

# India Meteorological Department

# FDP STORM Bulletin No. 116 (30-06-2018)

# **1. CURRENT SYNOPTIC SITUATION:**

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

• The axis of monsoon trough at mean sea level has shifted northwards and now passes through Bikaner ,Alwar, Kanpur, Sultanpur, Muzaffarpur, Purnea, Dhubri and thence eastwards to east Assam.

• The Western Disturbance as a trough in mid & upper tropospheric westerlies with its axis at 5.8 km above mean sea level now runs roughly along Long 70°E to the north of Lat 34°N and is moving away northeastwards.

• The cyclonic circulation over east Rajasthan and neighbourhood now lies over northwest Rajasthan and neighbourhood and extends upto 3.1km above mean sea level.

• The cyclonic circulation over northeast Arabian Sea off north Gujarat coast now lies over northeast Arabian Sea and neighbourhood and extends between 1.5 km & 5.8 km above mean sea level.

- A cyclonic circulation between 3.1 Km and 3.6 Km above mean sea level lies over Saurashtra and neighbourhood.
- The cyclonic circulation over east central Arabian Sea off south Maharashtra coast at 7.6 km above mean sea level persists.
- The off-shore trough at mean sea level now runs from south Maharashtra Coast to Lakshadweep area and is feeble.

# 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 to moderate convection seen over Jammu & Kashmir, Himachal Pradesh, Uttarakhand and Delhi. Isolated low/medium clouds over Punjab and Uttar Pradesh. Isolated high clouds seen over Uttar Pradesh.

**East:** Scattered low/medium clouds with embedded moderate to intense convection seen over Gangetic West Bengal, Assam Nagaland, Manipur, Mizoram, Tripura and weak convection seen over Odisha, North Chhattisgarh and Jharkhand. Isolated low/medium clouds over rest parts of the region and High clouds seen over North Bihar.

West: Scattered low/medium clouds with embedded moderate to intense convection seen over Rajasthan, Konkan & Goa, North and East Madhya Pradesh. Isolated low/medium clouds over Gujarat, West Madhya Pradesh and Maharashtra.

**South:** Scattered low/medium clouds with embedded intense to very intense convection seen over South Andhra Pradesh, Northeast Tamilnadu & Lakshadweep and Nicobar Islands. Scattered low/medium clouds with embedded isolated weak convection seen over Karnataka & Kerala and Isolated over Telangana.

**Arabian Sea:** Scattered low/medium clouds with embedded moderate to intense convection seen over East Arabian Sea off South Maharashtra - Karnataka - Kerala Coast and also over Lakshadweep & neighbourhood.

Bay of Bengal & Andaman Sea: Scattered low/medium clouds with embedded moderate to intense convection seen over Central & Western Bay & Southeast Bay Andaman Sea.

#### Past Observation: Not Received

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

Isolated/Multiple moderate echoes observed on DWR Vishakhapatnam (dBZ >50, height >12 km). Light to Moderate echoes observed on DWR Bhopal, Delhi, Gopalpur, Hyderabad, , Kochi, Nagpur, Paradeep, Patiala and Light echoes over Agartala, Goa, Jaipur, Lucknow, Kolkata, Mohanbari, Mumbai, Patna, Srinagar and Thiruvananthapuram at around 1630 IST.

RAPID RGB Satellite imagery at 1530 IST indicates significant convection over Punjab, Southeast Haryana, Northwest Rajasthan, Central Uttar Pradesh, East Bihar, Jharkhand, Central Gangetic West Bengal, Southeast Madhya Pradesh, South Chhattisgarh, Odisha, North Coastal Andhra Pradesh, South Telangana, North Kerala, North Interior Tamilnadu adjoining South Interior Karnataka and Lakshadweep Islands.

