

# India Meteorological Department FDP STORM Bulletin No. 79 (24-05-2018)

# **1. CURRENT SYNOPTIC SITUATION:**

# NWFC INFERENCE (0300UTC of the Day):

• Conditions are becoming favourable for the advance of Southwest monsoon into South Andaman Sea & neighbourhood during next 48 hours.

• The Very Severe Cyclonic Storm "**Mekunu**" over West central & adjoining Southwest Arabian Sea moved further north north-westwards with a speed of 11 kmph during past 06 hours and lay centred at 0830 hours IST of today, the 24th May 2018 over west central & adjoining Southwest Arabian Sea near lat 13.3°N & long 55.4°E, about 180 km east northeast of Socotra Islands and 440 km south southeast of Salalah (Oman). It is very likely to intensify further during next 24 hours. It is very likely to move nearly northwards during next 24 hours and then north north-westwards and cross south Oman southeast Yemen coasts as a Very Severe Cyclonic Storm with wind speed of 160170 kmph gusting to 190 kmph between 53°E and 55°E close to Salalah around 26th May 2018 morning. As the system is away from the Indian coast, no adverse weather is expected along and off west coast of India.

♦ The Western Disturbance as an upper air cyclonic circulation over north Pakistan and adjoining Jammu & Kashmir at 3.1 km above mean sea level has become less marked. However the trough aloft with its axis at 5.8 km above mean sea level now runs roughly along Long 74°E to the north of Lat 34°N.

• The trough at 0.9 km above mean sea level from East Rajasthan to Gangetic West Bengal now runs from East Rajasthan to Jharkhand with an embedded cyclonic circulation over northwest Madhya Pradesh and neighbourhood.

• The cyclonic circulation over east Bihar and adjoining Sub Himalayan West Bengal now lies over Bihar & neighbourhood and extends upto 2.1 km above mean sea level.

• The north south trough at 3.1 km above mean sea level runs roughly along Long 88°E to the north Lat 20°N.

• The cyclonic circulation over southwest Bay of Bengal off Tamilnadu coast between 1.5 & 3.1 km above mean sea level now lies over Southwest Bay of Bengal off south Tamilnadu coast.

A cyclonic circulation between 5.8 km & 7.6 km above mean sea level lies over Maldives Comorin area.

# SATELLITE OBSERVATIONS during past 24 hrs and current observation:

# Current Observation (based on 0600UTC imagery of INSAT 3D):

## Vortex over south-west Arabian Sea:

Vortex (MEKUNU) over south-west Arabian Sea now lay centred near 13.8N/55.3E. Intensity T4.5 RPT T4.5. Associated broken low/medium clouds with embedded intense to very intense convection over area between lat 8.0N to 16.0N long 51.5E to 58.0E (Minimum CTT Minus 93 Deg C) Western Disturbance (WD):

Scattered multi/layered clouds observed over Iran and neighbourhood in associated WD over the area.

# Clouds Descriptions within India: NORTH:-

Scatted low/medium clouds with embedded isolated weak convection over Jammu & Kashmir, North Himachal Pradesh and North Uttarakhand. Scatted low/medium clouds over Northwest & Southeast Uttar Pradesh.

# EAST:-

Scatted low/medium clouds with embedded intense to very intense convection seen over Central & South Assam, North Sub Himalayan West Bengal, Tripura and Nepal. Scatted low/medium clouds with embedded moderate to intense convection seen over Meghalaya and Arunachal Pradesh. Isolated low/medium clouds with embedded isolated weak convection seen over Odisha and Chhattisgarh. Isolated low/medium clouds seen over rest parts of the region.

#### WEST:-

Scatted low/medium clouds with embedded weak to moderate convection seen over Maharashtra & Goa. Scatted low/medium clouds over Northeast Rajasthan, South Gujarat and East Madhya Pradesh.

#### SOUTH:-

Broken low/medium clouds with embedded intense to very intense convection seen over South Tamilnadu, Palk Strait. Scatted low/medium clouds with embedded moderate to intense convection seen over Andaman & Nicobar Islands and Scatted weak to moderate convection seen over Kerala rest Tamilnadu, Karnataka, Andhra Pradesh, Telangana, Rayalaseema, Lakshadweep. Scatted low/medium clouds over rest parts of the region. ARABIAN SEA:

Scatted low/medium clouds with embedded intense to very intense convection seen over Southeast Arabian Sea.

#### **BAY OF BENGAL & ANDAMAN SEA:**

Scatted low/medium clouds with embedded moderate to intense convection seen over South Bay and East Central Bay.

#### **Past Weather:**

#### Convection (during last 24 hrs):

Intense to Very Intense convection was observed over Uttrakhand north east states north east Bihar Jharkhand West Bengal south Himalaya West Bengal; Odisha Chhattisgarh Uttar Pradesh Madhya Pradesh Gujarat and south India Lakshadweep Andaman & Nicobar Islands.

## OLR:

Upto **230** wm<sup>-2</sup> was observed over north interior Karnataka Telangana Vidarbha Jharkhand Sikkim south Himalaya west Bengal north east states Upto 200 wm<sup>-2</sup> South interior Karnataka Kerala & Tamilnadu Orissa **Westerly Trough & Jet Stream:** Westerly Trough & Jet Stream are not observed over Indian Region.

#### Synoptic features

Westerly Trough & Jet-Stream: Trough in Westerlies runs roughly along Longitude 75.0E & north of Latitude 34.0N. No Jet Stream is observed over India.

## **Dynamic Features: Wind Shear**

Wind shear up to 60 Knots is observed over Northern India

Wind shear upto 20 knots observed over central and eastern parts of India

Positive Shear tendency upto 20 knots observed over extreme south India

A Positive Vorticity Up to 100 is observed over west Uttar Pradesh Jharkhand Kerala and Mizoram.

Positive low level convergence observed over east Uttar Pradesh north east Madhya Pradesh Bihar Chhattisgarh Nagaland Manipur Mizoram Tripura.

# Precipitation:

# IMR:

Rainfall Up to 150 mm was observed over East Tamilnadu isolated north Karnataka.

Rainfall Up to 110 mm was observed over Karnataka Kerala South Himalayan west Bengal

Rainfall Up to 90 mm was observed over Telangana Andhra Pradesh

Rainfall Up to 30 mm was observed over Central Parts of Arunachal Pradesh Assam Orissa isolated Chhattisgarh Maharashtra Lakshadweep Andaman & Nicobar Islands

Rainfall Up to 20 mm was observed over North J&K Uttarakhand Meghalaya Nagaland rest Maharashtra Jharkhand Gangetic west Bengal.

# **DWR and RAPID Observations:**

Strong multiple echoes (dBZ > 55 and height >15km) were seen on DWR Lucknow and Machilipatnam domain at around 1550IST. Isolated/multiple Light to moderate echoes were also seen on DWR Agartala, Chennai, Hyderabad, Jaipur, Kochi Vishakhapatnam and Thiruvananthapuram (dBZ around 40-45 and height >10km) and light echoes observed on DWR Delhi, Kolkata and Patna at around 1640IST.

RAPID RGB Satellite imagery at 1530 IST indicated significant convection over East Uttarakhand, Assam, Meghalaya, Nagaland, Manipur, Mizoram, Tripura, Southwest Bihar, Jharkhand, North Madhya Pradesh, North Chhattisgarh, South Odisha adjoining North Coastal Andhra Pradesh, Kerala, Tamilnadu and Lakshadweep.

# Environmental Condition (dust etc) and its Forecast based on 00UTC of date:

Higher Dust concentration was observed over northern Africa, Arab countries and western part of India. Dust concentration is expected to increase for next few days over IGP and north India.

Particulate matter concentration is expected to remain in poor to very poor category for next 2 days in Delhi.

| Delhi – SAFAR analysis & Forecast | 24.05.2018 | 25.05.2018 |
|-----------------------------------|------------|------------|
| PM10 (micro-g/m <sup>3</sup> )    | 290        | 348        |
| PM2.5 (micro-g/m <sup>3</sup> )   | 105        | 126        |

# 2. NWP MODEL GUIDANCE:

NCMRWF (NCUM forecast based on 00UTC the day):

# 1. Weather Systems:

Low level Cycirs, Troughs: 00 &12UTC of Day 1-5: A CYCIR at 850 hPa over BOB off Tamil Nadu/AP coast, System gradually moving north northeast ward and intensifies in Day 3-5

00UTC of Day 1-3: 850hPa N-S trough from east UP to Karnataka across Madhya Pradesh, Maharashtra, Vidarbha region

00UTC of Day 1-5: VSCS Mekunu moving towards north-northwest AS getting further intensified and tracking towards coast of Oman.

Confluence & Wind Discontinuity Regions: 12 UTC of Day 0-3: 850hPa SW-NE line of discontinuity extending from east UP to Karnataka.

Synoptic Systems: 00 UTC of Day 1-4: Western disturbance as a trough moving though J&K to Uttrakhand 2. Location of jet and jet core (>60kt) at 500hPa: Nil

#### 3. Convergence at 850 hPa:

#### Day/Index: Subdivisions with Lower Level Convergence > 15 x 10^-5 /s

Day0: Jharkhand, West MP, East MP, Madhya Maharashtra, NI Karnataka,

Day1: Uttarakhand, East MP, Vidarbha, NI Karnataka, SI Karnataka,

Day2: Jharkhand, Himachal Pradesh, East RJ, Odisha, West MP, East MP, Madhya Maharashtra, Vidarbha, Chhattisgarh, Coastal AP, NI Karnataka,

Day3: Jharkhand, Uttarakhand, West MP, East MP, Madhya Maharashtra, Marathwada, Vidarbha, Chhattisgarh, NI Karnataka, SI Karnataka, Day4: Assam Meghalaya, Jharkhand, Bihar, Jammu Kashmir, East RJ, Odisha, West MP, East MP, Chhattisgarh, Rayalseema, NI Karnataka,

#### 4. Low level Vorticity:-Positive Vorticity:

#### Day/Index: Subdivisions with Lower Level Vortex > 15 x 10^-5 /s

Day0: Arunachal Pradesh, Assam Meghalaya, Jharkhand, Uttarakhand, Himachal Pradesh, Tamilnadu, Puducherry, Kerala,

Day1: Arunachal Pradesh, Assam Meghalaya, Uttarakhand, Himachal Pradesh, Jammu Kashmir, Coastal Karnataka, Kerala,

Day2: Arunachal Pradesh, Assam Meghalaya, Jharkhand, Bihar, Uttarakhand, Himachal Pradesh, Tamilnadu, Puducherry, Kerala,

Day3: Arunachal Pradesh, Assam Meghalaya, Jharkhand, Bihar, Uttarakhand, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka, Kerala,

Day4: Arunachal Pradesh, Assam Meghalaya, Gangetic WB, Bihar, West UP, Odisha, West MP, Coastal AP, Telangana, Tamilnadu, Puducherry, Kerala

#### 5. Showalter Index: -3 to -4[Very unstable]:

#### Day/Index: Subdivisions with Showalter Index < -4

Day0: Arunachal Pradesh, NE NMMT, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, East UP, West UP, Uttarakhand, Himachal Pradesh, Jammu Kashmir, Odisha, Konkan Goa, Madhya Maharashtra, Chhattisgarh, Coastal AP, Telangana, Rayalseema, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka, Kerala,

Day1: Arunachal Pradesh, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, Uttarakhand, Himachal Pradesh, Jammu Kashmir, Odisha, Saurashtra Kutch, Konkan Goa, Madhya Maharashtra, Vidarbha, Chhattisgarh, Coastal AP, Telangana, Rayalseema, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka, Kerala,

Day2: Arunachal Pradesh, Sub Himalayan WB, Bihar, Uttarakhand, Himachal Pradesh, Jammu Kashmir, Odisha, Konkan Goa, Madhya Maharashtra, Vidarbha, Chhattisgarh, Coastal AP, Telangana, Rayalseema, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka, Kerala,

Day3: Arunachal Pradesh, NE NMMT, Sub Himalayan WB, Bihar, East UP, Uttarakhand, Himachal Pradesh, Jammu Kashmir, Odisha, Konkan Goa, Madhya Maharashtra, Vidarbha, Chhattisgarh, Coastal AP, Telangana, Rayalseema, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka, Kerala,

Day4: Arunachal Pradesh, Assam Meghalaya, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, East UP, Uttarakhand, Himachal Pradesh, Jammu Kashmir, Odisha, Chhattisgarh, Coastal AP, Telangana, Rayalseema, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka,

#### 6. Spatial distribution of TTI: TTI >50 [Scattered Thunderstorms few severe]:

#### Day/Index: Subdivision with Total Totals Index > 52

Day0:Arunachal Pradesh, Sub Himalayan WB, Bihar, East UP, West UP, Uttarakhand, Himachal Pradesh, Jammu Kashmir, East RJ, Odisha, West MP, East MP, Gujarat Region, Saurashtra Kutch, Chhattisgarh, Telangana, NI Karnataka,

Day1: Arunachal Pradesh, Sub Himalayan WB, Uttarakhand, Himachal Pradesh, Jammu Kashmir, Odisha, West MP, East MP, Konkan Goa, Madhya Maharashtra, Vidarbha, Chhattisgarh, Telangana, Rayalseema, Coastal Karnataka, SI Karnataka,

Madhya Maharashtra, Vidarbha, Chhattisgarh, Telangana, Rayalseema, Coastal Karnataka, Si Karnataka,

Day2: Arunachal Pradesh, Sub Himalayan WB, Uttarakhand, Himachal Pradesh, Jammu Kashmir, East MP, Konkan Goa, Madhya Maharashtra, Marathwada, Vidarbha, Chhattisgarh, Telangana, Rayalseema, Coastal Karnataka, NI Karnataka, SI Karnataka,

Day3: Arunachal Pradesh, Sub Himalayan WB, East UP, Uttarakhand, Himachal Pradesh, Jammu Kashmir, Konkan Goa, Madhya Maharashtra, Vidarbha, Chhattisgarh, Telangana, Rayalseema, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka, Day4: Arunachal Pradesh, Sub Himalayan WB, Bihar, East UP, West UP, Uttarakhand, Himachal Pradesh, Jammu Kashmir, East MP, Vidarbha, Chhattisgarh, Coastal AP, Telangana, Rayalseema, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka,

### 7. K-Index :> 35[Very Unstable thunderstorm likely]:

### Day/Index: Subdivisions with K Index > 40

Day0: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, East UP, West UP, Uttarakhand, Jammu Kashmir, Odisha, West MP, East MP, Gujarat Region, Saurashtra Kutch, Konkan Goa, Madhya Maharashtra, Marathwada, Chhattisgarh, Coastal AP, Telangana, Rayalaseema, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka, Kerala,

Day1: Arunachal Pradesh, NE NMMT, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, Uttarakhand, Himachal Pradesh, Odisha, Konkan Goa, Madhya Maharashtra, Vidarbha, Chhattisgarh, Coastal AP, Telangana, Rayalaseema, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka, Kerala,

Day2: Arunachal Pradesh, NE NMMT, Sub Himalayan WB, Gangetic WB, Jharkhand, Uttarakhand, Himachal Pradesh, Jammu Kashmir, Odisha, East MP, Madhya Maharashtra, Marathwada, Vidarbha, Chhattisgarh, Coastal AP, Telangana, Rayalseema, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka, Kerala,

Day3: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Jharkhand, Bihar, East UP, Jammu Kashmir, Odisha, East MP, Madhya Maharashtra, Vidarbha, Chhattisgarh, Coastal AP, Telangana, Rayalaseema, Tamilnadu, Puducherry, Coastal Karnataka, NI Karnataka, SI Karnataka, Kerala,

Day4: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, East UP, Uttarakhand, Himachal Pradesh, Jammu Kashmir, Odisha, Madhya Maharashtra, Vidarbha, Chhattisgarh, Telangana, Rayalseema, Tamilnadu, Puducherry, NI Karnataka, SI Karnataka

## 8. Rainfall and thunder storm activity:

## Day/Index: Subdivisions with Precipitation > 2 cm

Day1: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Bihar, Jammu Kashmir, Andaman Nicobar, Tamilnadu, Puducherry, SI Karnataka, Kerala,

Day2: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Jammu Kashmir, Andaman Nicobar, Tamilnadu, Puducherry, Coastal Karnataka, SI Karnataka, Kerala,

Day3: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Jammu Kashmir, Andaman Nicobar, Tamilnadu, Puducherry, Coastal Karnataka, SI Karnataka, Kerala,

Day4: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Bihar, Jammu Kashmir, Rayalseema, Tamilnadu, Puducherry, Coastal Karnataka, SI Karnataka, Kerala,

Day5: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Gangetic WB, Odisha, Coastal AP, Tamilnadu, Puducherry, Coastal Karnataka, SI Karnataka, Kerala,

## IMD GFS (T1534) based on 00UTC the day:

# 1. Synoptic Systems:

The analysis based on 00 UTC indicates a cyclonic circulation over North west Madhya Pradesh and adjoining area in lower Troposphere (925hPa). The forecast shows it will persist till day1 with eastward movement. The analysis shows a North- South Trough extends from North Interior Karnataka to South Tamil Nadu. The forecast shows the trough will persist till day3. The analysis shows an East- West Trough extending from East Rajasthan to Jharkhand. The forecast shows it will persist till day1. A cyclonic circulation is seen over Bihar and adjoining area in lower Troposphere (850hPa). The forecast shows it will persist till day2. Another cyclonic circulation is seen in the analysis over South west Bay of Bengal off South Tamil Nadu coast. The forecast shows it will persist till day 1.

2. Location of Jet and Jet Core (>60kt) at 500hPa: Although the presence of strong westerlies is found over Eastern parts of the India and over North and North western parts of India but no jet core over the Indian region for the next 3 days.

3. Low Level Vorticity {850hPa Positive Vorticity (>12 x 10<sup>-1</sup>/s)}: Low level Positive Vorticity is seen mostly from J&K up to Foothills of Himalaya, along the North- South and East- West Trough, around the cyclonic circulations, central parts of India, extreme south peninsular India during next 3 days; Low level Positive Vorticity is also seen over parts of NE states on from day 1 onwards.

4. Spatial distribution of T-storm Initiation Index, Lifted Index, Total Total Index, CAPE, CIN and Sweat Index [High potential for thunderstorm]:

**T-Storm Initiation Index (> 3):** over parts of Gujarat, Southern parts of East and west Rajasthan, East Uttar Pradesh, Gangetic Plains, Bihar, Jharkhand, Gangetic West Bengal, SHWB, Orissa, coastal Maharashtra, Konkan & Goa, coastal and Interior Karnataka, Kerala, Tamil Nadu, Telangana, Rayalaseema, Madhya Maharashtra, Marathwada, Vidarbha, Chhattisgarh, East and west Madhya Pradesh, Andhra Pradesh, along east and west coast of India, Sikkim, Assam, Tripura and adjoining areas during next 3 days; over parts of Uttarakhand and West Uttar Pradesh on day 1 and 2; Significant zone lies over Gujarat, South East Rajasthan, coastal areas along the east coast and west coast, GWB, SHWB, Bihar, Jharkhand, East Uttar Pradesh, Orissa, Andhra Pradesh, Telangana, coastal Maharashtra, Vidarbha, Chhattisgarh, Interior Karnataka and Madhya Maharashtra.

Lifted Index (< -2): Similar to T-storm Index lies over Gujarat, South Rajasthan, Gangetic plains and along east and west coast of India with an extension over Interior Karnataka and Telangana, East Uttar Pradesh Bihar, Jharkhand, Madhya Pradesh, Orissa, GWB, SHWB, Assam, Arunachal Pradesh, Meghalaya, Mizoram, Tripura and adjoining areas, Telangana, Vidarbha, Chhattisgarh, Andhra Pradesh, coastal Maharashtra, Konkan & Goa, coastal and Interior Karnataka, Kerala, Tamil Nadu, Madhya Maharashtra and Marathwada during next 3 days, it also appears over Uttarakhand and West Uttar Pradesh on day 1; Significant zone with maximum negative value is found over Gujarat, East Uttar Pradesh and adjoining Bihar.

**Total Total Index (> 50):** Higher than Threshold value of the Index is seen over parts of J&K, Himachal Pradesh, Chhattisgarh, Telangana, Vidarbha, Madhya Pradesh, Andhra Pradesh, Orissa, Interior Karnataka, Madhya Maharashtra, Marathwada, Sikkim and Arunachal Pradesh on day 1; over most of the parts of the country except west and North west India including Gujarat, West Madhya Pradesh, Punjab, Assam, Tripura, Meghalaya, Mizoram and adjoining areas, Rajasthan on day 2 and 3; Significant zone with Maximum value of the index lies over Telangana, East Madhya Pradesh, Chhattisgarh, Vidarbha, East Uttar Pradesh and some parts of West Madhya Pradesh.

Sweat Index (> 300): Is seen over the sub-divisions along east and west coast, areas along foothills of Himalayas, NE states, and most parts of the country except Rajasthan, central parts of Madhya Pradesh, Punjab, Haryana, Himachal Pradesh and adjoining Uttarakhand, North west India during next 3 days; significant zone lies over parts of East Uttar Pradesh, Bihar, Chhattisgarh, Gujarat, North Madhya Maharashtra, Telangana, North Interior Karnataka and Jharkhand.

**CAPE (> 1000):** Mostly seen over parts of Gujarat, southern peninsular India, along west coast and east coast, GWB, Orissa, Bihar, Jharkhand, East Uttar Pradesh, Andhra Pradesh, Rayalaseema, Tamil Nadu, Kerala, Karnataka, Konkan and Goa, Telangana, coastal Maharashtra including Mumbai, south Madhya Maharashtra, Marathwada, Vidarbha, Chhattisgarh, east Madhya Pradesh, Sikkim, Assam, Arunachal Pradesh, Meghalaya, Tripura and adjoining areas during next 3 days; over parts of West Uttar Pradesh and Uttarakhand on day 1; maximum value of the index is seen over parts of GWB, SHWB, Orissa, coastal and Interior Andhra Pradesh, coastal Tamil Nadu, coastal Maharashtra, coastal Karnataka, Bihar, Jharkhand, East Uttar Pradesh and adjoining West Uttar Pradesh.

**CIN (50-150):** Over sub-divisions along east and west coast of India, extreme south over Kerala and Tamil Nadu and whole south Peninsular India the value of the index lies in the above range over most of the parts of the country except central parts of West Madhya Pradesh, J&K, West Rajasthan, Himachal Pradesh, Uttarakhand, Punjab, Haryana, North and North west India on day 1; and over most parts of the country except

central parts of Madhya Pradesh, North and North west India on day 2 and 3; significant zone with highest value of the index lies over parts of Gujarat adjoining west Madhya Pradesh, Vidarbha, Madhya Maharashtra, North coastal Maharashtra, Andhra Pradesh, South Chhattisgarh, Telangana, GWB and Orissa.

#### 5. Rainfall Activity:

Above 130 mm Rainfall: over parts of South coastal Kerala on day 3.

70-130 mm Rainfall: over parts of Arunachal Pradesh on day 1.

40-70 mm Rainfall: over parts of Assam, Arunachal Pradesh, Orissa and North Interior Karnataka on day 1; over parts of Sikkim, Assam, Meghalaya, GWB, Orissa, Kerala, adjoining Tamil Nadu and South Interior Karnataka on day 2; over parts of Assam, Arunachal Pradesh, Kerala and adjoining Tamil Nadu on day 3.

10-40 mm Rainfall: over parts of Kerala, Karnataka, Tamil Nadu, East Bihar, Sikkim and NE states during next 3 days; over parts of GWB and Orissa on day 1 and 2; over parts of South Chhattisgarh, Andhra Pradesh, Konkan and Goa, South coastal Maharashtra and South Madhya Maharashtra on day 1; over some parts of Jharkhand on day 2.

Up to 10 mm rainfall: Over parts of J&K, Himachal Pradesh, Foothills of Himalaya, GWB, SHWB, Sikkim, NE states, Bihar, Jharkhand, Orissa, Chhattisgarh, Kerala, Interior Karnataka, Konkan & Goa, coastal Maharashtra, South Madhya Maharashtra, Marathwada, East Madhya Pradesh, Vidarbha, Tamil Nadu, Telangana, Rayalaseema, Telangana, and Andhra Pradesh during next 3 days; over parts of West Uttar Pradesh and West Madhya Pradesh on day 1; over parts of Uttarakhand on day 2 and 3.

#### IMD WRF (9km based on 00UTC of the day):

1. Model Reflectivity (Max. dBz): >25 dBZ Model Reflectivity: On day 1, over parts of J&K, Kerala, Karnataka, Tamil Nadu, NE states, Telangana, Orissa, GWB, SHWB, Sikkim, East Bihar, Andhra Pradesh, south coastal Maharashtra, Marathwada, Rayalaseema and Andhra Pradesh; On day 2 over parts of Karnataka, Kerala, Tamil Nadu, some parts of Vidarbha, Telangana, GWB, SHWB, NE states and Sikkim; On day 3 mostly over parts of Kerala, Tamil Nadu adjoining Karnataka, GWB, SHWB, adjoining East Bihar, Sikkim and NE states.

2. Spatial distribution of Total Index, K-Index, CAPE and CIN [High potential for thunderstorm]:

**Total Index (> 50):** Above threshold value is observed over most parts of the country except extreme south peninsular India, southern parts of west coast and the east coast, parts of Karnataka, south coastal Maharashtra, South Madhya Maharashtra, Marathwada, Konkan and Goa, Kerala, Andhra Pradesh, Tamil Nadu, GWB, SHWB, Bihar, Jharkhand, Chhattisgarh, East Uttar Pradesh, Orissa, Sikkim and NE states during next 3 days; below threshold value of the index is also seen over parts of Telangana on day 3.

K-Index (> 35): Less than threshold value is observed over most of the part of the country during the next 3 days. Prominent values are found over parts of Interior Karnataka, Telangana, Chhattisgarh, Kerala, Tamil Nadu, Andhra Pradesh, Orissa, Bihar, Jharkhand, GWB, South Madhya Maharashtra, Marathwada, East Madhya Pradesh, Konkan and Goa, Foothills of Himalaya and NE states.

**CAPE (> 1500):** Greater than threshold value over parts of Gujarat, East Uttar Pradesh, coastal areas of west coast, coastal Maharashtra, Konkan & Goa, coastal areas along the east coast, SHWB, GWB, Orissa, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Bihar, Jharkhand, Telangana, Rayalaseema, Madhya Maharashtra, Chhattisgarh and Vidarbha during next 3 days; over parts of West Uttar Pradesh on day 1; over some parts of East Madhya Pradesh on day 3; Maximum value of the index is seen over the parts of Orissa, GWB, SHWB, coastal and Interior Andhra Pradesh, Karnataka, coastal Tamil Nadu, Bihar, Jharkhand, East and West Uttar Pradesh, Kerala, North coastal Maharashtra, South Madhya Maharashtra, Konkan and Goa and Gujarat.

**CIN (50-150):** It covers most of the parts of the country except J&K, North Gujarat, North west India, North Madhya Maharashtra and Marathwada, Punjab, Haryana, North West Rajasthan, Himachal Pradesh and Uttarakhand and central parts of West Madhya Pradesh during next 3 days; it has significant larger values over parts of Eastern and Western parts of the country including Gujarat, Madhya Maharashtra, Marathwada, East Uttar Pradesh, Vidarbha, Madhya Pradesh, Bihar, Jharkhand, Chhattisgarh, Orissa, Telangana, North Interior Karnataka and Andhra Pradesh during next 3 days.

#### 3. Rainfall and thunderstorm activity:

Above 200 mm Rainfall: over parts of Meghalaya and adjoining Assam on day 2; over parts of South Kerala on day 3.

130- 200 mm Rainfall: over parts of Assam and adjoining areas during next 3 days; over parts of Kerala and Tamil Nadu and Arunachal Pradesh on day 3.

70-130 mm Rainfall: over parts of Sikkim, Assam, Meghalaya, Arunachal Pradesh and adjoining areas during next 3 days; over parts of Kerala and Tamil Nadu on day 2 and 3.

40-70 mm Rainfall: over parts of Kerala and Tamil Nadu, Sikkim and NE states during next 3 days; over parts of SHWB, South coastal Maharashtra, Karnataka, Konkan and Goa on day 1.

10- 40 mm Rainfall: Over parts of Kerala, Tamil Nadu, Karnataka, Sikkim, GWB, SHWB, Foothills of Himalaya and NE states during next 3 days; over parts of Bihar, Jharkhand, Orissa, Andhra Pradesh, South coastal Maharashtra, South Madhya Maharashtra, Konkan and Goa on day 1; over parts of Jharkhand on day 2; over parts of J&K on day 1 and 3.

Up to 10 mm Rainfall: Over parts of J&K, Foothills of Himalaya, Kerala, Tamil Nadu, Karnataka, Konkan and Goa, Chhattisgarh, Vidarbha, East Madhya Pradesh, Sikkim, Bihar, Jharkhand, Orissa, Andhra Pradesh and NE states during next 3 days; over parts of Himachal Pradesh, Uttar Pradesh, Madhya Maharashtra and Marathwada on day 1.

# 3. IOP ADVISORY FOR 24 and 48Hrs:

#### **Summary and Conclusions:**

o Most thermodynamic indices (T-STORM Initiation Index, K-Index, Lifted Index) from IMD GFS deterministic model indicate high probability of thunderstorm occurrence over entire Indian region excluding northwest and extreme north Indian region on day 1. On day 2, the probability of convection increase over north coastal Andhra Pradesh, Odisha and Gangetic West Bengal. SWEAT index, which accounts for the wind shear between 850 and 500 hPa levels in addition to thermodynamic parameters, indicates high values over north peninsular Indian region, with probability increasing over the northeast peninsular India on day 2. The 850-200 hPa wind shear is very high over North and northwest India on day 1 and day 2.

o Synoptic analysis indicates that a trough in the lower levels runs from East Rajasthan to Jharkhand with an embedded cyclonic circulation over northwest Madhya Pradesh and neighbourhood. There is also a north-south trough from North Interior Karnataka to south Tamilnadu. There is also a cyclonic circulation over Bihar & neighbourhood. IMD GFS deterministic model forecasts indicate that the north-south trough is likely to shift slightly eastwards on account of the diurnal cycle. Consequently, thunderstorms are expected all along the east coast of India on day 1. On account of the cyclonic circulation over Bihar & neighbourhood, heavy to very heavy rainfall is expected over Sub Himalayan West Bengal on day 1 and over northeastern states on day 2.

o Over South India, the southern part of the trough is likely to terminate in the cyclonic circulation over southwest Bay of Bengal off Tamilnadu coast in the afternoon. The moist easterlies from the circulation are likely to give heavy rainfall over south peninsula on day 1 and day 2.

# **IOP** Area for Day-1 & Day-2:

| 24 hour Advisory for IOP:   | 48 hour Advisory for IOP:  |
|---|--|
| Significant Rainfall:   | Significant Rainfall:  |
| Sub Himalayan West Bengal and Sikkim                              | Interior Tamil Nadu, South Interior Karnataka, Coastal Karnataka,  |
| Mizoram, Tripura, Arunachal Pradesh, Assam and Meghalaya          | Kerala, Lakshadweep  |
| Interior Tamil Nadu, South Interior Karnataka, Coastal Karnataka, | Mizoram, Tripura, Assam and Meghalaya, Arunachal Pradesh,          |
| Kerala  | Sub Himalayan West Bengal and Sikkim                               |
|   | Andaman & Nicobar  |
|   |  |
| Thunderstorm with squall or gusty winds:                          | Thunderstorm with squall or gusty winds:                           |
| Tamil Nadu, Kerala, Lakshadweep, Karnataka,                       | Tamil Nadu, Kerala, Lakshadweep, South Interior Karnataka, Coastal |
| Rayalaseema, Telangana, Coastal Andhra Pradesh,                   | Karnataka  |
| Chhattisgarh, North Madhya Pradesh, Jharkhand                     |  |
| Gangetic West Bengal, Odisha                                      |  |
| West Uttar Pradesh, Uttarakhand                                   |  |
|   |  |
| I hunderstorm with squall and hall                                | Inunderstorm with squall and hall                                  |
| NI  | NI   |
| Thunderstorm/Duststorm  | Duststorm:   |
|   |  |
|   |  |
|   | 1  |



# **Graphical Presentation of Potential Areas for Severe Weather:**













# Past 24 hours DWR Report:

| Radar<br>Station<br>name | Date     | Time interval of<br>observation<br>(UTC)  | Organization of the cells<br>(Isolated single cells/multiple<br>cells/ convective regions/ squall<br>lines) with height of 20 dBZ<br>echo top and maximum<br>reflectivity                                 | Formation w.r.t radar<br>station and Direction<br>of movement  | Remarks  | Associated<br>severe<br>weather if<br>any | Districts<br>affected  |
|--------------------------|----------|---|---|--|--|---|--|
|                          |          | 230300<br>-<br>232322   | NIL   | N/A  | N/A  | N/A                                       | N/A  |
| Patna                    | 24-05-18 | 232322<br>-<br>240300   | Multiple Cell<br>LAT 27.38N<br>LONG 84.50E<br>Maximum Reflectivity: 46.5 dBZ<br>Echo Top: 11 KM<br>LAT 26.86N<br>LONG 85.52E<br>Maximum Reflectivity:<br>44 dBZ<br>Echo Top: 9 KM                         | Range: 209.1 KM from<br>DWR Patna in NW<br>direction<br>Movement: towards<br>NORTH WESTERLY<br>Range: 148.7 KM from<br>DWR Patna in NE<br>direction<br>Movement: towards<br>NORTH WESTERLY | Warning issued   | THUNDERS<br>TORM                          | WEST<br>CHAMPARAN,S<br>ITAMARHI  |
| Jaipur                   | 24-05-18 | 230300-240300<br>(Radar shut-<br>down from<br>231612-<br>231655IST &<br>240620-240655<br>due to power<br>cut) | Nil   |  |  |   |  |
| Patiala                  | 24-05-18 | 230300-240252   | NO Significant Echo   |  |  |   |  |
| Lucknow                  | 24-05-18 | 230300-231522   | NIL   | NIL  | NIL  | NIL                                       | NIL  |
|                          |          | 231522-232122   | A single cell formed at 1522 UTC<br>over 250km North of North-West<br>from station with height 5km of<br>32dbz echo top and developed at<br>1552UTC in multiple cells with<br>maximum reflectivity 59dbz. | Mutiple cells moving<br>w.r.t. radar station and<br>direction of movement<br>Southeast with speed<br>55km/h  | Mutiple cells weakend<br>and dissipated at 2122<br>UTC over 250KM<br>In North of northeast<br>direction from station | TS/RA/<br>SQ/HS                           | Pilibhit,<br>Lakhimpur<br>Bahraich,<br>Shravasti,<br>Balrampur,<br>Sidharthnagar,<br>Maharajganj |
|                          |          | 232122-240300   | NIL   | NIL  | NIL  | NIL                                       | NIL  |

| Radar Station<br>Name | Date     | Time<br>interval<br>of<br>observa<br>tion<br>(UTC) | Organization of the cells (Isolated<br>single cells/multiple cells/<br>convective regions/ squall lines)<br>with height of 20 dBZ echo top and<br>maximum reflectivity | Formation w.r.t<br>radar station and<br>Direction of<br>movement     | Remarks  | Associated<br>severe<br>weather if<br>any | Districts affected                              |
|-----------------------|----------|--|--|--|--|---|---|
| Visakhapatnam         | 24-05-18 | 230600   | Multiple cb cell with max reflectivity 55dbz and height 6kms.  | 194kms(NE) formed<br>at 05:51UTC.and<br>moving Southerly.            | -  | -   | GANJAM<br>KANDHARMAL<br>(ODISSA)                |
|                       |          | 230900   | Multiple cb cell with max reflectivity 56dbz and height 9kms.  | 177 kms(NE)<br>formed since last<br>observation and<br>moving SE ly. | -  | -   | Rayagada<br>(ODISHA)                            |
|                       |          | 231200   | Multiple cb cell with max reflectivity 60dbz and height 10kms.   | 184 kms(W) and moving SW ly.   | Strong cb cells<br>formed since last<br>observation and<br>developed | Thunderstorm with rain                    | East Godavari and<br>West Godavari<br>Dist.(AP) |
|                       |          | 231500   | Multiple cb cell with max reflectivity 54 dbz and height 9 kms.  | 167 kms(W) and moving SW ly.   | cb cells<br>dissipating<br>started from<br>1221 UTC                  | -   | East Godavari and<br>West Godavari<br>Dist.(AP) |

# Realised past 24hrs TS/SQ/HS Data:

| Realised TS/HS/SQ during past 24hours ending at 0300UTC of today (received from RMCs/MCs) |             |                    |                                |          |                               |                      |  |
|---|-------------|--------------------|--------------------------------|----------|-------------------------------|----------------------|--|
| Name of Station Reporting   | Region      | State/Sub Division | Weather Event (TS/Hail/Squall) | Date     | Time of Commencement<br>(IST) | Time of end<br>(IST) |  |
| Shirali   | South India | C Karnataka        | Thunderstorm                   | 23-05-18 | 2300                          | 0110                 |  |
| Belgaum AP  | South India | NI Karnataka       | Thunderstorm                   | 23-05-18 | 2255                          | 2355                 |  |
| Gadag   | South India | NI Karnataka       | Thunderstorm                   | 23-05-18 | 1915                          | 0005                 |  |
| Mandya  | South India | SI Karnataka       | Thunderstorm                   | 23-05-18 | 2030                          | 2300                 |  |
| Bengaluru City  | South India | SI Karnataka       | Thunderstorm                   | 23-05-18 | 1400<br>1915                  | 1600,<br>2030        |  |
| AMS HAL Bengaluru   | South India | SI Karnataka       | Thunderstorm                   | 23-05-18 | 1400                          | 1620                 |  |
| Yelahanka IAF   | South India | SI Karnataka       | Thunderstorm                   | 23-05-18 | 1345<br>2100                  | 1700<br>2330         |  |
| Chamarajanagar  | South India | SI Karnataka       | Thunderstorm                   | 23-05-18 | 1700                          | 1830                 |  |
| Chitradurga   | South India | SI Karnataka       | Thunderstorm                   | 23-05-18 | 1905                          | 2150                 |  |

| Realised TS/HS/SQ during past 24hours ending at 0300UTC of today (received from RMCs/MCs) |                 |                           |                                |             |                               |                      |  |
|---|-----------------|---------------------------|--------------------------------|-------------|-------------------------------|----------------------|--|
| Name of Station Reporting   | Region          | State/Sub Division        | Weather Event (TS/Hail/Squall) | Date        | Time of Commencement<br>(IST) | Time of end<br>(IST) |  |
| Tehri   | Northwest India | Uttarakhand               | Thunderstorm                   | 23-05-18    | 1510                          | 1634                 |  |
| Dehradun  | Northwest India | Uttarakhand               | Thunderstorm                   | 23-05-18    | 1543                          | 1650                 |  |
| Mukteshwar  | Northwest India | Uttarakhand               | Thunderstorm                   | 23-05-18    | 1915                          | 1940                 |  |
| Raipur  | Central India   | Chhattisgarh              | Thunderstorm                   | 23-05-18    | 1755                          | 1815                 |  |
| Passighat   | Northeast India | Arunachal Pradesh         | Thunderstorm                   | 23/24-05-18 | 232300                        | 240100               |  |
| Itanagar  | Northeast India | Arunachal Pradesh         | Thunderstorm                   | 23-05-18    | 1545                          | 2025                 |  |
| Jorhat  | Northeast India | Assam                     | Thunderstorm                   | 23-05-18    | 1915                          | 2215                 |  |
| Silchar   | Northeast India | Assam                     | Thunderstorm                   | 23-05-18    | 1500                          | 1630                 |  |
| Dibrugarh   | Northeast India | Assam                     | Thunderstorm                   | 23/24-05-18 | 232200                        | 240115               |  |
| N/Lakhimpur   | Northeast India | Assam                     | Thunderstorm                   | 23-05-18    | 1620,<br>1700                 | 1730,<br>1800        |  |
| Tezpur  | Northeast India | Assam                     | Thunderstorm                   | 23-05-18    | 1500                          | 1605                 |  |
| Dhubri  | Northeast India | Assam                     | Thunderstorm                   | 23-05-18    | 1135                          | 1200                 |  |
| Barapani  | Northeast India | Meghalaya                 | Thunderstorm                   | 23-05-18    | 1055                          | 1255                 |  |
| Lengpui   | Northeast India | Mizoram                   | Thunderstorm                   | 23-05-18    | 1458                          | 1550                 |  |
| Kailasahar  | Northeast India | Tripura                   | Thunderstorm                   | 23-05-18    | 1015,<br>1325                 | 1105,<br>1450        |  |
| Agartala  | Northeast India | Tripura                   | Thunderstorm                   | 23-05-18    | 1205                          | 1420                 |  |
| Coochbehar  | East India      | SHWB                      | Thunderstorm                   | 24-05-18    | 0750                          | 0800                 |  |
| Jalpaiguri  | East India      | SHWB                      | Thunderstorm                   | 24-05-18    | 0630                          | 0820                 |  |
| DumDum  | East India      | GWB                       | Thunderstorm                   | 23-05-18    | 0830                          | 0929                 |  |
| Diamond Harbour   | East India      | GWB                       | Thunderstorm                   | 23-05-18    | 0830                          | 0900                 |  |
| Haldia  | East India      | GWB                       | Thunderstorm                   | 23-05-18    | 0830                          | 0927                 |  |
| Purnia  | East India      | Bihar                     | Thunderstorm                   | 24-05-18    | 0440                          | 0510                 |  |
| Ranchi  | East India      | Jharkhand                 | Thunderstorm                   | 23-05-18    | 1710                          | 1820                 |  |
| Bhubaneswar   | East India      | Odisha                    | Thunderstorm                   | 23-05-18    | 0828                          | 1220                 |  |
| Chandbali   | East India      | Odisha                    | Thunderstorm                   | 23-05-18    | 0830                          | 0945                 |  |
| Puri  | East India      | Odisha                    | Thunderstorm                   | 23-05-18    | 1030                          | 1130                 |  |
| Keonjhargarh  | East India      | Odisha                    | Thunderstorm                   | 23-05-18    | 0945                          | 1020                 |  |
| Port Blair  | A and N Islands | A and N Islands           | Thunderstorm                   | 23/24-05-18 | 1626-<br>0410                 | 1650<br>0530         |  |
| Adiramapatinam  | South India     | North coastal Tamil Nadu  | Thunderstorm                   | 23/24-05-18 | 2301                          | 0247                 |  |
| Coimbatore  | South India     | North interior Tamil Nadu | Thunderstorm                   | 23-05-18    | 1620<br>2008                  | 1830<br>2200         |  |
| Coonoor   | South India     | North interior Tamil Nadu | Thunderstorm                   | 23-05-18    | 1630<br>1830                  | 1730<br>2130         |  |
| Karaikal  | South India     | Coastal Tamil Nadu        | Thunderstorm                   | 24-05-18    | 0445                          | 0630                 |  |
| Alappuzha   | South India     | Kerala                    | Thunderstorm                   | 23-05-18    | 1530                          | 1620                 |  |
| Karipur A P   | South India     | Kerala                    | Thunderstorm                   | 23-05-18    | 1900                          | 2026                 |  |
| Kozhikode   | South India     | Kerala                    | Thunderstorm                   | 23-05-18    | 2100                          | 2200                 |  |
| Thiruvananthapuram AP   | South India     | Kerala                    | Thunderstorm                   | 24-05-18    | 0005                          | 0215                 |  |
| Thiruvananthapuram C  | South India     | Kerala                    | Thunderstorm                   | 23-05-18    | 1420                          | 1755                 |  |

# **IMPORTANT LINKS:**

# WEATHER SYMBOLS:



