



# India Meteorological Department

## **FDP STORM Bulletin No. 109 (23-06-2018)**

### **1. CURRENT SYNOPTIC SITUATION:**

#### **NWFC Inference (0300UTC of the day):**

- ◆ Southwest monsoon has further advanced into remaining parts of central Arabian Sea, some more parts of Maharashtra and some parts of Gujarat region. The Northern Limit of Monsoon passes through Lat. 20°N/ Long. 60°E, Lat. 20°N/ Long. 65°E, Lat. 20°N/ Long. 70°E, Valsad, Malegaon, Amravati, Gondia, Titlagarh, Cuttack, Midnapore, Lat. 24°N/ Long. 89°E, Goalpara, Baghdogra and Lat. 27°N/ Long. 87°E.
- ◆ Conditions are favourable for further advance of Southwest Monsoon over some parts of north Arabian Sea, remaining parts of Maharashtra & Assam; some more parts of Gujarat region, Chhattisgarh, Odisha, West Bengal; some parts of south Saurashtra, Jharkhand, Bihar and Madhya Pradesh during next 2-3 days.
- ◆ Conditions are becoming favourable for pre-monsoon thunderstorm activity over parts of northwest India from 27 June onwards.
- ◆ The Western Disturbance as a trough in mid & upper tropospheric levels with its axis at 5.8 km above mean sea level now runs roughly along Long. 72°E to the north of lat. 32°N.
- ◆ The cyclonic circulation over southwest Uttar Pradesh & neighbourhood now lies over north Haryana & neighbourhood and extends upto 0.9 km above mean sea level.
- ◆ A cyclonic circulation lies over central Assam & neighbourhood and extends upto 0.9 km above mean sea level.
- ◆ The cyclonic circulation over south Konkan & neighbourhood persists and now seen between 3.1 and 5.8 above mean sea level.
- ◆ A cyclonic circulation lies over north Konkan & adjoining south Gujarat between 2.1 km and 3.6 km above mean sea level.
- ◆ The off-shore trough at mean sea level from Maharashtra coast to Kerala coast now runs from south Gujarat coast to Kerala coast.
- ◆ The cyclonic circulation over northwest Bay of Bengal & neighbourhood persists and now seen between 2.1 km and 3.6 km above mean sea level.
- ◆ The East-West shear zone runs roughly along latitude 20.0°N over Indian region between 3.1 and 7.6 km above mean sea level and tilt southwards with height.
- ◆ The trough from Bihar to northwest Bay of Bengal across Jharkhand persists and now seen at 0.9 km above mean sea level.

## Satellite Observations during past 24 hrs and current observation:

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

#### Clouds descriptions within India:

**North:** Scattered low/medium clouds with embedded weak convection seen over Jammu & Kashmir, Himachal Pradesh, Punjab and East Uttar Pradesh. Scattered low/medium clouds over Uttarakhand, Haryana, Delhi and west Uttar Pradesh.

**East:** Broken low/medium clouds with embedded moderate to intense convection seen over Bihar, adjoining Nepal, Northeast Jharkhand, Northeast Odisha, Gangetic West Bengal, Assam, Meghalaya, Nagaland, Manipur, Tripura, Bangladesh and Bhutan. Scattered low/medium clouds with embedded isolated weak to moderate convection seen over rest Odisha, rest Jharkhand, Sikkim, Sub-Himalayan west Bengal and rest Northeastern states. Scattered low/medium clouds over rest parts of the region.

**West:** Scattered low/medium clouds with embedded moderate to intense convection seen over extreme Southwest Gujarat, North Madhya Maharashtra and Goa. Scattered low/medium clouds with embedded isolated weak convection seen over East Rajasthan, East Gujarat, Madhya Pradesh and rest Maharashtra. Scattered low/medium clouds seen over West Rajasthan.

**South:** Scattered low/medium clouds with embedded moderate to intense convection seen over Coastal Andhra Pradesh & Lakshadweep and weak to moderate convection seen over Telangana, Rayalaseema, Karnataka, Kerala and Tamilnadu. Scattered low/medium clouds seen over Bay Islands.

**Arabian Sea:** Scattered low/medium clouds with embedded intense to very intense convection seen over Gulf of Cambay and moderate to intense convection seen over East Arabian Sea north of lat 9.0N and east of long 69.0E.

**Bay of Bengal & Andaman Sea:** Scattered low/medium clouds with embedded moderate to intense convection seen over North Bay, Central Bay, and Arakan Coast.

### Past Observation:

#### Convection:-

Moderate to Intense convection was observed over East Uttar Pradesh South-East Rajasthan Madhya Pradesh Chhattisgarh Odisha Bihar Jharkhand West Bengal Sikkim North-East States Andhra Pradesh Telangana Gujarat Maharashtra Karnataka Kerala Tamilnadu Lakshadweep & Andaman Islands. Weak to Moderate convection was observed over J&K Himachal Pradesh Punjab Haryana Delhi West Uttar Pradesh.

#### OLR:-

Up to **150**  $\text{wm}^{-2}$  was observed over Telangana.

Up to **230**  $\text{wm}^{-2}$  was observed over J&K Extreme South Uttar Pradesh Madhya Pradesh Chhattisgarh West Jharkhand South Odisha West Bengal Sikkim North-East States Andhra Pradesh Maharashtra Karnataka Kerala Tamilnadu Lakshadweep Andaman Islands.

#### Synoptic features

#### Westerly Trough & Jet-Stream:

Trough in Westerlies roughly along Longitude 72.0E & north of Latitude 32.0N

#### Dynamic Features :-

Wind shear up to 30-40 Kts is observed over J&K Himachal Pradesh Punjab and 30-60 Kts over Peninsula India and 15-20 Kts observed over rest India.

Positive Shear tendency (0 Kts) is observed over most parts of Indian region.

Vorticity (850 hPa) up to 250 is observed over Uttarakhand Uttar Pradesh Gangetic West Bengal Telangana South Tamilnadu.

Negative low level convergence observed over West Madhya Pradesh Rajasthan and Positive low level convergence (5 Kts) observed over rest parts of Indian region.

#### **Precipitation:**

##### **IMR:**

Rainfall up-to 90-130 mm observed over North Chhattisgarh North-West Bihar Sub Himalayan West Bengal Telangana North Interior Karnataka Marathwada

Rainfall up-to 30-70 mm observed over North-East Uttar Pradesh South-East Rajasthan Madhya Pradesh Madhya Maharashtra North Coastal Andhra Pradesh West Jharkhand Gangetic West Bengal North-East Assam Arunachal Pradesh.

Rainfall up-to 20-30 mm observed over East Gujarat South Uttar Pradesh Sikkim rest North-East States Lakshadweep.

Rainfall up-to 1-20 mm observed over J&K Uttarakhand rest Bihar Odisha South Chhattisgarh Rayalaseema South Coastal Andhra Pradesh South-West Gujarat South Interior Karnataka Kerala North Tamilnadu Andaman Islands

#### **DWR and RAPID Observations:**

Moderate to strong (max dBZ 50-55 and height around 15km) multiple echoes are seen on DWR Kolkata domain at around 1530IST. Light to moderate isolated/multiple echoes are also seen on DWR Srinagar, Delhi, Jaipur, Lucknow, Patna, Agartala, Mohanbari, Visakhapatnam, Machilipatnam, Gopalpur, Paradeep, Hyderabad, Kochi, Thiruvananthapuram, Goa and Mumbai domains at around 1545 IST.

RAPID RGB Satellite imagery at 1430 IST indicates significant convection over Gangetic West Bengal, Odisha, Northeast Jharkhand, East Madhya Pradesh, Telangana, Maharashtra, South Gujarat, South Rajasthan, Assam, Meghalaya, Nagaland, Manipur, Mizoram and Tripura.

#### **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 decrease over IGP and north India.

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

<b>Delhi – SAFAR analysis &amp; Forecast</b>	<b>23.06.2018</b>	<b>24.06.2018</b>
PM10 (micro-g/m <sup>3</sup> )	227	216
PM2.5 (micro-g/m <sup>3</sup> )	84	80

## 2. NWP MODEL GUIDANCE:

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

#### 1. Weather Systems:

**Low level Cycirs, Troughs: 00UTC of Day 0-5:** at 850 hPa, a trough as a weak CYCIR over east of UP and Bihar, moving towards east.

**00UTC Day0-5:** At 850 hPa, extended trough from Bihar to Meghalaya via Bangladesh.

**00UTC Day0-2:** At 850 hPa, a trough over east Maharashtra, North Telangana and Chhattisgarh and moving towards east

**Confluence & wind Discontinuity regions: 12 UTC Day 0:** NIL

**Synoptic systems: 00UTC of 500hPa Day 0-4:** WD as trough over Pakistan, Punjab and adjoin region.

**00UTC of 500hPa Day1-5:** Anti CYCIR over MP and moving towards north on Day-4-5.

#### 2. Location of jet and jet core (>60kt) at 500hPa: Nil

#### 3. Convergence at 850 hPa:

**Day/Index: Subdivisions with Lower Level Convergence >  $15 \times 10^{-5}$  /s**

Day0: TN\_Puducherry,

Day1: TN\_Puducherry,

Day2: Assam\_Meghalaya, East\_UP, Uttarakhand, Odisha, Chhattisgarh,

Day3: Jharkhand, Odisha,

Day4:

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

**Day/Index: Subdivisions with Lower Level Vortex >  $15 \times 10^{-5}$  /s**

Day0: Arunachal\_Pradesh, Assam\_Meghalaya, Uttarakhand, Himachal\_Pradesh, Saurashtra\_Kutch, TN\_Puducherry,

Day1: Arunachal\_Pradesh, Assam\_Meghalaya, Uttarakhand, Himachal\_Pradesh, TN\_Puducherry, Kerala,

Day2: Arunachal\_Pradesh, Assam\_Meghalaya, Bihar, Uttarakhand, Himachal\_Pradesh, TN\_Puducherry, Kerala,

Day3: Assam\_Meghalaya, Bihar, East\_UP, Uttarakhand, Himachal\_Pradesh, TN\_Puducherry, Kerala,

Day4: Assam\_Meghalaya, Gangetic\_WB, East\_UP, TN\_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, Uttarakhand, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ, East\_RJ, Odisha, West\_MP, East\_MP, Guj\_Reg, Saurashtra\_Kutch, Madhya\_Maharashtra, Marathwada, Vidarbha, Chhattisgarh,

Day1: Arunachal\_Pradesh, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, East\_UP, West\_UP, Uttarakhand, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ, East\_RJ, Odisha, West\_MP, East\_MP, Guj\_Reg, Saurashtra\_Kutch, Madhya\_Maharashtra, Vidarbha, Chhattisgarh, Coastal\_AP,

Day2: Arunachal\_Pradesh, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, East\_UP, West\_UP, Uttarakhand, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ, East\_RJ, Odisha, West\_MP, East\_MP, Vidarbha, Chhattisgarh, Coastal\_AP,

Day3: Arunachal\_Pradesh, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, East\_UP, West\_UP, Uttarakhand, Hry\_Chhd\_Delhi, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ, East\_RJ, Odisha, West\_MP, East\_MP, Chhattisgarh,

Day4: Arunachal\_Pradesh, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, East\_UP, West\_UP, Uttarakhand, Hry\_Chhd\_Delhi, Punjab, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ, East\_RJ, Odisha, West\_MP, East\_MP, Saurashtra\_Kutch, Chhattisgarh

## **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, Uttarakhand, Punjab, Himachal\_Pradesh, Jammu\_Kashmir,

Day1: Arunachal\_Pradesh, Sub\_Himalayan\_WB, Uttarakhand, Himachal\_Pradesh, Jammu\_Kashmir,

Day2: Arunachal\_Pradesh, Sub\_Himalayan\_WB, Uttarakhand, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ,

Day3: Arunachal\_Pradesh, Sub\_Himalayan\_WB, Jharkhand, East\_UP, Uttarakhand, Hry\_Chhd\_Delhi, Punjab, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ, East\_RJ, East\_MP,

Day4: Arunachal\_Pradesh, Sub\_Himalayan\_WB, West\_UP, Uttarakhand, Hry\_Chhd\_Delhi, Punjab, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ

## **7. Spatial distribution of 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, Hry\_Chhd\_Delhi, Punjab, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ, East\_RJ, Odisha, West\_MP, East\_MP, Guj\_Reg, Saurashtra\_Kutch, Madhya\_Maharashtra, Marathwada, Vidarbha, Chhattisgarh, Coastal\_AP, Rayalseema, TN\_Puducherry,

Day1: Arunachal\_Pradesh, Assam\_Meghalaya, NE\_NMMT, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, East\_UP, West\_UP, Uttarakhand, Hry\_Chhd\_Delhi, Punjab, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ, East\_RJ, West\_MP, East\_MP, Guj\_Reg, Saurashtra\_Kutch, Madhya\_Maharashtra, Marathwada, Vidarbha, Chhattisgarh, Coastal\_AP, Rayalseema, TN\_Puducherry,

Day2: Arunachal\_Pradesh, Assam\_Meghalaya, NE\_NMMT, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, East\_UP, West\_UP, Uttarakhand, Hry\_Chhd\_Delhi, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ, East\_RJ, Odisha, West\_MP, East\_MP, Guj\_Reg, Chhattisgarh, Coastal\_AP, Telangana,

Day3: Arunachal\_Pradesh, Assam\_Meghalaya, NE\_NMMT, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, East\_UP, West\_UP, Uttarakhand, Hry\_Chhd\_Delhi, Punjab, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ, East\_RJ, Odisha, West\_MP, East\_MP, Guj\_Reg, Vidarbha, Chhattisgarh, Coastal\_AP,

Day4: Arunachal\_Pradesh, Assam\_Meghalaya, NE\_NMMT, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, East\_UP, West\_UP, Uttarakhand, Hry\_Chhd\_Delhi, Punjab, Himachal\_Pradesh, Jammu\_Kashmir, West\_RJ, East\_RJ, Odisha, West\_MP, East\_MP, Madhya\_Maharashtra, Marathwada, Vidarbha, Chhattisgarh, Coastal\_AP, Telangana, Rayalseema, TN\_Puducherry, NI\_Karnataka

## **8. Rainfall and thunder storm activity:**

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

Day1: Arunachal\_Pradesh, Assam\_Meghalaya, NE\_NMMT, Sub\_Himalayan\_WB, Gangetic\_WB, Bihar, Odisha, Guj\_Reg, Konkan\_Goa, Madhya\_Maharashtra, Coastal\_AP, Telangana, Coastal\_Karnataka, NI\_Karnataka, SI\_Karnataka, Kerala,

Day2: Arunachal\_Pradesh, Assam\_Meghalaya, NE\_NMMT, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, Odisha, Guj\_Reg, Saurashtra\_Kutch, Konkan\_Goa, Madhya\_Maharashtra, Chhattisgarh, Coastal\_AP, Telangana, Coastal\_Karnataka, NI\_Karnataka, SI\_Karnataka, Kerala,

Day3: Arunachal\_Pradesh, Assam\_Meghalaya, NE\_NMMT, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, Uttarakhand, Odisha, Guj\_Reg, Saurashtra\_Kutch, Konkan\_Goa, Madhya\_Maharashtra, Coastal\_Karnataka, NI\_Karnataka, SI\_Karnataka, Kerala,

Day4: Arunachal\_Pradesh, Assam\_Meghalaya, NE\_NMMT, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, East\_UP, Uttarakhand, Odisha, East\_MP, Guj\_Reg, Konkan\_Goa, Madhya\_Maharashtra, Chhattisgarh, Coastal\_AP, Coastal\_Karnataka, NI\_Karnataka, SI\_Karnataka, Kerala,

Day5: Arunachal\_Pradesh, Assam\_Meghalaya, NE\_NMMT, Sub\_Himalayan\_WB, Gangetic\_WB, Jharkhand, Bihar, East\_UP, West\_UP, Uttarakhand, Hry\_Chhd\_Delhi, Himachal\_Pradesh, East\_RJ, Odisha, West\_MP, East\_MP, Guj\_Reg, Konkan\_Goa, Madhya\_Maharashtra, Vidarbha, Chhattisgarh, Andaman\_Nicobar, Coastal\_AP, Telangana, Coastal\_Karnataka, NI\_Karnataka, SI\_Karnataka, Kerala,

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

#### **1. Synoptic Systems:**

The analysis based on 00 UTC shows a cyclonic circulation over North Haryana and adjoining areas in lower troposphere (925hPa). The forecast shows it will persist till day3 with eastward shift. The analysis shows a cyclonic circulation over central Assam and adjoining area. The forecast shows it will persist till day3. An off-shore Trough is seen in the analysis at mean sea level extends from South Gujarat coast to Kerala

coast and forecast shows it will persist till day3. The analysis shows a trough extends from Bihar to Northwest Bay of Bengal across Jharkhand at (925hPa). The forecast shows it will persist till day.

## **2. Location of Jet and Jet Core (>60kt) at 500hPa:**

There is 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 around the cyclonic circulation, from J&K to Foothills of Himalaya, Sikkim, Tamil Nadu, Kerala and NE states during next 3 days; over parts of East and West Uttar Pradesh, North Rajasthan, Northwest Madhya Pradesh, North Punjab, Himachal Pradesh and Uttarakhand from day 1.

## **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, Rajasthan, Bihar, Jharkhand, East and adjoining West Uttar Pradesh, Gangetic West Bengal, SHWB, Orissa, Madhya Pradesh, Vidharbha, northern parts of Madhya Maharashtra, Marathwada, north coastal Maharashtra, Telangana, along east coast of India, coastal Andhra Pradesh, coastal Tamil Nadu, Sikkim and adjoining areas on all 3 days; over parts of Uttarakhand, Punjab, Haryana, Delhi and adjoining areas from day 2 onwards.

**Lifted Index (< -2):** Similar to T-Storm Initiation Index lies over parts of Punjab, Gujarat, Rajasthan, Uttar Pradesh, Bihar, Jharkhand, Gangetic West Bengal, SHWB, Orissa, North coastal Maharashtra, Madhya Maharashtra, Marathwada, Vidharbha, coastal Tamil Nadu, Telangana, Chhattisgarh, East and west Madhya Pradesh, coastal Andhra Pradesh, along east coast of India, Sikkim, NE states during next 3 days; over parts of Haryana, Delhi, Himachal Pradesh, Uttarakhand and adjoining Jammu and Kashmir from day 2 onwards.

**Total Total Index (> 50):** Higher than Threshold value of the Index is seen over parts of J&K, Himachal Pradesh, Uttarakhand, Punjab, Haryana, Rajasthan, Uttar Pradesh, Madhya Pradesh, foothills of Himalaya, Sikkim and Arunachal Pradesh during next 3 days; over parts of Bihar, Jharkhand and Chhattisgarh on day 3.

**Sweat Index (> 300):** Is seen over the sub-divisions along east and west coast, areas along foothills of Himalayas, Central India, South Peninsular India, NE states and most parts of the country during next 3 days; significant zone lies over parts of J&K, Uttarakhand, Himachal Pradesh, Foothills of Himalaya, Sikkim and Arunachal Pradesh.

**CAPE (> 1000):** Mostly seen over parts of Gujarat, Rajasthan, Uttar Pradesh, coastal areas along east coast, GWB, SHWB, Bihar, Jharkhand, Orissa, coastal and interior Andhra Pradesh, coastal Tamil Nadu, Madhya Pradesh, Vidharbha, North coastal Maharashtra including Mumbai, Northern parts of Madhya Maharashtra, Marathwada, Telangana, Chhattisgarh, some parts of Rayalaseema, Sikkim and NE states during next 3 days.; over parts of Uttarakhand and Punjab from day 2 onwards; significant zone with highest value of index lies over parts of East Bihar and east Uttar Pradesh on day 2.

**CIN (50-150):** Mostly seen over Central India, GWB, SHWB, Bihar, Jharkhand, Uttar Pradesh, east coast of India and parts of Gujarat, Eastern parts of India and NE states and over most of the parts of the country except J&K, Himachal Pradesh, Uttarakhand and coastal areas along the southern parts of West coast including Karnataka and its coastal areas, Kerala, South Madhya Maharashtra, Konkan and Goa during next 2 days; over most parts of the country except &K, Himachal Pradesh and Uttarakhand on day 3.



## **5. Rainfall Activity:**

Above 130 mm Rainfall: over some parts of Chhattisgarh on day 2.

70-130 mm Rainfall: over parts of Sikkim, Assam, Nagaland, Chhattisgarh and adjoining East Madhya Pradesh on day 2; over parts of Nagaland, Manipur and North coastal Maharashtra on day 3.

40-70 mm Rainfall: over parts of Sikkim, Assam, Arunachal Pradesh and coastal Maharashtra including Mumbai and coastal Gujarat during next 3 days; over parts of Chhattisgarh, East Madhya Pradesh, Orissa, Nagaland, Manipur and adjoining area on day 2 and 3; over parts of East Rajasthan, SHWB and Vidharbha on day 2; over parts of Meghalaya, Gujarat, coastal Karnataka, Kerala, Konkan and Goa on day 3.

10-40 mm Rainfall: over parts of J&K, coastal and Interior Karnataka, Kerala, coastal Maharashtra including Mumbai, coastal Tamil Nadu, Konkan and Goa, Madhya Maharashtra, Marathwada, Vidharbha, Chhattisgarh, Jharkhand, East Bihar, Jharkhand, Orissa, Telangana, Andhra Pradesh, Rayalaseema, Madhya Pradesh, Gujarat, East Rajasthan, Sikkim and NE states during next 3 days.

Up to 10 mm rainfall: Over parts of J&K, Himachal Pradesh, Uttarakhand, Rajasthan, Uttar Pradesh, Foothills of Himalaya, GWB, SHWB, Sikkim, NE states, Bihar, Jharkhand, Orissa, Chhattisgarh, Madhya Pradesh, Vidharbha, Kerala, Interior Karnataka, Konkan & Goa, coastal Maharashtra including Mumbai, Gujarat, Madhya Maharashtra, Marathwada, Tamil Nadu, Telangana and Andhra Pradesh during next 3 days; over parts of Punjab and Haryana on day 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, coastal areas along the west coast, Telangana, Konkan and Goa, Madhya Maharashtra, Marathwada, Gujarat, East Rajasthan, Orissa, Bihar, Jharkhand, Andhra Pradesh, Kerala, Coastal Maharashtra including Mumbai, Madhya Pradesh, Sikkim and NE states; On day 2 over parts of J&K, Madhya Pradesh adjoining East Rajasthan and South Haryana, Orissa, Bihar, Jharkhand, Chhattisgarh coastal areas along the west coast, Coastal Maharashtra including Mumbai, East Uttar Pradesh, GWB, SHWB, Sikkim, NE states, North Kerala Telangana, Vidharbha and Andhra Pradesh; on day 3 over parts of Bihar, Jharkhand, East Uttar Pradesh, Orissa, Madhya Pradesh, Chhattisgarh, Vidharbha, J&K, South Gujarat, coastal Maharashtra, Konkan and Goa, coastal Karnataka and adjoining North Kerala..

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

**Total Index (> 50):** The value of the index greater than the threshold value is seen over parts of J&K, Himachal Pradesh, Uttarakhand, Punjab, Haryana, Delhi, Uttar Pradesh, Rajasthan, Madhya Pradesh, Bihar, Jharkhand, North Chhattisgarh, East Vidharbha, North Gujarat and some parts of coastal Andhra Pradesh with prominent values are found over parts of J&K, Himachal Pradesh, Uttarakhand, Punjab, Haryana, Delhi, Uttar Pradesh adjoining Northwest Madhya Pradesh and Rajasthan.

**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 J&K, Himachal Pradesh, Uttarakhand, Rajasthan, Madhya Pradesh, Vidharbha, coastal Maharashtra including Mumbai, Madhya Maharashtra, Marathwada, Karnataka, Telangana, Chhattisgarh, Andhra Pradesh, Kerala, Tamil Nadu, Gujarat, Orissa, Bihar, Jharkhand, Uttar Pradesh, GWB, SHWB, Foothills of Himalaya, Sikkim and NE states.



**CAPE (> 1500):** Greater than threshold value over Gangetic plains, Gujarat, Rajasthan, coastal areas of west coast, coastal Maharashtra including Mumbai, Konkan & Goa, coastal Karnataka, coastal Kerala, coastal areas along the east coast, SHWB, GWB, Orissa, East Uttar Pradesh, coastal Andhra Pradesh, coastal Tamil Nadu, Bihar, Jharkhand Orissa, Madhya Pradesh, Chhattisgarh, Vidharbha, Madhya Maharashtra, Marathwada, Telangana, GWB, SHWB, Sikkim and NE states during next 3 days; over parts of West Uttar Pradesh and Uttarakhand on day 2 and 3; Prominent value of the index is seen over parts of GWB, Bihar, Jharkhand, Orissa, and coastal Andhra Pradesh.

**CIN (50-150):** The value of the index lies in the 50-150 range over parts of North India, Northwest India, central India, Bihar Jharkhand, GWB and SHWB, NE states except J&K, Himachal Pradesh, Uttarakhand, Punjab, Haryana and South Peninsular India on day 1; and over most of the parts of the country except J&K, Himachal Pradesh, Uttarakhand and South Peninsular India on day 2 and 3; significant zone with maximum value of index lies over parts of Rajasthan adjoining Northwest Madhya Pradesh, Punjab, Haryana, Delhi and Uttar Pradesh.

### **3. Rainfall and thunderstorm activity:**

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

130-200 mm Rainfall: over parts of Sikkim during all 3 days; over parts of Assam and Meghalaya, on day 2 and 3; over parts of Arunachal Pradesh on day 3.

70-130 mm Rainfall: over parts of Sikkim, Assam, Meghalaya, Arunachal Pradesh, coastal Maharashtra, coastal Karnataka, Konkan and Goa on all 3 days; over parts of coastal Maharashtra including Mumbai on day 3; over parts of Bihar and North Kerala on day 2 and 3.

40-70 mm Rainfall: over west coast from coastal Maharashtra including Mumbai, Konkan and Goa, coastal Karnataka to Kerala and adjoining South Tamil Nadu, Sikkim, SHWB, NE states, Bihar and GWB on all 3 days.

10-40 mm Rainfall: over parts of J&K, Foothills of Himalaya, Madhya Pradesh, Vidharbha, Gujarat, Kerala, Tamil Nadu, coastal and Interior Karnataka, Konkan and Goa, coastal Maharashtra including Mumbai, Sikkim, Orissa, Telangana, Madhya Maharashtra, Marathwada, Chhattisgarh, Bihar, Jharkhand, Andhra Pradesh, Sikkim, GWB, SHWB and NE states during next 3 days; over parts of East Rajasthan on day 2 and 3.

Up to 10 mm Rainfall: Over parts of J&K, Himachal Pradesh, Uttarakhand, Foothills of Himalaya, Rajasthan, Kerala, Tamil Nadu, coastal and Interior Karnataka, Konkan and Goa, Sikkim, GWB, SHWB, Uttar Pradesh, Bihar, Jharkhand, Orissa, Telangana, Madhya Maharashtra, Marathwada, Vidharbha, coastal Maharashtra including Mumbai, Madhya Pradesh, Andhra Pradesh, Gujarat and NE states during next 3 days.

### 3. IOP ADVISORY FOR 24 and 48Hrs:

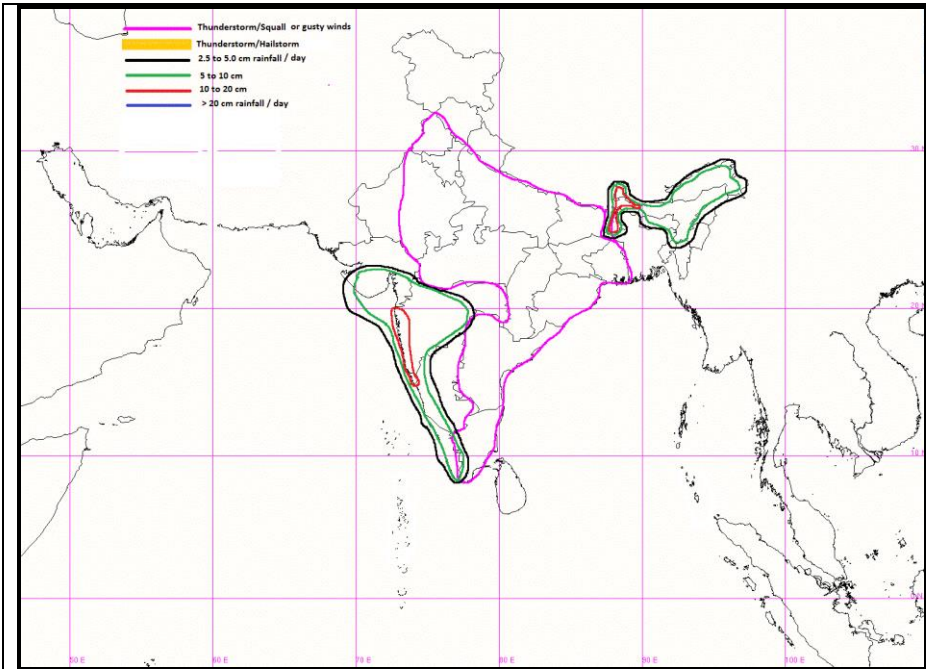
#### Summary and Conclusions:

- Synoptic analysis indicates that the off shore trough at mean sea level runs from South Gujarat Coast to Kerala coast. Also, a cyclonic circulation lies over south Konkan & neighbourhood between 3.1 and 5.8 km above mean sea level and another cyclonic circulation lies over north Konkan & adjoining south Gujarat between 2.1 km and 3.6 km above mean sea level. In addition East-west shear zone runs roughly along latitude 20.0°N over India region between 3.1 and 7.6 km above mean sea level tilting southwards with height. Under the influence of the above meteorological conditions, isolated heavy to very heavy rain over Konkan & Goa and isolated heavy rainfall over Gujarat region, Madhya Maharashtra, Marathwada, Coastal Karnataka and Kerala is very likely on Day 1. On Day 2 the intensity of rainfall is expected to decrease and only South Gujarat and Konkan & Goa may experience isolated heavy rainfall. Also, Tamilnadu, Rayalaseema, Coastal Andhra Pradesh and Telangana may experience isolated thunderstorm activity accompanied with gusty winds on Day 1 & Day 2
- Synoptic analysis also indicates the presence of a Western Disturbance as a trough in mid & upper tropospheric levels with its axis at 5.8 km above mean sea level running roughly along Long. 72°E to the north of lat. 32°N. Also, a cyclonic circulation lies over north Haryana & neighbourhood and extends upto 0.9 km above mean sea level. As a result, isolated thunderstorm activity accompanied with gusty winds is likely over Punjab Haryana, Chandigarh & Delhi on Day 1. Uttar Pradesh may experience isolated Duststorm/thunderstorm on Day 1 & Day 2.
- In addition, a trough runs from Bihar to northwest Bay of Bengal across Jharkhand at 0.9 km above mean sea level and a cyclonic circulation lies over northwest Bay of Bengal & neighbourhood between 2.1 km and 3.6 km above mean sea level. These conditions may trigger isolated thunderstorm with gusty winds over Gangetic West Bengal, Bihar, Jharkhand, and Odisha on Day 1 & Day 2.
- Further, a cyclonic circulation lies over central Assam & neighbourhood and extends upto 0.9 km above mean sea level. This condition together with NWP model analysis indicates possibility of heavy to very heavy rainfall at a few places over Sub-Himalayan West Bengal & Sikkim on Day 1 & Day 2 and isolated heavy rainfall over Assam & Meghalaya and Arunachal Pradesh on Day 1. On Day 2 the intensity of rainfall is likely to increase over northeast and Assam & Meghalaya may experience isolated heavy to very heavy rainfall. Isolated heavy rainfall is also expected over Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura on Day 2.

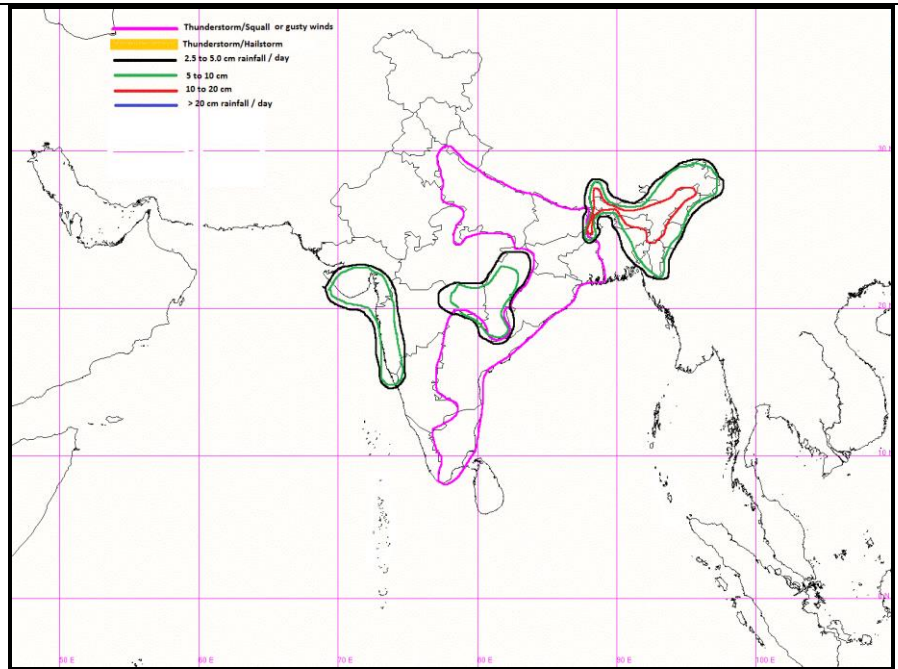
## IOP Area for Day-1 & Day-2:

24 hour Advisory for IOP:	48 hour Advisory for IOP:
<p><b>Significant Rainfall:</b> Konkan &amp; Goa, Madhya Maharashtra, Marathawada, South Gujarat Kerala, Coastal Karnataka Sub Himalayan West Bengal &amp; Sikkim Assam &amp; Meghalaya, Arunachal Pradesh</p> <p><b>Thunderstorm with squall or gusty winds:</b> Tamilnadu, Rayalaseema, Telangana, Coastal Andhra Pradesh Punjab, Haryana, Chandigarh, Delhi, Uttar Pradesh, East Rajasthan Madhya Pradesh, Chhattisgarh Gangetic West Bengal, Bihar, Jharkhand, Odisha</p> <p><b>Thunderstorm with squall and hail</b> Nil</p> <p><b>Duststorm:</b> Uttar Pradesh</p>	<p><b>Significant Rainfall:</b> Konkan &amp; Goa, South Gujarat Sub Himalayan West Bengal &amp; Sikkim Vidarbha, Chhattisgarh Assam &amp; Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura</p> <p><b>Thunderstorm with squall or gusty winds:</b> Tamilnadu, Rayalaseema, Telangana, Coastal Andhra Pradesh Gangetic West Bengal, Bihar, Jharkhand, Odisha</p> <p><b>Thunderstorm with squall and hail</b> Nil</p> <p><b>Duststorm/Thunderstorm:</b> Uttar Pradesh</p>

Graphical Presentation of Potential Areas for Severe Weather:

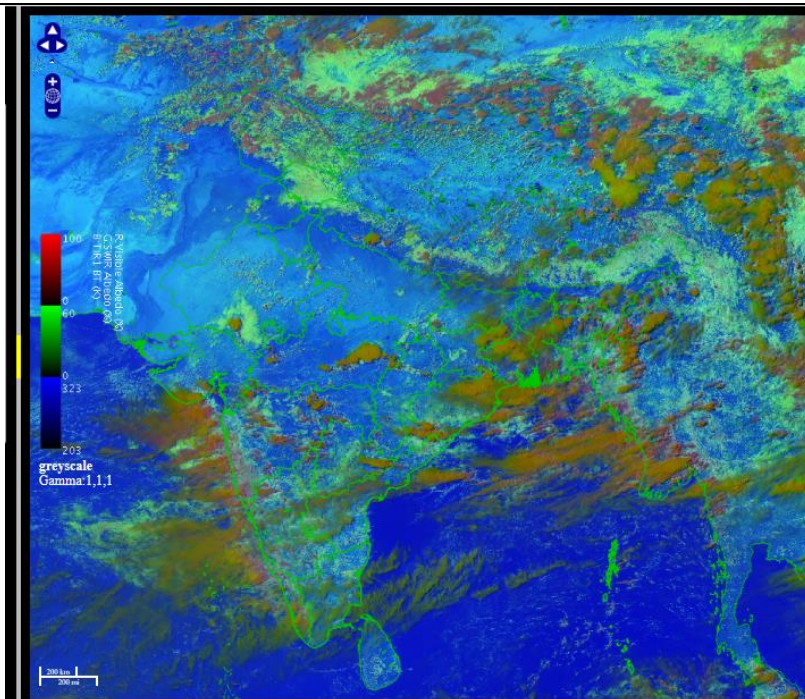


IOP Advisory for 24 hours

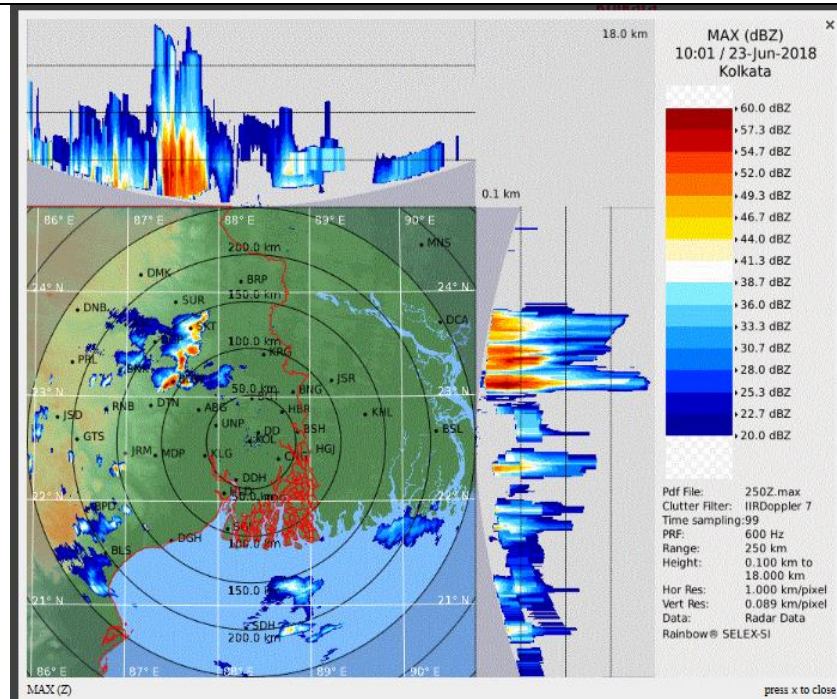


IOP Advisory for 48 hours

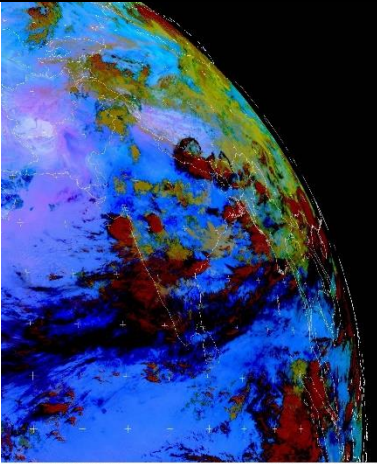




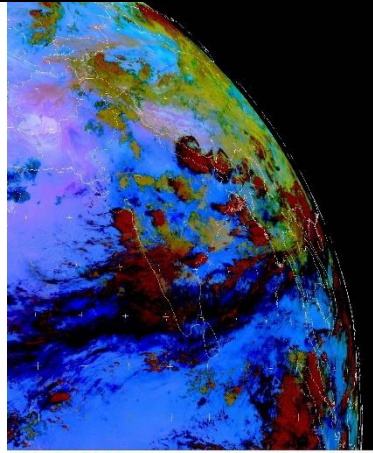
**RAPID RGB Satellite Imagery at 1430 IST**



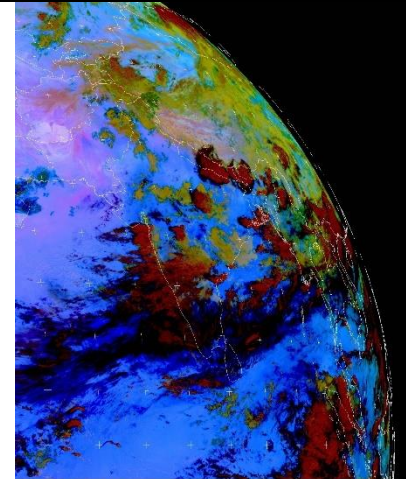
**DWR Kolkata reflectivity at 1531 IST**



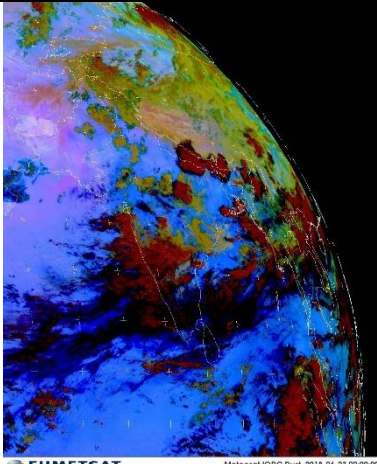
EUMETSAT  
Meteosat IODC Dust, 2018-06-23 03:00:00



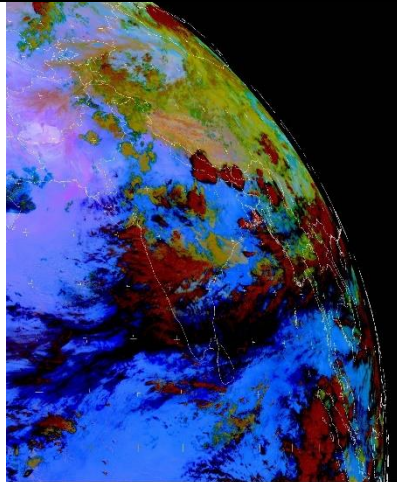
EUMETSAT  
Meteosat IODC Dust, 2018-06-23 02:00:00



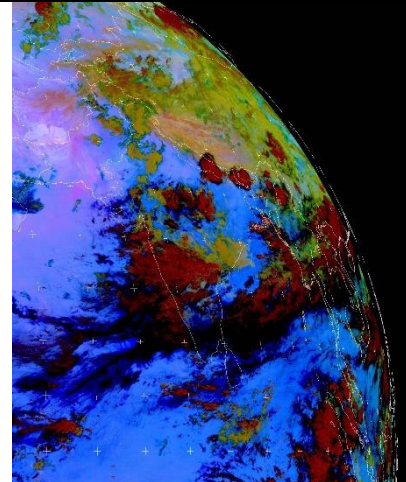
EUMETSAT  
Meteosat IODC Dust, 2018-06-23 01:00:00



EUMETSAT  
Meteosat IODC Dust, 2018-06-23 00:00:00



EUMETSAT  
Meteosat IODC Dust, 2018-06-22 23:00:00

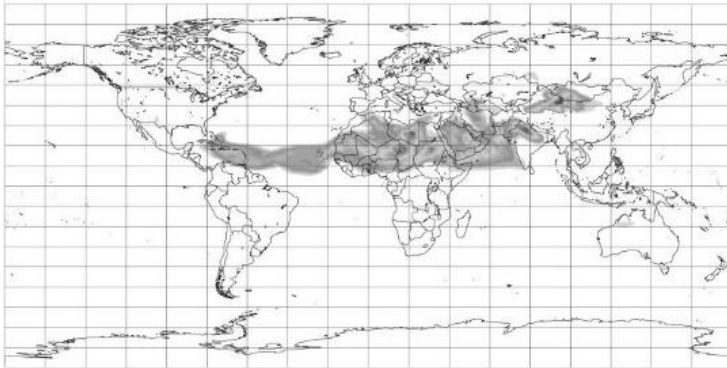


EUMETSAT  
Meteosat IODC Dust, 2018-06-22 22:00:00

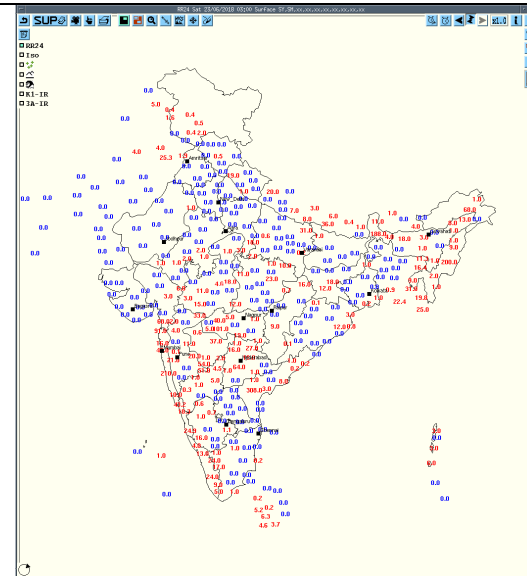
**Observed Satellite Dust Images of today**



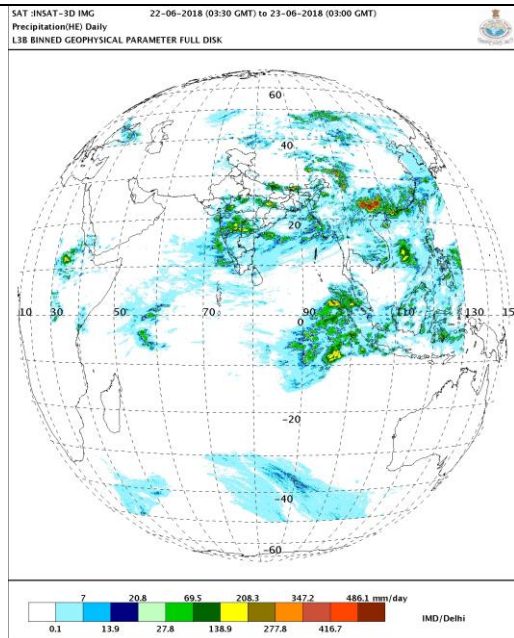
Dust aerosol optical depth at 550 nm (provided by CAMS, the Copernicus Atmosphere Monitoring Service)  
Friday 22 Jun, 00 UTC T+120 Valid: Wednesday 27 Jun, 00 UTC



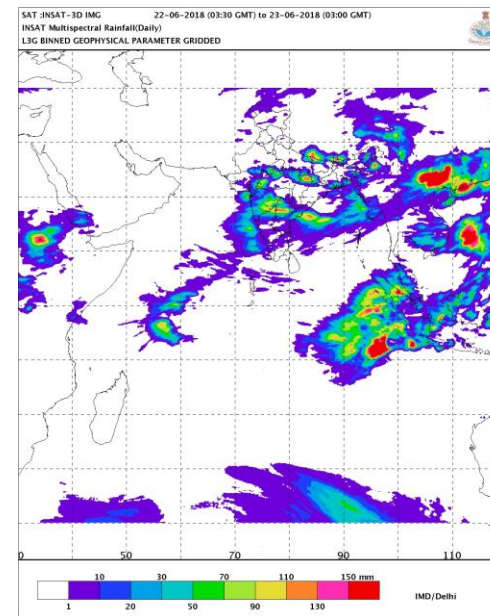
**Dust Forecast**



**Accumulated 24 Hour rainfall (in red) recorded at 0300UTC of today**

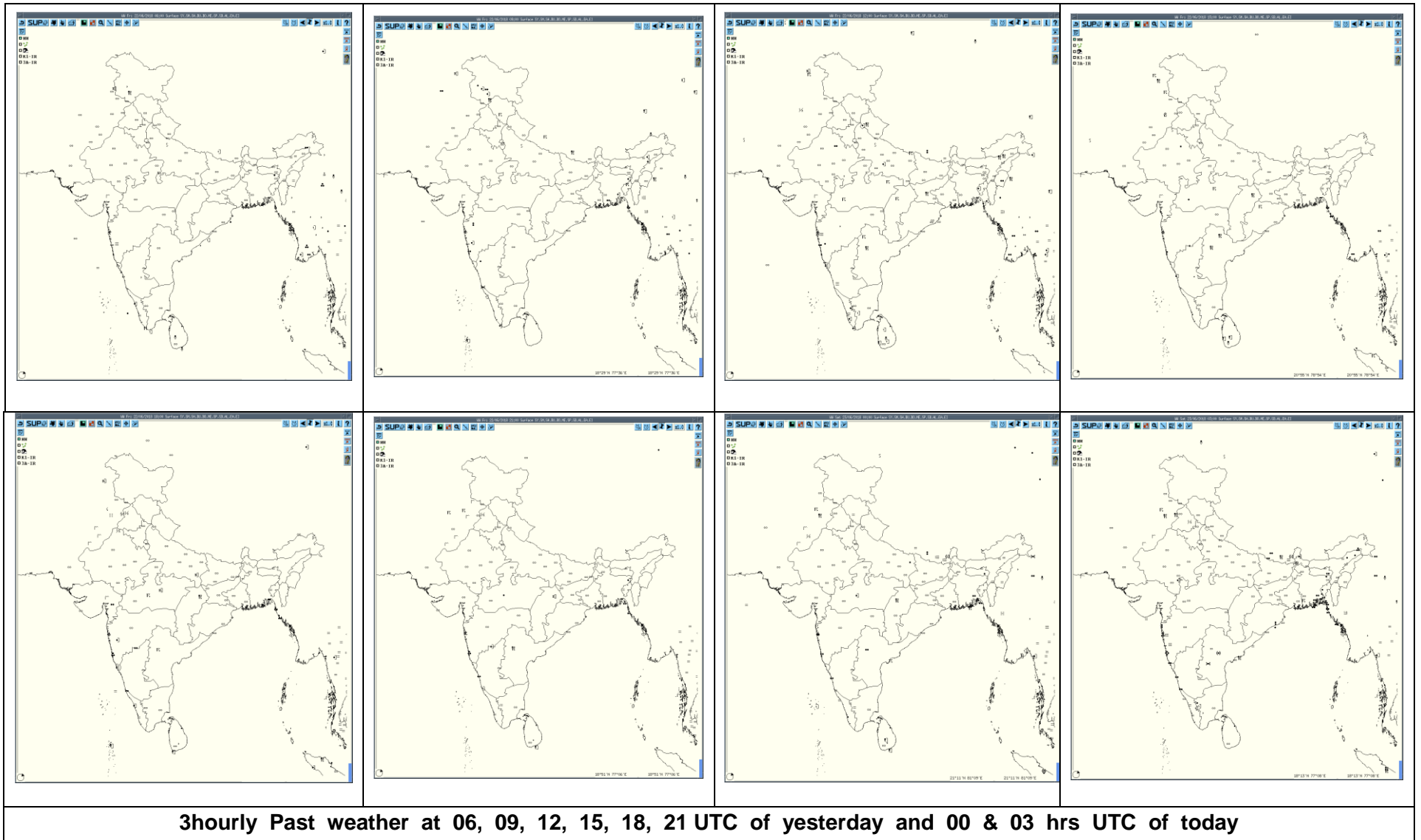


**HEM Rainfall**

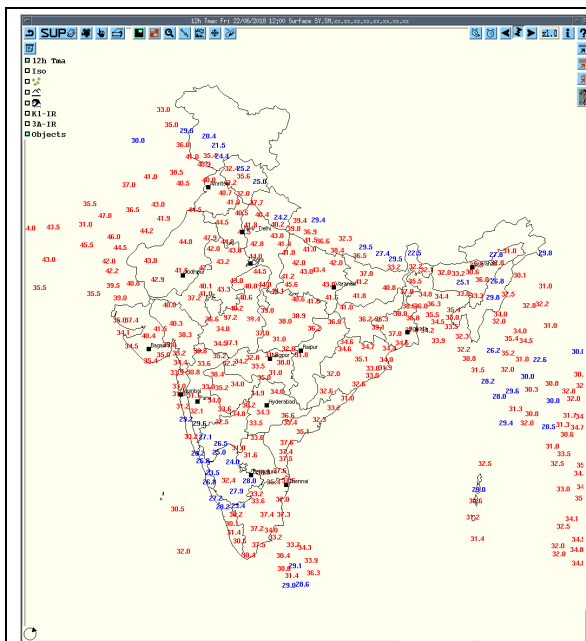


**IMR Rainfall**

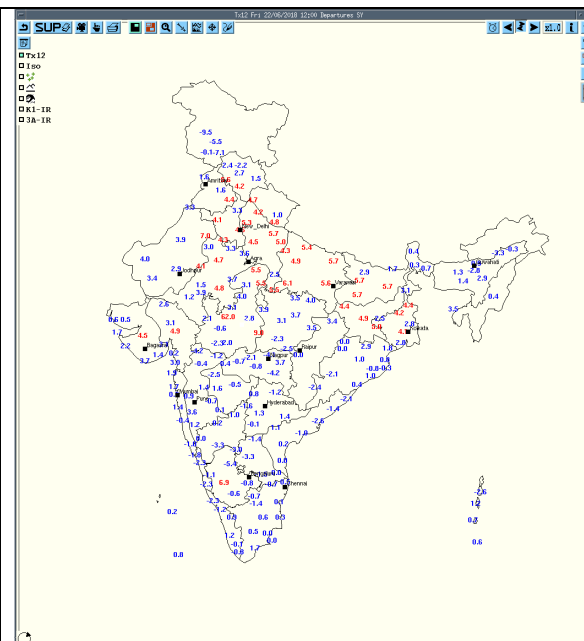




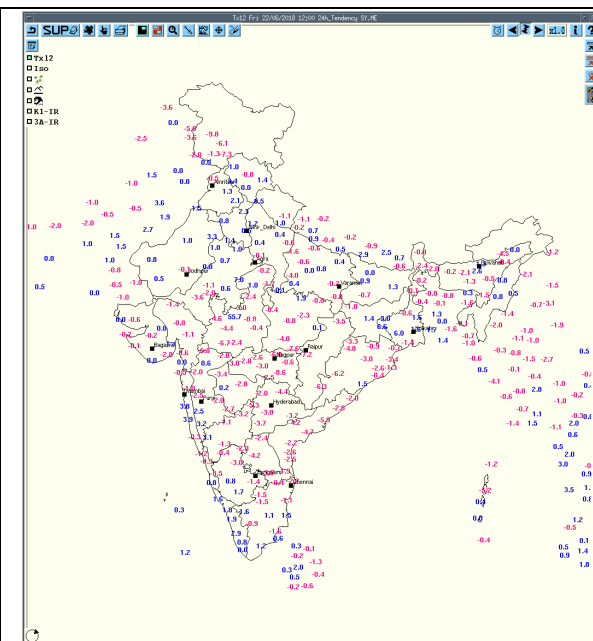
3hourly Past weather at 06, 09, 12, 15, 18, 21 UTC of yesterday and 00 & 03 hrs UTC of today



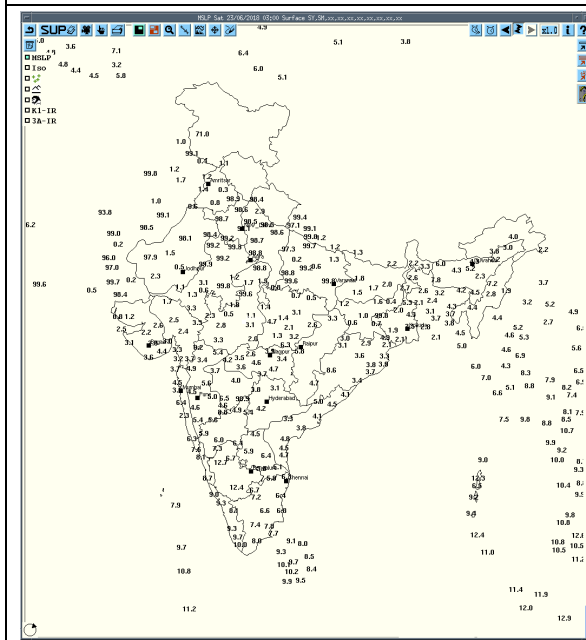
**Tmax**



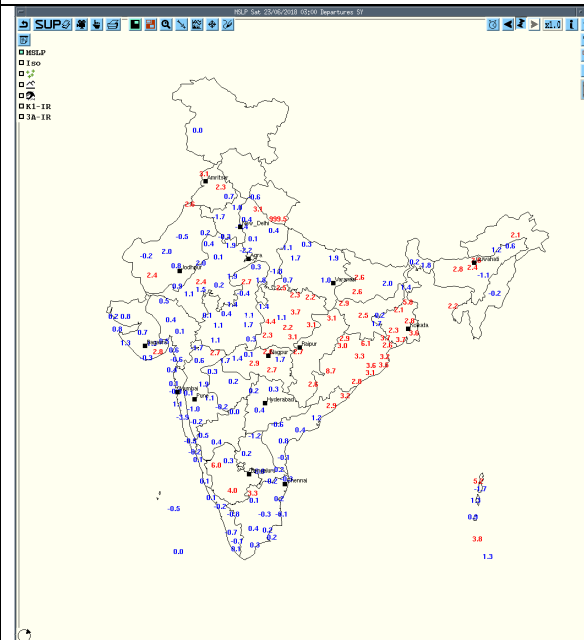
**Departure Tmax**



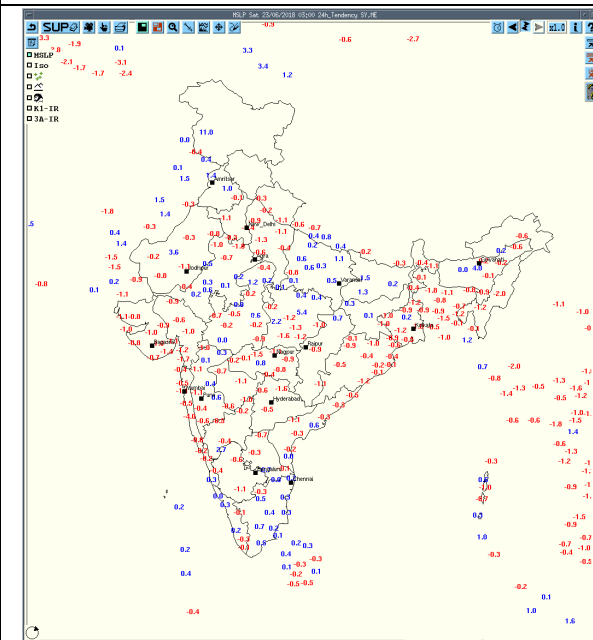
**Tendency Tmax**



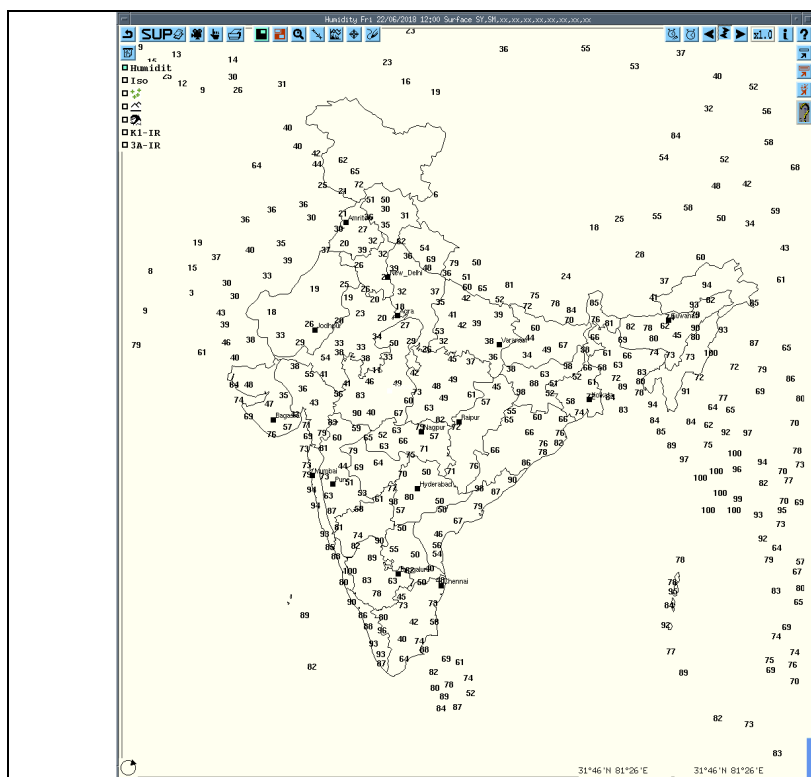
**MSLP**



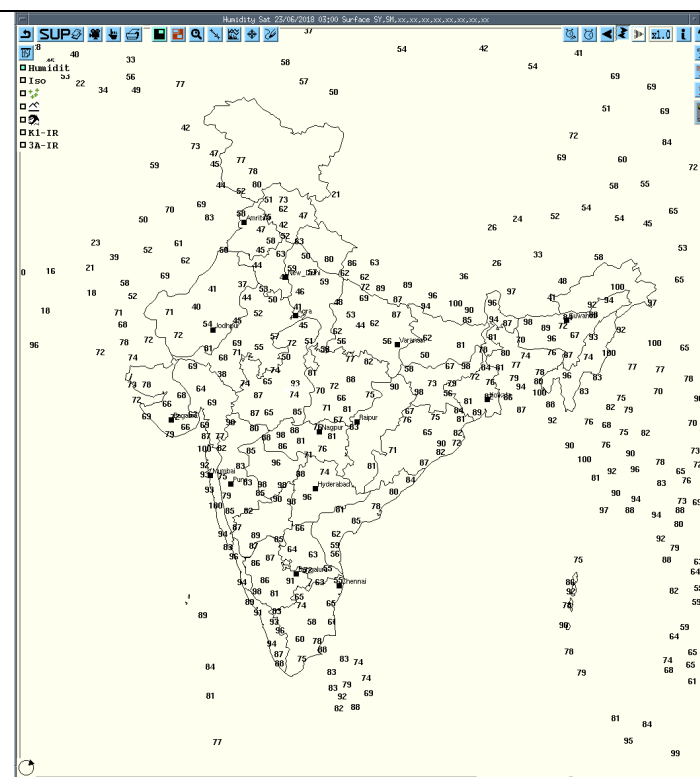
**Departure MSLP**



**Tendency MSLP**



RH at 1200UTC yesterday



RH at 0300UTC today

## Past 24 hours DWR Report:

Radar Station name	Date	Time interval of observation (UTC)	Organization of the cells (Isolated single cells/multiple cells/ convective regions/ squall lines) with height of 20 dBZ echo top and maximum reflectivity.	Formation w.r.t radar station and Direction of movement.	Remarks	Associated severe weather if any	Districts affected
Patiala	23-06-18	220300 - 220600	No Significant Echo	-----		-----	-----
		220600 - 220900	MULTIPLE CELLS DBZ 50.0 HT. 10-12 KM	N SECTOR MOVEMENT SW - WARDS		RA/TS	Nadaun, Hamirpur, Uttarkashi and their adjoining areas.
		220900- 221200	MULTIPLE CELLS DBZ 56.0 HT. 10-12 KM	NE,SW SECTORS MOVEMENT E -WARDS		RA/TS	Uttarkashi, Dehradun, Gangotri, Mandi and their adjoining areas.
		221200 - 221500	MULTIPLE CELLS DBZ 50.0 HT. 10 KM	SW SECTOR MOVEMENT E -WARDS		RA	Hissar, Fatehabad and their adjoining areas.
		221500 - 221800	MULTIPLE CELLS DBZ 44.5 HT. 9 KM	SW,NW SECTORS MOVEMENT E -WARDS		RA	Khemkaran, Rajgarh, Ferozpur, Bhiwani and their adjoining areas.
		221800 - 222100	MULTIPLE CELLS DBZ 43.5 HT. 8-9 KM	NW,SW SECTORS MOVEMENT S E - WARDS		RA	Amritsar, Kapurthala, Jhunjunu, Loharu, Mohindergarh and their adjoining areas.
		222100- 230000	MULTIPLE CELLS DBZ 53.0 HT. 10 KM	SWNW,W SECTORS MOVEMENT E -WARDS		RA	Muktsar, Faridkot, Ferozpur, Rajgarh, Jhunjunu and their adjoining areas.
		230000- 230252	MULTIPLE CELLS DBZ 46.0 HT. 10 KM	NW SECTOR MOVEMENT E -WARDS		RA	Faridkot, Zira, Amritsar, Ferozpur, Halwara, Batala, Muktsar and their adjoining areas.
Jaipur	23-06-18	220752- 220252	Multiple cell with average height of 6.0 km & maximum reflectivity 60.50 dBZ	Multiple cell develop from 07:52 UTC of 22/06/18 towards W,SW,NW,,E,S,N,SE of Jaipur and moved to SW, SE Wards at speed 10-15 km/hr	Multiple cell develop from 07:52 UTC of 22/06/18 towards W,SW,NW,E,S,N,SE of Jaipur and reaches maximum refelectivity at 11:12 UTC of 22/06/2018 and Dead at 0252 UTC of 23.06.2018.	Dust storm/Thund erstorm/ Light rain at Isolated places	Nagaur, Sawai Madhopur, karauli, Ajmer, , Sikar, Churu, Jhunjunu, Jaipur, Dausa, Chittorgarh, Bhilwara, Kota, Bundi, Baran, Jhalawar, Tonk,Pali, Rajsamand, Udaipur Districts.

Radar Station name	Date	Time interval of observation (UTC)	Organization of the cells (Isolated single cells/multiple cells/ convective regions/ squall lines) with height of 20 dBZ echo top and maximum reflectivity	Formation w.r.t radar station and Direction of movement	Remarks	Associated severe weather if any	Districts affected
Visakhapatnam	23-06-18	220600	Isolated and merged cb cells formed in the convection region with max reflectivity 52dbz and height 10KMS.	129kms(SW) 04:01UTC and moving Easterly over the sea.	Forming continually due to convection over the sea.	Slight rain.	Visakhapatnam, East Godavari Dists(AP)
		220900	Isolated and merged cb cells formed in the convection region with max reflectivity 54dbz and height 10KMS.	183kms(SSE) 06:01UTC and moving Easterly over the sea.	Since last observation forming continually due to convection over the sea.	Slight rain	visakhapatnam, bay region
		221200	Isolated and merged cb cells formed in the convection region with max reflectivity 49 dbz and height 8 KMS.	231 kms (SSE) 09:01UTC and moving Easterly over the sea.	Since last observation forming continually due to convection over the sea.	NIL	bay region
		221500	Single cb cell formed in the WSW direction with max reflectivity 51 dbz and height 8 KMS.	215 kms (WSW) 14:51UTC and moving westerly	convection over the sea dissipated	NIL	NIL
		221800	Isolated single cb cell with max reflectivity 49 dbz and height 6 KMS.	230 kms (WSW) 1521UTC and moving westerly	Since last observation	NIL	NIL
		230000	Isolated cb cells with max reflectivity 51 dbz and height 8 KMS.	85 kms (SSW) 2351UTC and moving Easterly	Since last observation	NIL	Bay of bengal
		230300	Isolated cb cells with max reflectivity 54 dbz and height 8 KMS.	57 kms (S) 0111UTC and moving Easterly	Since last observation	NIL	Bay of bengal

Radar Station Name	Date	Time Interval Of Observation (UTC)	Organisation Of The Cells(Isolated Single Cells/ Multiple Cells/ Convective Regions/ Squall Lines) With Height Of 20 dbZ echo top and maximum reflectivity	Formation w.r.t. radar station and Direction of movement	Remarks	Associated severe weather if any	Districts affected
PATNA	23-06-18	220300 - 221142	NIL	NIL	NIL	NIL	NIL
		221142 - 221502	Isolated Multiple cell Maximum Reflectivity: 50 dBZ Echo Top: 11.3 KM	Range: 126.5 KM from DWR Patna in South-West direction Movement: Stationary	Warning Issued	N/A	AURANGABAD, ARWAL, ROHTAS, BHOJPUR, BUXAR
		221502 - 221812	NIL	NIL	NIL	NIL	NIL
		221812 - 230300	Isolated Multiple cell Maximum Reflectivity: 46.5 dBZ Echo Top: 14+ KM	Range: 153.8 KM from DWR Patna in NNW direction Movement: ESE	Warning Issued	N/A	WEST CHAMPARAN, EAST CHAMPARAN, GOPALGANJ, SIWAN, SARAN, SITAMADHI, SHEOHAR, MUZAFFARPUR, MADHUBANI, DARBHANGA, SAMASTIPUR, SUPAUL, MADHEPURA, SAHARSA, KHAGARIA

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

Realised TS/HS/SQ during past 24hours ending at 0300UTC of today (received from RMCs/MCs)						
Station	Region	State/Sub Division	Weather Event (TS/Hail/Squall)	Date	Time of Commencement (IST)	Time of end (IST)
Pahalgam	Northwest India	Jammu & Kashmir	Thunderstorm	22-06-18	1230	1320
Banihal	Northwest India	Jammu & Kashmir	Thunderstorm	22-06-18	1110 1145 2305	1125 1200 2340
Bhaderwah	Northwest India	Jammu & Kashmir	Thunderstorm	22-06-18	1330	1600
Dehradun	Northwest India	Uttarakhand	Thunderstorm	22-06-2018	1452	1740
Mukteshwar	Northwest India	Uttarakhand	Thunderstorm	22-06-2018	1440	1520
Tehri	Northwest India	Uttarakhand	Thunderstorm	22-06-2018	1550	1740
Sundernagar	Northwest India	Uttarakhand	Thunderstorm	22-06-2018	1414	1458
Amritsar	Northwest India	Punjab	Thunderstorm	23-06-18	0615	0635
			<b>Squall from W direction with max speed 64kmph</b>	<b>22-06-18</b>	<b>2251</b>	<b>2300</b>
Kanpur IAF	Northwest India	East Uttar Pradesh	Thunderstorm	22-06-18	1500	1700
Kanpur City	Northwest India	East Uttar Pradesh	Thunderstorm	22-06-18	1500	1700
Gorakhpur	Northwest India	East Uttar Pradesh	Thunderstorm	23-06-18	0330	0430
Kanpur city	Northwest India	East Uttar Pradesh	Thunderstorm	22-06-18	1500	1600
			Duststorm	22-06-18	1500	1600
Churk	Northwest India	East Uttar Pradesh	Thunderstorm	22-06-18	1522	1540
Akola	Central India	Vidarbha	Thunderstorm	23-06-18	0610	0730
Amravati	Central India	Vidarbha	Thunderstorm	22-06-18	1830	2000
Washim	Central India	Vidarbha	Thunderstorm	22-06-18	1930	2300
Bhopal	Central India	West Madhya Pradesh	Thunderstorm	22-06-18	2320	2400
Indore	Central India	West Madhya Pradesh	Thunderstorm	22-06-18	1550	1720
Sagar	Central India	East Madhya Pradesh	Thunderstorm	22-06-18	1850	2245
Ambikapur	Central India	Chhattisgarh	Thunderstorm	22-06-18	1945	2400



## IMPORTANT LINKS:

For NCMRWF NWP products:(<http://www.ncmrwf.gov.in/HomePage/NEPS-prod-1.php>)

For IMD NWP products:([http://nwp.imd.gov.in/diagpro\\_new.php](http://nwp.imd.gov.in/diagpro_new.php))

For Synoptic plotted data and charts

<http://amssdelhi.gov.in/>

<http://www.amsskolkata.gov.in/>

For RANDHRA PRADESHID tool:

[http://rAndhra\\_Pradeshid.imd.gov.in/](http://rAndhra_Pradeshid.imd.gov.in/)

Low Level Winds

[http://satellite.imd.gov.in/archive/INSAT-3D-IMAGER/3D-PRODUCTS/AMV/LLW/MAR\\_2017/?C=M;O=D](http://satellite.imd.gov.in/archive/INSAT-3D-IMAGER/3D-PRODUCTS/AMV/LLW/MAR_2017/?C=M;O=D)

Upper level winds

[http://satellite.imd.gov.in/archive/INSAT-3D-IMAGER/3D-PRODUCTS/AMV/HLW/MAR\\_2017/?C=M;O=D](http://satellite.imd.gov.in/archive/INSAT-3D-IMAGER/3D-PRODUCTS/AMV/HLW/MAR_2017/?C=M;O=D)

Past24hourHEMandIMRRainfall(upto03UTCof today)

IMR: [http://satellite.imd.gov.in/img/3Ddaily\\_imr.jpg](http://satellite.imd.gov.in/img/3Ddaily_imr.jpg)

HEM: [http://satellite.imd.gov.in/img/3Ddaily\\_he.jpg](http://satellite.imd.gov.in/img/3Ddaily_he.jpg)

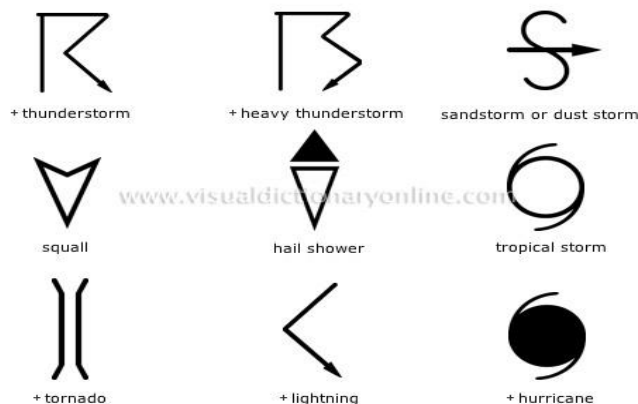
For Radar images of the past 24 hours including mosaic of images:

[http://ddgmui.imd.gov.in/dwr\\_img/](http://ddgmui.imd.gov.in/dwr_img/)

Satellite sounder based T- Phigram

[http://satellite.imd.gov.in/mAndhra\\_Pradesh\\_skm2.html](http://satellite.imd.gov.in/mAndhra_Pradesh_skm2.html)

## WEATHER SYMBOLS:



∞	haze
☼	smoke
☼	dust or sand storm
≡	fog
•	drizzle
•	rain
✱	snow
▽	showers
△	hail
☼	thunderstorm
<b>Weather Symbols</b>	