#### 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 satisfactory category for next 2 days in Delhi.

Delhi – SAFAR analysis & Forecast	30.06.2018	01.07.2018
PM10 (micro-g/m <sup>3</sup> )	88	79
PM2.5 (micro-g/m <sup>3</sup> )	46	42

# 2. NWP MODEL GUIDANCE:

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

1. Weather Systems: Low level Cycirs, Troughs:00&12UTC of Day 0-2: CYCIR at 925 and 850 hPa over Bihar and UP moving westwards. 00&12UTC of Day 0-2: CYCIR over northern Arabian Sea, prominent even at 500 hPa

Confluence & wind Discontinuity regions: NIL

Synoptic systems: NIL

2. Location of jet and jet core (>60kt) at 500hPa: Nil. Strong westerly over Pakistan.

#### 3. Convergence at 850 hPa:

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

Day0: Assam Meghalaya,

Day1: Arunachal Pradesh, Assam Meghalaya, NE NMMT,

Day2: Assam Meghalaya, NE NMMT,

Day3:

Day4:

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

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

Day0: Arunachal Pradesh, Assam Meghalaya, Tamilnadu Puducherry,

Day1: Arunachal Pradesh, Assam Meghalaya, East UP, Uttarakhand, Tamilnadu Puducherry,

Day2: Arunachal Pradesh, Assam Meghalaya, Sub Himalayan WB, Bihar, East UP, West UP, Uttarakhand, Tamilnadu Puducherry, Kerala,

Day3: Arunachal Pradesh, Assam Meghalaya, Sub Himalayan WB, Bihar, East UP, Uttarakhand, Himachal Pradesh, Tamilnadu Puducherry, Kerala,

Day4: Arunachal Pradesh, Assam Meghalaya, Sub Himalayan WB, Uttarakhand, Tamilnadu Puducherry, Kerala,

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

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

Day0: Arunachal Pradesh, Sub Himalayan WB, Uttarakhand, Himachal Pradesh, Jammu Kashmir, Chhattisgarh,

Day1: Arunachal Pradesh, Sub Himalayan WB, Jharkhand, Bihar, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, West Rajasthan, Chhattisgarh,

Day2: Arunachal Pradesh, Sub Himalayan WB, Jharkhand, West UP, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, West Rajasthan, East Rajasthan, Odisha, Chhattisgarh,

Day3: Arunachal Pradesh, Sub Himalayan WB, Jharkhand, Bihar, East UP, West UP, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, West Rajasthan, East Rajasthan, Odisha, West MP, East MP, Chhattisgarh, Coastal AP,

Day4: Arunachal Pradesh, Assam Meghalaya, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, East UP, West UP, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, West Rajasthan, East Rajasthan, Odisha, West MP, East MP,

## 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, Himachal Pradesh, Jammu Kashmir,

Day1: Arunachal Pradesh, Sub Himalayan WB, Uttarakhand, Himachal Pradesh, Jammu Kashmir,

Day2: Arunachal Pradesh, Sub Himalayan WB, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, West Rajasthan,

Day3: Arunachal Pradesh, Sub Himalayan WB, Uttarakhand, Punjab, Himachal Pradesh, Jammu Kashmir, West Rajasthan,

Day4: Arunachal Pradesh, Sub Himalayan WB, West UP, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, West Rajasthan, East Rajasthan, West MP,

#### 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, Jharkhand, East UP, West UP, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, East MP, Saurashtra Kutch, Chhattisgarh, Tamilnadu Puducherry, SI Karnataka,

Day1: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, East UP, West UP, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, Odisha, East MP, Chhattisgarh, Tamilnadu Puducherry,

Day2: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, East UP, West UP, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, Odisha, East MP, Chhattisgarh,
Day3: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, East UP, West UP, Uttarakhand, Punjab, Himachal Pradesh, Jammu Kashmir, East Rajasthan, Odisha, West MP, East MP, Vidarbha, Coastal AP,
Day4: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Gangetic WB, Bihar, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, East Rajasthan, West MP, East MP, Vidarbha, Tamilnadu Puducherry,

## 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, East UP, West UP, Uttarakhand, Punjab, West Rajasthan, Odisha, Konkan Goa, Vidarbha, Chhattisgarh, Coastal Karnataka, SI Karnataka, Kerala,

Day2: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, East UP, West UP, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, Odisha, Konkan Goa, Madhya Maharashtra, Chhattisgarh, Coastal Karnataka, SI Karnataka, Kerala,

Day3: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Gangetic WB, Jharkhand, Bihar, East UP, West UP, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, Konkan Goa, Madhya Maharashtra, Chhattisgarh, Coastal Karnataka, SI Karnataka, Kerala,

Day4: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Jharkhand, Bihar, East UP, West UP, Uttarakhand, Haryana, Chandigarh, Delhi, Punjab, Himachal Pradesh, Jammu Kashmir, Gujarat Region, Konkan Goa, Madhya Maharashtra, Coastal Karnataka, Day5: Arunachal Pradesh, Assam Meghalaya, NE NMMT, Sub Himalayan WB, Bihar, Punjab, Himachal Pradesh, Jammu Kashmir, Gujarat Region, Konkan Goa, Madhya Maharashtra,

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

1. Synoptic Systems: The analysis based on 00 UTC shows an East- West oriented Trough extends from Northwest Rajasthan to East Assam in lower Troposphere (850hPa). The forecast shows it will persist till day3 with Northward shift. The analysis shows a cyclonic circulation over Northwest Rajasthan and adjoining area. The forecast shows it will become less marked on day2. A cyclonic circulation is seen in the analysis over Northeast Arabian sea and adjoining area. The forecast shows it will persist till day 2 with South-westward shift. A feeble off-shore Trough is seen in the analysis at mean sea level extends from South Maharashtra coast to Lakshadweep area and forecast shows it will persist till day2.

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, East-West Trough, Sikkim, Tamil Nadu, Kerala and NE states during next 3 days; Low level Positive Vorticity also seen over parts of Northwest Rajasthan and adjoining area on day 1. Parts of J&K, Himachal Pradesh, Uttarakhand, Foothills of Himalaya up to NE states also have positive Vorticity from day 2 onwards.

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

**T-Storm Initiation Index (> 3):** Over parts of Gujarat, West Rajasthan, coastal Tamil Nadu, coastal Andhra Pradesh, Orissa and GWB on all 3 days; over some parts of East Uttar Pradesh, Vidarbha and Telangana on day 1; on day 2 over some parts of East Uttar Pradesh, Punjab, Haryana, Bihar, Jharkhand and Telangana; on day 3 over parts of J&K, Punjab, Haryana, Himachal Pradesh, Uttarakhand, West and East Uttar Pradesh, Bihar, Jharkhand, Vidarbha, Chhattisgarh and Telangana.

Lifted Index (< -2): The value of Index (< -2) lies over parts of Gujarat, Rajasthan, Gangetic West Bengal, SHWB, Odisha, coastal Tamil Nadu, Chhattisgarh, Madhya Pradesh, East Uttar Pradesh, coastal Andhra Pradesh, Vidarbha, Telangana, Madhya Maharashtra, Marathwada, Tamil Nadu, Karnataka, along East coast of India, Sikkim and NE states on all 3 days; over parts of J&K, Himachal Pradesh, Uttarakhand, Punjab, Haryana, Delhi, West Uttar Pradesh, Bihar, Jharkhand and West Madhya Pradesh on day 2 and 3.

**Total Total Index (> 50):** Higher than Threshold value of the Index is seen over parts of J&K, Himachal Pradesh, Uttarakhand, foothills of Himalaya, Sikkim and Arunachal Pradesh during all 3 days; over parts of Punjab, Haryana and Northwest Rajasthan on day 3; prominent values are seen over parts of J&K and Himachal Pradesh.

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, coastal areas along East coast, GWB, SHWB, coastal Tamil Nadu, coastal Andhra Pradesh and coastal Orissa on all 3 days; over some parts of West Rajasthan, Assam, Chhattisgarh, Vidarbha, Telangana and adjoining areas on day 1; over parts of Chhattisgarh, Northwest Rajasthan adjoining Punjab, Haryana, Bihar, Jharkhand and Assam on day 2; over some parts of J&K, East Uttar Pradesh, Bihar and Jharkhand on day 3.

**CIN (50-150):** Mostly seen over North, West and Northwest 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 on day 1; over most parts of the country except NE states on day 2 and 3; prominent values are seen over parts of West Rajasthan on day 2 and 3.

#### 5. Rainfall Activity:

Above 130 mm Isolated Rainfall: over some parts of Sikkim and adjoining Assam on day 3.

70-130 mm Rainfall: over Foothills of Himalaya, Sikkim and Arunachal Pradesh on all 3 days; over some parts of Nagaland on day 1; over parts of Uttarakhand, Assam, Meghalaya and adjoining areas on day 2 and 3; over parts of West Uttar Pradesh, North Punjab adjoining Himachal Pradesh and North Haryana on day 3.

40-70 mm Rainfall: over parts of Sikkim, Foothills of Himalaya and NE states on all 3 days; over parts of East Uttar Pradesh, Uttarakhand, Bihar and SHWB on day 2 and 3; over parts of West Uttar Pradesh, Punjab adjoining Himachal Pradesh and North Haryana on day 3.

10-40 mm Rainfall: over parts of J&K, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Chhattisgarh, Vidarbha, Jharkhand, Bihar, Odisha, coastal Andhra Pradesh, South coastal Maharashtra, East Madhya Pradesh, Sikkim, SHWB, GWB and NE states on all 3 days; over parts of Rajasthan, Kerala, Tamil Nadu, South Karnataka and adjoining interior Andhra Pradesh on day 1; over parts of Punjab, Haryana, Delhi,

Northeast Rajasthan and West Madhya Pradesh on day 2; over parts of Punjab, Haryana and adjoining areas, coastal Maharashtra including Mumbai, coastal Karnataka, Konkan and Goa on day 3.

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

#### 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, Himachal Pradesh, Uttarakhand, Telangana, Konkan and Goa, Gujarat, South Madhya Maharashtra, Andhra Pradesh, Kerala, Tamil Nadu, Coastal Maharashtra, Orissa, Bihar, Uttar Pradesh, Sikkim, GWB and NE states; On day 2 over parts of East and West Uttar Pradesh, Bihar, Jharkhand, GWB, Sikkim, NE states, Himachal Pradesh, Uttarakhand, J&K, Haryana, Delhi, Northwest Madhya Pradesh, coastal Maharashtra, Konkan and Goa; on day 3 over parts J&K, Rajasthan, Himachal Pradesh, Uttarakhand, Punjab, Haryana, Delhi, Bihar, Jharkhand, Uttar Pradesh, South Gujarat, coastal Maharashtra including Mumbai, Konkan and Goa, Telangana, coastal Karnataka and adjoining areas, GWB, Sikkim, SHWB and NE states.

#### 2. Spatial distribution of 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 some parts of Punjab, Haryana, Northwest Rajasthan, some parts of Andhra Pradesh and North Tamil Nadu on day 2 and 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 J&K, Himachal Pradesh, Uttarakhand, Punjab, Haryana, Delhi and adjoining areas, Rajasthan, Madhya Pradesh, Vidarbha, 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 during next 3 days.

**CAPE (> 1500):** Greater than threshold value over Gujarat, Rajasthan, coastal areas of East coast, coastal Kerala, GWB, coastal Orissa, coastal Andhra Pradesh, Sikkim, GWB, Bihar, Jharkhand, NE states, coastal Tamil Nadu, Telangana, Vidarbha, South Chhattisgarh and adjoining areas on all 3 days; over parts of Northwest Madhya Pradesh on day 1; over parts of Punjab, Haryana, Delhi, West Uttar Pradesh, J&K, Himachal Pradesh and Uttarakhand on day 2 and 3.

**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 coastal areas along the west coast and NE states on day 1 and 2; over most of the parts of country on day 3; prominent values are seen over parts of West Rajasthan on day 3.

#### 3. Rainfall and thunderstorm activity:

Above 200 mm Isolated Rainfall: over parts of East Uttar Pradesh and Meghalaya on day 2 and 3; over parts of Bihar and Assam on day 3. 130-200 mm Isolated Rainfall: over parts of Sikkim, Assam and Arunachal Pradesh on day 1; over parts of East Uttar Pradesh, Assam and

Meghalaya on day 2 and 3; over parts of West Uttar Pradesh on day 2; over parts of North Bihar on day 3.

70-130 mm Rainfall: over parts of Sikkim, Assam, Meghalaya and Arunachal Pradesh on all 3 days; over parts of Uttarakhand, East and West Uttar Pradesh, Bihar and adjoining areas on day 2 and 3; over parts of Himachal Pradesh adjoining North Haryana and some parts of Tripura on day 3.

40-70 mm Rainfall: over parts of South coastal Maharashtra, Konkan and Goa, Sikkim and NE states during all 3 days; over parts of J&K on day 1; over parts of Uttarakhand, East and West Uttar Pradesh, Bihar, Jharkhand, SHWB on day 2 and 3; over parts of Himachal Pradesh and adjoining North Haryana on day 3.

10-40 mm Rainfall: over parts of J&K, Himachal Uttarakhand, Rajasthan, Uttar Pradesh, Foothills of Himalaya, 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 on all 3 days; on day 1 and 2 over parts of Rajasthan and Madhya Pradesh; over parts of Punjab, Haryana, Delhi and adjoining areas on day 2 and 3.

Up to 10 mm Rainfall: Over parts of J&K, Himachal Pradesh, Uttarakhand, Punjab, Haryana, Delhi and adjoining areas, 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, Vidarbha, 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:**

- Entire India is under the regime of southwest monsoon since yesterday (29<sup>th</sup> June 2018).
- In tune with this, the convective events also have reduced significantly, as the season progressed.
- Hence, much of the weather (rainfall specifically) could be depicted in terms of synoptic scale and not in the convective scale, unless for a weak / break phase of southwest monsoon.
- The synoptic analysis shows that the axis of monsoon trough lies to the north of its normal position in its western part and more to the north of its normal position in the eastern part. This is expected to shift towards the foothills of the Himalayas tomorrow. Along the west coast, the off-shore trough is also weakening.
- Under this scenario, heavy rainfall need to be monitored for, over Jammu & Kashmir, Arunachal Pradesh and Assam & Meghalaya (presence of the monsoon trough and moisture incursion from the Bay of Bengal provides conducive situation for very heavy rains as well) and sub-Himalayan West Bengal today (30<sup>th</sup> June 2018) and Arunachal Pradesh, Assam & Meghalaya (probable extremely heavy rains over Meghalaya), Nagaland-Manipur-Mizoram & Tripura, sub-Himalayan west Bengal & Sikkim, Bihar, Uttar Pradesh (northern districts for very heavy rains), Uttarakhand and Himachal Pradesh for tomorrow (1<sup>st</sup> July 2018).
- This is the last FDP storm bulletin for the current year, for the reasons stated in the first two points. However, regular monitoring for the issuance of nowcasts for Heavy rains and other severe weather events shall be continued.

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

24 hour Advisory for IOP:	48 hour Advisory for IOP:
Significant Rainfall:	Significant Rainfall:
Jammu & Kashmir	Himachal Pradesh, Uttar Pradesh, Uttarakhand
Sub Himalayan West Bengal	Sub Himalayan West Bengal, Bihar
Arunachal Pradesh, Assam & Meghalaya	Arunachal Pradesh, Assam & Meghalaya
	Nagaland, Manipur, Mizoram, Tripura
Thunderstorm with squall or gusty winds: Nil	Thunderstorm with squall or gusty winds: Nil
Thunderstorm with squall and hail Nil	Thunderstorm with squall and hail Nil
Duststorm/Thunderstorm: Nil	Duststorm/Thunderstorm: Nil

