Mountain Expedition Forecast

- IMD issues mountain expedition forecast for different peaks of Himalayas including Mount Everest, Makalu, Satopanth, Bhagirathi, Vasuki Prabat etc.
- Parameters: Temperature, wind speed/direction and precipitation.
- Appreciated by its users like Indian Army, Navy, ITBP, CRPF, ONGC, SSB etc.
- Example of Bulletin is shown below:

Government of India
India Meteorological Department
Ministry of Earth Sciences
Mausam Bhawan, Lodi Road,New Delhi – 110003

BULLETIN NO: -07 DATE:-30/09/2019

Expedition conducted by NAVY

MT. SATOPANTH Expedition

Forecast for Lat. 30°50'59" N & Long. 79°12'30"E at altitude: 4.5 km

Forecast valid for next 24 hrs commencing from 1130 hrs IST of 30/09/2019 to 1130 hrs IST of 01/10/2019.

Time	Wind Direction	Wind Speed (Km/hour)	Temp. (°C)	Weather
1130 IST of 30.09.19 to 1730 IST of 30.09.19	Southwest	05-10	03-05	Generally cloudy sky with Precipitation up to 10 mm.
1730 IST of 30.09.19 to 2330 IST of 30.09.19	West Southwest	10-15	03-05	Partly cloudy sky with precipitation upto 2 mm.
2330 IST of 30.09.19 to 0530 IST of 01.10.19	West Southwest	10-15	02-04	Partly cloudy sky.
0530 IST of 01.10.19 to 1130 IST of 01.10.19	West	05-10	01-03	Partly cloudy sky.

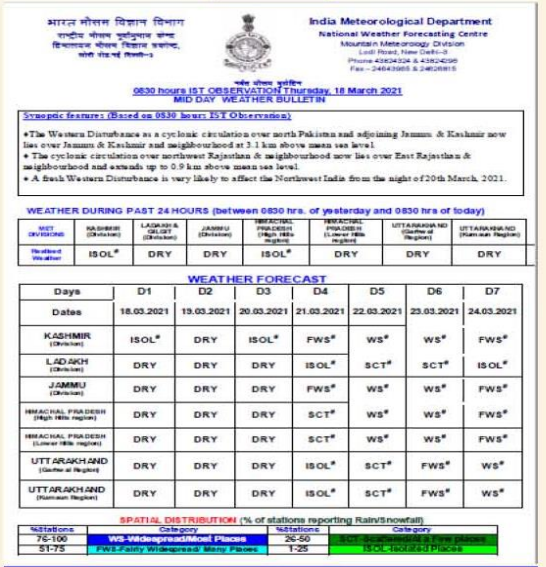
Outlook for subsequent 2 Days

Time	Wind Direction	Wind Speed (Km/hour)	Temp. (°C)	Weather
1130 IST of 01.10.19 to 1130 IST of 02.10.19	West Southwest	10-20	00-04	Partly cloudy sky with Precipitation up to 05 mm.
1130 IST of 02.10.19 to 1130 IST of 03.10.19	Southwest	10-15	-01-03	Partly cloudy sky with Precipitation up to 05 mm.

Steps in Forecasting

- Synoptic analysis
- NWP model guidance from regional & global NWP models like, WRF, GFS, GEFS, NCUM, UMEPS, UM Regional etc
- Objective Consensus based on model guidance
- Subjective consensus based in knowledge, experience and expertise of forecasters
- Final consensus forecast with modulation of objective consensus with subjective consensus

Impact based Forecast & warning



India Meteorological Department
National Weather Forecasting Centre
Mausam Meteorology Division

0830 hours IST OBSERVATION Thursday, 18 March 2021
MID DAY WEATHER BULLETIN

Synoptic features: (Based on 0530 hours IST Observation)

- The Western Disturbance as a cyclonic circulation over north Pakistan and adjoining Jammu & Kashmir now lies over Jammu & Kashmir and neighbourhood at 3.1 km above mean sea level.
- The cyclonic circulation over northwest Rajasthan & neighbourhood now lies over East Rajasthan & neighbourhood and extends up to 0.9 km above mean sea level.
- A fresh Western Disturbance is very likely to affect the Northwest India from the night of 20th March, 2021.

WEATHER DURING PAST 24 HOURS (between 0830 hrs. of yesterday and 0830 hrs of today)

MET DIVISIONS	KASHMIR (Division)	LADAKH & GILGIT (Division)	JAMMU (Division)	HIMACHAL PRADESH (High Hills region)	HIMACHAL PRADESH (Lower Hills region)	UTTARAKHAND (Garhwal Region)	UTTARAKHAND (Kumaun Region)
Realised Weather	ISOL*	DRY	DRY	ISOL*	DRY	DRY	DRY

WEATHER FORECAST

Days	D1	D2	D3	D4	D5	D6	D7
Dates	18.03.2021	19.03.2021	20.03.2021	21.03.2021	22.03.2021	23.03.2021	24.03.2021
KASHMIR (Division)	ISOL*	DRY	ISOL*	FWS*	WS*	WS*	FWS*
LADAKH (Division)	DRY	DRY	DRY	ISOL*	SCT*	SCT*	ISOL*
JAMMU (Division)	DRY	DRY	DRY	FWS*	WS*	WS*	FWS*
HIMACHAL PRADESH (High Hills region)	DRY	DRY	DRY	SCT*	WS*	WS*	FWS*
HIMACHAL PRADESH (Lower Hills region)	DRY	DRY	DRY	SCT*	WS*	WS*	FWS*
UTTARAKHAND (Garhwal Region)	DRY	DRY	DRY	ISOL*	SCT*	FWS*	WS*
UTTARAKHAND (Kumaun Region)	DRY	DRY	DRY	ISOL*	SCT*	FWS*	WS*

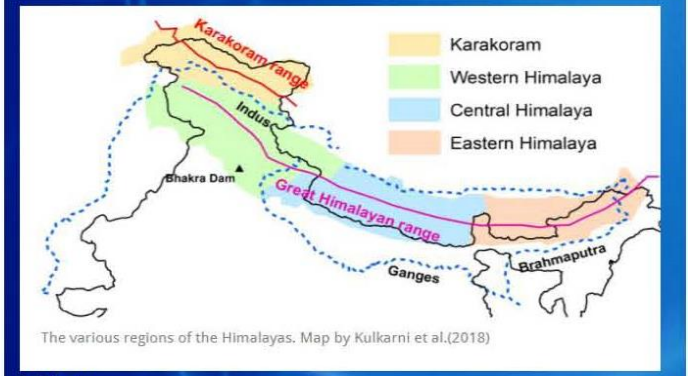
SPATIAL DISTRIBUTION (% of stations reporting Rain/Snowfall)

%stations	Category	%stations	Category
76-100	WS-Widespread/Most Places	26-50	SCT-Scattered/Few Places
51-75	FWS-Fairly Widespread/ Many Places	1-25	ISOL-Isolated/Few Places

Warning Dissemination Tools:

- ➔ National IMD website (https://mausam.imd.gov.in) and regional IMD websites.
- ➔ Social Media: Facebook & Twitter handles of IMD and NDMA and WhatsApp Groups.
- ➔ Electronic and Print media.
- ➔ Multi-media messages are generated for dissemination to general public for awareness and mitigation measures.

Mountain Meteorological Services
India Meteorological Department
Ministry of Earth Sciences
Government of India



The various regions of the Himalayas. Map by Kulkarni et al.(2018)

Vision

- Provision of weather information through real time monitoring and forecasting for optimum application in socio-economic activities of Mountaneous region of the Himalayas.
- No severe weather to go undetected and unpredicted in this region

Mission

- To generate and disseminate Impact based weather forecast for mountaneous region of the Himalayas.
- Provision of special forecasts for Mountain Expedition to the peaks of the Himalayas .
- Weather hazard analysis over the region
- Documentation of weather systems like Western Disturbances affecting the region.
- Research studies and development of tools to improve forecasting and warning services.

Climatological Characteristics of the Himalayas:-

- Complex Terrain & large variability in climate
- Large variation in annual average precipitation in the Himalayas.
- Southern slopes of Eastern Himalayas experience some of the highest annual rainfall totals on Earth while other areas receive as low as 50 mm a year. Rainfall decreases from east to west (300 to 150 cm).
- Mountain ranges also influence mid latitude systems, resulting in rain/snow in hills and adjoining plains of northern India.

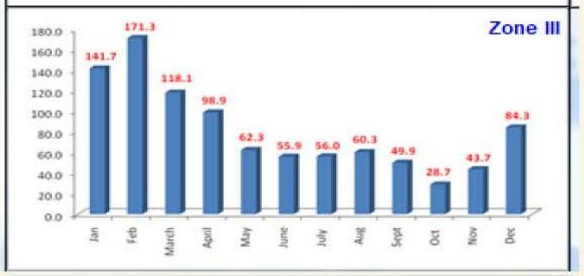
Contrasting features of Western & Eastern Himalayas:-

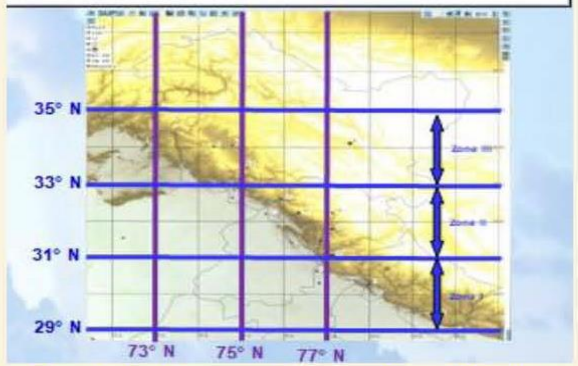
- Western Himalayas: Two peaks in precipitation; 1st peak in January to March due to Western Disturbances and 2nd peak in July to September due to southwest monsoon and its interaction with westerly systems:

- Eastern Himalayas: Mainly rainfall occurs during June to August due to monsoon and thunderstorm activity during March to may

Latitudinal Variation of Precipitation in Western Himalayas

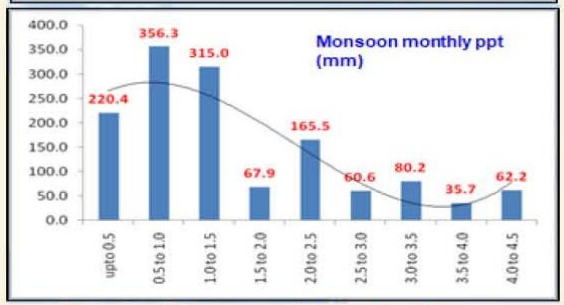
- Lower latitudes received precipitation during monsoon season, middle latitude maximum in monsoon followed by winter season and high latitudes mainly in winter season only.





Precipitation variation with altitude:-

- Winter precipitation increases with increase in altitude,
- Monsoon precipitation increases upto 1.5 km & decrease thereafter with increase in altitude.



Favorable conditions for heavy rain/snow over western Himalayas

- Winter season: Deep trough in middle tropospheric level westerly winds and high moisture feeding from Arabian Sea over northwest Himalayas at lower & middle tropospheric levels.
- Monsoon season: Confluence between westerly and easterly winds and/ or monsoon trough along the foothills of Himalayas