- VMAX = 89KTS (**increased by 26kts**) and VIR = 97KTS (**increased by 36kts**)
- **SATCON (Satellite Consensus) winds at 1145 UTC = 109KTS**



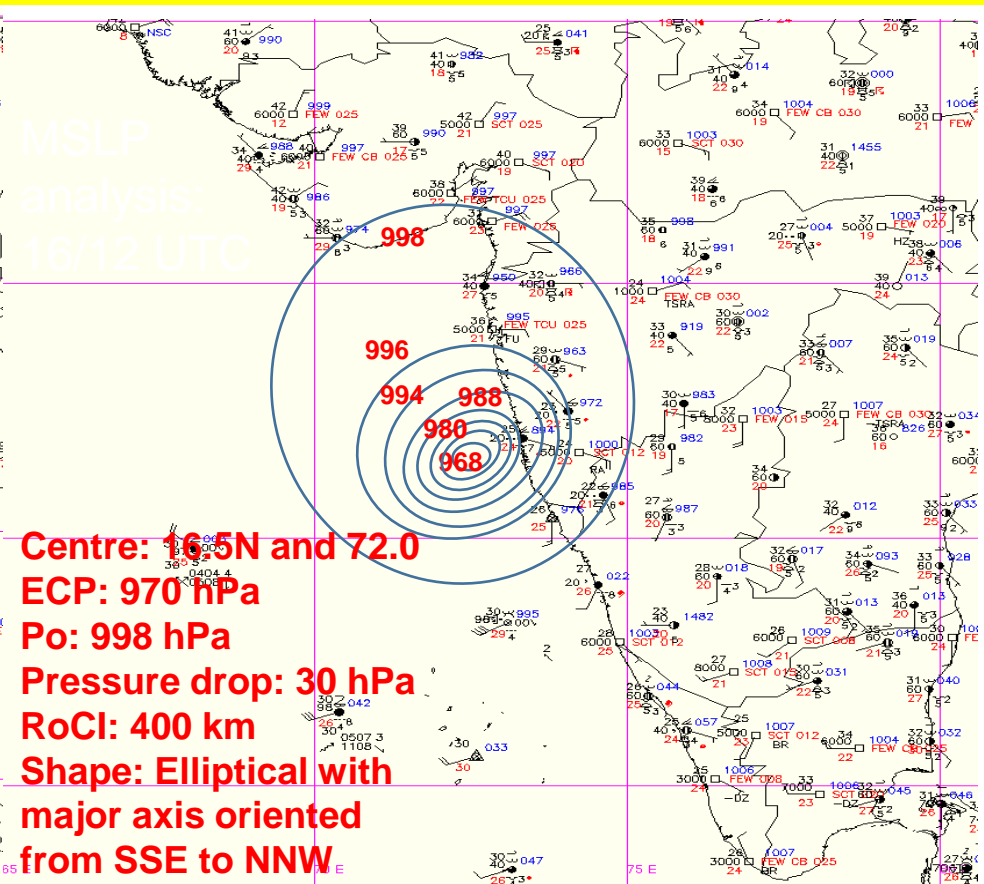
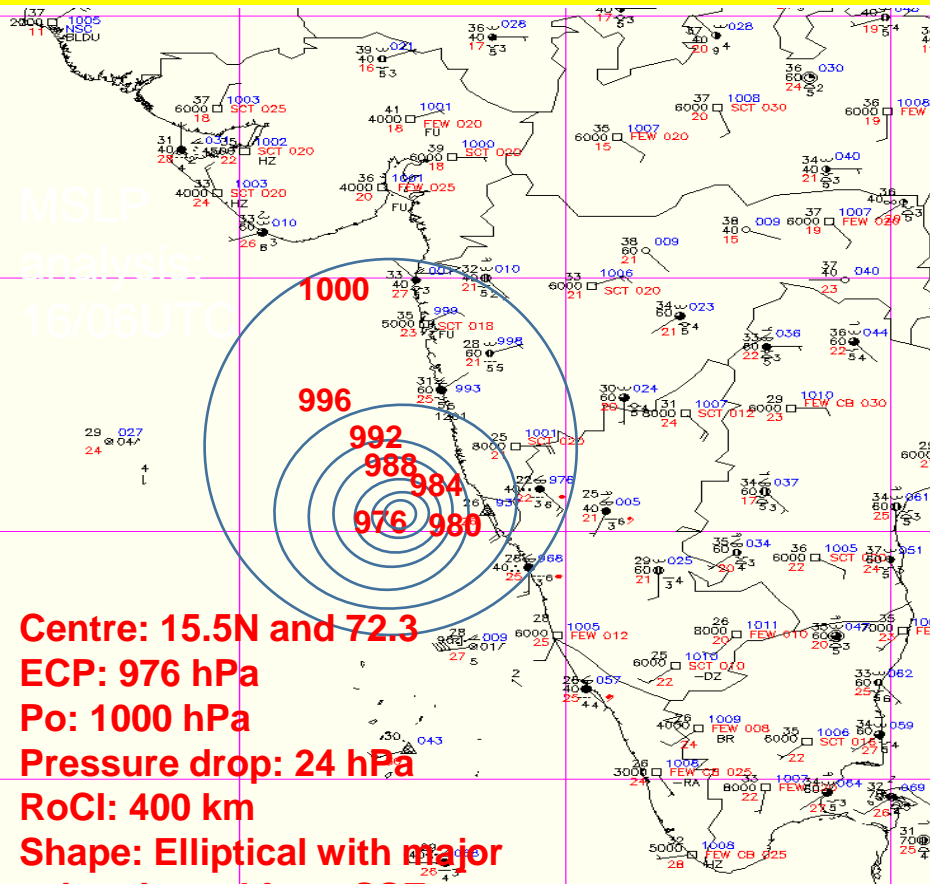
Observations from DWR Goa at 1200 UTC of 16th May

Time: 16/05/2021 1730 IST

1.	Name of the Station	DWR GOA
2.	Date & Time of observation (UTC)	16/05/2021 1200 Z
3.	Name of Cyclone	Tauktae Tauktae
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	b) Shape of the Eye	Broken Circle
	c) Diameter of the Eye (km)	48.5 km
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	e) Echo top (20 dBZ level) of rain bearing clouds around the cyclone within 100 km radius	12.6 km
	f) Maximum radar reflectivity (dBZ) in eye wall and Spiral band region, its height (km) and position (azimuth and distance from the radar)	44.50 dBZ, 2.0 km (Height), Azimuth: 303.7 Distance: 183.8 km
	g) Maximum reflectivity at any other area (spiral/ streamers etc)	49.50 dBZ/5.6 km (Height)/174.1 deg/39.0 km Max ref/height/bearing/range
	h) Maximum radial velocity in eye wall and Spiral band region observed (mps), its height (km) and its position (azimuth and distance from the Radar)	50.08 mps/3.1 km/325.2 deg./198.3 km From Radar
	i) Maximum velocity in any other area (spiral / streamers / rain shields etc)	29.98 mps/0.6 km/233.2 deg./68.2 km From Radar

Date	Centre	Eye	MSW
16/11	16.6/72.6 (High confidence)	Visible	Max. vel: 50.1 mps (83 knots)
16/12	16.7/72.5 (High confidence)	Visible	NNW 20 kmph Max. vel: 50.1 mps (83 knots) at 3.1 km height

Surface Observations: 16 May 2021

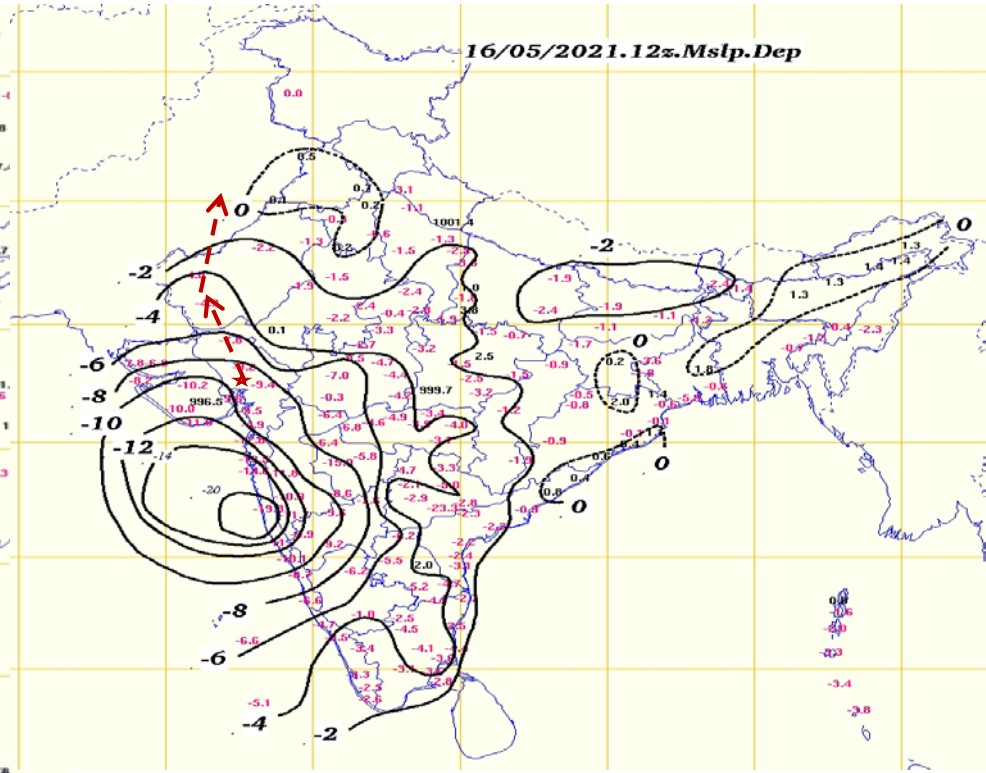
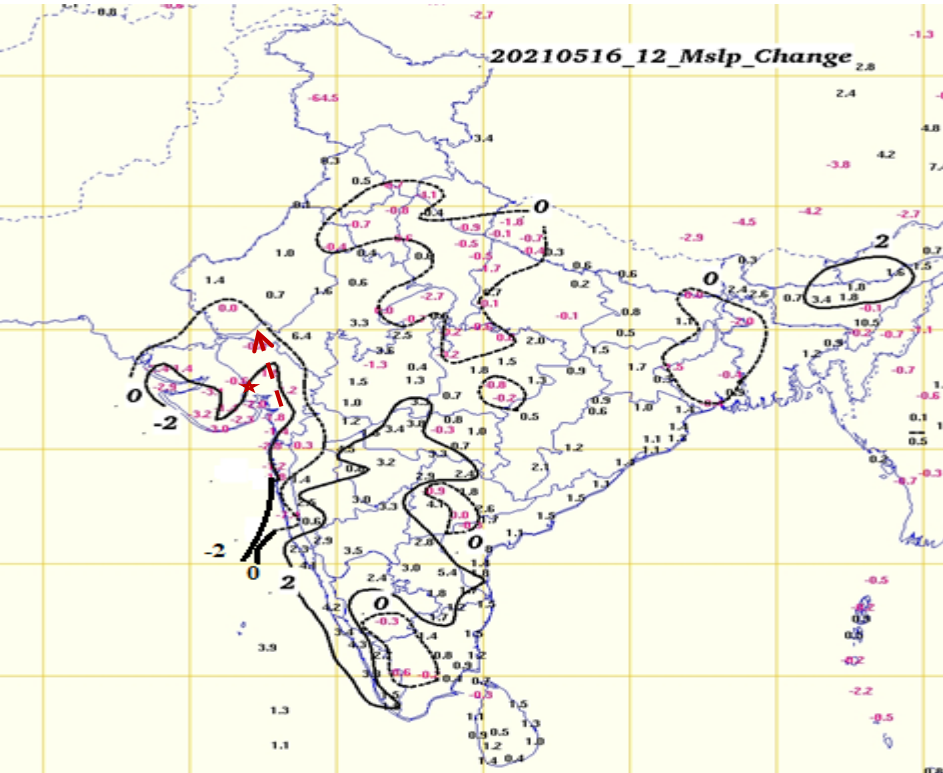


Centre: 15.5N and 72.3
ECP: 976 hPa
Po: 1000 hPa
Pressure drop: 24 hPa
RoCI: 400 km
Shape: Elliptical with major axis oriented from SSE to NNW

Centre: 16.5N and 72.0
ECP: 970 hPa
Po: 998 hPa
Pressure drop: 30 hPa
RoCI: 400 km
Shape: Elliptical with major axis oriented from SSE to NNW

16-May-2021

1200 UTC MSLP 24 Hrs Change



Determination of location and intensity at 16/1200UTC		
Centre	Lat./Long.	Intensity
IMD Sat	16.9/72.5	T 4.5
Microwave	NA	
ASCAT	NA	
ADT	16.78/72.6	T 5.8
JTWC	16.79/72.47	T 5.0
SATCON	16.78N - 72.67 E	109 kt
ARCHER/ 1142 UTC	16.80 N - 72.35E	NA
CIRA	16.7/72.5	Vmax: 89KT, VIR: 93 KT
RADAR	16.7/72.5	83 KT
IMD Previous forecast based	16.5/72.4	85 KT
IMD FINAL at 1200 UTC	16.7/72.5	85 KT

Determination of ECP and Pressure Drop

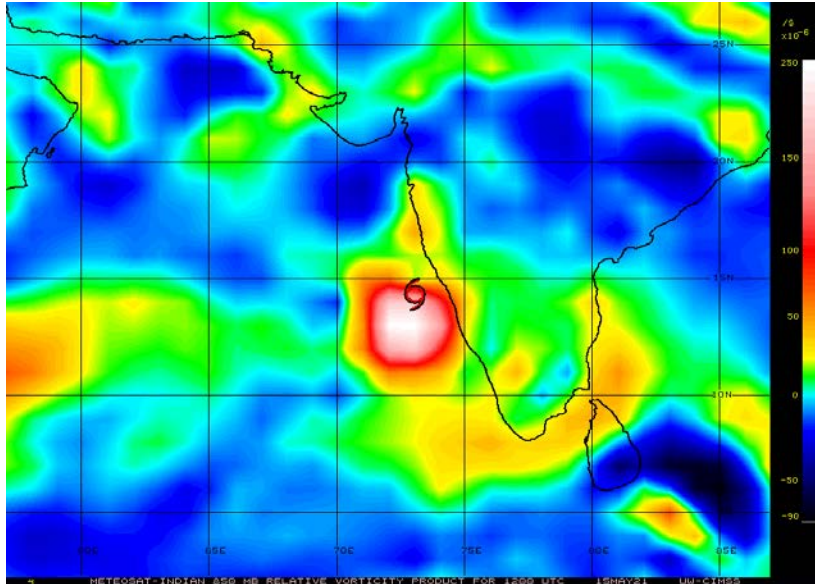
Parameter	16/12 UTC
Pressure of outermost closed isobar	998 hPa
T Number	4.5
MSW based on T number	77 knots
Pressure drop at centre	30 hPa
Estimated Central Pressure	968 hPa
Radius of outermost closed isobar	400 km
Movement during past six hours	NNW/18 kmph

Determination of size

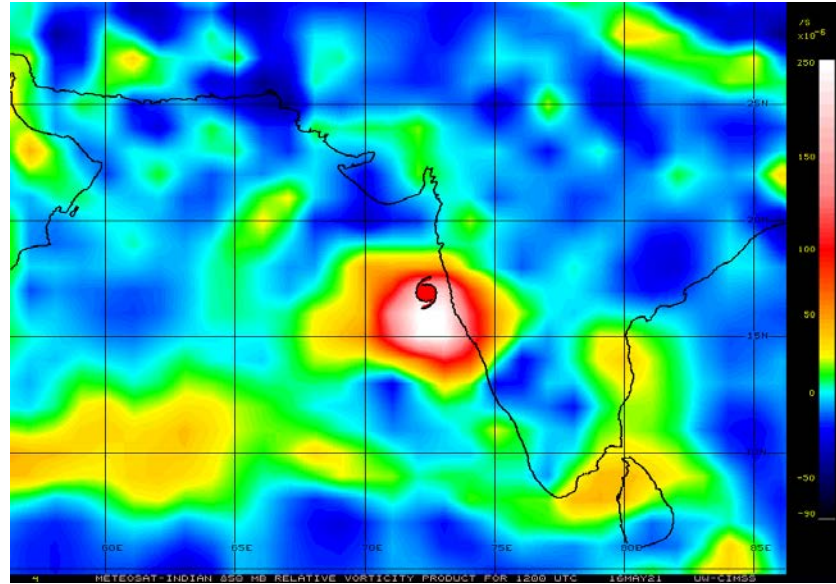
Parameter	16/12 UTC
Radius of outermost closed isobar	1000 hPa
R34 in NE sector	160 km
R34 in NW sector	200 km
R34 in SE sector	300 km
R34 in SW sector	300 km
Radius of maximum wind	120 km
Movement during past six hours	NNW/18 kmph

Dynamical Parameters analysis: Lower Level Vorticity

15TH MAY 2021 1200 UTC



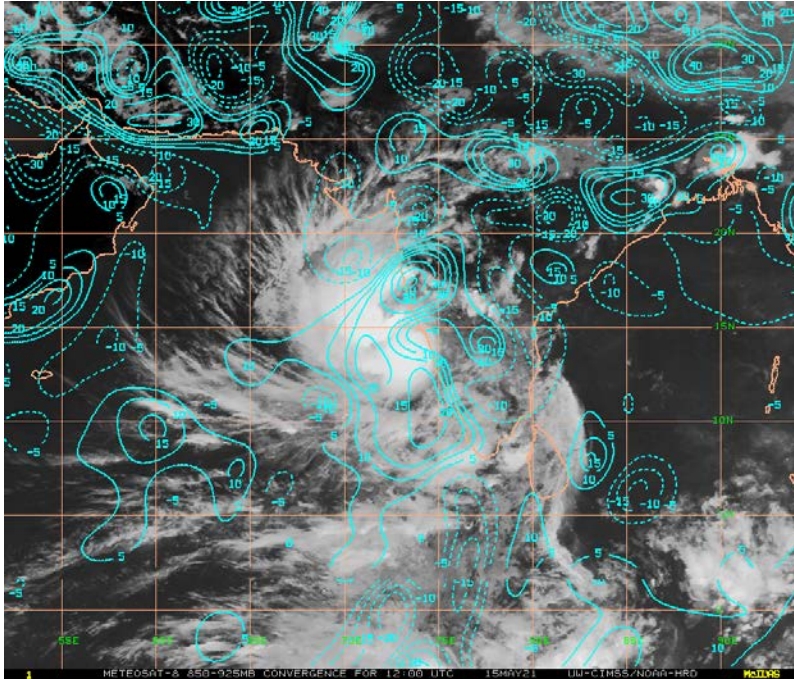
16TH MAY 2021 1200 UTC



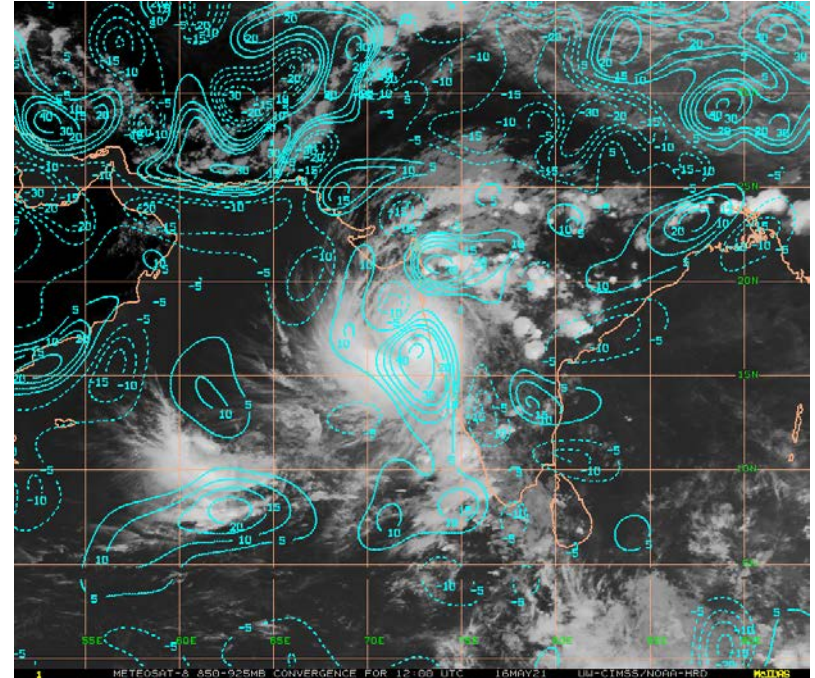
Vorticity field now covers a larger area and is more concentrated.

Dynamical Parameters analysis: Lower level convergence

15TH MAY 2021 1200 UTC



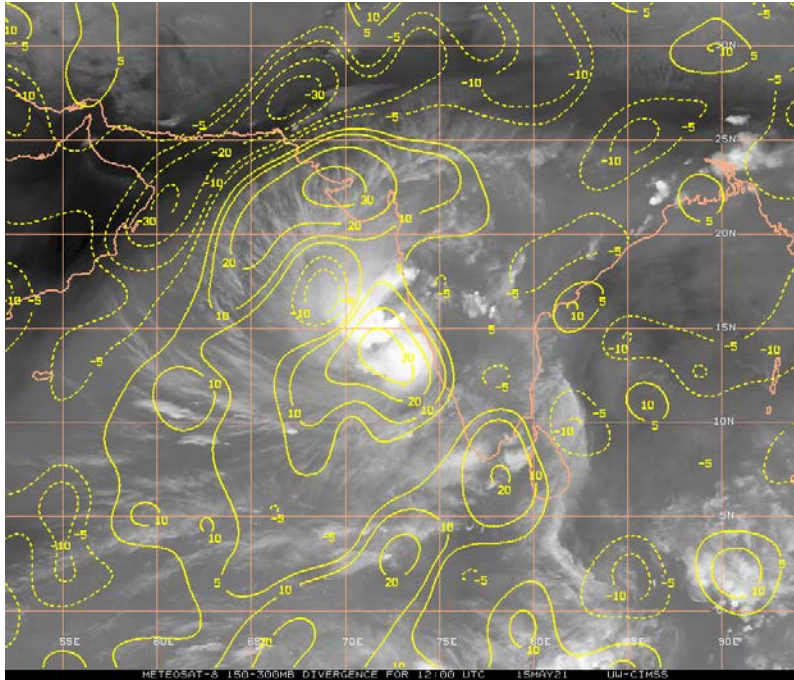
16TH MAY 2021 1200 UTC



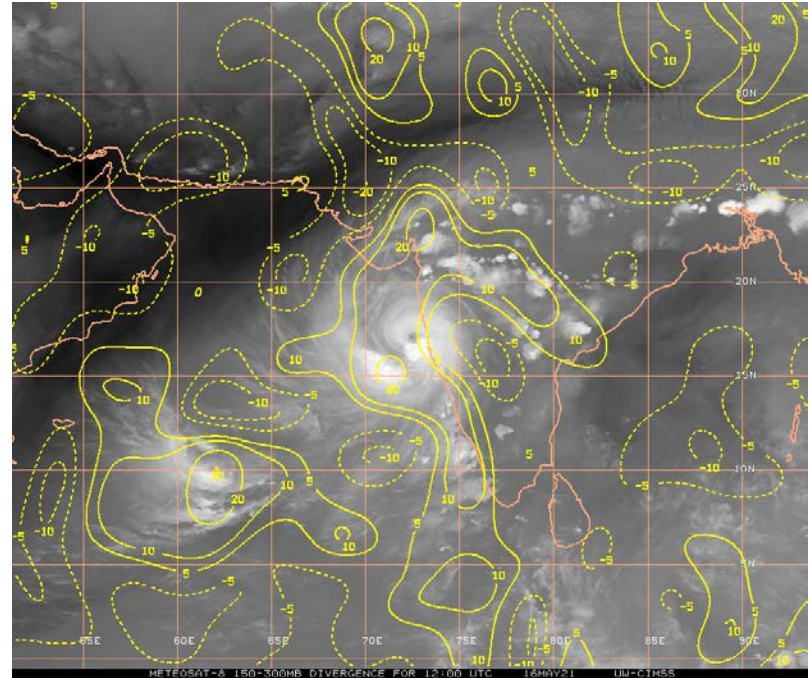
The area of convection now lies over central feature of System as opposed away from the system in 24hrs ago. The orientation of convergence is also changed now to NNW.