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















# Past 24 hours DWR Report:

DWR Station	Date	Time interval of observation	Organization of the cells ( isolated single cell/multiple cells convective regions/squall	Formation w.r.t. radar station & direction of movement	Remarks	Associat ed severe weather,	Districts affected
			lines) with height of 20 dBZ echo top and maximum reflectivity			if any	
Lucknow	29/06/2018	290952 UTC TO 291732 UTC	Multiple cell formed over 100 Km South at 0952 UTC. Max reflectivity observed was 52.5 dBZ & height reached more than 16 Km of 20 dBZ echo top.	Multiple cell system moved NWly with avg. speed 40 Km/h w.r.t. the station.	Moved beyond the radar range at around 1832 UTC over 250 Km WNW.	TSRA SQ	Knapur Dehat Kanpur Nagar Mainpuri Kannauj Auraiya Fatehpur
		291602 UTC TO 291732 UTC	Single cell formed over 130 WSW direction at 1632 UTC. Max reflectivity observed was 47.5 dBZ & height reached 9 Km of 20 dBZ echo top.	Single cell system moved with avg. velocity 40 Km/h in NW direction w.r.t. the station.	Dissipated at around 1732 UTC over 180 Km W.	TSRA	Kanpur Dehat Kannauj Etawah Auraiya
		291852 UTC TO 300032 UTC	Multiple cell formed over 50 Km SW & 70 Km SE at 1852 UTC, later widespread from 50 Km W to 100 Km E. Max reflectivity observed was 50 dBZ & height reached 10 Km of 20 dBZ echo top.	Multiple cell system moved with avg. velocity 30 Km/h in North direction w.r.t. the station.	Dissipated at around 300032 UTC over 70 Km NNW direction w.r.t. the station.	TSRA	Amethi, Barabanki Lucknow, Unnao, Sitapur, Kanpur Dehat, Faizabad, Raebareily
Jaipur	30/06/18	0300 UTC of 29/06/18 to 00:02 UTC of 30/06/18.	Multiple cell with average height of 7.5 km & maximum reflectivity 53.50 dBZ	Multiple cell develop from 0300 UTC of 29/06/18 towards N,NE,E,SE,S,SW,W,NW of Jaipur and moved to N W,NW,SW wards at speed 20-25 km/hr.	Multiple cell develop from 0300 UTC of 29/06/18 towards N,NE,E, SE, S, SW,W,NW of Jaipur and reaches maximum reflectivity from 09:52 UTC of 29/06/2018 to 11:32 UTC of 29/06/2018 and died down of 30/06/2018	Dust storm/ Thunderst orm/ Light to moderate rain at Isolated places	Jaipur, Alwar Ajmer, Nagaur, Pali, Tonk, Dausa, Kota, Bundi, Bhilwara, Jhalawar, Baran, Sawai Madhopur, Karauli, Sikar, Jhunjhunu, Churu, Bikaner, Bharatpur, Dholpur, Chittorgarh, Rajsamand Districts.

Radar Station name	Date	Time interval of observatio n (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	Assoc iated severe weath er if any	Districts affected
Patiala	30-06-18	29/06/2018 0300 - 0600	Multiple Echoes 42.5 dbz Ht. 06 KM.	SW-DIRECTORS MOV. NW - WARDS		RA/TS	Sirsa, Ratia And Their Adjoining Areas.
		29/06/2018 0600 -0900	NO SIGNIFICANT ECHO				
		29/06/2018 0900- 1200	Multiple Echoes Z: 57.0 dbz Ht. 9-11 KM.	SW,NW SECTORS Dir. N -WARDS		RA/TS	Karnal, Hisar, Rohtak, Patran, Barnala, Ratia, Muktsar, Fridkot, Ferozpur, Tarn-Tarn, Kapurthala, Amritsar, Batala, Patiala And Their Adjoining Areas.
		29/06/2018 1200 - 1500	Multiple Echoes Z: 57.0 dbz Ht. 9-11 KM.	SW,NW SECTORS Dir. N -WARDS		RA/TS	Elanabad, Patran, Barnala, Ratia, Muktsar, Narwana, Mansa, Bathinda, Ferozpur, Tarn-Tarn, Kapurthala, Amritsar, Batala, Gurdaspur, Pathankot, B-Dam, Solan, Shimla, Patiala And Their Adjoining Areas.
		29/06/2018 1500 -1800	Multiple Echoes Z: 46.5 dbz Ht. 6-9 KM.	NW,SW,SE SECTORS Dir. N -WARDS		RA/TS	Hamirpur, Mandi, Ndaun, Faridabad, Delhi, Gaziabad, Sonipat, Siwani, Fatehabad, Ratia And Their Adjoining Areas.
		29/1800 - 30/0252	NO SIGNIFICANT ECHO				
Agartala	30/06/18	290300 To 300300	MULTIPLE CELLS FOUND OVER NE OF TRIPURA BECOMING SQUALL LINE AT 291040Z; 08KMS; 42DBZ	100 KMS;NE ;30KMPH;E-LY	Cell Dissipated Over South Assam At 29/1340z	TSRA	NOT KNOWN=

Radar Station name	Date	Time interval of observatio n (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	Associate d severe weather if any	Districts affected
Visakhapatnam	30/06/18	0600UTC	Isolated cb cells towards W,S and E with max reflectivity 55 dbz and height 10 kms.	65 kms (S) 03:21UTC and moving E ly.	since last observation cb cells are continuing	Moderate drizzle.	Visakhapatnam, East Godavari(AP) bay region
		0900UTC	Multiple cb cells over the land and bay of Bengal with max reflectivity 50 dbz and height 8kms.	124kms(NE) 07:01UTC and moving Easterly.	Massive clouds hovering over Visakhapat nam.	Slight rain.	Visakhapatnam, Srikakulam, East Godavari (AP).
		1200UTC	Multiple cb cells with max reflectivity 45dbz and height 4kms.	99kms(NNW) 09:31UTC and moving NE ly.	-	Moderate drizzle.	Visakhapatnam, srikakulam, East Godavari (AP).
		1500UTC	CB cell with reflectivity 44dbz and height 4kms.	178kms(SW) 12:01UTC and stationary.	-	-	Over Bay of Bengal.
		1800UTC	Multiple Cb cells over the sea with reflectivity 46 dbz and height 4kms.	196kms(SE) 15:11 UTC and moving NE ly.	-		Over the Bay of Bengal
		0300UTC	CB CELL over the sea with reflectivity 53 dbz and height 8kms.	169kms(SSW) 02:11 UTC and moving NE ly.	-	-	Over the bay of Bengal.
Patna	30/06/18	290830- 291900	NIL	NIL	NIL	NIL	NIL
		291900- 292100	Multiple cell Maximum Reflectivity: 40.5 dBZ Echo Top: 7.5 KM	Range: 65 KM from DWR Patna in ESE direction Movement: NORTH DIRECTION	Warning Issued	THUNDER STORM WITH RAIN	Patna, Nalanda, Sheikhpura.
		292100- 300830	NIL	NIL	NIL	NIL	NIL

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

Realised TS/HS/SQ	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)
Sundernagar	Northwest India	Himachal Pradesh	Thunderstorm	29-06-18	2003	2047
Amritsar	Northwest India	Punjab	Thunderstorm	29-06-18	1304	1545
Palam	Northwest India	Delhi	Thunderstorm	29-06-18	1730	1745
Lucknow	Northwest India	East Uttar Pradesh	Thunderstorm	29-06-18	0200	0305
Vanasthali	Northwest India	East Rajasthan	Thunderstorm	29-06-18	2000	2015
Mt. Abu	Northwest India	East Rajasthan	Thunderstorm	29-06-18	2030	2130
Kota	Northwest India	East Rajasthan	Thunderstorm	29-06-18	1540	1640
Phalodi	Northwest India	West Rajasthan	Thunderstorm	29-06-18	1430	1530
Sri Ganganagar	Northwest India	West Rajasthan	Thunderstorm	29-06-18	1600	1605
Barmer	Northwest India	West Rajasthan	Thunderstorm	29-06-18	1635	1700
Bikaner	Northwest India	West Rajasthan	Thunderstorm	29-06-18	0420	0420
					1635	1635
Sagar	Central India	Madhya Pradesh	Thunderstorm	29-06-18	1940	2050
Pendra Road					1540	1615
					1740	1815
Patna	East India	Bihar	Thunderstorm	29-06-18	1625	1710
Nizamabad	South India	Telangana	Thunderstorm	29-06-18	1530	1600
Ramagundam	South India	Telangana	Thunderstorm	29-06-18	1720	1930
Tuni	South India	Coastal Andhra Pradesh	Thunderstorm	29-06-18	1010	1045
Vijayawada AP	South India	Coastal Karnataka	Thunderstorm	29-06-18	1615	1620
Narsapur	South India	Coastal Karnataka	Thunderstorm	29-06-18	1230	0130
Kakinada	South India	Coastal Karnataka	Thunderstorm	29-06-18	1405	1430
Karaikal	South India	Coastal Tamil Nadu			2025	2150
Minicoy	Lakshadweep	Lakshadweep Islands			2230	2335

# **IMPORTANT LINKS:**

For NCMRWF NWP products:( <u>http://www.ncmrwf.gov.in/HomePage/NEPS-prod-1.php</u> )
For IMD NWP products:( <u>http://nwp.imd.gov.in/diagpro_new.php</u> )
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/
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
Past24hourHEMandIMRrainfall(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- Phigram
http://satellite.imd.gov.in/mAndhra Pradesh skm2.html

# WEATHER SYMBOLS:



