# India Meteorological Department

## FDP STORM Bulletin No. 17(22-03-2017)

## 1. CURRENT SYNOPTIC SITUATION at 0300 UTC of 22-03-2017:

### SYNOPTIC FEATURES:

A Western Disturbance as an upper air cyclonic circulation over north Pakistan and neighbourhood, now lies over north Pakistan and adjoining Jammu & Kashmir and extends upto 3.1 km above mean sea level.

The trough in mid-tropospheric westerlies with its axis at 5.8 km above mean sea level roughly along longitude 48.0°E and north of latitude 20.0°N, now runs roughly along longitude 50.0°E and north of latitude 25.0° N.

An induced upper air cyclonic circulation lies over Central Pakistan & adjoining West Rajasthan and extends upto 1.5 Km above mean sea level.

The upper air cyclonic circulation over northern parts of Bangladesh and adjoining Sub Himalayan West Bengal extending upto 0.9 km above mean sea level persists.

The trough in lower level easterlies from Lakshadweep area to north Coastal Andhra Pradesh, now runs from Lakshadweep area to south interior Karnataka and extends upto 0.9 km above mean sea level.

An upper air cyclonic circulation lies over Interior Karnataka & neighbourhood and extends upto 1.5 Km above mean sea level.

The upper air cyclonic circulation over Assam and adjoining Nagaland, Manipur, Mizoram & Tripura at 1.5 km above mean sea level has become less marked.

### SATELLITE OBSERVATIONS during past 24hrs and current observation:

**Clouds (based on 0900 UTC imagery of INSAT3D):**

Broken multi/layered clouds were seen over J & K and Himachal Pradesh in association with western disturbance over the area.

Scattered low/medium clouds with embedded isolated moderate to intense convection seen over north Kerala. Scattered low/medium clouds over north Punjab, north Uttarakhand, northwest Bihar, northeast Jharkhand, Sub-Himalayan West Bengal, east Gangetic West Bengal, Sikkim, north-eastern states, Karnataka, Andhra Pradesh, rest Kerala and Tamilnadu.

**Arabian Sea:-**

No significant clouds over the region.

**Bay of Bengal & Andaman Sea:**

No significant clouds over the region.

**Convection:** Moderate to Strong convection was observed over North West parts of India. Moderate convection was observed over South Interior Karnataka.

**OLR:** - Upto 340 $wm^{-2}$ was over South Gujarat Maharashtra South Chhattisgarh Telangana South Odisha North Karnataka West Andhra Pradesh. upto 310 $wm^{-2}$ was over North Gujarat Madhya Pradesh North Chhattisgarh Jharkhand and North Odisha, upto 300 $wm^{-2}$ was over Rajasthan East Uttar Pradesh East West Bengal Tamilnadu, upto 290 $wm^{-2}$ was over North West Uttar Pradesh North Bihar . upto 270 $wm^{-2}$ was over South Karnataka Kerala Punjab North Haryana and Up to 200 $wm^{-2}$ was over J&K..

**Jet Stream:** No Jet stream was observed .

**Dynamic Features:** A positive vorticity field is seen over Uttar Pradesh Bihar and Coastal Karnataka. Moderate to High wind shear observed over North West India and Moderate over Central India. Positive shear tendency observed over North India.

**Precipitation:**

**IMR**: Rainfall upto 50mm was observed over NW Jammu Kashmir, Rainfall upto 20mm was observed over Central J&K and Rainfall upto 10mm was observed over Rest J&K Extreme North Himachal Pradesh Kerala South Karnataka North Sikkim .

**HEM**: Rainfall up to 70 mm was observed over West J&K Extreme North Himachal Pradesh South Karnataka and Kerala.

### RADAR and RAPID observation:

No significant convection was observed in DWR Composite at 1650hrs IST.

In RGB satellite imagery convection appears in progress over North Coastal Kerala and adjoing Karnataka.

### Environmental condition (dust etc) and its forecast based on 00UTC of date:

No significant dust concentration observed over Arabian Peninsula and west Rajasthan. No significant change in dust concentration expected over northern India for next three days.

## 2. NWP MODEL GUIDANCE:

### NCMRWF (NCUM Forecasts based on 00 UTC of the day):-

**1. Weather Systems:**

Sea on all Days; Localized weak, cyclonic flow over two regions eastern UP and Maharashtra up to Day 3. 12UTC Charts on all days from Day0-4 show feeble trough in MSLP over J & K.

12UTC charts on all days from Day0-4 show Wind discontinuity at 925 hPa over Maharashtra, Chhattisgarh and Odisha. Similar features are also reflected at 850 hPa on all days.

850hPa anticyclonic flow lies over Arabian Sea.

**2. Location of jet and jet core at 500hPa:-500hPa Jet core (>60kt):**

Weak in magnitude on all Days. Well defined anticyclonic flow centred near Mumbai-Gujarat after Day-3.

**3. Convergence at 850 hPa:**

Strong low level convergence in land all along the west coast on all days at 12UTC.

**4. Low level Vorticity:-Positive Vorticity (>15 x $10^{-5}$/s):**

Lower values at 12UTC on all days.

At 00UTC high values along the west coast over peninsula and EW along the line of low level discontinuity.

**5. Showalter Index: -3 to -4[Very Unstable]:**

Day-0:TN, Kerala and Karnataka. Day-1: Kerala –Karnataka coast. Day-1-2: J& K and HP region.

Day-2: Bihar, WB and Bangladesh with parts of Arunachala Pradesh.

**6. K-Index :> 35[Very Unstable thunderstorm likely]:**

Day-0:TN, Kerala and Karnataka. Day-1: Kerala –Karnataka coast.

Day-3: Parts of Arunachala, Meghalaya, Assam and Tripura.

**7. Spatial distribution of TTI: TTI >44 [Scattered Numerous Thunderstorms]:**.

Day-0:TN, Kerala and Karnataka. Day-1: Kerala –Karnataka coast. Day-1-2: J& K and HP region.

Day-3: Parts of Arunachal, Meghalaya, Assam and Tripura.

**8. Rainfall and thunder storm activity**:
Day-1-2: (>4cm/day) Parts of J & k Region.
Day-3-5 : (> 2cm/day) Parts of Assam and Arunachal Pradesh.

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

**1. Weather Systems:** In the analysis, a CYCIR over GWB and adjoin areas is noticed with presence of north-south trough north Odisha, GWB, Jharkhand and Bihar. A CYCIR over coastal Odisha is seen during day 2 and the NE-SW oriented trough from GWB to Odisha, Chhattisgarh, south MP and adjoining Maharashtra is prominent during day 3 to day 5.
Another quasi-stationary CYCIR with north-south trough is seen over interior Karnataka, Marathwada and adjoining areas during next 4 to 5 days.
**2. Location of jet and jet core at 500 hPa**:**-500 hPa Jet core (>60kt):** The Jet at 500 hPa almost does not exist over India during next 5 days except a small belt over Bihar region on day 3.
**3. Low level Vorticity:-Positive Vorticity (>15x10$^{-5}$/s):** Mainly along foothill of Himalaya and north-eastern states during next 5. The pocket of vorticity maxima is concentrated towards Bihar, Jharkhand, GWB, Odisha, Chhattisgarh, east MP region during the morning hours on most of next 5 days.
The significant vorticity zones associated with the cyclonic circulations are seen over Karnataka and Konkan-Goa during next 5 days only in morning hours.
**4. Spatial distribution of T-Storm Initiation Index, Lifted Index, Total Total Index, CAPE, CINE and Sweat Index (High potential for thunderstorm]:**
**T-Storm Initiation Index (> 4):** No significant zone is seen over the country during next 3 days. However, after the 78hr forecasts some regions over the eastern coastal belt including Odisha, GWB and adjoining regions indicate the value higher than 4.
**Lifted Index (< -2):** The areas with index less than -2 lies along east coast regions for next 5 days with gradually the LI areas with less than -2 mainly concentrated over GWB, Odisha, coastal AP, Bihar and adjoining areas after day 2.
**Sweat Index (> 400):** Then significant zones are confined along south east coast of India over Andhra coast during initial 2 days and subsequently the maxima belts lie over GWB, Orissa and adjoining regions till day 5. The index crosses threshold over J & K and adjoining areas from day 1 - 4. Some parts of western Gujarat states also crosses the threshold values during initial 2 days.
**Total Total Index (> 50):** Above threshold value in some parts of central India adjoining parts of the country from day 1 up to day 5 particularly at 12 UTC of each day.
**CAPE (> 1000):** Mostly along south east coast of India over south AP and adjoining TN coast during next 2 days. Subsequently the maximum CAPE is noticed over Gangetic West Bengal, Orissa and adjoining regions during day 3-5. The CAPE values also above threshold over Kerala, parts of coastal Karnataka, Konkan-Goa during day 3-5 and part of western Gujarat on day 1-2.
**CINE (50-150):** Maximum CINE values are found in some areas along east coast over GWB, Odisha, coastal AP and Tamilnadu from Day-1 to Day-5. The CIN values are higher along west coast and maxima over costal Gujarat and adjoining west Rajasthan.
**5. Rainfall and thunderstorm activity**:
10-40 mm rainfall over Kerala and J & K region during next 2 days with J & K rainfall even on day 3 also.
Subsequently on day 4 and 5 the rainfall is mainly over NE states.

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

**1. Model reflectivity (Max. dBz)**: **(>25 dBz)** mainly over J & K region during next 3 days with some parts of NE states exceeding the threshold value on afternoon of day 2.

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

**Total Total Index (> 50):** Above threshold value over most parts of India during next 3 days except parts of extreme south peninsular region and northeastern states during morning hours.

**K-Index (> 35):** Less than threshold value over most parts of India during next 3 days but significant values are seen over some parts of peninsular India.

**CAPE (> 1000):** Mostly along south east coast of India over Andhra Pradesh and Tamilnadu during next 3 days. Another zone along west coast over Kerala, coastal Karnataka, Konkan & Goa. CAPE exceeding 1000 unit is also seen over NCR region and parts of western Gujarat in the afternoon of day 1.

**CINE (50-150):** CINE values are mostly small all over India during all three days of forecasts except some areas along coastal areas of India over Odisha, coastal AP, coastal Karnataka and Konkan-Goa and some parts of UP, Haryana, Punjab and adjoining Rajasthan on day 2.

**5. Rainfall activity:-** Rainfall activity (~ 10-40 mm) over J & K region during next 3 days along with some parts over the extreme south peninsula (Kerala, TN and coastal AP region). Rainfall over NE states mainly on day 3.

## ECMWF Forecasts based on 0000 UTC of 22nd March 2017

**Mean sea level:**

No significant systems over Indian region till 26th March 2017.

**Lower Level Winds (925 hpa & 850 hpa)**

An upper air cyclonic circulation is seen over Central Pakistan and adjoining West Rajasthan on 22nd March and has become less marked thereafter.

A trough in lower level easterlies runs from Lakshadweep area to South Interior Karnataka on 22nd March & persists on 23rd and becomes less marked thereafter.

A trough runs from Gangetic West Bengal to Odisha on 25th march and persists on 26th March.

A trough runs from north Andaman Sea to South East Bay of Bengal on 23rd march and is seen on South East Bay of Bengal on 24th march, persists on 25th and not seen thereafter.

A trough in easterlies runs from Tamilnadu to Interior Karnataka on 24th, extends till Madhya Maharashtra on 25th march & persists on 26th March.