Dynamical Parameters analysis: Upper level Divergence

15TH MAY 2021 1200 UTC



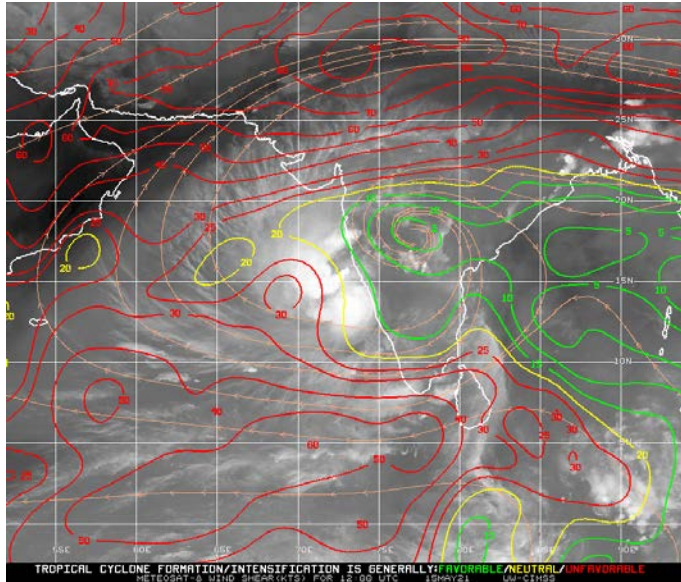
16TH MAY 2021 1200 UTC



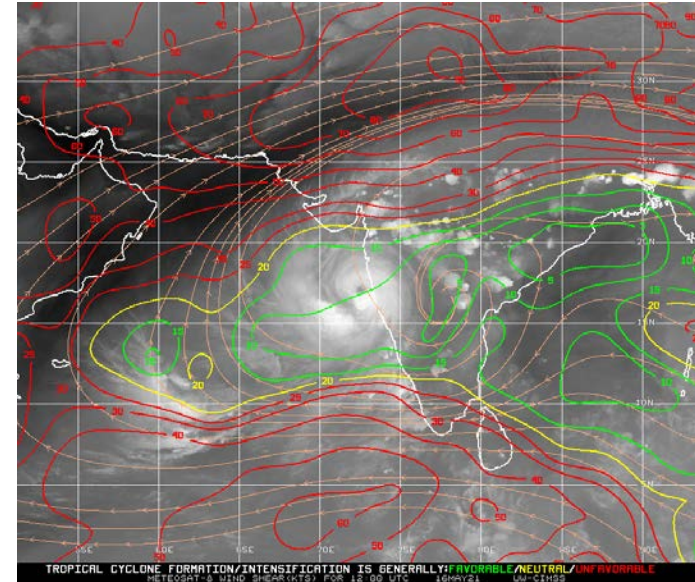
The divergence is now oriented in the north-south direction. It has decreased by 10.

Dynamical Parameters analysis: Vertical Wind Shear of Horizontal Wind

15TH MAY 2021 1200 UTC

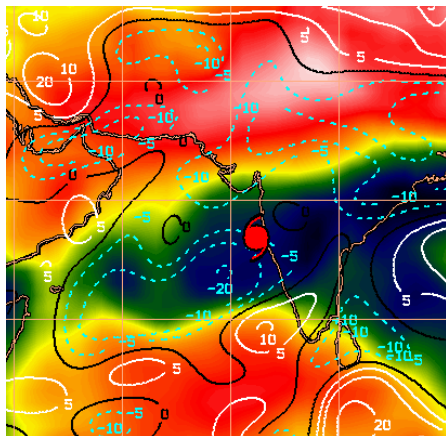
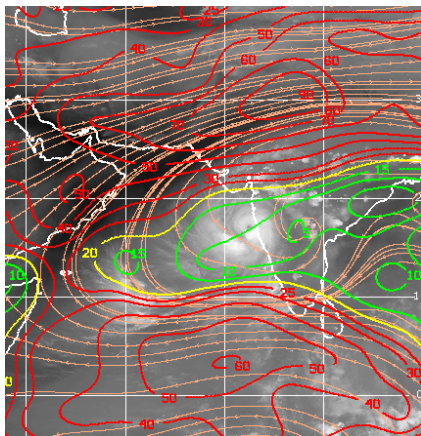
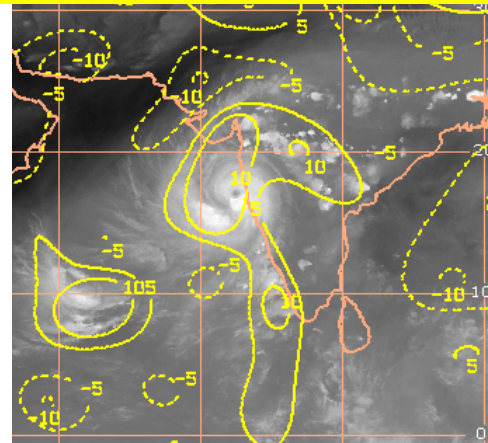
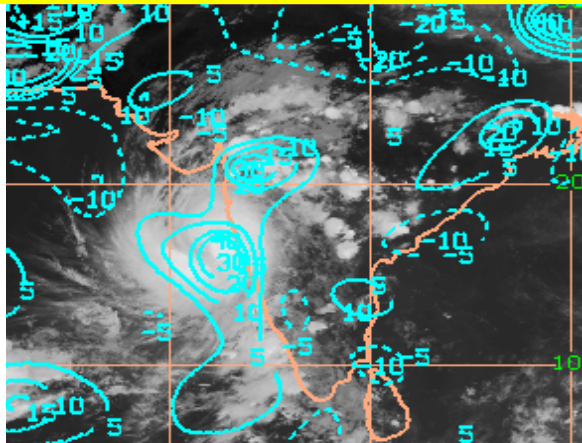
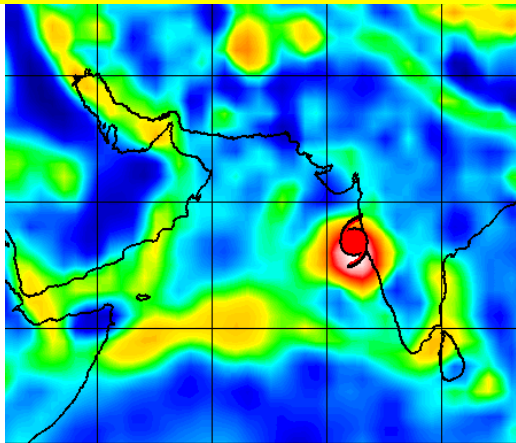


16TH MAY 2021 1200 UTC



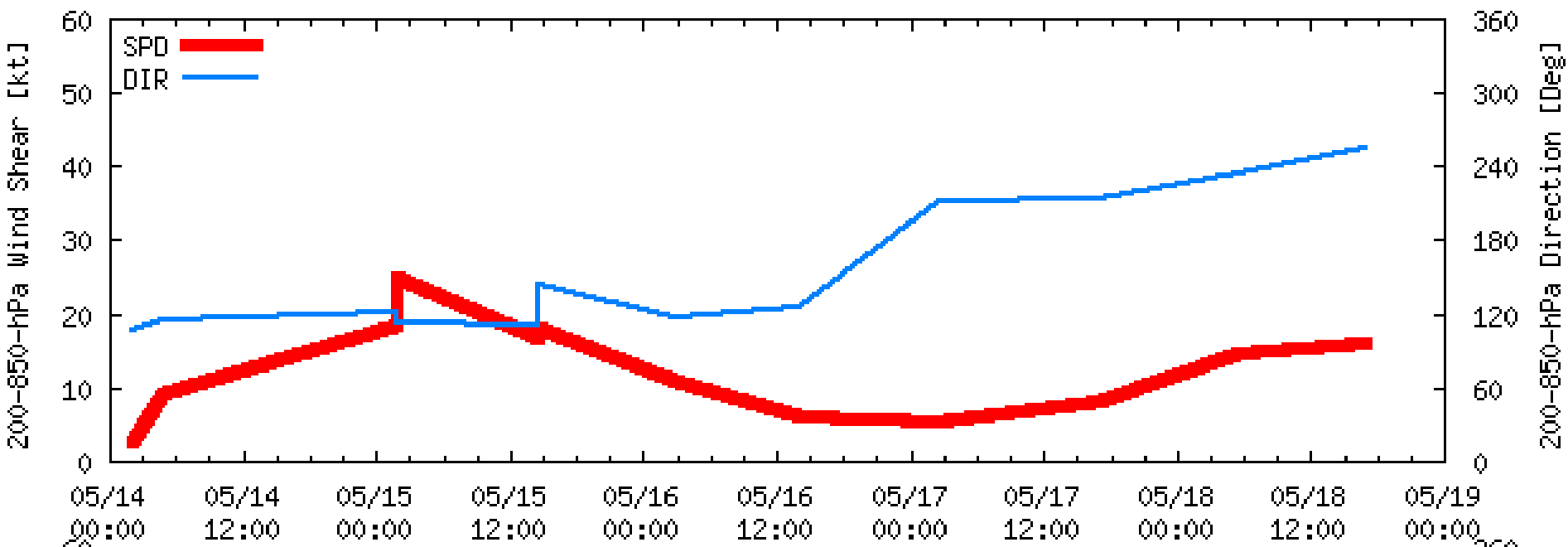
System has moved from neutral to unfavourable environment into a favourable environment in last 24 hrs. It currently lies in Shear of 10-15 kts

Dynamical and environmental parameters



PARAMETERS	VALUE (trend in last 6 hours)
CONVERGENCE	40 (0)
DIVERGENCE	10 (-10)
VORTICITY	250 (50)
WIND SHEAR	10 (-5)
WIND SHEAR TENDENCY	-5

AMSU Wind shear



SE wind shear of 10 kts is observed indicating possible movement in NNE direction.

Steering winds: High level winds



INSAT-3D 16-MAY-2021 12:00 TIR1/WV IMG

HIGH LEVEL WIND

(1 Kt = 0.5 m/s)

10 Kt

15 Kt

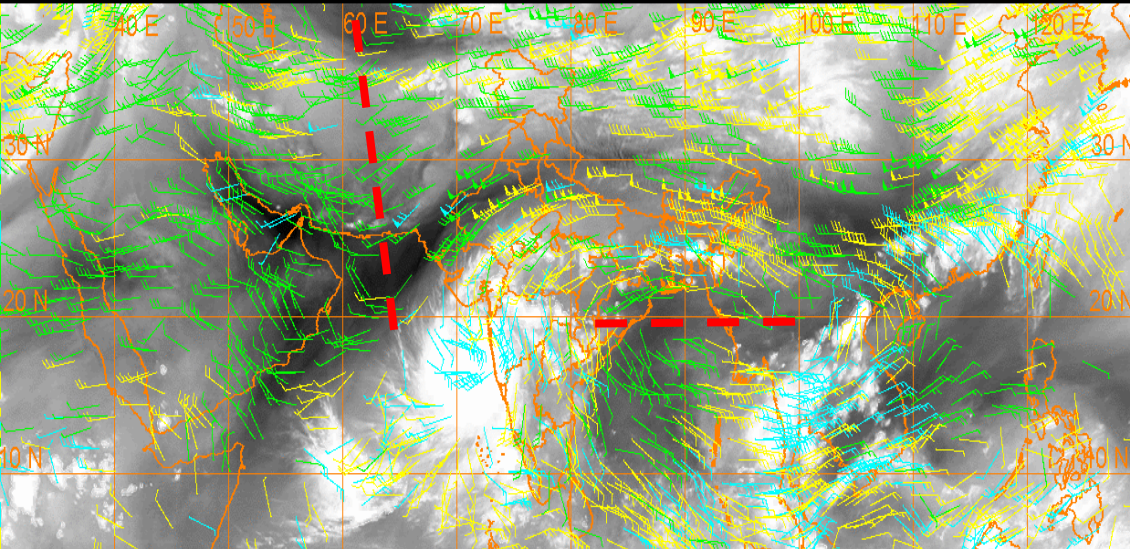
20 Kt

50 Kt

100-250 hPa

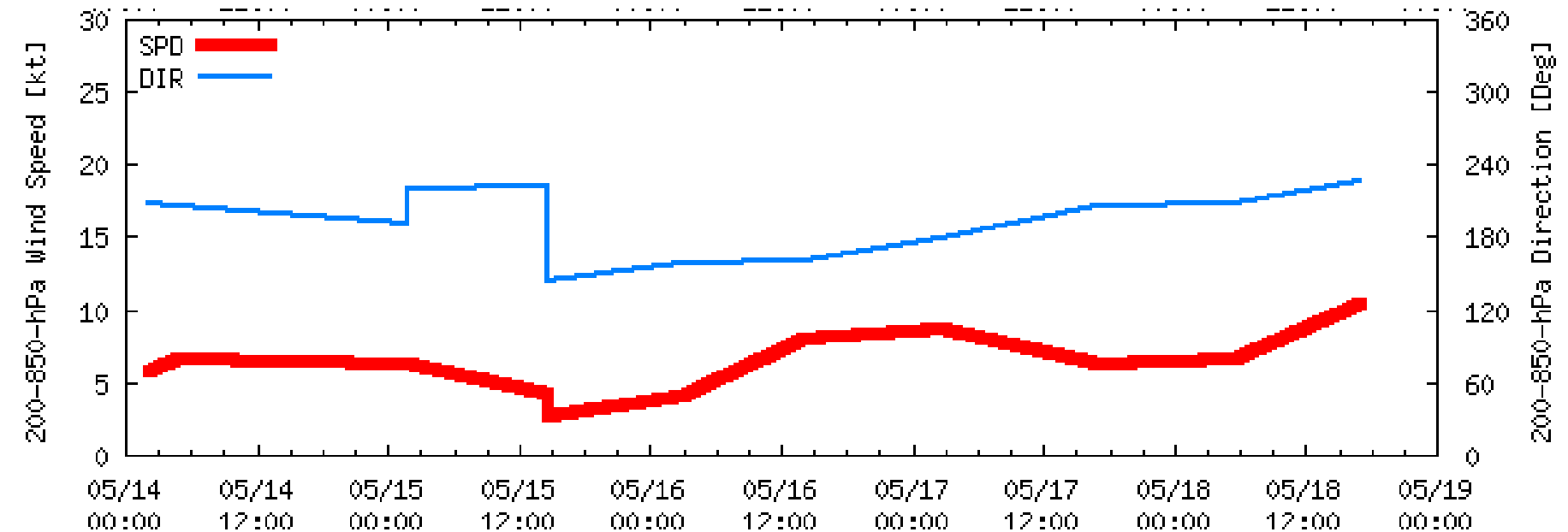
251-350 hPa

351-500 hPa



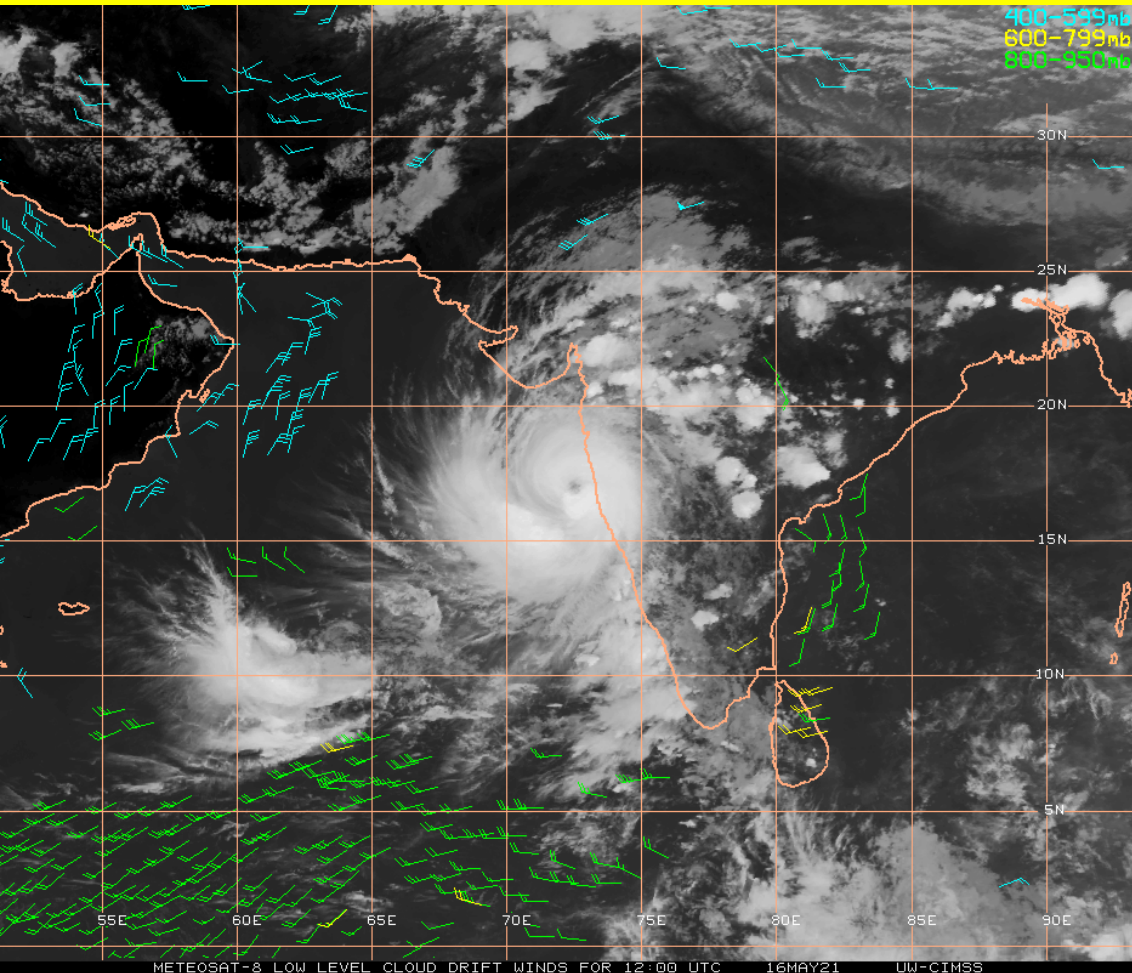
- Trough position roughly along 61 E up to 19 deg. N
- Trough tilted NNW-SSE Jet observed over Rajasthan at 300 hPa
- Ridge over BoB along 20 N
- Westerly deep trough will restrict NW movement of system.
- Jet stream will provide supportive upper level divergence to maintain system intensity over land

Steering mean winds



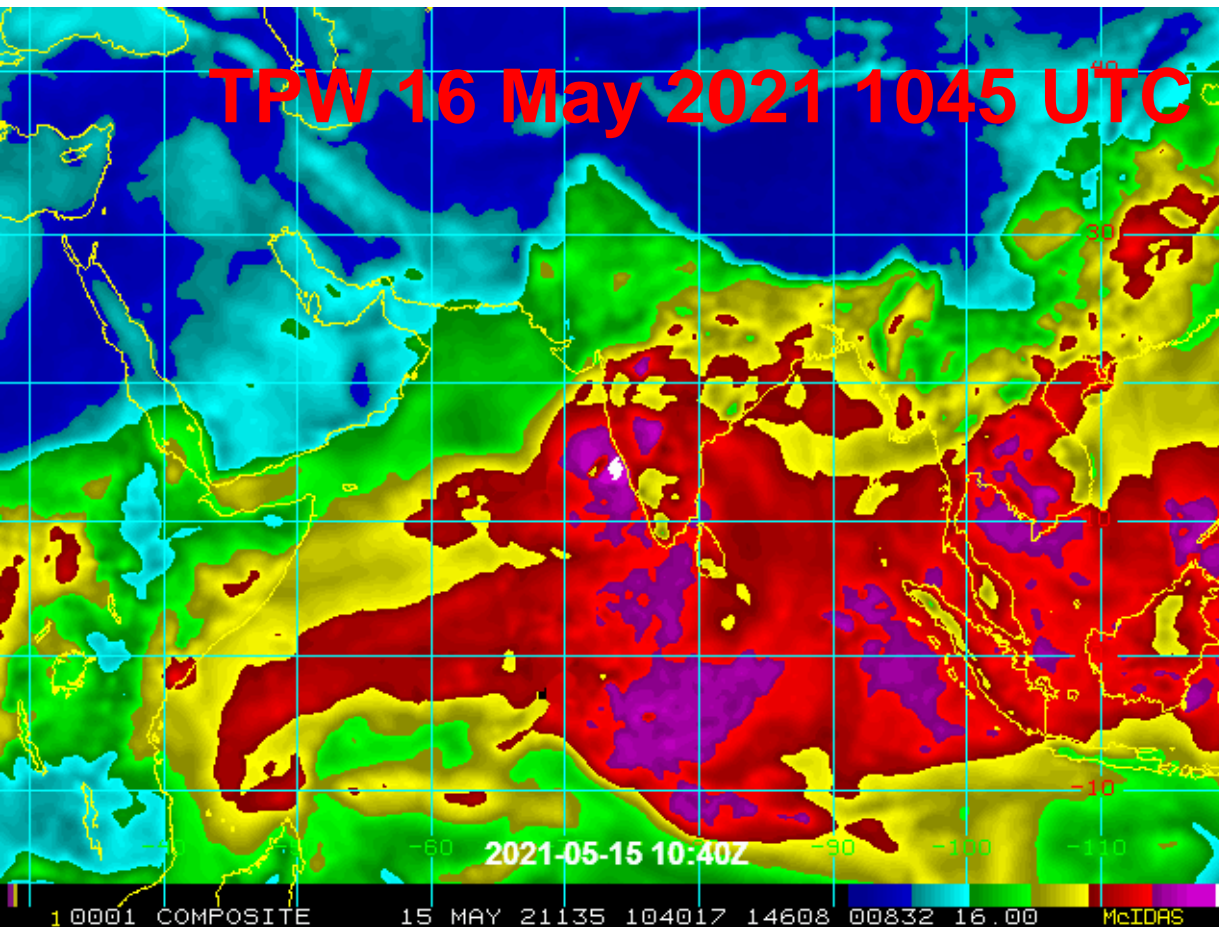
Steering mean winds of 6-7 kts in the NNW direction indicative of likely movement in that direction

Lower level winds at 16/1200 UTC



- Broad low level circulation is observed.
- Also indicative of low level moisture incursion from BoB.
- No dry air advection from northwest

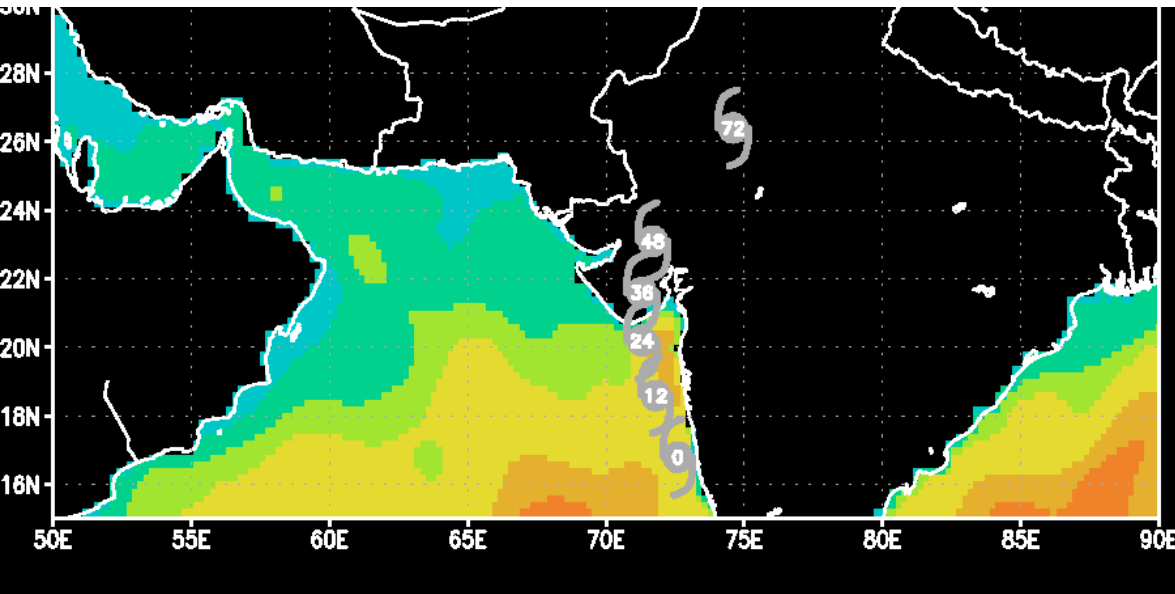
TOTAL PRECIPITABLE WATER



- TPW product shows enhanced moisture feeding from Arabian sea and Bay of Bengal.
- This is indicative of favourable moisture conditions with no indication of dry air incursion into the system.
- TPW is now oriented North-South instead of east-west earlier indicating northward movement in future.

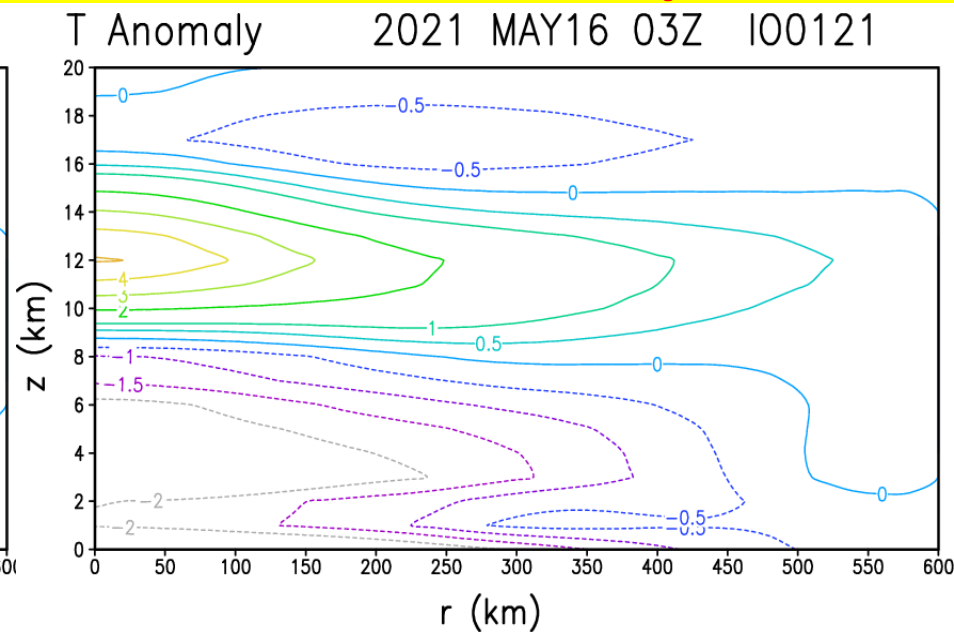
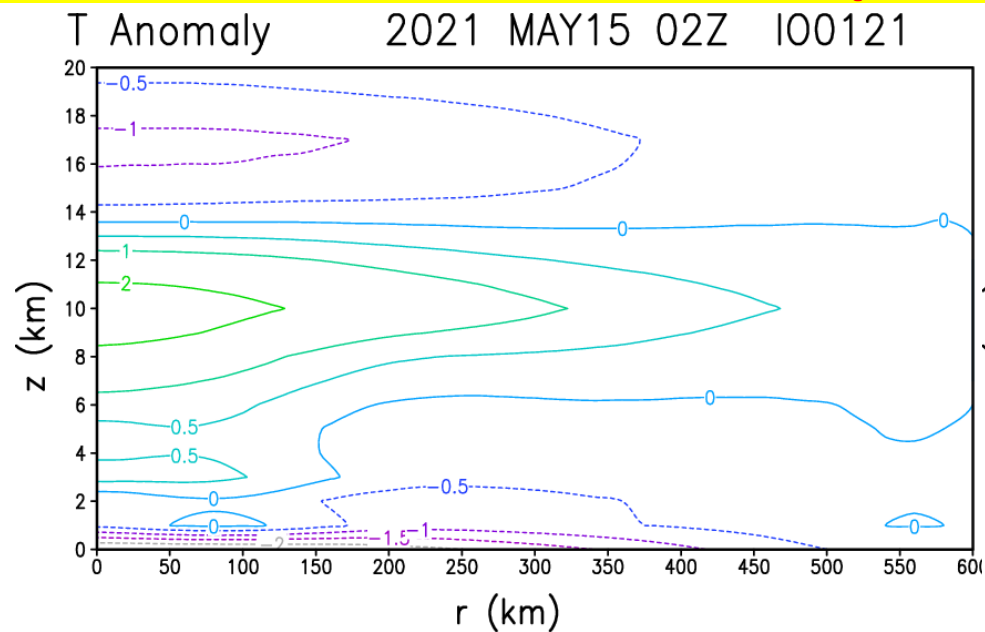
Ocean heat content

16TH MAY 2021 1200 UTC



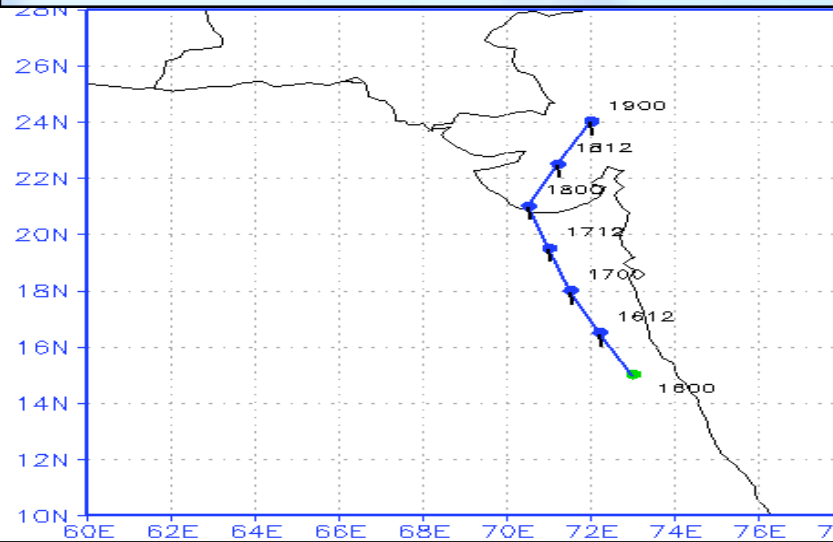
- Ocean heat content map shows favourable (more than 50 kJ/cm²) OHC over the current position as well as forecasted track
- Higher OHC in the forward sector is indicative of likely intensification.

AMSU – Temperature anomaly



- **Temperature anomaly** at the height of 10-12km is **increased from +2°C to +5°C over last 24 hrs.**
- **This is indicative of intensification of the system.**

ECMWF Deterministic Guidance based on 16th May/000UTC



Date/Time (UTC)	Lat./Long.	Intensity
16/00	14.5/73.0	SCS
16/12	16.2/72.2	VSCS
17/00	18.0/71.8	VSCS
17/12	19.4/70.4	ESCS
18/00	20.9/70.2	ESCS
18/12	22.3/73.0	CS
19/00	24.0/72.0	DD

Current Location: 16.2/72.2

Current Intensity: SCS

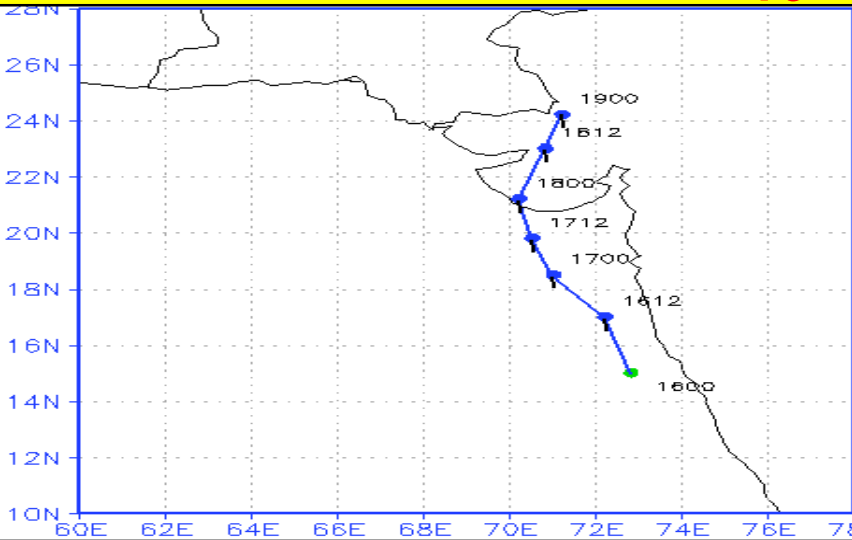
Track: Initial NNW till 18th/0000 UTC, Recurve NNEwards thereafter

Landfall Point: 20.9/70.2

Landfall Time: 17/1800 - 18/0000 UTC

Peak Intensity: ESCS at the time of landfall

NCEP GFS Deterministic Guidance based on 16th May/000UTC



Date/Time (UTC)	Lat./Long.	Intensity
16/00	14.4/72.8	VSCS
16/12	17.0/72.2	VSCS
17/00	18.0/71.0	ESCS
17/12	19.8/70.2	ESCS
18/00	21.0/70.1	ESCS
18/12	23.2/70.8	SCS
19/00	24.0/71.0	CS

Current Location: 17.0/72.2

Current Intensity: VSCS

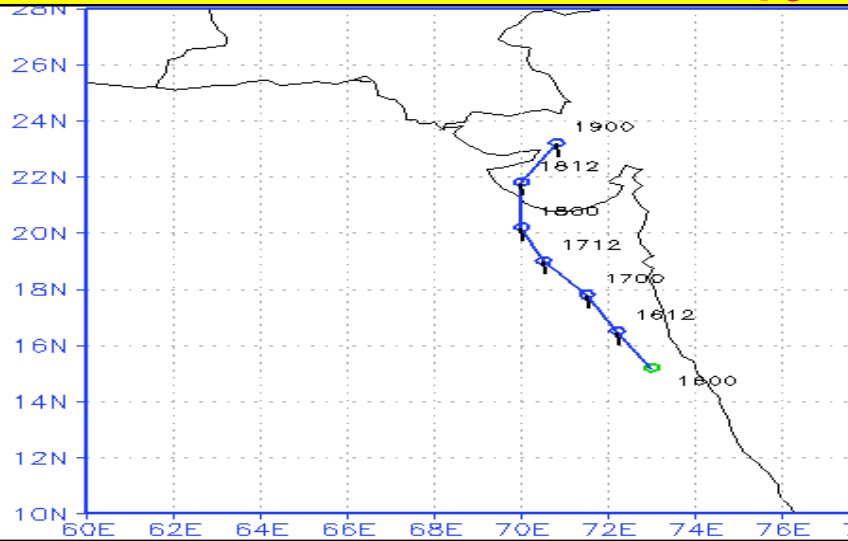
Track: Initial NNW till 18th/0000 UTC, Nearly northwards during 17/00-18/00 and recurve NNEwards thereafter

Landfall Point: 21.0/70.1

Landfall Time: 17/2200 to 18/0000 UTC

Peak Intensity: ESCS at the time of landfall

JMA Deterministic Guidance based on 16th May/000UTC



Date/Time (UTC)	Lat./Long.	Intensity
16/00	14.6/72.8	SCS
16/12	16.3/72.2	SCS
17/00	18.0/71.9	VSCS
17/12	19.0/70.3	VSCS
18/00	20.0/70.0	VSCS
18/12	21.8/70.0	SCS
19/00	23.6/71.0	CS

Current Location: 16.3/72.2

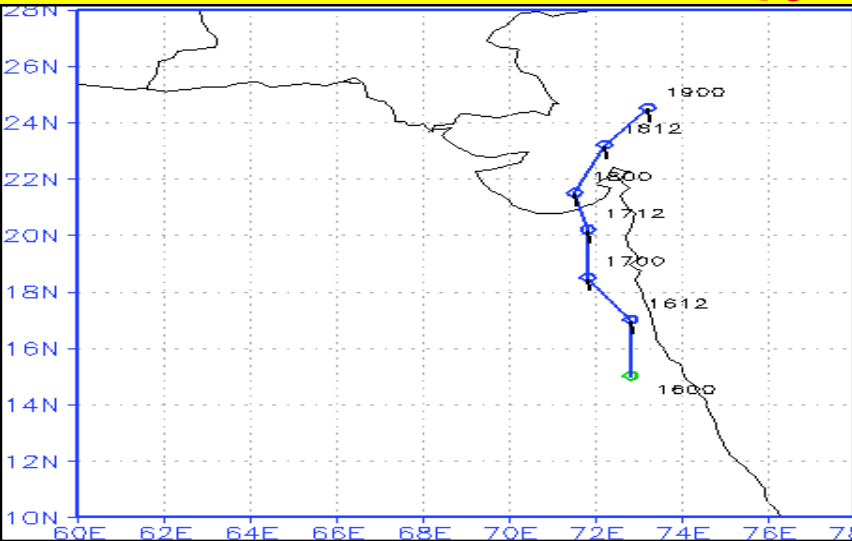
Current Intensity: SCS

Track: Initial NNW till 18th/0000 UTC, then northwards till 18/1200 and recurve NNEwards thereafter

Landfall Point: 21.8/70.0, **Landfall Time:** 18/0900 UTC

Peak Intensity: VSCS at the time of landfall

IMD GFS Deterministic Guidance based on 16th May/000UTC



Date/Time (UTC)	Lat./Long.	Intensity
16/00	14.4/72.8	VSCS
16/12	16.8/72.8	VSCS
17/00	18.2/72.0	ESCS
17/12	20.0/72.0	ESCS
18/00	21.8/71.9	ESCS
18/12	23.2/72.1	SCS
19/00	24.4/72.6	CS

Current Location: 16.8/72.8

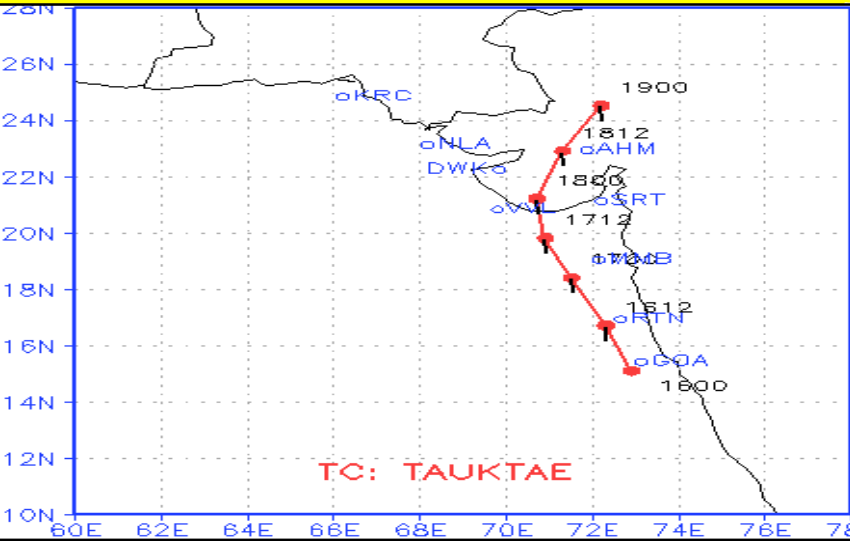
Current Intensity: VSCS

Track: Initial Northwards till 16th/1200 UTC, then NNEwards till 18/0000 and recurve NNEwards thereafter

Landfall Point: 20.8/71.7, Landfall Time: 17/1800-17/2100 UTC

Peak Intensity: ESCS at the time of landfall

IMD MME Deterministic Guidance based on 16th May/000UTC



Date/Time (UTC)	Lat./Long.	Intensity
16/00	15.1/72.9	65
16/12	16.7/72.3	83
17/00	18.4/71.5	97
17/12	19.8/70.9	98
18/00	21.2/70.7	100
18/12	22.9/71.3	38
19/00	24.5/72.2	27

Current Location: 16.7/72.3

Current Intensity: VSCS (65 knots)

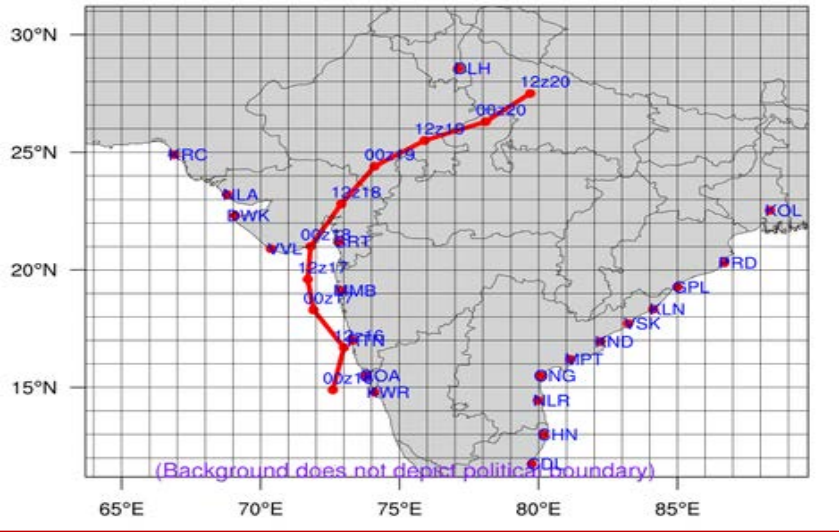
Track: Initial NNW till 18th/1200 UTC, then NNEwards thereafter

Landfall Point: 20.4/70.8

Landfall Time: 17/1800 UTC

Peak Intensity: 100 KTs at 18/0000 UTC

IMD HWRF Deterministic Guidance based on 16th May/000UTC



Date/Time (UTC)	Lat./Long.	Intensity
16/00	14.9/72.6	56
16/12	16.7/73.0	53
17/00	18.3/71.9	61
17/12	19.6/71.7	72
18/00	21.0/71.8	94
18/12	22.8/72.9	53
19/00	24.4/74.1	32

Current Location: 16.7/73.0

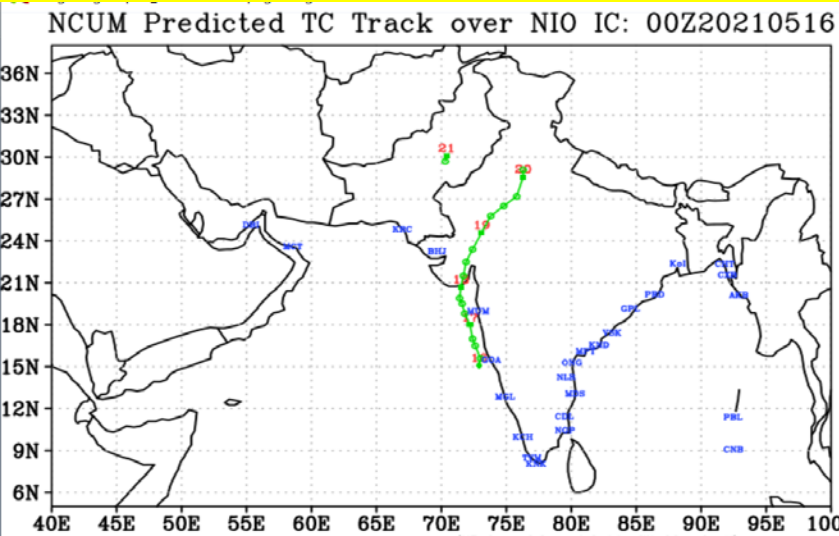
Current Intensity: 53 KT (SCS)

Track: Initial NNE till 16th/1200 UTC, then NNWwards till 17/1200 UTC and NNEwards thereafter

Landfall Point: 21.0/71.8, Landfall Time: 18/0000 UTC

Peak Intensity: 94 knots at 18/0000 at the time of landfall

NCUM Global Deterministic Guidance based on 16th May/000UTC



Date/Time (UTC)	Lat./Long.	Intensity
16/00	15.1/72.9	51
16/12	16.5/72.6	55
17/00	18.0/72.2	57
17/12	19.5/71.6	55
18/00	20.7/71.5	58
18/12	22.5/71.9	51
19/00	24.6/73.1	33

Current Location: 16.5/72.6

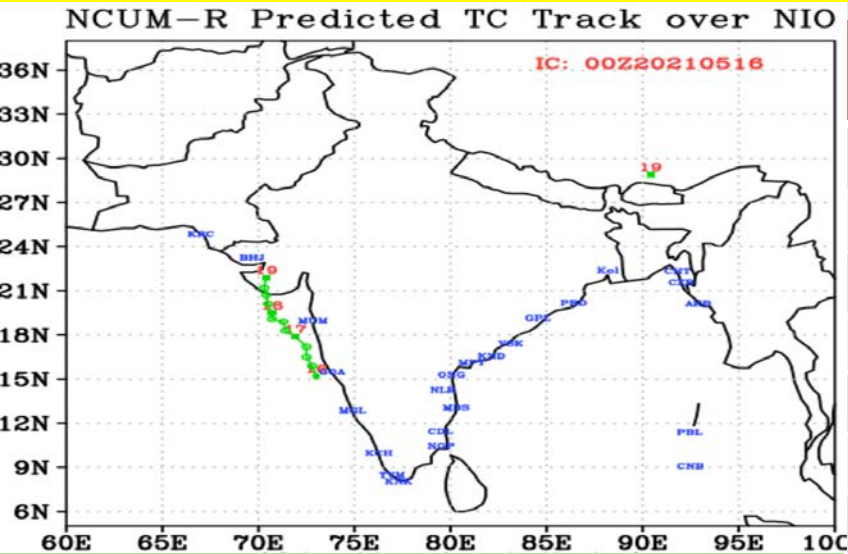
Current Intensity: 55 KTs

Track: Initial NNW till 18th/0000 UTC, then NNEwards thereafter

Landfall Point: 20.1/71.5, Landfall Time: 17/1800 UTC

Peak Intensity: 61 knots at 17/1800 (SCS at the time of landfall)

NCUM Regional Deterministic Guidance based on 16th May/000UTC



Date/Time (UTC)	Lat./Long.	Intensity
16/00	15.2/73.0	60
16/12	16.5/72.5	62
17/00	17.9/71.9	62
17/12	18.9/71.3	61
18/00	19.5/70.7	62
18/12	20.7/70.4	74
19/00	21.9/70.4	51

Current Location: 16.7/73.0

Current Intensity: 53 KTs

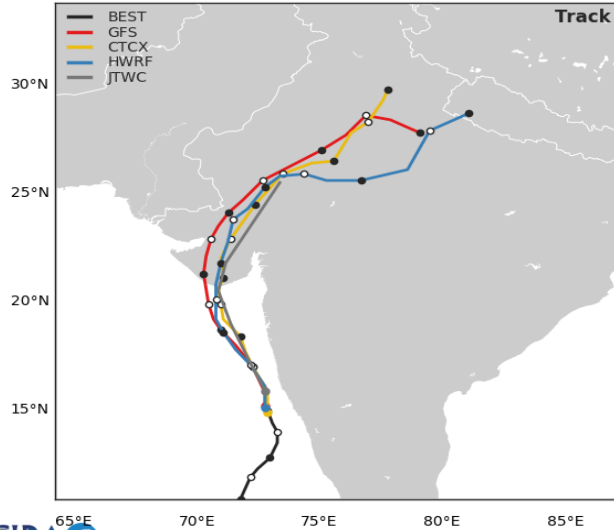
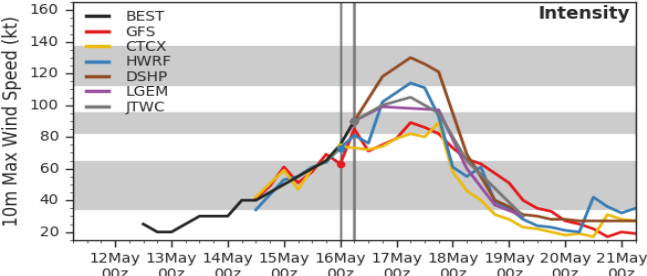
Track: Initial NNW till 18th/0000 UTC, then northwards thereafter

Landfall Point: 21.2/70.3, Landfall Time: 17/1700 UTC

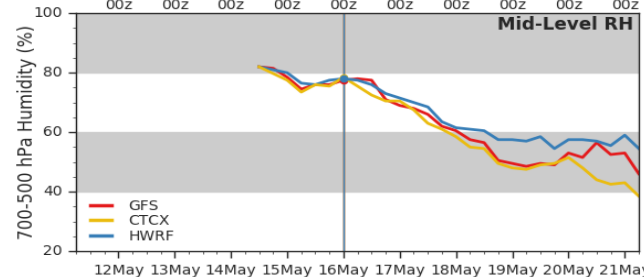
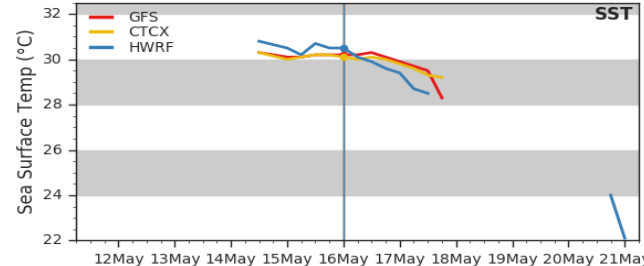
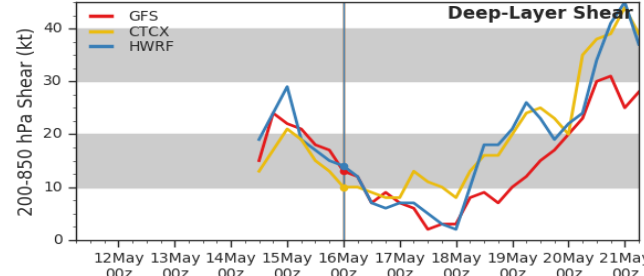
Peak Intensity: 77 knots at 17/1800 (VSCs at the time of landfall)

Model Guidance from CIRA outputs

Multi-Model Diagnostic Comparison



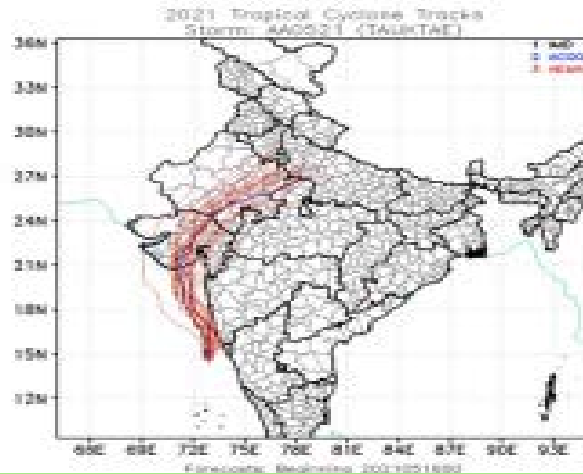
TAUKTAE - IO012021



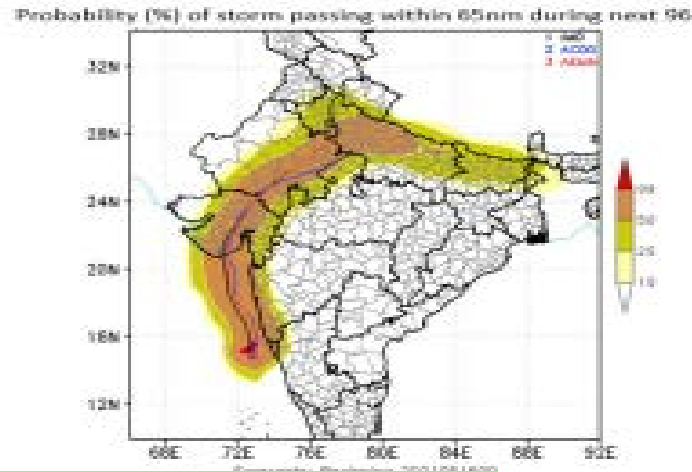
- Consensus on landfall near 71 deg.E
- Peak Intensity: 85-125 knots Around 17/06 UTC
- Deep layer shear is decreasing upto 18/00 UTC
- SST is > 28C till 18/00 UTC, but shows decreasing trend
- Middle level humidity also decreasing, but >60% till 18/00UTC

GEFS Ensemble Guidance based on 16th May/000UTC

Ensemble Tracks



Strike Probability



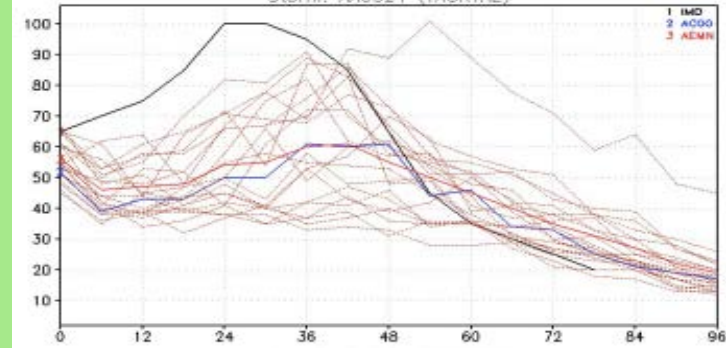
Control Run landfall: 20.8/71.2

GEFS Mean landfall: 20.8/71.8

Strike Probability: 90% South Gujarat Coast

Peak Intensity: 58 kts (SCS category)

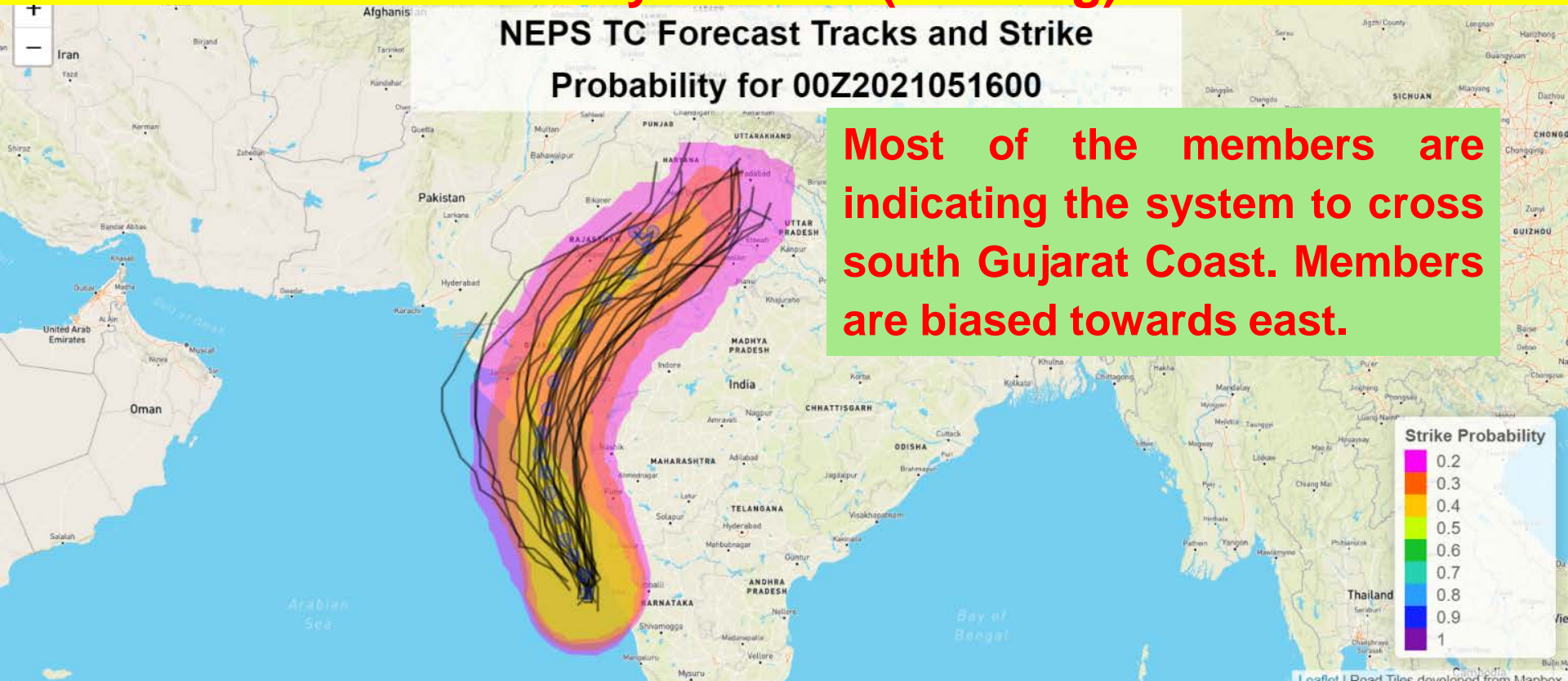
2021 Tropical Cyclone Intensity
Storm: AA0521 (TAUKTAE)



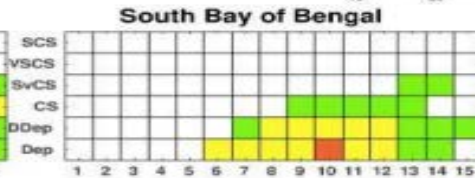
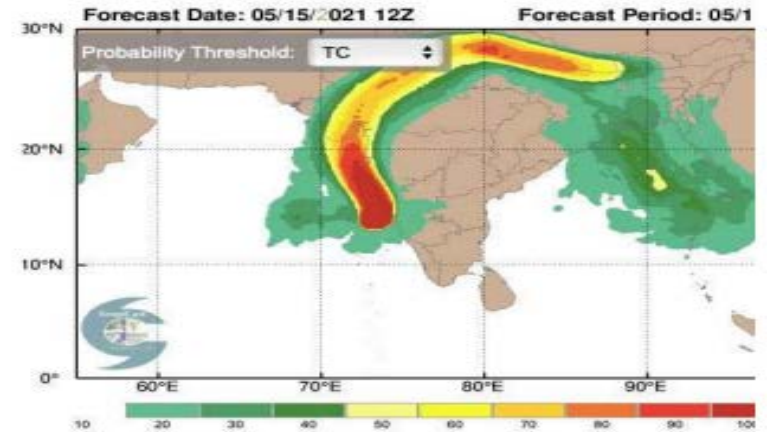
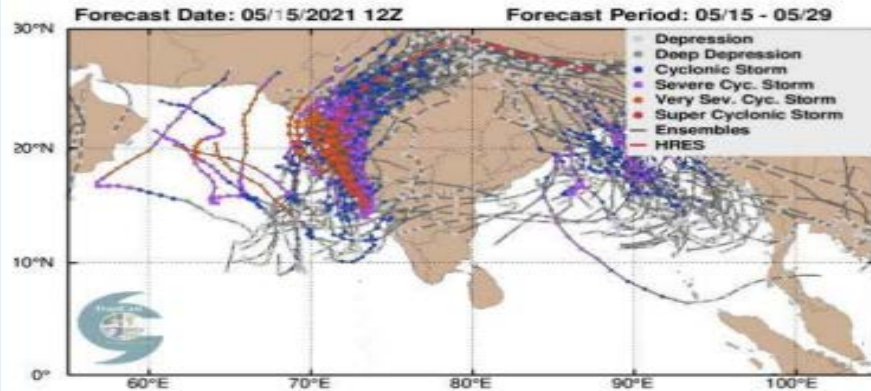
NCUM Ensemble Guidance based on 16th May/000UTC (Pending)

NEPS TC Forecast Tracks and Strike
Probability for 00Z2021051600

Most of the members are indicating the system to cross south Gujarat Coast. Members are biased towards east.



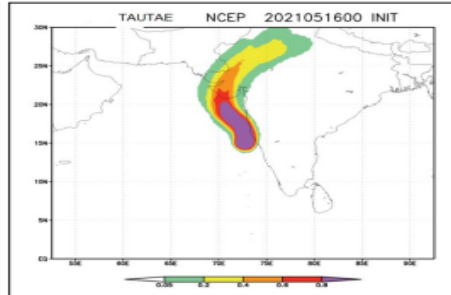
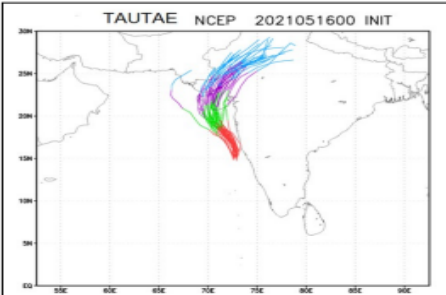
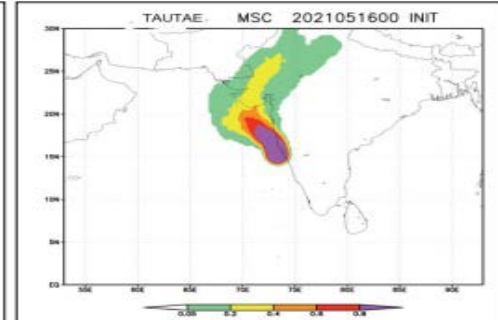
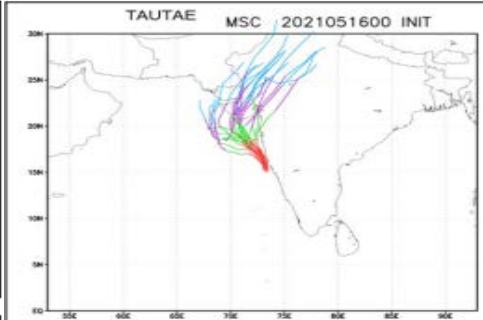
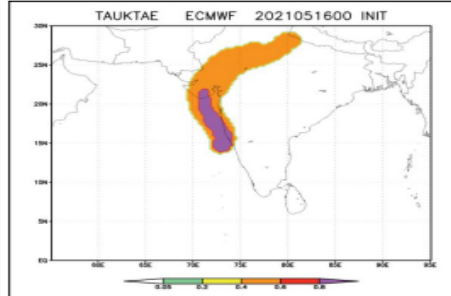
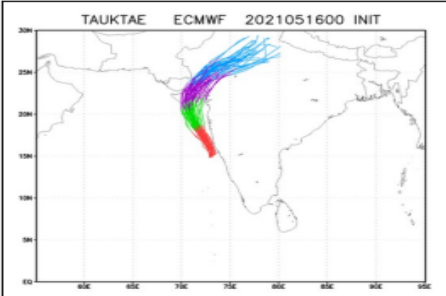
ECMWF Ensemble Guidance based on 16th May/000UTC



Probability Threshold: 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

90-100% Probability to cross south Gujarat coast as a very severe cyclonic storm and recurve north-northeastwards

TIGGE Ensemble Guidance based on 16th May/000UTC



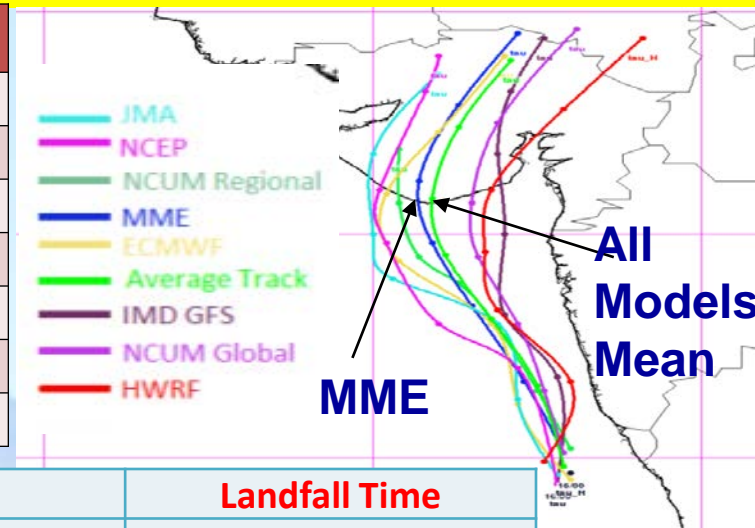
MSC: 20-40% Probability to cross south Gujarat coast. Large divergence among members

ECMWF: 80-100% Probability to cross south Gujarat coast. Deterministic tracks are converging towards south Gujarat coast.

NCEP: 60-80% Probability to cross south Gujarat coast. Comparatively less convergence among members

All Models Average wrt track, intensity and landfall point

Date/Time (UTC)	Lat.	Long.	Intensity
16/00	14.8	72.9	70 kts
16/12	16.6	72.5	90 kts
17/00	18.1	71.8	100 kts
17/12	19.5	71.1	100 kts
18/00	20.8	70.9	65 kts
18/12	22.5	71.6	50 kts
19/00	23.9	72.1	40 kts



Model	Landfall Point	Landfall Time
IMD GFS	20.8/71.7	17/1800-17/2100
NCEP GFS	21.0/70.1	17/2200 - 18/0000
ECMWF	20.9/70.4	17/1800 - 18/0000
JMA (Outlier)	21.8/70.0	18/0900
NCUM Global	20.1/71.5	17/1800
NCUM Regional	21.2/70.5	17/1700
IMD HWRF	21.0/71.8	18/0000
MME	20.8/70.8	18/0000
All Models Average	21.0/71.0	17/2000 UTC



Initialization and Consistency Check

Current Status: 16.7/72.5 MSW: 75 kts

Operational Forecast issued at 16/0600 UTC

Date/Time (UTC)	Lat.	Long.	Intensity
16/06	15.7	72.7	70 kts
16/12	16.5	72.4	75 kts
16/18	17.4	71.8	80 kts
17/00	18.2	71.3	85 kts
17/06	19.0	71.0	85 kts
17/18	20.2	70.8	85 kts
18/06	21.7	71.0	60 kts
18/18	23.4	71.6	30 kts
19/06	24.9	72.2	20 kts

Model Guidance available from 0000 UTC Models

Date/Time (UTC)	Lat.	Long.	Intensity
16/06	15.7	72.7	80 kts
16/12	16.6	72.5	90 kts
16/18	17.3	72.1	95 kts
17/00	18.1	71.8	100 kts
17/06	18.8	71.4	100 kts
17/18	20.1	71.0	80 kts
18/06	21.6	71.2	55 kts
18/18	23.2	71.9	45 kts
19/06	24.6	72.3	35 kts

Model

Landfall Point

Landfall Time

Average

21.0/70.8

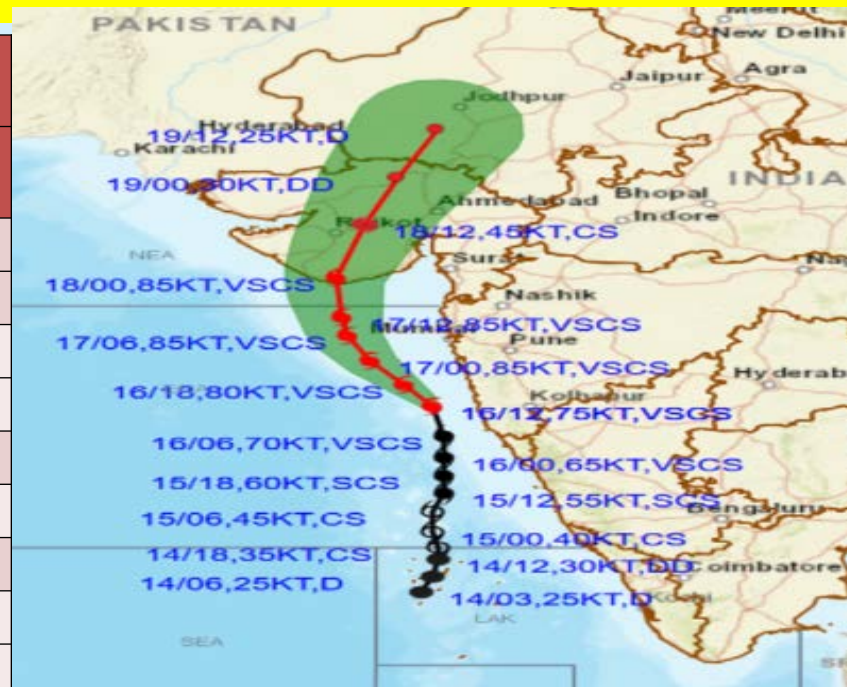
17/1800-18/0000 UTC



Final Track & Intensity Forecast at 1200 UTC of 16th May

Final forecast at 1200 UTC of 16th May

Date/Time (UTC)	Lat.	Long.	Intensity
16/12	16.7	72.5	75 kts
16/18	17.4	72.0	80 kts
17/00	18.2	71.4	85 kts
17/06	19.0	71.0	85 kts
17/12	19.6	70.9	85 kts
18/00	20.9	70.8	85 kts
18/12	22.6	71.3	45 kts
19/00	24.1	71.9	30 kts
19/12	25.6	72.6	25 kts



Landfall Point

20.9/70.8

Landfall Time

17/2200

Current Location: 16.7/72.5

Current Intensity: 75 kts

Forecast Landfall Point & time: To cross Gujarat coast between Porbander and Mahua (Bhavnagar district) around 18th early morning.

Average Model Guidance (GEFS+NEPS+HWRF+GFS) for wind distribution

Average Model Guidance based on 0000 UTC of 16 th May												
Lead Period	R34				R50				R64			
	NE	SE	SW	NW	NE	SE	SW	NW	NE	SE	SW	NW
00	60	112	145	96	34	42	37	34	27	26	27	17
12	82	102	109	69	44	44	35	39	27	19	18	26
24	104	114	88	71	42	48	35	36	22	26	24	23
36	100	128	84	81	54	55	42	48	32	34	29	26
48	85	125	77	90	40	59	41	44	20	37	29	26
60	85	78	74	86	50	43	37	42	34	30	26	30
72	66	68	69	70	50	50	45	40	35	27	36	28
84	53	71	70	64	43	52	45	46	19	16	22	14
96	56	39	39	30	0	51	36			32	28	

Climatological Guidance

Lead Period	R28				R34				R50				R64			
	NE	SE	SW	NW	NE	SE	SW	NW	NE	SE	SW	NW	NE	SE	SW	NW
75	200	180	240	260	100	90	120	130	50	55	60	65	34	35	36	37
85	220	200	280	300	110	100	140	150	60	65	70	75	40	40	42	42
85	220	200	280	300	110	100	140	150	60	65	70	75	40	40	42	42
85	220	200	280	300	110	100	140	150	60	65	70	75	40	40	42	42
45	130	140	170	200	65	70	85	100								
30	110	120	150	180												



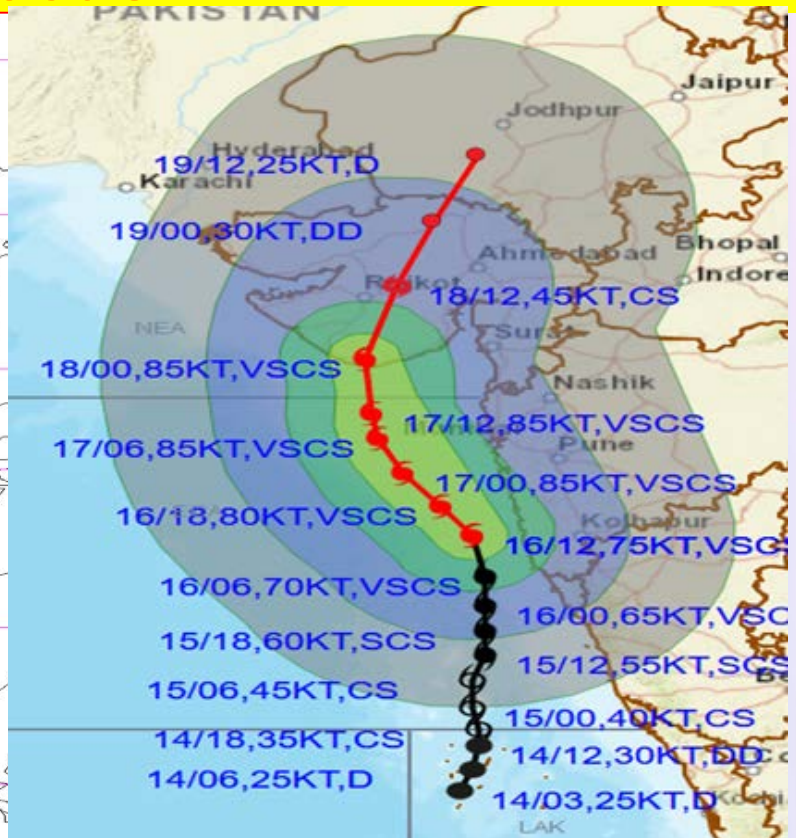
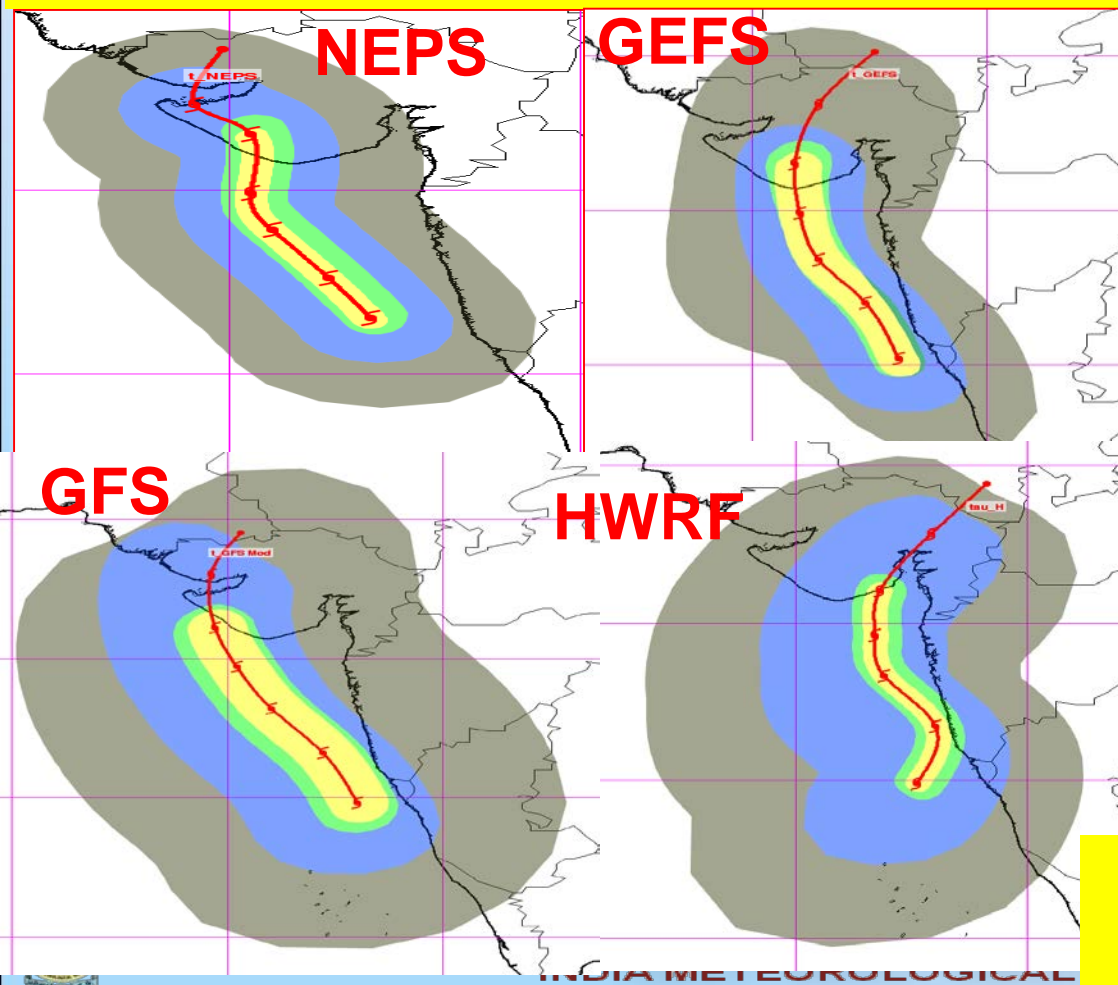
Operational wind distribution

Cuurent Dist. From CIRA	R28				R34				R50				R64			
	NE	SE	SW	NW	NE	SE	SW	NW	NE	SE	SW	NW	NE	SE	SW	NW
	250	150	140	150	150	135	125	135	80	65	45	70	50	20	0	35

Operational Distribution after Initialisation and Consistency Check

[illegible]

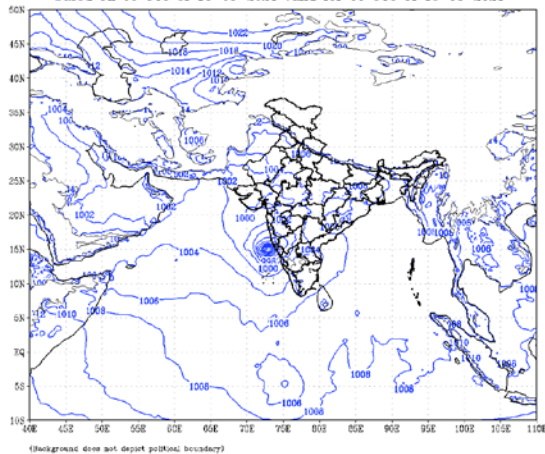
Structure Forecast



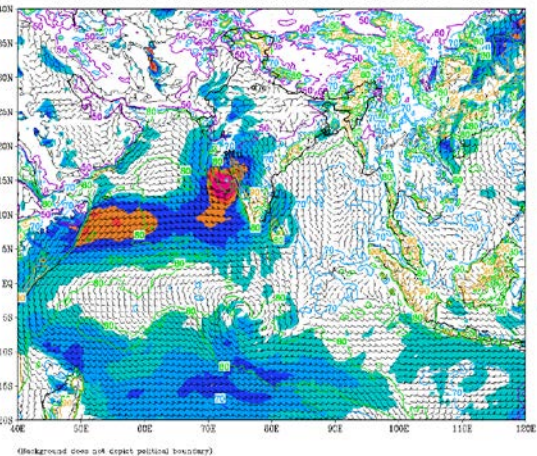
**Wind distribution
Graphics (Operational)**

IMD GFS MSLP, 10m wind, 850,500 & 200 hPa winds

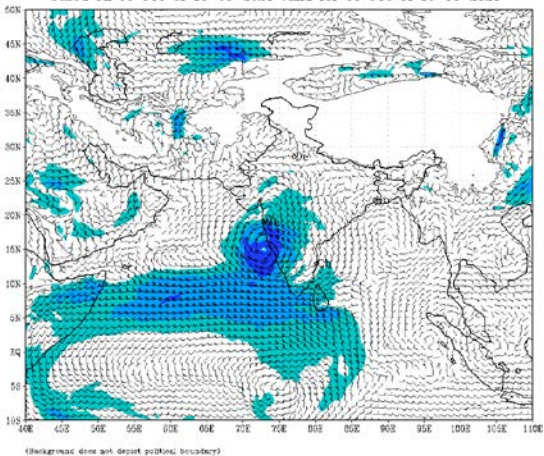
IMD :GFS MODEL(12 Km) MSL Pressure (hPa) FORECAST (00 HR)
based on 00 UTC of 16-05-2021 valid for 00 UTC of 16-05-2021



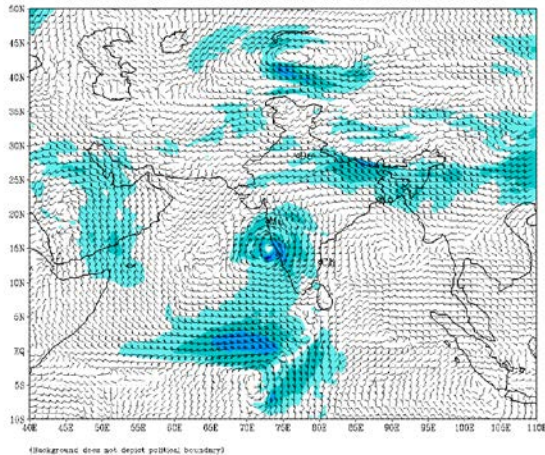
IMD: GFS(12Km) 10m WIND (barb)& GUST (shaded:kt) FORECAST (00 HR)
based on 00 UTC of 16-05-2021 valid for 00 UTC of 16-05-2021



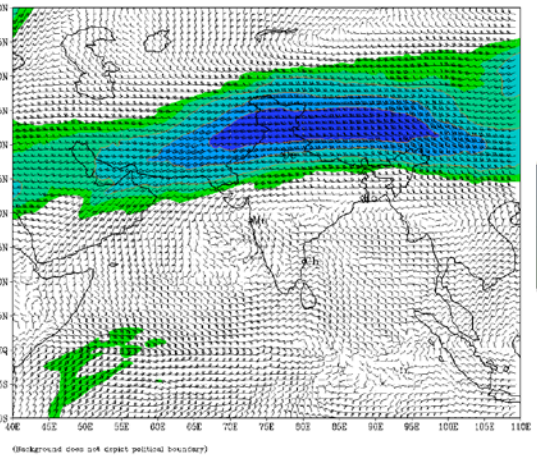
IMD:GFS MODEL(12 Km) 850 hPa WIND (kt) FORECAST (00 HR)
based on 00 UTC of 16-05-2021 valid for 00 UTC of 16-05-2021



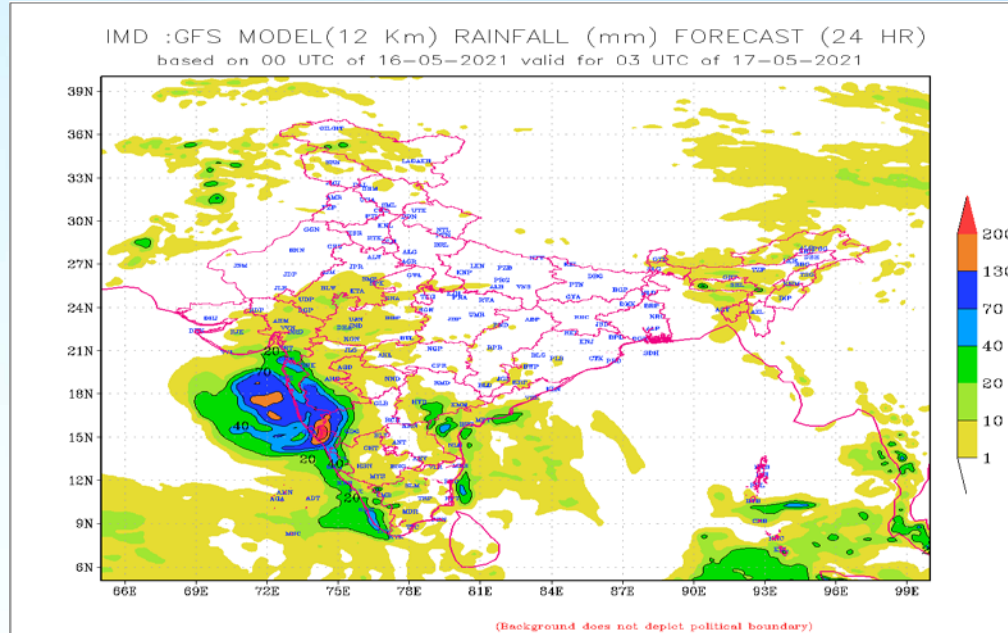
based on 00 UTC of 16-05-2021 valid for 00 UTC of 16-05-2021



based on 00 UTC of 16-05-2021 valid for 00 UTC of 16-05-2021



IMD GFS Rainfall



H-VH & EH on 16th and H-VH on 17th over south Konkan & Goa

H-VH over north Konkan

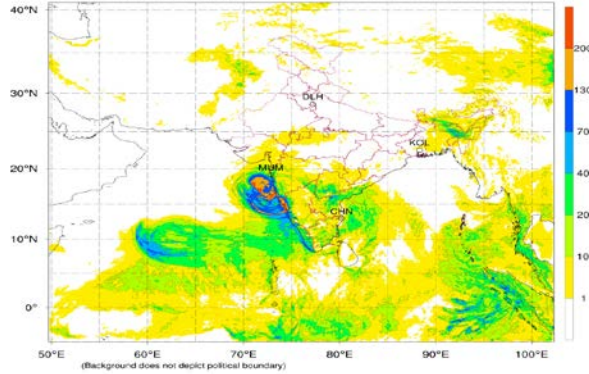
**H-VH and EH on 17th and 18th over south Gujarat and H-VH over north Gujarat
Regn on 18th.**

EH at isolated places on 17th and H-VH on 18th over southeast Rajasthan

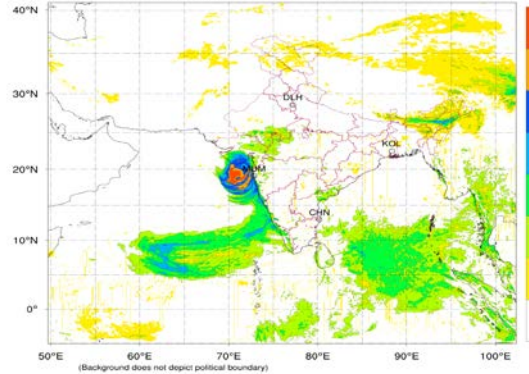


IMD WRF Rainfall

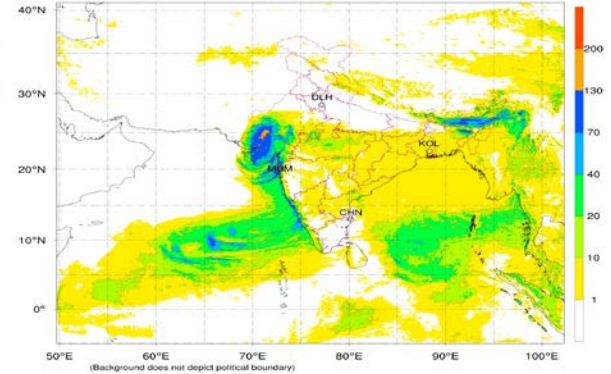
IMD MESOSCALE MODEL(03 Km) 24 HOURLY RAINFALL (mm) FORECAST (24 hr)
based on 00 UTC of 16-05-2021 valid for 03 UTC of 17-05-2021



IMD MESOSCALE MODEL(03 Km) 24 HOURLY RAINFALL (mm) FORECAST (48 hr)
based on 00 UTC of 16-05-2021 valid for 03 UTC of 18-05-2021



IMD MESOSCALE MODEL(03 Km) 24 HOURLY RAINFALL (mm) FORECAST (72 hr)
based on 00 UTC of 16-05-2021 valid for 03 UTC of 19-05-2021



On 16th, Ext. Hvy at isolated places rainfall over coastal Goa & Konkan. Hvy to Very Hvy over south coastal Maharashtra

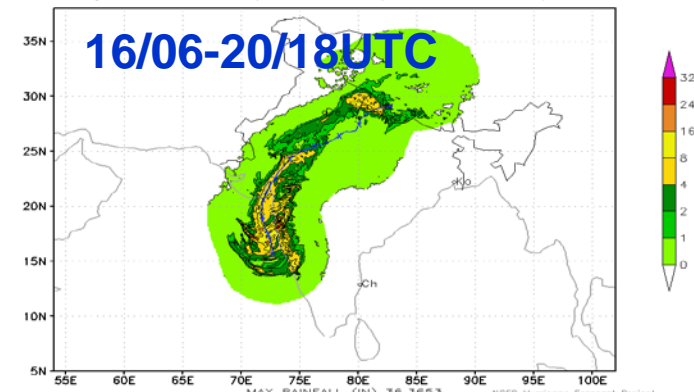
Commencement of H-VH on 17th over south Gujarat coast

H-VH on 18th over south Gujarat coast and interior Gujarat at most places with EH at isolated places over interior parts.

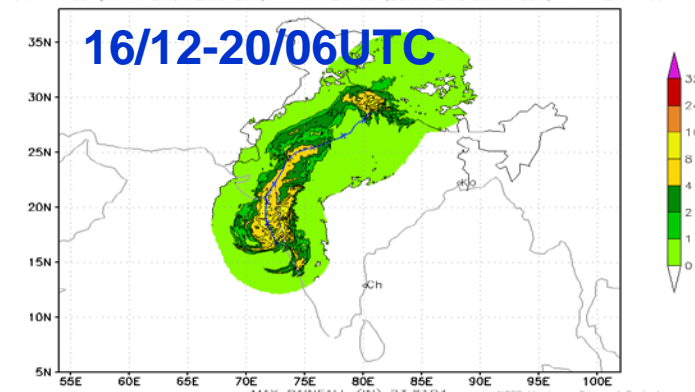


Rainfall Guidance – IMD HWRF

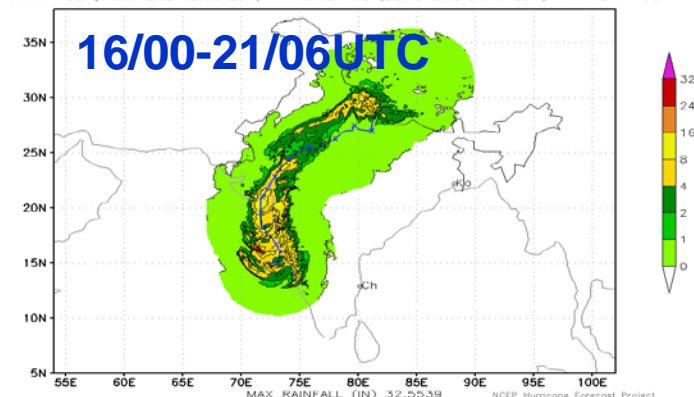
INIT Z for 108 h FCST VALID 2021052018 Z
hwrfl TOTAL RAINFALL(IN) TAUKTAE01A
START POS (15.70 LAT, 72.70 LON) FINAL POS (29.10 LAT, 82.80 LON) X=12 h POS



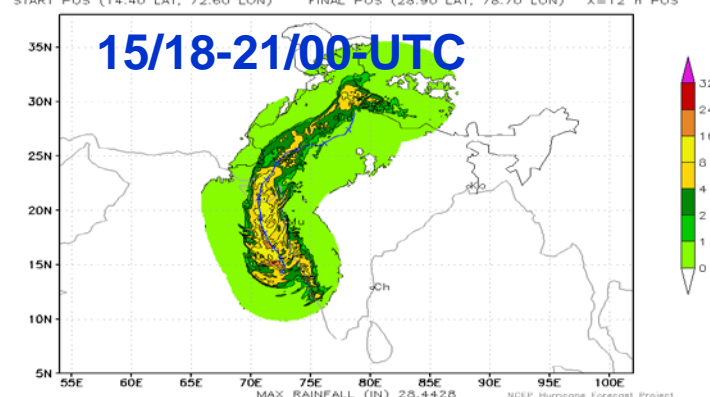
INIT Z for 90 h FCST VALID 2021052006 Z
hwrfl TOTAL RAINFALL(IN) TAUKTAE01A
START POS (16.70 LAT, 72.60 LON) FINAL POS (28.50 LAT, 80.70 LON) X=12 h POS



INIT Z for 126 h FCST VALID 2021052106 Z
hwrfl TOTAL RAINFALL(IN) TAUKTAE01A
START POS (14.90 LAT, 72.60 LON) FINAL POS (28.40 LAT, 81.40 LON) X=12 h POS



INIT Z for 126 h FCST VALID 2021052100 Z
hwrfl TOTAL RAINFALL(IN) TAUKTAE01A
START POS (14.40 LAT, 72.60 LON) FINAL POS (28.90 LAT, 78.70 LON) X=12 h POS

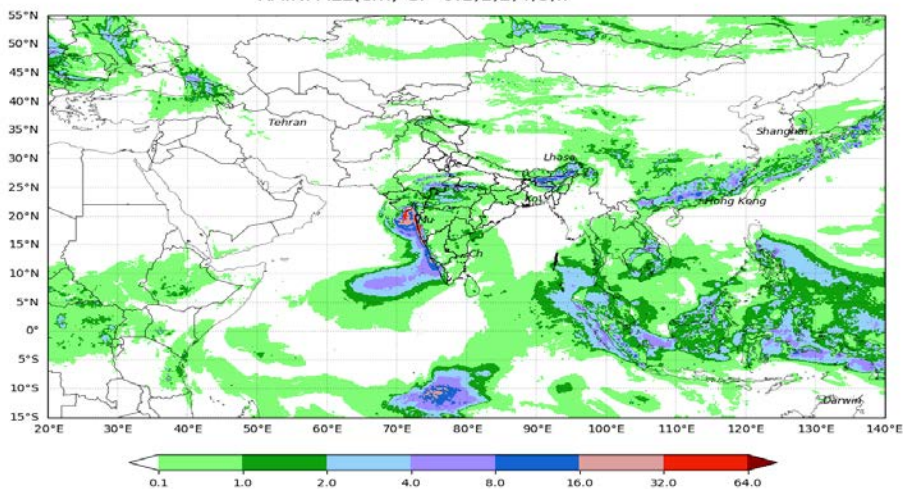


Cumulative rainfall could be upto 40 cm over south Gujarat around the landfall area.

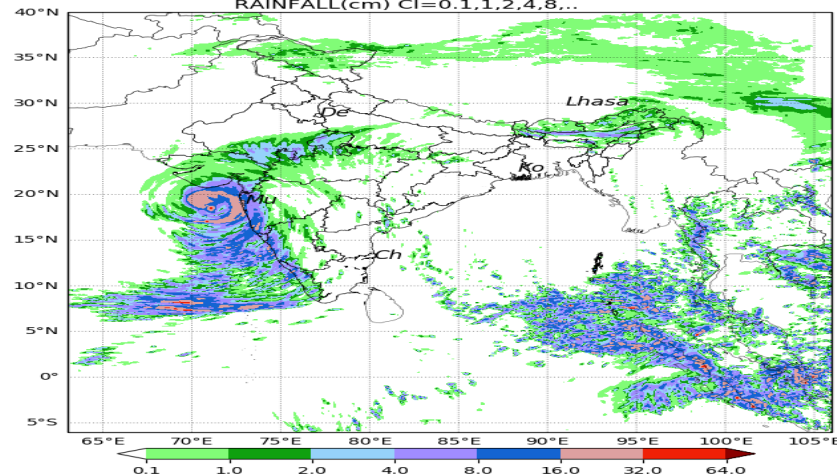


Rainfall Guidance – NCUM (Global & Regional 48 hour forecast) on 17th May

NCUM 48HR FORECAST VALID ON 03Z18May2021
RAINFALL(cm) CI=0.1,1,2,4,8,...



NCMRWF Regional (4km) model 48HR FORECAST VALID ON 03Z18May2021
RAINFALL(cm) CI=0.1,1,2,4,8,...



NCUM (Regional)

H-VH over north Maharashtra and south Gujarat region

H-VH over south Maharashtra and Konkan & Goa

NCUM (Global)

EH at isolated places over south Gujarat region, coastal north Maharashtra and

H-VH over south Maharashtra, Konkan & Goa, Karnataka and Kerala coast

Final Heavy rainfall warning issued at 1200 UTC of 16th May

Kerala:

Heavy to very to very heavy falls at isolated places on 16th and heavy falls at isolated places on 17th May.

South Konkan & Goa:

Heavy to very heavy falls at a few places and extremely heavy falls at isolated places over south Konkan & Goa and adjoining Ghat areas on 16th and heavy to very heavy falls at isolated places on 17th May.

North Konkan:

Heavy to very heavy falls at isolated places on 16th and 17th May.

Gujarat:

Light to moderate rainfall to commence over coastal districts of Saurashtra from 16th afternoon, with heavy to very heavy falls at isolated places over Saurashtra & Kutch, Diu and southern most Gujarat region with extremely heavy falls at isolated places on 17th and with heavy to very heavy falls at a few places over Saurashtra & Kutch and Diu & south Gujarat region with extremely heavy falls (≥ 20 cm) at isolated places on 18th .

Rajasthan:

Extremely heavy falls at isolated places very likely over south Rajasthan on 18th & heavy to very heavy falls at isolated places over Rajasthan on 19th May.



Districtwise rainfall warnings for Gujarat

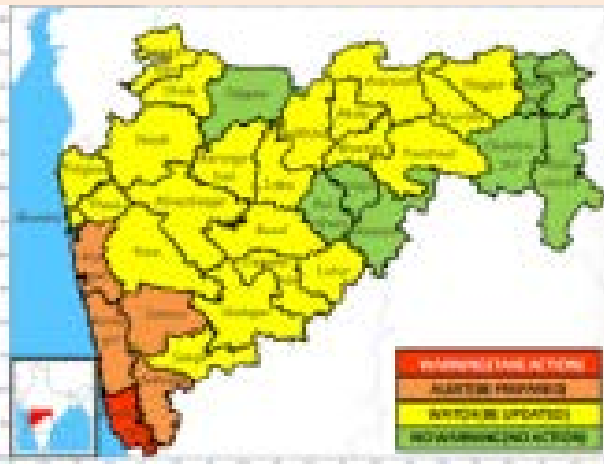


	NO Warning (No Action)
	Watch (Be updated)
	Alert (Be prepared)
	Warning (Take action)

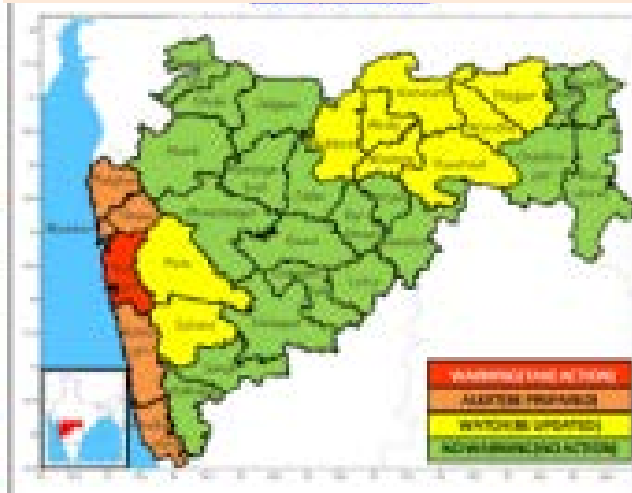


Districtwise rainfall warnings for Maharashtra

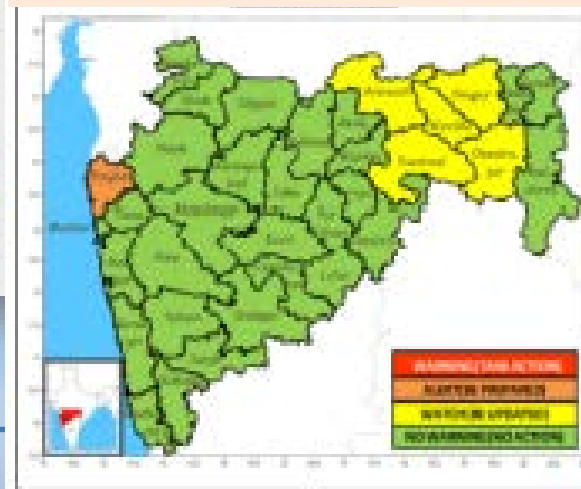
Warning for 16th May, 2021







Warning for 17th May, 2021



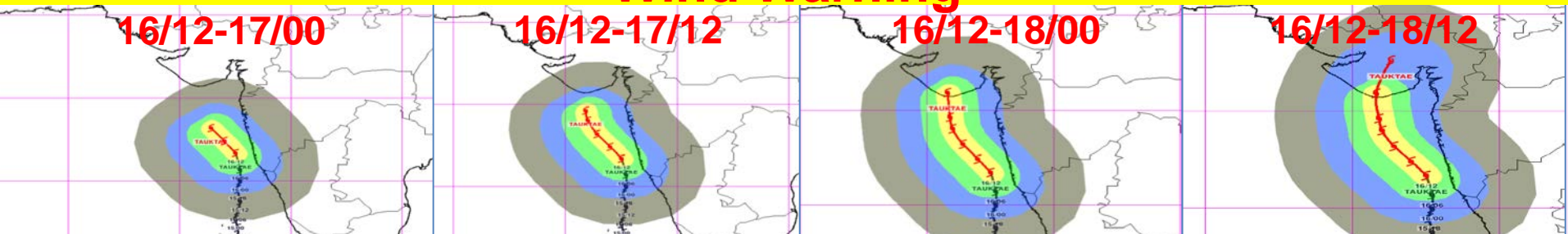
Warning for 18th May, 2021



	NO Warning (No Action)
	Watch (Be updated)
	Alert (Be prepared)
	Warning (Take action)



Wind Warning



Sea Area:

- 140–150 gusting to 165 kmph over EC Arabian Sea. To increase becoming 155-165 kmph gusting to 185 kmph from 17th forenoon.
- 40-50 kmph gusting to 60 kmph is prevailing over NE Arabian Sea along & off south Gujarat & Daman and Diu coasts. To increase 155-165 gusting to 185 kmph from 18th early morning.

Coastal regions:

- 80-90 gusting to 100 kmph along & off south Maharashtra –Goa and adjoining Karnataka coasts on 16th.
- 65- 75 gusting to 85 kmph along & off north Maharashtra coast from 17th morning till 18th morning.
- 155-165 gusting to 185 kmph over northeast Arabian Sea and along & off Gujarat coast (Porbandar, Junagarh, Gir Somnath, Amreli, Bhavnagar), 120 -140 gusting to 165 kmph over Bharuch, Anand, south Ahmedabad, Botad, 90 -100 gusting to 120 kmph over Devbhoomi Dwarka, Jamnagar, Rajkot, Morbi, Kheda from early hours of 18th.

Storm Surge Warning

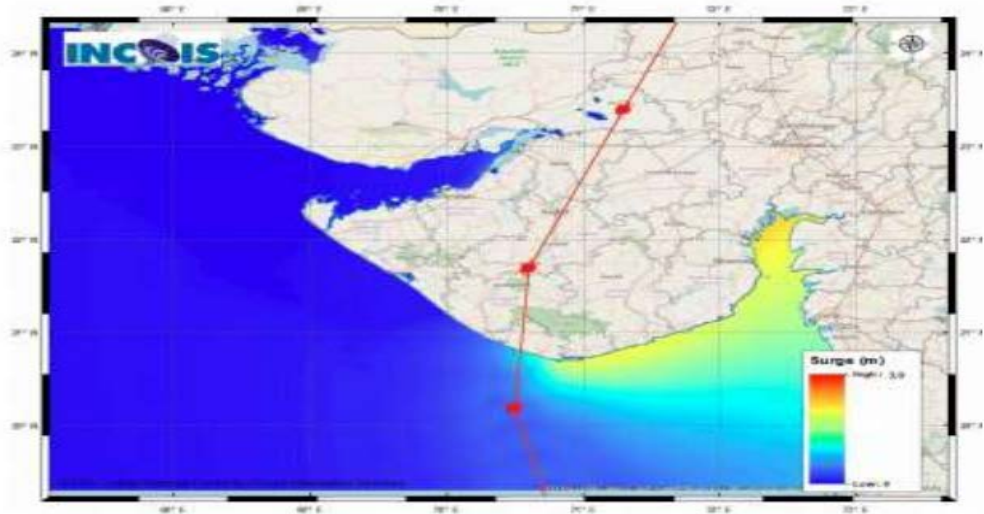


Figure: Storm Surge Map

Tidal wave above astronomical tide to inundate coastal areas:

about 3 m: Junagarh,

about 1-2.5 m: Diu, Gir Somnath, Amreli, Bharuch, Bhavnagar, Ahmedabad, Anand, Surat and

about 0.5 -1m: Devbhoomi Dwarka , Jamnagar, Porbandar, Kutch the remaining coastal districts of Gujarat during the time of landfall.

Bulletins Issued from Head Quarter at New Delhi



भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT



SOP : BULLETINS AND WARNINGS for NATIONAL PURPOSE

❖ Four stage cyclone warning

- i. Sea area bulletin
- ii. Coastal weather bulletin
- iii. Bulletins for Indian navy
- iv. Fisheries warnings
- v. Port warnings
- vi. Aviation warning
- vii. Bulletins for AIR/
Doordarshan/ press
- viii. CWDS bulletins
- ix. Warnings for registered/
designated users.
- x. Impact based forecast
and warning using
historical damage
potential

- ❖ Pre-cyclone watch (Yellow) – Issued to Cabinet Secretary and Senior Officials indicating formation of a cyclonic disturbance – potential to intensify into a Tropical Cyclone and coastal belt to be affected.
- ❖ Cyclone Alert (Orange)- Issued at least 48 hrs in advance indicating expected adverse weather conditions.
- ❖ Cyclone warning (Red) – Issued at least 24 hrs in advance indicating latest position of Tropical Cyclone, intensity, time and point of landfall, storm surge height, type of damages expected and actions suggested.
- ❖ Post-Landfall Outlook- Issued about 12 hrs before landfall & till cyclone force winds prevail; District Collectors of interior districts besides the coastal areas are also informed.
- ❖ Finally a 'De-Warning' message is issued when the Tropical Cyclone weakens into Depression stage.

National Bulletin (through email/FAX/whatsapp/website)

National Bulletin to Control Room MHA, NDMA, NDRF, Cabinet Secretary, Secretary to Minister of Science & Technology, HQ Defence, Chief Secretary of states along West Coast of India



**India Meteorological Department
(Ministry of Earth Sciences)**

BULLETIN NO. 19: (ARB/01/2021)

TIME OF ISSUE: 2040 HOURS IST

DATED: 16.05.2021

FROM: INDIA METEOROLOGICAL DEPARTMENT (FAX NO. 24643965/24699216/24623220)

TO: CONTROL ROOM, NDM, MINISTRY OF HOME AFFAIRS (FAX.NO. 23092398/23093750)

CONTROL ROOM NDMA (FAX.NO. 26701729)

CABINET SECRETARIAT (FAX.NO.23012284, 23018638)

PS TO HON'BLE MINISTER FOR S & T AND EARTH SCIENCES (FAX NO.23316745)

SECRETARY, MOES (FAX NO. 24629777)

H.Q. (INTEGRATED DEFENCE STAFF AND CDS) (FAX NO. 23005137/23005147)

DIRECTOR GENERAL, DOORDARSHAN (23385843) DIRECTOR GENERAL, AIR (23421101, 23421105, 23421219)

PIB MOES (FAX NO. 23389042)

UNI (FAX NO. 23355841)

D.G. NATIONAL DISASTER RESPONSE FORCE (NDRF) (FAX NO. 26105912, 2436 3260)

DIRECTOR, PUNCTUALITY, INDIAN RAILWAYS (FAX NO. 23388503)

CHIEF SECRETARY, KERALA (FAX NO. 0471-2327176)

ADMINISTRATOR, LAKSHADWEEP ISLANDS (FAX NO. 0413-262184)

CHIEF SECRETARY, KARNATAKA (FAX NO. 080-22258913)

CHIEF SECRETARY, GOA (FAX NO. 0832-2415201)

CHIEF SECRETARY, MAHARASHTRA (FAX NO. 022- 22028594)

CHIEF SECRETARY, GUJARAT (FAX NO. 079-23250305)

CHIEF SECRETARY, DAMAN & DIU (FAX NO. 0260-2230775)

CHIEF SECRETARY, DADRA & NAGAR HAVELI (FAX NO. 0260-2645466)

CHIEF SECRETARY, TAMIL (FAX NO. 044-25672304)



National Bulletin at 1200 UTC of 16th May

Sub: Very Severe Cyclonic Storm "Tauktae" (pronounced as Tau'Te) over Eastcentral Arabian Sea: Cyclone Warning for Gujarat & Diu coasts (Orange message)

The **Very Severe Cyclonic Storm "Tauktae" (pronounced as Tau'Te)** over eastcentral Arabian Sea moved north-northwestwards with a speed of about 19 kmph during past 06 hours and lay centred at 1730 hours IST of today, the 16th May, 2021 over eastcentral Arabian Sea near latitude 16.7°N and longitude 72.5°E, about 190 km northwest of Panjim-Goa, 270 km south-southwest of Mumbai, 510 km south-southeast of Veraval (Gujarat), 470 km south-southeast of Diu and 700 km southeast of Karachi (Pakistan).

It is very likely to intensify further during next 24 hours. It is very likely to move north-northwestwards and reach Gujarat coast in the evening hours of 17th & cross Gujarat coast between Porbandar & Mahuva (Bhavnagar district) around 18th May early morning.

The System is being monitored by Doppler weather RADAR Goa.

Forecast track and intensity are given in the following table:

Date/Time(IST)	Position (Lat. °N/ long. °E)	Maximum sustained surface wind speed (Kmph)	Category of cyclonic disturbance
16.05.21/1730	16.7/72.5	140-150 gusting to 165	Very Severe Cyclonic Storm
16.05.21/2330	17.4/72.0	145-155 gusting to 170	Very Severe Cyclonic Storm
17.05.21/0530	18.2/71.4	150-160 gusting to 175	Very Severe Cyclonic Storm
17.05.21/1130	19.0/71.0	155-165 gusting to 185	Very Severe Cyclonic Storm

17.05.21/1730	19.6/70.9	155-165 gusting to 185	Very Severe Cyclonic Storm
18.05.21/0530	20.9/70.8	155-165 gusting to 185	Very Severe Cyclonic Storm
18.05.21/1730	22.6/71.3	80-90 gusting to 100	Cyclonic Storm
19.05.21/0530	24.1/71.9	50-60 gusting to 70	Deep Depression
19.05.21/1730	25.6/72.6	35-45 gusting to 55	Depression

Warnings:

(i) Rainfall:

- **Kerala:** Light to moderate rainfall at many places with heavy to very to very heavy falls at isolated places on 16th and heavy falls at isolated places on 17th May.
- **South Konkan & Goa:** Light to moderate rainfall at most places with heavy to very heavy falls at a few places and extremely heavy falls at isolated places over south Konkan & Goa and adjoining Ghat areas on 16th and heavy to very heavy falls at isolated places on 17th May.
- **North Konkan:** Light to moderate rainfall at most places with heavy to very heavy falls at isolated places on 16th and 17th May.
- **Gujarat:** Light to moderate rainfall at many places very likely to commence over coastal districts of Saurashtra from today afternoon, with heavy to very heavy falls at isolated places over Saurashtra & Kutch, Diu and southern most Gujarat region with extremely heavy falls at isolated places on 17th and with heavy to very heavy falls at a few places over Saurashtra & Kutch and Diu & south Gujarat region with extremely heavy falls (≥ 20 cm) at isolated places on 18th.
- **Rajasthan:** Light to moderate rainfall at many places with heavy to very heavy falls & extremely heavy falls at isolated places very likely over south Rajasthan on 18th & heavy to very heavy falls at isolated places over Rajasthan on 19th May.

(ii) Wind warning

- Gale wind speed reaching 140–150 kmph gusting to 165 kmph is prevailing over eastcentral Arabian Sea. It is likely to increase becoming 155-165 kmph gusting to 185 kmph from the forenoon of 17th May.
- Gale winds speed reaching 80-90 kmph gusting to 100 kmph along & off south Maharashtra –Goa and adjoining Karnataka coasts on 16th, 50-60 kmph gusting to 70 kmph along & off north Maharashtra coast during next 12 hours. It is likely to become 65- 75 kmph gusting to 85 kmph along & off north Maharashtra coast from 17th morning till 18th morning.
- Squally wind speed reaching 40-50 kmph gusting to 60 kmph is prevailing over northeast Arabian Sea and along & off south Gujarat & Daman and Diu coasts. It is likely to gradually increase becoming Gale winds speed reaching 155-165 kmph gusting to 185 kmph over northeast Arabian Sea and along & off Gujarat coast (Porbandar, Junagarh, Gir Somnath, Amreli, Bhavnagar) and 120 -140 kmph gusting to 165 kmph over Bharuch, Anand, south Ahmedabad, Botad, 90 -100 kmph gusting to 120 kmph over Devbhoomi Dwarka, Jamnagar, Rajkot, Morbi, Kheda districts of Gujarat from early hours of 18th. Gale winds speed reaching 70-90 kmph gusting to 100 kmph likely to prevail along & off Dadra, Nagar Haveli, Daman, Valsad, Navsari, Surat, Surendranagar, districts from 17th mid-night till 18th morning.



National Bulletin at 1200 UTC of 16th May

(iii) Sea condition

- Sea condition over eastcentral Arabian Sea will be very high to Phenomenal on 16th May and over northeast Arabian Sea from 17th till 18th May noon and improve gradually thereafter.
- Sea conditions will be very rough to High along & off south Maharashtra–Goa coasts during next 12 hours and along & off north Maharashtra coast on 17th Morning. It is very likely to be very rough to High along & off south Gujarat coast from 17th May morning and very high to Phenomenal from 17th midnight, till 18th May forenoon and improve gradually thereafter.

(iv) Storm surge warning

Tidal wave above astronomical tide is likely to inundate coastal areas as per details below:

about 3 meter (m) over Amreli, Gir Somnath, Diu, Bhavnagar, 2-3 m over Bharuch, Anand, southern parts of Ahmedabad, 1-2 m over Surat, Navsari, Valsad, and 0.5 – 1m over the remaining coastal districts of Gujarat during the time of landfall.(Details given in Annexure-I).

(v) Fishermen Warning

- Total suspension of fishing operations over eastcentral Arabian Sea till 18th May.
- Total suspension of fishing operations over northeast Arabian Sea and along & off Gujarat coast from 17th May.
- The fishermen are advised not to venture into eastcentral Arabian Sea along & off Karnataka coast till 17th Morning and into eastcentral Arabian Sea and along & off Maharashtra–Goa coasts and into northeast Arabian Sea along & off Gujarat coast till 18th May.
- Those who are out at Sea over north Arabian Sea are advised to return to the coast.

(vi) (A) Damage Expected over Porbandar, Amreli Junagarh, Gir Somnath Botad & Bhavnagar and coastal areas of Ahmedabad:

- Total destruction of thatched houses/ extensive damage to kutch houses. Some damage to pucca houses. Potential threat from flying objects.
- Bending/ uprooting of power and communication poles.
- Major damage to Kutch and Pucca roads. Flooding of escape routes. Minor disruption of railways, overhead power lines and signaling systems.
- Widespread damage to salt pans & standing crops,. Blowing down of bushy trees.
- Small boats, country crafts may get detached from moorings.
- Visibility severely affected.

(vi) (B) Damage Expected over Devbhoomi Dwarka, Kutch, Jamnagar, Rajkot & Morbi, Valsad, Surar, Vadodara, Bharuch, Navsari, Anand, Kheda and interior parts of Ahmedabad districts of Gujarat:

- Major damage to thatched houses/ huts. Roof tops may blow off. Unattached metal sheets may fly.
- Minor damage to power and communication lines.
- Major damage to Kutch and some damage to Pucca roads. Flooding of escape routes.
- Breaking of tree branches, uprooting of large avenue trees. Moderate damage to banana and papaya trees. Large dead limbs blown from trees.
- Major damage to coastal crops.
- Damage to embankments/ salt pans.

(vii) Action Suggested:

- Mobilise evacuation in vulnerable areas.
- Total suspension of fishing operations.
- Judicious regulation of rail and road traffic.
- People in affected areas to remain indoors.
- Movement in motor boats and small ships unsafe.

The next bulletin will be issued at 2330 hrs IST of today, the 16th May, 2021.

(Sunitha Devi S)
Scientist-F, RSMC, New Delhi

Copy to: ACWC Chennai/ ACWC Mumbai/ MC Goa/ MC Bengaluru/ CWC Ahmedabad/ Thiruvananthapuram.



National Bulletin at 1200 UTC of 16th May

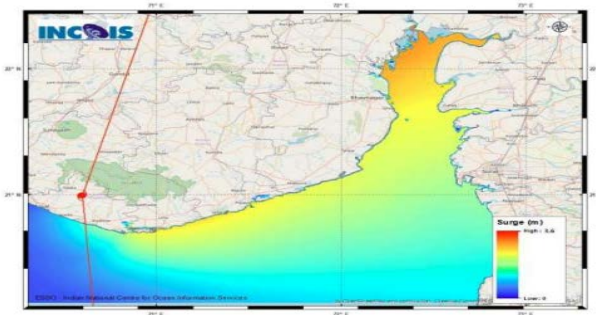
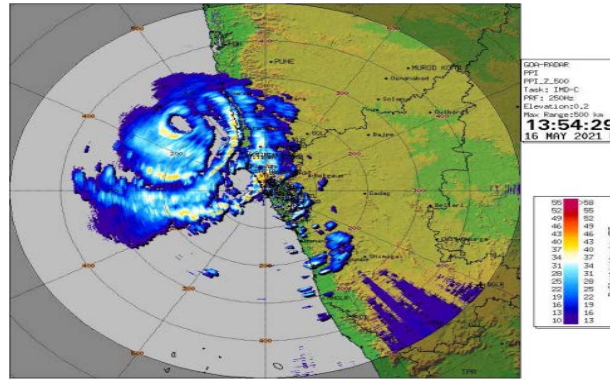
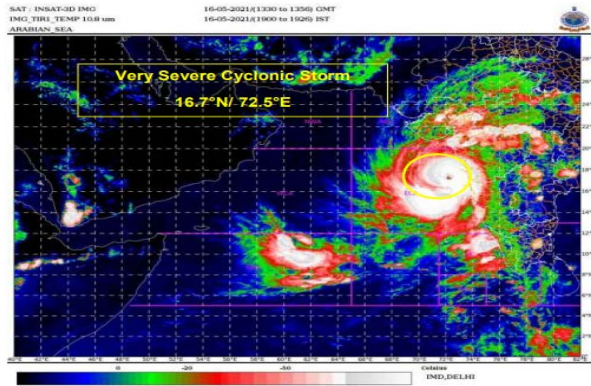
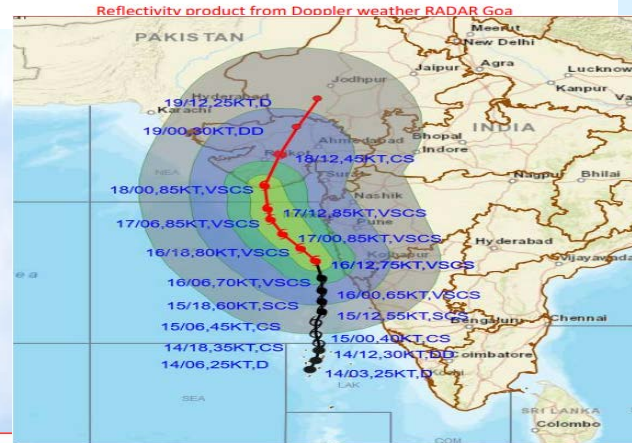


Figure: Storm Surge Map



ENT



Bulletin from DGM IMD to senior Government officials through FAX and email (daily once)

डॉ. मृत्युंजय महापात्र

नेशनल मिशन विभाग के महाप्रतिनिधि,
विश्व मौसम विज्ञान संगठन में भारत के स्थायी प्रतिनिधि
एवं सर्वोच्च सचिव के सचिव

Dr. Mrutyunjay Mohapatra

Director General of Meteorology,
Permanent Representative of India with WMO,
Member of Executive Council, WMO



भारत सरकार
पृथ्वी विज्ञान मंत्रालय
भारत मौसम विज्ञान विभाग
मौसम भवन, लोदी रोड
नई दिल्ली-110003
Government of India
Ministry of Earth Sciences
India Meteorological Department
Mausam Bhawan, Lodi Road
New Delhi - 110003

BULLETIN NO.3 (ARB/01/2021)

Time of issue: 1600 hours IST

Dated: 16th May, 2021

Very Severe Cyclonic Storm "Tauktae" (pronounced as Tau'Te) over eastcentral Arabian Sea: Cyclone Warning for Gujarat & Diu coasts (Orange Message)

Yesterday's Cyclonic Storm "Tauktae" (pronounced as Tau'Te) over eastcentral and adjoining southeast Arabian Sea moved nearly northwards and intensified into a severe cyclonic storm in the same afternoon (1430 hrs IST of 15th May). Continuing to move further northwards, it intensified into a very severe cyclonic storm in the early hours (0230 hrs IST) of today, the 16th May, 2021.

Continuing to move northwards, it lay centered at 1130 hours IST over eastcentral Arabian Sea near latitude 15.7°N and longitude 72.7°E, about 120 km west-northwest of Panaji-Goa, 380 km south-southwest of Mumbai, 620 km south-southeast of Veraval (Gujarat) and 790 km southeast of Karachi (Pakistan).

It is very likely to intensify further during next 24 hours. It is very likely to move north-northwestwards and reach Gujarat coast in the evening hours of 17th & cross Gujarat coast between Porbandar & Mahuva (Bhavnagar district) around 18th May early morning.

The System is being monitored by Doppler weather RADAR Goa.

Forecast track and intensity are given in the following table:

Date/Time(IST)	Position (Lat. °N long. °E)	Maximum sustained surface wind speed (Kmph)	Category of cyclonic disturbance
16.05.21/1130	15.7/72.7	135-145 gusting to 160	Very Severe Cyclonic Storm
16.05.21/1730	16.5/72.4	140-150 gusting to 165	Very Severe Cyclonic Storm
16.05.21/2330	17.4/71.8	145-155 gusting to 170	Very Severe Cyclonic Storm
17.05.21/0630	18.2/71.3	160-160 gusting to 175	Very Severe Cyclonic Storm
17.05.21/1130	19.0/71.0	155-165 gusting to 185	Very Severe Cyclonic Storm
17.05.21/2330	20.2/70.8	155-165 gusting to 185	Very Severe Cyclonic Storm
18.05.21/1130	21.7/71.0	110-120 gusting to 135	Severe Cyclonic Storm
18.05.21/2330	23.4/71.8	50-60 gusting to 70	Deep Depression
19.05.21/1130	24.9/72.2	35-45 gusting to 55	Depression

Warnings:

(i) Rainfall:

- Kerala: Light to moderate rainfall at many places with heavy to very heavy falls at isolated places on 16th and heavy falls at isolated places on 17th May.
- Karnataka (coastal & adjoining Ghat districts): Light to moderate rainfall at most places with heavy to very heavy falls at isolated places on 16th.
- South Konkan & Goa: Light to moderate rainfall at most places with heavy to very heavy falls at a few places and extremely heavy falls at isolated places over south Konkan & Goa and adjoining Ghat areas on 16th and heavy to very heavy falls at isolated places on 17th May.

- North Konkan:** Light to moderate rainfall at most places with heavy to very heavy falls at isolated places on 16th and 17th May.
- Gujarat:** Light to moderate rainfall at many places very likely to commence over coastal districts of Saurashtra from today afternoon, with heavy to very heavy falls at isolated places over Saurashtra & Kutch, Diu and southern most Gujarat region with extremely heavy falls at isolated places on 17th and with heavy to very heavy falls at a few places over Saurashtra & Kutch and Diu & south Gujarat region with extremely heavy falls (≥ 20 cm) at isolated places on 18th.
- Rajasthan:** Light to moderate rainfall at many places with heavy to very heavy falls & extremely heavy falls at isolated places very likely over south Rajasthan on 18th & heavy to very heavy falls at isolated places over Rajasthan on 19th May.

(ii) Wind warning

- Gale wind speed reaching 135-145 kmph gusting to 160 kmph is prevailing over eastcentral Arabian Sea. It is likely to increase over eastcentral Arabian Sea becoming 145-155 kmph gusting to 170 kmph from 16th May mid-night.
- Gale winds speed reaching 80-90 kmph gusting to 100 kmph along & off south Maharashtra - Goa and adjoining Karnataka coasts on 16th, 50-60 kmph gusting to 70 kmph along & off north Maharashtra coast on 16th. It is likely to become 65-75 kmph gusting to 85 kmph along & off north Maharashtra coast from 17th till 18th morning.
- Squally wind speed reaching 40-50 kmph gusting to 60 kmph likely over northeast Arabian Sea and along & off south Gujarat & Daman and Diu coasts from 16th morning and gradually increase becoming Gale winds speed reaching 150-160 kmph gusting to 175 kmph over northeast Arabian Sea and along & off Gujarat coast (Porbandar, Junagarh, Gir Somnath, Amreli, Bhavnagar) and 100-120 kmph gusting to 135 kmph over Bharuch, Anand, south Ahmedabad, Botad, Surendranagar, 90-100 kmph gusting to 120 kmph over Devbhoomi Dwarka, Jamnagar, Rajkot, Morbi districts of Gujarat from early hours of 18th. Gale winds speed reaching 70-90 kmph gusting to 100 kmph likely to prevail along & off Dadra, Nagar Haveli, Daman, Valsad, Navsari, Surat, Kheda districts from 17th mid-night till 18th morning.

(iii) Sea condition

- Sea condition over eastcentral Arabian Sea will be very high to Phenomenal on 16th May and over northeast Arabian Sea on 17th & 18th May.
- Sea conditions will be very rough to High along & off Maharashtra-Goa coasts on 16th May and along & off north Maharashtra coast on 17th Morning. It is very likely to be very rough to High along & off south Gujarat coast from 17th May morning and very high to Phenomenal from 17th midnight.

(iv) Storm surge warning

Tidal wave above astronomical tide is likely to inundate coastal areas as per details below:
About 3 meter (m) over Amreli, Gir Somnath, Diu, Bhavnagar, 2-3 m over Bharuch, Amreli, Anand, southern parts of Ahmedabad, 1-2 m over Surat, Navsari, Valsad, and 0.5 - 1m over the remaining coastal districts of Gujarat during the time of landfall. (Details given in Annexure-I).

Bulletin from DGM IMD to senior Government officials through FAX and email (daily once)

- 3 -

(v) Fishermen Warning

- Total suspension of fishing operations over eastcentral Arabian Sea and along & off Karnataka-Goa-Maharashtra coasts.
- Total suspension of fishing operations over northeast Arabian Sea and along & off Gujarat coast from 17th May.
- The fishermen are advised not to venture into eastcentral Arabian Sea along & off Karnataka coast till 17th Morning and into eastcentral Arabian Sea and along & off Maharashtra-Goa coasts and into northeast Arabian Sea along & off Gujarat coast till 18th May.
- Those who are out at Sea over north Arabian Sea are advised to return to the coast.

(vi) (A) Damage Expected over Porbandar, Amreli Junagarh, Gir Somnath Botad & Bhavnagar and coastal areas of Ahmedabad:

- > Total destruction of thatched houses/ extensive damage to kutcha houses. Some damage to pucca houses. Potential threat from flying objects.
- > Bending/ uprooting of power and communication poles.
- > Major damage to Kutcha and Pucca roads. Flooding of escape routes. Minor disruption of railways, overhead power lines and signaling systems.
- > Widespread damage to salt pans & standing crops. Blowing down of bushy trees.
- > Small boats, country crafts may get detached from moorings.
- > Visibility severely affected.

(vi) (B) Damage Expected over Devbhoomi Dwarka, Kutch, Jamnagar, Rajkot & Morbi, Valsad, Surat, Vadodara, Bharuch, Navsari, Anand, Ahmedabad districts of Gujarat:

- > Major damage to thatched houses/ huts. Roof tops may blow off. Unattached metal sheets may fly.
- > Minor damage to power and communication lines.
- > Major damage to Kutcha and some damage to Pucca roads. Flooding of escape routes.
- > Breaking of tree branches, uprooting of large avenue trees. Moderate damage to banana and papaya trees. Large dead limbs blown from trees.
- > Major damage to coastal crops.
- > Damage to embankments/ salt pans.

(vii) Action Suggested:

- > Mobilise evacuation in vulnerable areas.
- > Total suspension of fishing operations.
- > Judicious regulation of rail and road traffic.
- > People in affected areas to remain indoors.
- > Movement in motor boats and small ships unsafe.

The system is under continuous surveillance and the concerned state governments are being informed regularly.

Kindly visit www.rsmcnewdelhi.imd.gov.in and www.mausam.imd.gov.in for regular updates.

- 4 -

Cabinet Secretary
Principal Secretary to PM
Secretary, Ministry of Home Affairs
Secretary, Ministry of Agriculture
Secretary, Ministry of Defence
Secretary, Ministry of I & B
Secretary, MoES
Secretary, DST
Secretary, Ministry of Shipping & Surface Transport
Control Room, NDM, Ministry of Home Affairs
Director of Punctuality, Indian Railways
Director General, Doordarshan
Director General, AIR
Secretary, NDMA
Director General, NDRF

Chief Secretary, Govt. of Kerala
Chief Secretary, Govt. of Karnataka
Chief Secretary, Govt. of Lakshadweep
Chief Secretary, Govt. of Daman & Diu and Dadra, Nagar Haveli
Chief Secretary, Govt. of Maharashtra
Chief Secretary, Govt. of Goa
Chief Secretary, Govt. of Gujarat
Chief Secretary, Govt. of Tamilnadu

CC: CRS Pune/ ACWC Mumbai/ACWC Chennai/CWC Thiruvananthapuram/ CWC Ahmedabad/MC Bengaluru/MC Goa


(M. Mohapatra)

Press Release to senior Government officials, Media, TC Forecasters within country through email, whatsapp & website (daily once)



Government of India
Ministry of Earth Sciences



India Meteorological Department

PRESS RELEASE - 5

Time of issue: 1530 hours IST

Dated: 16-05-2021

Sub: Very Severe Cyclonic Storm "Tauktae" (pronounced as Tau/Te) over eastcentral Arabian Sea: **Cyclone Warning for Gujarat & Dlu coasts (Orange Message)**

Yesterday's Cyclonic Storm "Tauktae" (pronounced as Tau/Te) over eastcentral and adjoining southeast Arabian Sea moved nearly northwards and intensified into a severe cyclonic storm in the same afternoon (1430 hrs IST of 15th May). Continuing to move further northwards, it intensified into a very severe cyclonic storm in the early hours (0230 hrs IST) of today, the 16th May, 2021.

Continuing to move northwards, it lay centered at 1130 hours IST over eastcentral Arabian Sea near latitude 15.7°N and longitude 72.7°E, about 120 km west-northwest of Panjim-Goa, 380 km south-southwest of Mumbai, 620 km south-southeast of Veraval (Gujarat) and 790 km southeast of Karachi (Pakistan).

It is very likely to intensify further during next 24 hours. It is very likely to move north-northwestwards and reach Gujarat coast in the evening hours of 17th & cross Gujarat coast between Porbandar & Mahuva (Bhavnagar district) around 18th May early morning.

The System is being monitored by Doppler weather RADAR Goa.

Forecast track and intensity are given in the following table:

Date/Time(IST)	Position (Lat. °N long. °E)	Maximum sustained surface wind speed (Kmph)	Category of cyclonic disturbance
16.05.21/1130	15.7/72.7	135-145 gusting to 160	Very Severe Cyclonic Storm
16.05.21/1730	16.5/72.4	140-150 gusting to 165	Very Severe Cyclonic Storm
16.05.21/2330	17.4/71.8	145-155 gusting to 170	Very Severe Cyclonic Storm
17.05.21/0530	18.2/71.3	150-160 gusting to 175	Very Severe Cyclonic Storm
17.05.21/1130	19.0/71.0	155-165 gusting to 185	Very Severe Cyclonic Storm
17.05.21/2330	20.2/70.8	155-165 gusting to 185	Very Severe Cyclonic Storm
18.05.21/1130	21.7/71.0	110-120 gusting to 135	Severe Cyclonic Storm
18.05.21/2330	23.4/71.6	50-60 gusting to 70	Deep Depression
19.05.21/1130	24.9/72.2	35-45 gusting to 55	Depression

Warnings:

(i) Rainfall:

- Kerala:** Light to moderate rainfall at many places with heavy to very to very heavy falls at isolated places on 16th and heavy falls at isolated places on 17th May.
- Karnataka (coastal & adjoining Ghat districts):** Light to moderate rainfall at most places with heavy to very heavy falls at isolated places on 16th.
- South Konkan & Goa:** Light to moderate rainfall at most places with heavy to very heavy falls at a few places and extremely heavy falls at isolated places over south Konkan & Goa and adjoining Ghat areas on 16th and heavy to very heavy falls at isolated places on 17th May.
- North Konkan:** Light to moderate rainfall at most places with heavy to very heavy falls at isolated places on 16th and 17th May.

- Gujarat:** Light to moderate rainfall at many places very likely to commence over coastal districts of Saurashtra from today afternoon, with heavy to very heavy falls at isolated places over Saurashtra & Kutch, Dlu and southern most Gujarat region with extremely heavy falls at isolated places on 17th and with heavy to very heavy falls at a few places over Saurashtra & Kutch and Dlu & south Gujarat region with extremely heavy falls (≥ 20 cm) at isolated places on 18th.
- Rajasthan:** Light to moderate rainfall at many places with heavy to very heavy falls & extremely heavy falls at isolated places very likely over south Rajasthan on 18th & heavy to very heavy falls at isolated places over Rajasthan on 19th May.

(ii) Wind warning

- Gale wind speed reaching 135-145 kmph gusting to 160 kmph is prevailing over eastcentral Arabian Sea. It is likely to increase over eastcentral Arabian Sea becoming 145-155 kmph gusting to 170 kmph from 16th May mid-night.
- Gale winds speed reaching 80-90 kmph gusting to 100 kmph along & off south Maharashtra - Goa and adjoining Karnataka coasts on 16th, 50-60 kmph gusting to 70 kmph along & off north Maharashtra coast on 16th. It is likely to become 65-75 kmph gusting to 85 kmph along & off north Maharashtra coast from 17th till 18th morning.
- Squally wind speed reaching 40-50 kmph gusting to 60 kmph likely over northeast Arabian Sea and along & off south Gujarat & Daman and Dlu coasts from 16th morning and gradually increase becoming Gale winds speed reaching 150-160 kmph gusting to 175 kmph over northeast Arabian Sea and along & off Gujarat coast (Porbandar, Junagarh, Gir Somnath, Amreli, Bhavnagar) and 100-120 kmph gusting to 135 kmph over Bharuch, Anand, south Ahmedabad, Botad, Surendranagar, 90-100 kmph gusting to 120 kmph over Devbhoomi Dwarka, Jamnagar, Rajkot, Morbi districts of Gujarat from early hours of 18th. Gale winds speed reaching 70-90 kmph gusting to 100 kmph likely to prevail along & off Dadra, Nagar Haveli, Daman, Valsad, Navsari, Surat, Kheda districts from 17th mid-night till 18th morning.

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- Sea condition over eastcentral Arabian Sea will be very high to Phenomenal on 16th May and over northeast Arabian Sea on 17th & 18th May.
- Sea conditions will be very rough to High along & off Maharashtra-Goa coasts on 16th May and along & off north Maharashtra coast on 17th Morning. It is very likely to be very rough to High along & off south Gujarat coast from 17th May morning and very high to Phenomenal from 17th midnight.

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Tidal wave above astronomical tide is likely to inundate coastal areas as per details below:
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Contact: Cyclone Warning Division, Office of the Director General of Meteorology, India Meteorological Department, Ministry of Earth Sciences.

Phone: (91) 11-24652484, FAX: (91) 11-24643128, 24623225, E-mail:cwddhq2008@gmail.com, Website: www.cwddhq2008.gov.in

Spatial rainfall distribution: Isolated: <25%, A few: 26-50%, Many: 51-75%, Most: 76-100%

Rainfall amount (mm): Heavy rain: 84.5 - 115.5, Very heavy rain: 115.6 - 204.4, Extremely heavy rain: 204.5 or more.

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Press Release to senior Government officials, Media, TC Forecasters within country through email & website (daily once)

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- Total suspension of fishing operations over eastcentral Arabian Sea and along & off Karnataka-Goa-Maharashtra coasts
- Total suspension of fishing operations over northeast Arabian Sea and along & off Gujarat coast from 17th May.
- The fishermen are advised not to venture into eastcentral Arabian Sea along & off Karnataka coast till 17th Morning and into eastcentral Arabian Sea and along & off Maharashtra-Goa coasts and into northeast Arabian Sea along & off Gujarat coast till 18th May.
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- Total destruction of thatched houses/ extensive damage to kutcha houses. Some damage to pucca houses. Potential threat from flying objects.
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- Major damage to thatched houses/ huts. Roof tops may blow off. Unattached metal sheets may fly.
- Minor damage to power and communication lines.
- Major damage to Kutcha and some damage to Pucca roads. Flooding of escape routes.
- Breaking of tree branches, uprooting of large avenue trees. Moderate damage to banana and papaya trees. Large dead limbs blown from trees.
- Major damage to coastal crops.
- Damage to embankments/ salt pans.

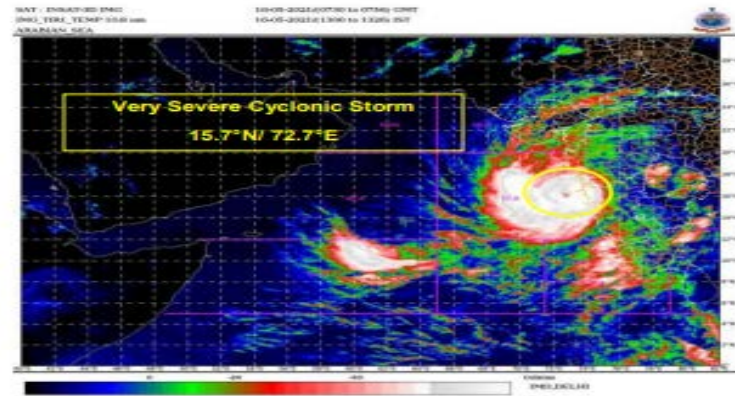
(vii) Action Suggested:

- Mobilise evacuation in vulnerable areas.
- Total suspension of fishing operations.
- Judicious regulation of rail and road traffic.
- People in affected areas to remain indoors.
- Movement in motor boats and small ships unsafe.

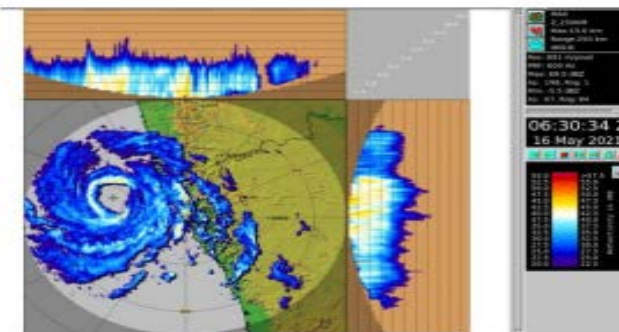
The system is under continuous surveillance and the concerned state governments are being informed regularly.

Kindly visit www.rsmcnwdelhi.imd.gov.in and www.mausam.imd.gov.in for regular updates.

Contact: Cyclone Warning Division, Office of the Director General of Meteorology,
India Meteorological Department, Ministry of Earth Sciences.
Phone: (91) 11-24652484, FAX: (91) 11-24643128, 24623220, E-mail: wdhg2008@gmail.com, Website: www.mausamdelhi.imd.gov.in
Spatial rainfall distribution: Isolated: <25%, A few: 26-50%, Many: 51-75%, Most: 76-100%
Rainfall amount (mm): Heavy rain: 64.5 – 115.5, Very heavy rain: 115.6 – 204.4, Extremely heavy rain: 204.5 or more.



INSAT-3D Enhanced Colored imagery based on 0730 UTC of 16th May, 2021



Reflectivity product from Doppler weather RADAR Goa at 0630 UTC of 16th May



RSMC Bulletin at 1200 UTC of 16th May through email, GTS, website



REGIONAL SPECIALISED METEOROLOGICAL CENTRE-TROPICAL CYCLONES, NEW DELHI
TROPICAL CYCLONE ADVISORY BULLETIN NO. 15



FROM: RSMC –TROPICAL CYCLONES, NEW DELHI

TO: STORM WARNING CENTRE, NAYPYI TAW (MYANMAR)
STORM WARNING CENTRE, BANGKOK (THAILAND)
STORM WARNING CENTRE, COLOMBO (SRILANKA)
STORM WARNING CENTRE, DHAKA (BANGLADESH)
STORM WARNING CENTRE, KARACHI (PAKISTAN)
METEOROLOGICAL OFFICE, MALE (MALDIVES)
OMAN METEOROLOGICAL DEPARTMENT, MUSCAT (THROUGH RTH JEDDAH)
YEMEN METEOROLOGICAL SERVICES, REPUBLIC OF YEMEN (THROUGH RTH JEDDAH)
NATIONAL CENTRE FOR METEOROLOGY, UAE (THROUGH RTH JEDDAH)
PRESIDENCY OF METEOROLOGY AND ENVIRONMENT, SAUDI ARABIA (THROUGH RTH JEDDAH)
IRAN METEOROLOGICAL ORGANISATION, (THROUGH RTH JEDDAH)
QATAR METEOROLOGICAL DEPARTMENT (THROUGH RTH JEDDAH)

TROPICAL CYCLONE ADVISORY NO. 15 FOR NORTH INDIAN OCEAN (THE BAY OF BENGAL AND ARABIAN SEA) VALID FOR NEXT 120 HOURS ISSUED AT 1500 UTC OF 16.05.2021 BASED ON 1200 UTC OF 16.05.2021.

SUB: VERY SEVERE CYCLONIC STORM "TAUKTAE" (PRONOUNCED AS TAU'TE) OVER EASTCENTRAL ARABIAN SEA

THE VERY SEVERE CYCLONIC STORM "TAUKTAE" (PRONOUNCED AS TAU'TE) OVER EASTCENTRAL ARABIAN SEA MOVED NORTH-NORTHWESTWARDS WITH A SPEED OF ABOUT 19 KMPH DURING PAST 06 HOURS AND AND LAY CENTRED AT 1200UTC OF TODAY, THE 16TH MAY, 2021 OVER EASTCENTRAL ARABIAN SEA NEAR LATITUDE 16.7°N AND LONGITUDE 72.5°E, ABOUT 190 KM NORTHWEST OF PANJIM-GOA (43192), 270 KM SOUTH-SOUTHWEST OF MUMBAI(43003), 510 KM SOUTH-SOUTHEAST OF VERAVAL (42909) AND 470 KM SOUTH-SOUTHEAST OF DIU (42914) AND 700 KM SOUTHEAST OF KARACHI (41780).

IT IS VERY LIKELY TO INTENSIFY FURTHER DURING NEXT 24 HOURS. IT IS VERY LIKELY TO MOVE NORTH-NORTHWESTWARDS AND REACH GUJARAT COAST DURING 1200-1500 UTC OF 17th & CROSS GUJARAT COAST BETWEEN PORBANDAR (42830) & MAHUVA (BHAVNAGAR DISTRICT 42838) AROUND 0000 UTC OF 18th MAY.

THE SYSTEM IS BEING MONITORED BY DOPPLER WEATHER RADAR GOA.

Issued for

A. 13 WMO/ESCAP Panel
Member countries including
Thailand, Bangladesh,
Myanmar, Maldives, India,
Sri Lanka, Pakistan, Iran,
Qatar, Saudi Arabia, Oman,
Yemen

B. Indian Navy/Indian Air Force

C. National Level Cyclone
Forecasters



RSMC Bulletin at 1200 UTC of 16th May

FORECAST TRACK AND INTENSITY ARE GIVEN IN THE FOLLOWING TABLE:

Date/Time(UTC)	POSITION (LAT. °N/ LONG. °E)	MAXIMUM SUSTAINED SURFACE WIND SPEED (KMPH)	CATEGORY OF CYCLONIC DISTURBANCE
16.05.21/1200	16.7/72.5	140-150 GUSTING TO 165	VERY SEVERE CYCLONIC STORM
16.05.21/1800	17.4/72.0	145-155 GUSTING TO 170	VERY SEVERE CYCLONIC STORM
17.05.21/0000	18.2/71.4	150-160 GUSTING TO 175	VERY SEVERE CYCLONIC STORM
17.05.21/0600	19.0/71.0	155-165 GUSTING TO 185	VERY SEVERE CYCLONIC STORM
17.05.21/1200	19.6/70.9	155-165 GUSTING TO 185	VERY SEVERE CYCLONIC STORM
18.05.21/0000	20.9/70.8	155-165 GUSTING TO 185	VERY SEVERE CYCLONIC STORM
18.05.21/1200	22.6/71.3	80-90 GUSTING TO 100	CYCLONIC STORM
19.05.21/0000	24.1/71.9	50-60 GUSTING TO 70	DEEP DEPRESSION
19.05.21/1200	25.6/72.6	35-45 GUSTING TO 55	DEPRESSION

PROBABILITY OF CYCLOGENESIS (FORMATION OF DEPRESSION)

NIL: 0%, LOW: 1-25%, FAIR: 26-50%, MODERATE: 51-75% AND HIGH: 76-100%

REMARKS:

AS PER INSAT-3D SATELLITE IMAGERY BASED ON 1200 UTC OF TODAY THE 16th MAY 2021, THE INTENSITY OF THE SYSTEM IS CATEGORISED AS T 4.5 WITH EYE PATTERN. **HOWEVER, EYE HAS BECOME RAGGED.** BROKEN LOW AND MEDIUM CLOUDS WITH EMBEDDED INTENSE TO VERY INTENSE CONVECTION LAY OVER EASTCENTRAL ARABIAN SEA (AS) BETWEEN LATITUDE 12.0°N & 20°N AND EAST OF LONG 67.0E, OVER SOUTH KONKAN GOA & COASTAL KARNATAKA AND SOUTH MAHARASHTRA.

THE ASSOCIATED MAXIMUM SUSTAINED WIND SPEED IS 80 KNOTS GUSTING TO 90 KNOTS. THE ESTIMATED CENTRAL PRESSURE IS 970 HPA. SEA CONDITION IS PHENOMENAL.

THE MADDEN JULIAN INDEX (MJO) CURRENTLY LIES IN PHASE 2 WITH AMPLITUDE MORE THAN 1. IT WILL CONTINUE TO BE IN SAME PHASE & SAME AMPLITUDE TILL 17TH. THEREAFTER, IT WILL MOVE TO PHASE 3 WITH AMPLITUDE NEAR 1 DURING SUBSEQUENT TWO DAYS. THUS, MJO IS CONDUCIVE FOR ENHANCED CONVECTION OVER THE ARABIAN SEA (AS) DURING NEXT 3 DAYS. THE TROPICAL CYCLONE HEAT POTENTIAL (TCHP) IS MORE THAN 140 KJ/CM² OVER SOUTHEAST AS AND IS DECREASING OVER CENTRAL PARTS OF CENTRAL AS & NORTH AS. SEA SURFACE TEMPERATURE (SST) IS AROUND 30°C OVER ENTIRE AS.

THE LOW LEVEL CYCLONIC VORTICITY IS ABOUT $250 \times 10^{-6} \text{ S}^{-1}$ AROUND SYSTEM CENTRE. LOW LEVEL CONVERGENCE IS ($30 \times 10^{-5} \text{ S}^{-1}$) TO THE SOUTHWEST OF SYSTEM CENTRE. POSITIVE UPPER LEVEL DIVERGENCE IS ($10 \times 10^{-5} \text{ S}^{-1}$) AROUND THE SYSTEM CENTRE. UPPER TROPOSPHERIC RIDGE RUNS ALONG 21°N. THE SYSTEM IS IN THE REGION OF LOW VERTICAL WIND SHEAR (VWS) (10-15 KTS).

MOST OF THE MODELS ARE INDICATING THAT THE VERY SEVERE CYCLONIC STORM OVER EASTCENTRAL ARABIAN SEA WOULD INTENSIFY FURTHER. IT WOULD MOVE NORTH-NORTHWESTWARDS AND CROSS GUJARAT COAST BETWEEN PORBANDAR (42830) & MAHUVA (BHAVNAGAR DISTRICT; 42838) AROUND 0000 UTC OF 18th MAY.

THUS, UNDER FAVOURABLE ENVIRONMENT LIKE MJO, HIGH SST, HIGH TCHP, GOOD POLEWARD OUTFLOW, LOW VWS AND WESTERLY WIND BURST, THE VERY SEVERE CYCLONIC STORM OVER EASTCENTRAL ARABIAN SEA WOULD INTENSIFY FURTHER DURING NEXT 24 HOURS. IT IS VERY LIKELY TO MOVE NORTH-NORTHWESTWARDS AND CROSS GUJARAT COAST BETWEEN PORBANDAR (42830) & MAHUVA (BHAVNAGAR DISTRICT; 42838) AROUND 0000 UTC OF 18th MAY.

(RK JENAMANI)
SCIENTIST-F
RSMC, NEW DELHI

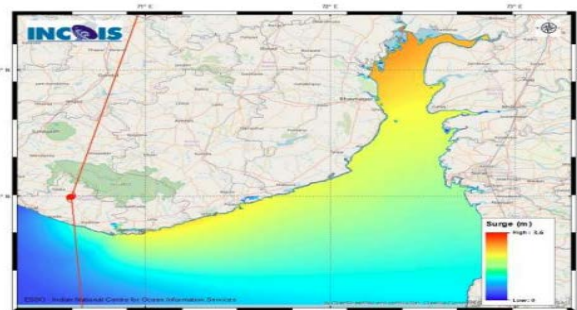
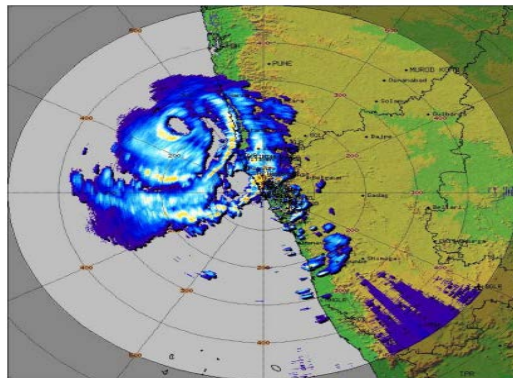


ज्ञान विभाग

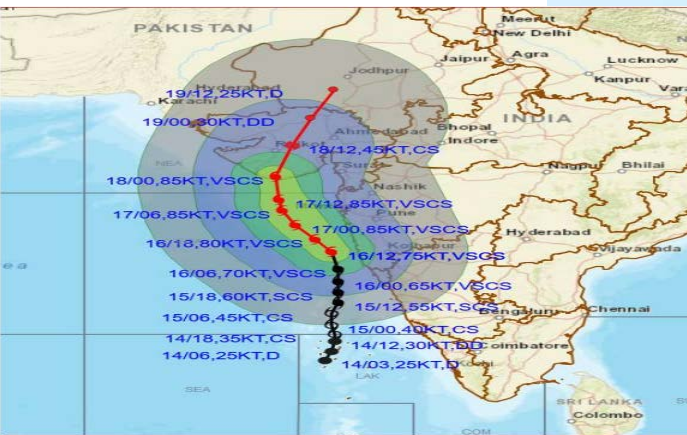
INDIA METEOROLOGICAL DEPARTMENT



SAT : INSAT-3D IMG 16-05-2021/(1330 to 1356) GMT
 IMG_TIR1_TEMP 10.8 um 16-05-2021/(1900 to 1926) IST
 ARABIAN SEA



Reflectivity product from Doppler weather RADAR Goa



IST-UTC + 0530
L: LOW PRESSURE AREA
WML: WELL MARKED LOW PRESSURE AREA
D: DEPRESSION (17-27 KT)
DD: DEEP DEPRESSION (28-33 KT)
CS: CYCLONIC STORM (34-47 KT)
CS: SEVERE CYCLONIC STORM (48-63KT)
VSCS: VERY SEVERE CYCLONIC STORM (64-89 KT)
SCS: EXTREMELY SEVERE CYCLONIC STORM (90-119 KT)
SuCS: SUPER CYCLONIC STORM (≥ 120 KT)

 LESS THAN 34 KT
 34-47 KT
 ≥ 48 KT
 OBSERVED TRACK
 FORECAST TRACK
 CONE OF UNCERTAINTY

DATE/TIME IN UTC
IST-UTC + 0530
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VCS: VERY SEVERE CYCLONIC STORM (64.89 KT)
ECS: EXTREMELY SEVERE CYCLONIC STORM (80.119 KT)
SuCS: SUPER CYCLONIC STORM (≥ 120 KT)

● LESS THAN 34 KT
 ○ 34-47 KT
 ○ ≥ 48 KT
 — OBSERVED TRACK
 — FORECAST TRACK
 — CONE OF UNCERTAINTY
 AREA OF MAXIMUM SUSTAINED WIND SPEED:
 28-33 KT (52-61 KMPH)
 34-49 KT (62-91 KMPH)
 50-63 KT (92-117 KMPH)
 ≥ 64 KT (≥ 118 KMPH)



TCAC Bulletin at 1200 UTC of 16th May for Asia Pacific Region to Met Watch Offices in region and Aviation Disaster Risk Reduction Centre, Hong Kong by email and GTS

TC ADVISORY

TCAC: NEW DELHI

DTG: 20210516/1200Z

TC: TAUKTAE

NR: 09

PSN: N1642 E07230

MOV: NW09KT

INTST CHANGE: INTSF

C: 976HPA

MAX WIND: 75KT

FCST PSN+06HR: 16/1800Z N1724 E07200

FCST MAX WIND +06HRS: 80 KT

FCST PSN+12HR: 17/0000Z N1812 E07124

FCST MAX WIND +12HRS: 85 KT

FCST PSN+18HR: 17/0600Z N1900 E07100

FCST MAX WIND +18HRS: 85 KT

FCST PSN+24HR: 17/1200Z N1936 E07054

FCST MAX WIND +24HRS: 85 KT

RMK: NIL

NEXT MSG: 160521/2100Z

TOO: 162012HRS IST



त मौसम विज्ञान विभाग
METEOROLOGICAL DEPARTMENT



Warning Dissemination system

- ❖ Telephone, Tele-fax, Mobile Phones (SMS) through IMD severe weather network, Agromet Network, INCOIS network.
- ❖ VHF/HFRT/Police Wireless, Aeronautical Fixed Terminal Network
- ❖ Global telecommunication system (GTS) :
- ❖ NAVTEX , Internet (e-mail), ftp
- ❖ Mass Media: : Radio/TV, News Paper network (AM, FM, Community Radio, Private TV) : Prasar Bharati and private broadcasters, Websites, Dedicated websites and web pages, Social media, Weekly and daily Weather Video
- ❖ GAMES and NAVIK



Damini for lightning



Meg hdoot for
Agromet services



Mausam for
weather
information and
warnings



- ❖ Public Website (mausam.imd.gov.in)
- ❖ IMD Apps: Mausam/ Meghdoot/DAMIN/RAIN ALARM, UMANG
- ❖ Social Media: Facebook, Twitter, Instagram, BLOG
- ❖ Twitter: <https://twitter.com/Indiametdept>
- ❖ Facebook::
- ❖ <https://www.facebook.com/India.Meteorological.Department/>
- ❖ Blog: <https://imdweather1875.wordpress.com/>
- ❖ Instagram:https://www.instagram.com/mausam_nwfc
- ❖ Youtube:https://www.youtube.com/channel/UC_qxTReoq07UVARm87CuyQw

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←  **IMD: National Media Group** +91 79787 36580, Akhil, Amitabh, Ana...

Sunitha Madam

Sub: Very Severe Cyclonic Storm Tauktae (pronounced as TauTe) over Eastcentral Arabian Sea: Cyclone Warning for Gujarat & Diu coasts (Orange message)

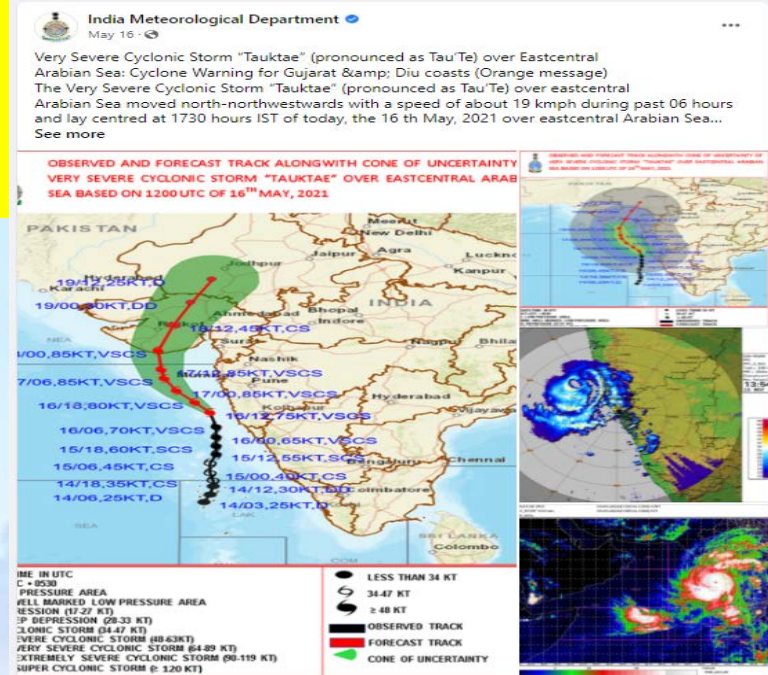
The Very Severe Cyclonic Storm Tauktae (pronounced as TauTe) over eastcentral Arabian Sea moved north-northwestwards with a speed of about 19 kmph during past 06 hours and lay centred at 1730 hours IST of today, the 16th May, 2021 over eastcentral Arabian Sea near latitude 16.7°N and longitude 72.5°E, about 190 km northwest of Panjim-Goa, 270 km south-southwest of Mumbai, 510 km south-southeast of Veraval (Gujarat), 470 km south-southeast of Diu and 700 km southeast of Karachi (Pakistan). It is very likely to intensify further during next 24 hours. It is very likely to move north-northwestwards and reach Guja...

[Read more](#)

8:58 pm

Sunitha Madam


India Meteorological Department
(Ministry of Earth Sciences)
BULLETIN NO. 19 (ARABIANSEA)
DATE OF ISSUE: 16.05.2021
FROM: NEW DELHI
19. National Bulletin 2...
10 pages • 1.4 MB • PDF
8:59 pm



Thank you