**Western Disturbance (700 hpa & 500 hpa)**

A western disturbance seen as an upper air cyclonic circulation over north Pakistan and adjoining Jammu & Kashmir on 22nd March and seen as a feeble trough roughly along longitude 70° E and north of 30° N on 23rd March and moved away thereafter.

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

### Summary and Conclusions:

**Day 1 & Day 2:**

The Western Disturbance as an upper air cyclonic circulation, which has moved eastwards in the last 24 hours, now lies over north Pakistan and adjoining Jammu & Kashmir and extends upto 3.1 km above mean sea level. This is likely to bring thunderstorms accompanied by squally weather and hail over Jammu and Kashmir region and adjoining Himachal Pradesh. There will also be isolated instances of heavy rainfall/snowfall over the western parts of Jammu and Kashmir. As the trough moves further eastwards tomorrow, the rainfall belt is likely to shift eastwards to over East Jammu and Kashmir and adjoining Himachal Pradesh on day 2.

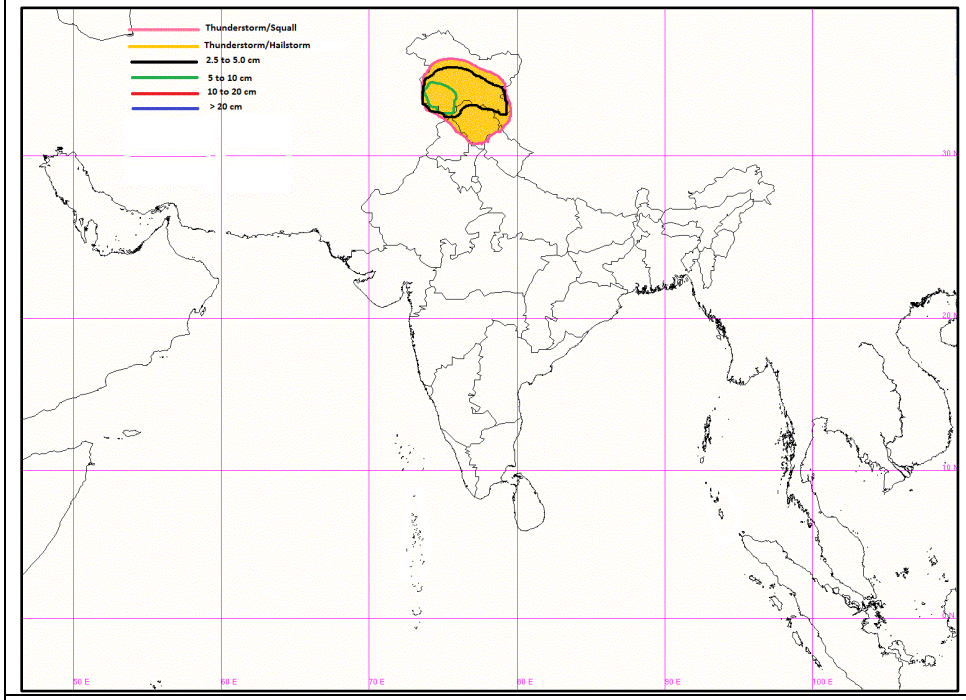
The induced upper air cyclonic circulation over Central Pakistan & adjoining West Rajasthan does not have moisture flow in the lower levels. Consequently there is some probability of dry convective thunderstorms over the region of West Rajasthan on day 1 and entire Rajasthan on day 2.

The trough in lower level easterlies from Lakshadweep area to south interior Karnataka is also likely to give thunderstorm activity over Kerala on day 1.

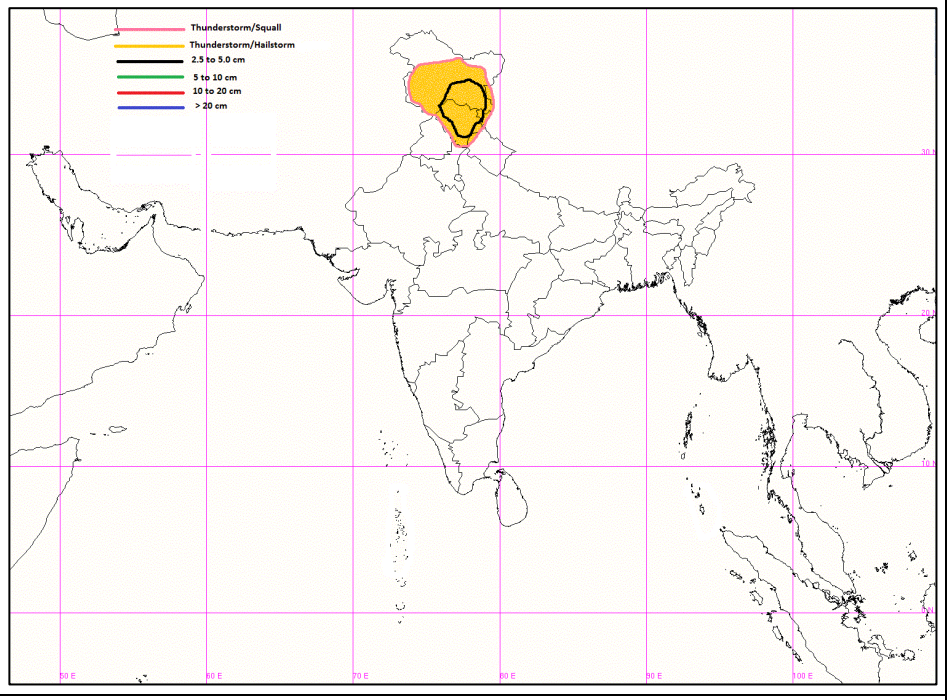
**24 hour Advisory for IOP:**
Jammu and Kashmir
Himachal Pradesh

**48 hour Advisory for IOP:**
East Jammu and Kashmir
Himachal Pradesh

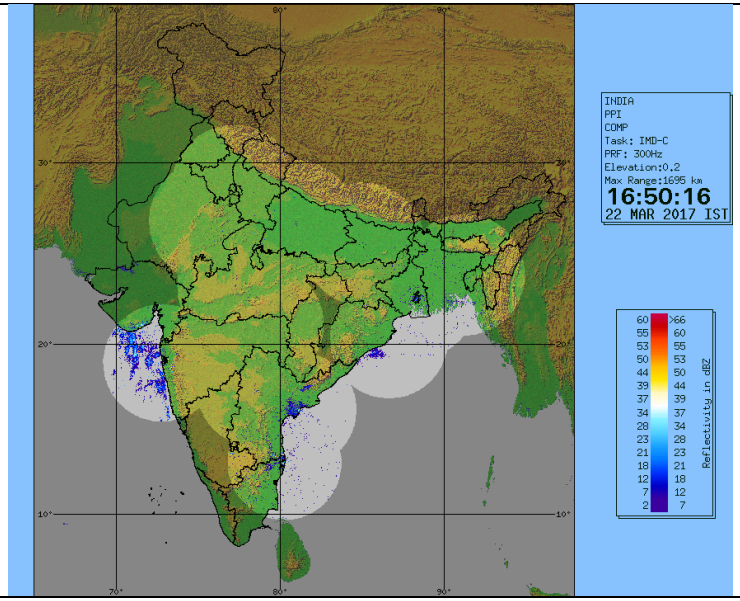
For NCMRWF NWP products:(http://www.ncmrwf.gov.in/HomePage/NEPS-prod-1.php)
For IMD NWP products:(http://nwp.imd.gov.in/diagpro_new.php)
For Synoptic plotted data and charts
http://amssdelhi.gov.in/
http://www.amsskolkata.gov.in/
For RAPID tool:
http://rapid.imd.gov.in/
Low Level Winds
http://satellite.imd.gov.in/archive/INSAT-3D-IMAGER/3D-PRODUCTS/AMV/LLW/MAR_2017/?C=M;O=D
Upper level winds
http://satellite.imd.gov.in/archive/INSAT-3D-IMAGER/3D-PRODUCTS/AMV/HLW/MAR_2017/?C=M;O=D
Past 24 hour HEM and IMR rainfall (upto03UTCoftoday)
IMR: http://satellite.imd.gov.in/img/3Ddaily_imr.jpg
HEM: http://satellite.imd.gov.in/img/3Ddaily_he.jpg
ForRadarimagesofthepast24hoursincludingmosaicofimages:
http://ddgmui.imd.gov.in/dwr_img/
Satellite sounder based T-Phi gram
http://satellite.imd.gov.in/map_skm2.html



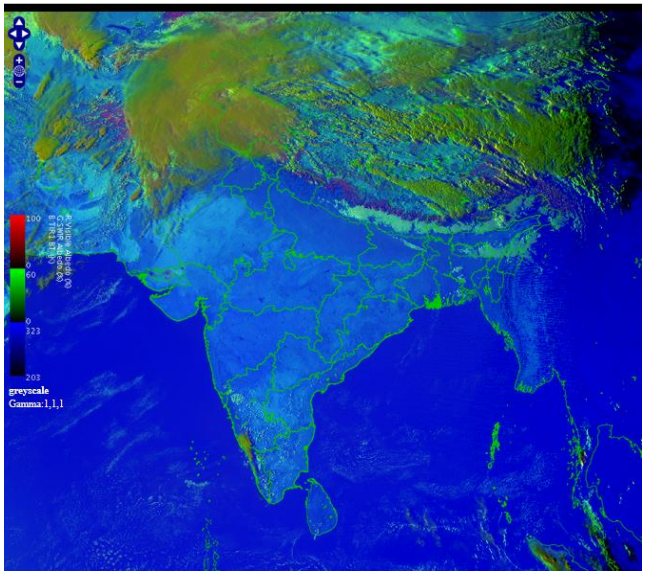

**IOP Advisory for 24hours**



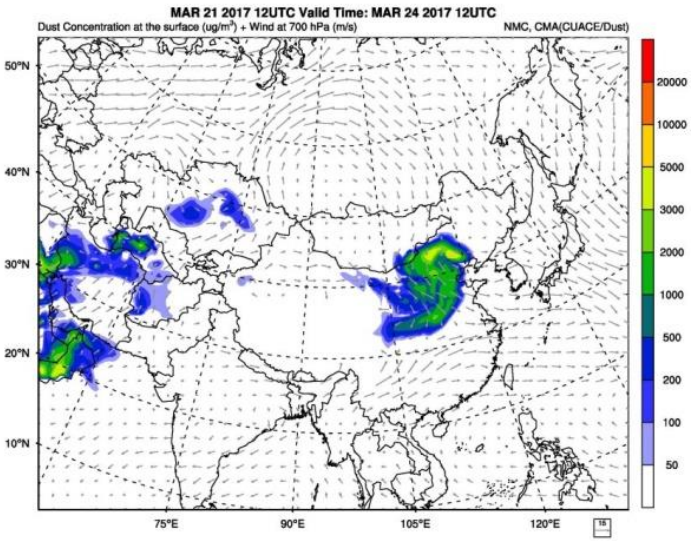

**IOP Advisory for 48hours**



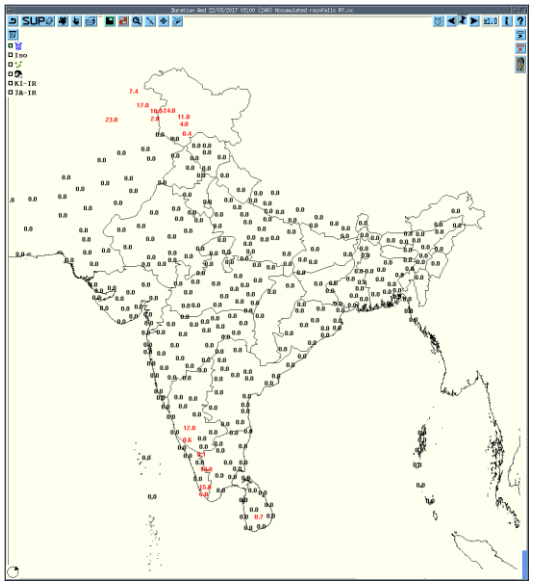

DWR Composite at 1650 hrs IST



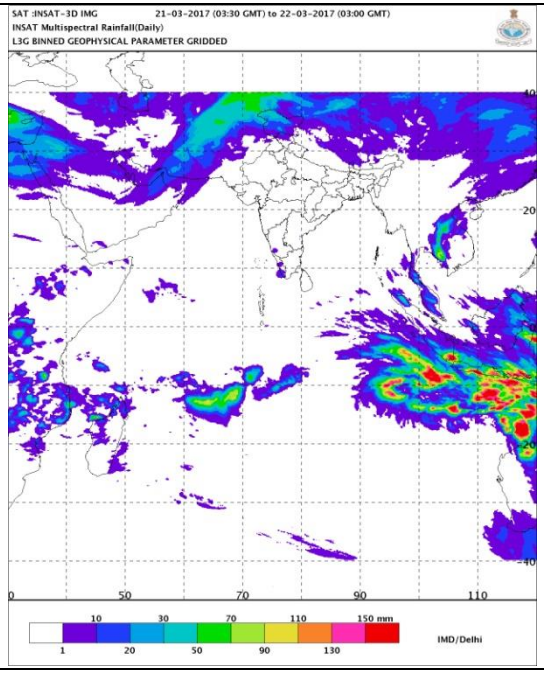

RGB Image of INSAT3D at 1630 hrs IST



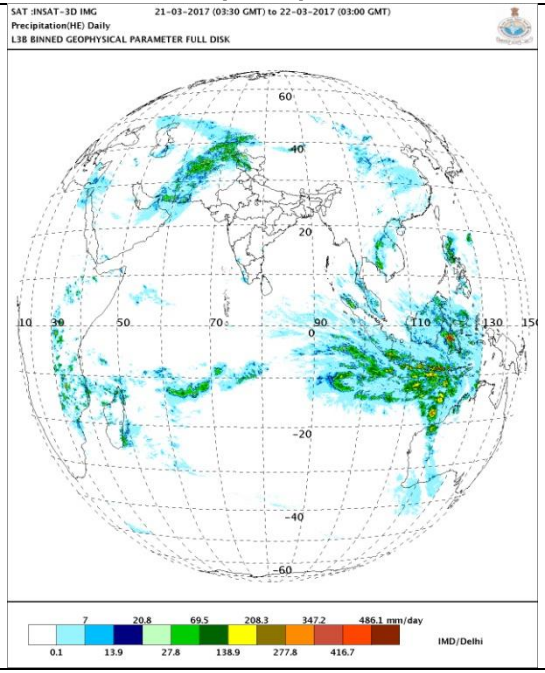

**Forecast Dust Concentration at 12 UTC of 24 March**



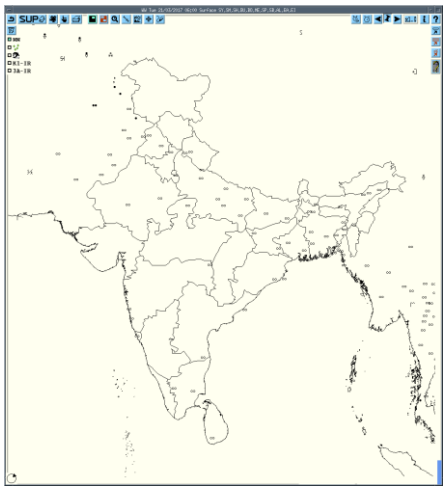
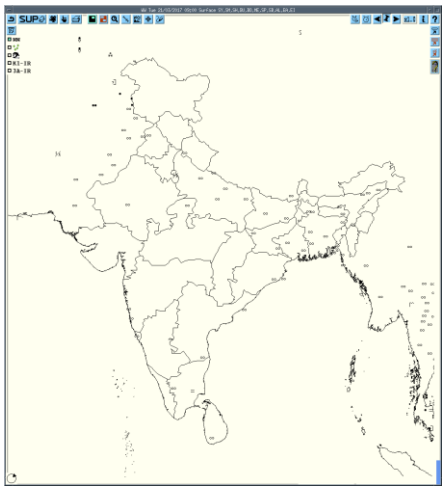
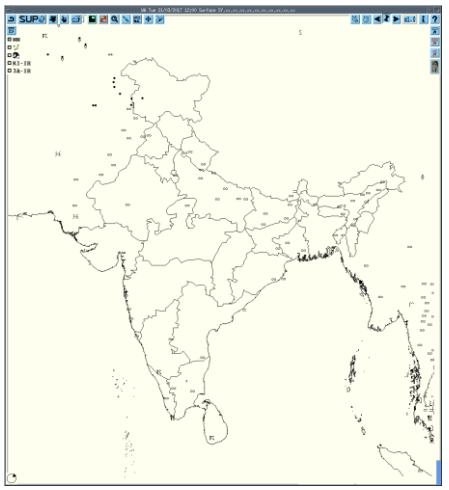
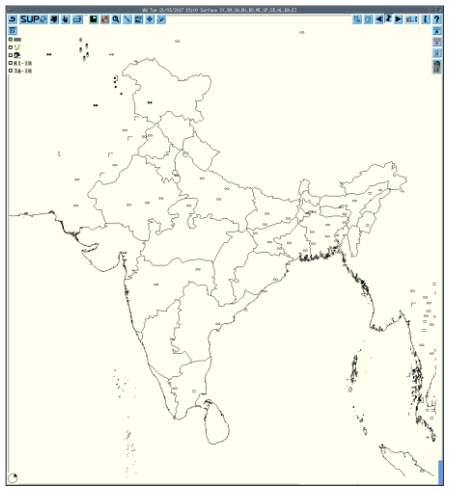
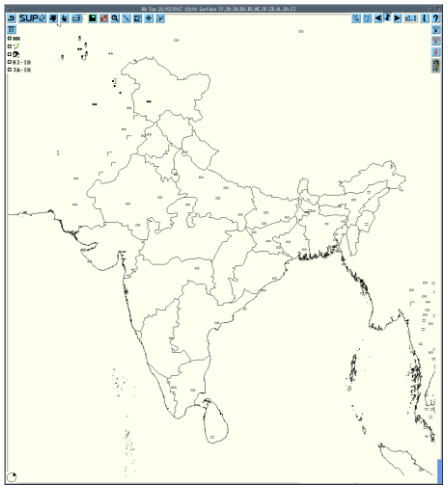
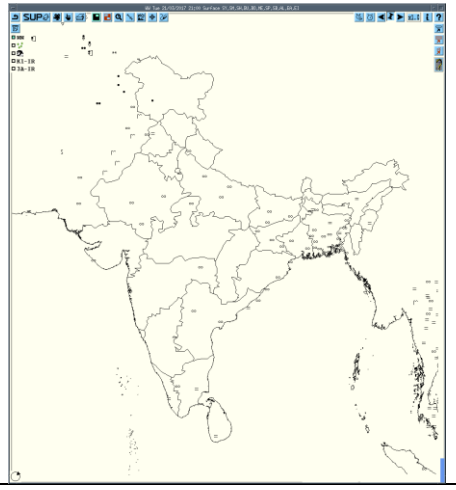
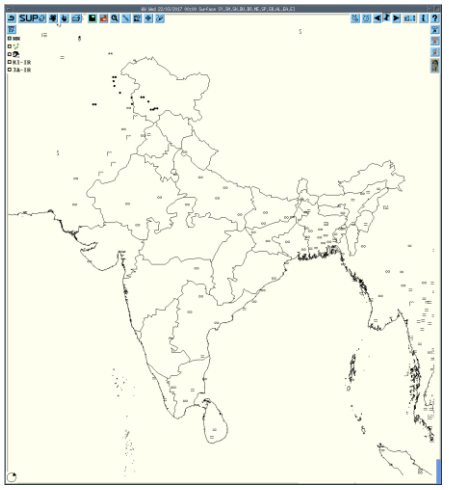
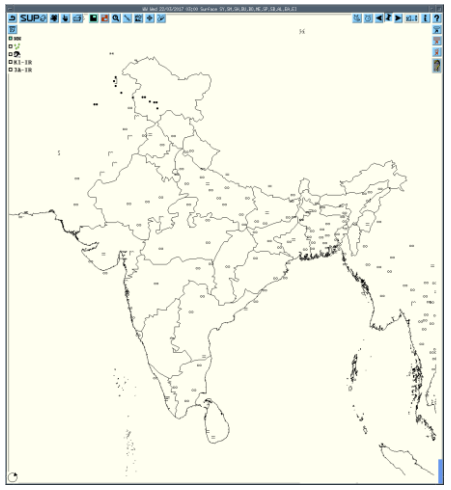
**Accumulated 24 Hour rainfall (in red) recorded at 0300 UTC of today**



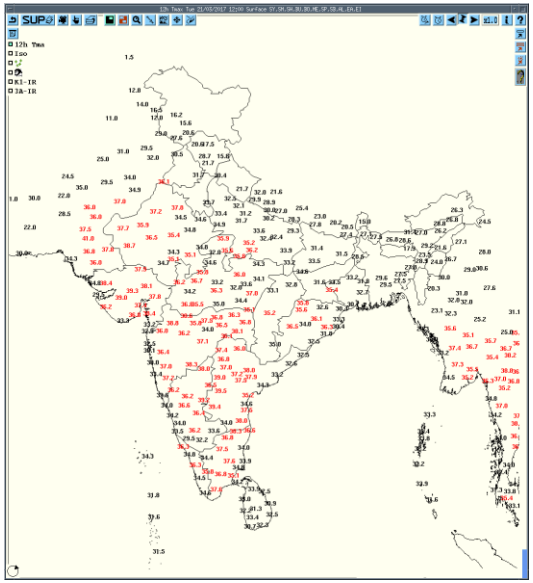
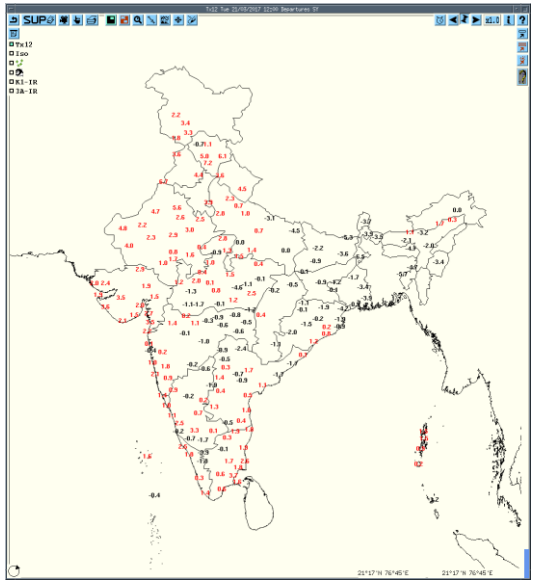
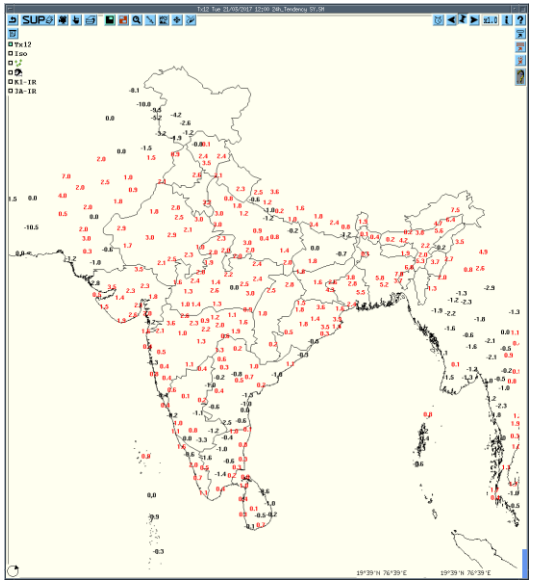
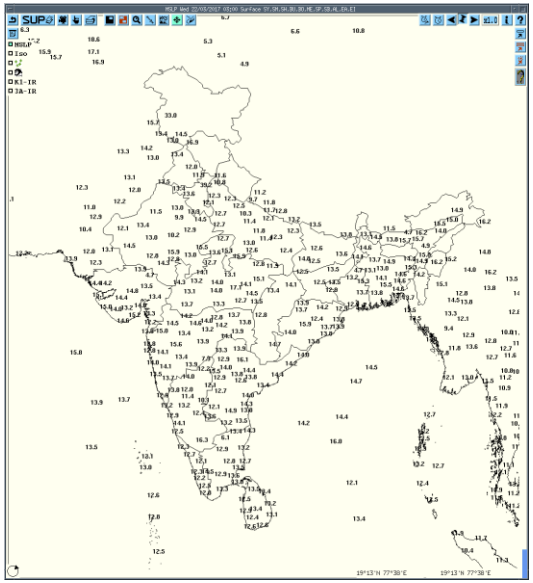
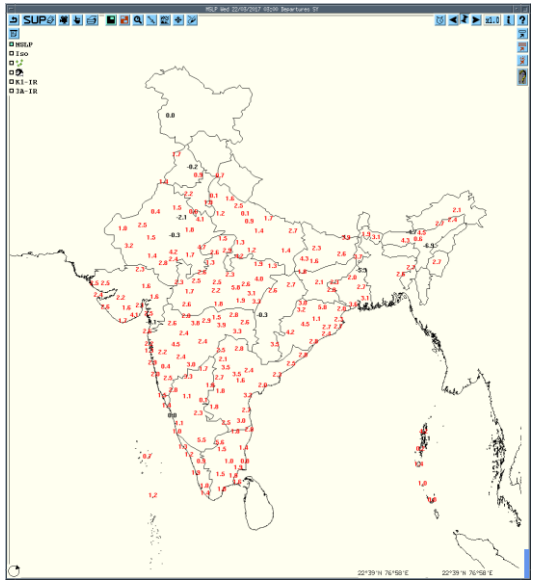
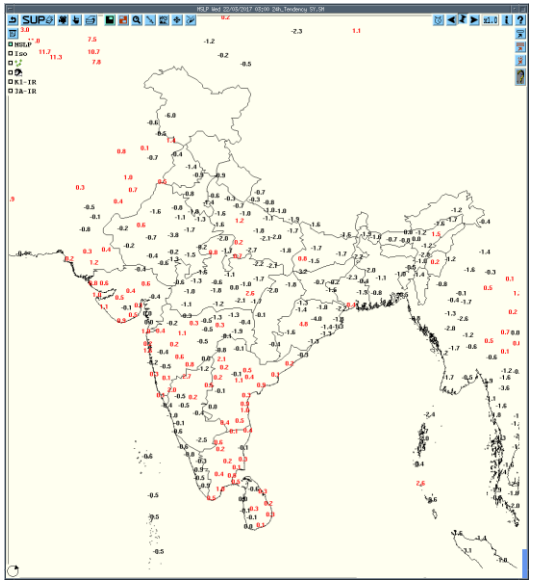

**IMR Rainfall**

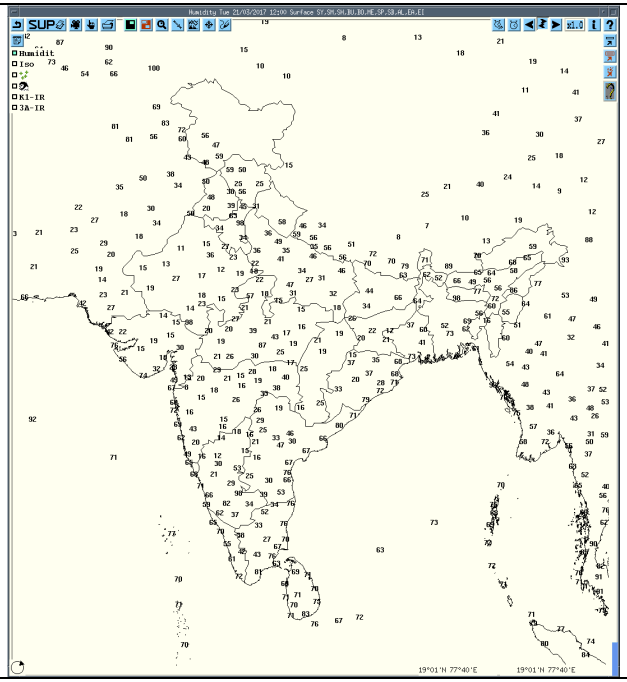
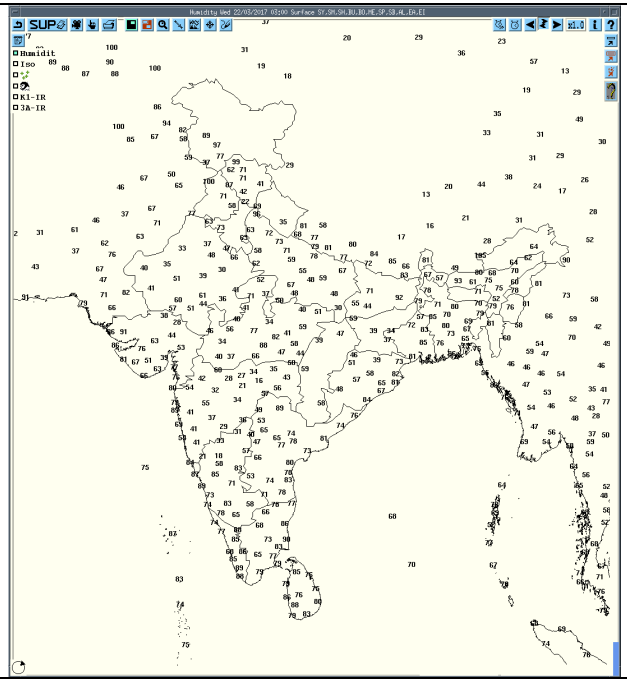



**HEM Rainfall**

**3 hourly 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 12 UTC yesterday** | **RH 03 UTC today** |

| Realized weather past 24 hours | | | | | |
|---|---|---|---|---|---|
| **Date** | **Time of Reporting** | **Name of Station Reporting** | **Region** | **STATE** | **Weather Event** |
| 21-03-2017 | 0600 UTC | Nil | Nil | Nil | Nil |
| 21-03-2017 | 0900 UTC | Nil | Nil | Nil | Nil |
| 21-03-2017 | 1200 UTC | Madkeri | South India | Karnataka | Thunderstorm |
| | | Thiruvanathapuram | South India | Kerala | Thunderstorm |
| 21-03-2017 | 1500 UTC | Nil | Nil | Nil | Nil |
| 21-03-2017 | 1800 UTC | Nil | Nil | Nil | Nil |
| 21-03-2017 | 2100 UTC | Nil | Nil | Nil | Nil |
| 22-03-2017 | 0000 UTC | Nil | Nil | Nil | Nil |
| 22-03-2017 | 0300 UTC | Nil | Nil | Nil | Nil |

| Name of Station Reporting | Region | STATE | **Weather** Event | Date | Time of Commencement (IST) | Time of end (IST) |
|---|---|---|---|---|---|---|
| PBO Sunder Nagar | Northwest India | Himachal Pradesh | Thunderstorm | 21-03-17 | 1605 | 1750 |

| Severe Weather warning based on DWR observation | |
|---|---|
| **Name of issuing Radar station** | **DWR Patna** |
| Geo-coordinates of issuing Station(Lat, Long,Alt) | --- |
| Date and time of issue in UTC (yyyyMMddhhmm) | 201703220600 |
| Nature of severe weather expected | Nil |
| **Name of issuing Radar station** | **DWR KARAIKAL** |
| Geo-coordinates of issuing Station(Lat, Long,Alt) | Lat:10.91381N,Long:79.84141E/Alt:25masl |
| Date and time of issue in UTC (yyyyMMddhhmm) | 201703220700 |
| Nature of severe weather expected | DWR U/S |
| **Name of issuing Radar station** | **DWR NAGPUR** |
| Geo-coordinates of issuing Station(Lat, Long,Alt) | Lat:21.1458°N,Long:79.0882°E |
| Date and time of issue in UTC (yyyyMMddhhmm) | --- |
| Nature of severe weather expected | ---- |
| **Name of issuing Radar station** | **DWR MUMBAI** |
| Geo-coordinates of issuing Station(Lat, Long,Alt) | Lat–18˚54'04", Long-72˚48'32"/HeightAMSL–3.22meters. |
| Date and time of issue in UTC (yyyyMMddhhmm) | 201703220700 UTC |
| Nature of severe weather expected | Nil |
| **Name of issuing Radar station** | **DWR AGARTALA** |
| Geo-coordinates of issuing Station(Lat, Long,Alt) | 23.89°N,91.25°E,16mabovemsl |
| Date and time of issue in UTC (yyyyMMddhhmm) | 201703220600 |
| Nature of severe weather expected | Nil |
| **Name of issuing Radar station** | **DWR KOLKATA** |
| Geo-coordinates of issuing Station(Lat, Long,Alt) | 22.5705° N / 88.353° E, 7m above msl |
| Date and time of issue in UTC (yyyyMMddhhmm) | 201703220702 UTC |
| Nature of severe weather expected | Nil |
| **Name of issuing Radar station** | **DWR Machilipatnam** |
| Geo-coordinates of issuing Station(Lat, Long,Alt) | LAT: 16.12’ LONG: 81.09’ ALT: 3.05m. |
| Date and time of issue in UTC (yyyyMMddhhmm) | **201703220601** |
| Nature of severe weather expected | Nil |

## 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 |
|---|---|---|---|---|---|---|---|
| NAGPUR | 21/03/17 | 0302-0422 | Nil | Nil | No Echoes | Nil | Nil |
| | | 0422-0942 | Nil | Nil | Radar U/S | Nil | Nil |
| | | 0942-2352 | Nil | Nil | No Echoes | Nil | Nil |
| | 22/03/17 | 0042-0232 | Single(very small patch) | 192 km SW dir. Moving | Very small reflectivity of 23 dbZ | Nil | Nil |
| | | 0232-0302 | Nil | Nil | Radar U/S | Nil | Nil |