WEATHER MAP

The weather of a place is defined as the sum of the atmospheric conditions as described by the weather elements at a particular point of time. A weather map is, therefore, one that portrays weather elements recorded at a particular time for the whole earth or part of it.

Normally the weather elements are shown either with the help of conventional symbols or absolute numerical values or codes. The weather elements usually recorded and shown are temperature (Maximum and minimum), pressure (continuous), wind (direction and velocity), cloud (type and coverage), precipitation (form and amount), other atmospheric phenomena and sea conditions.

In India, the Meteorological Department was started in 1864 with the headquarter at Simla. Till 1949, the weather maps provided information about three elements (Pressure, wind and precipitation) only. After World War I, the Indian Meteorological Department expanded and became more efficient and its Central office was shifted to Pune. At present in India there are about 350 weather stations belonging to 5 different classes.

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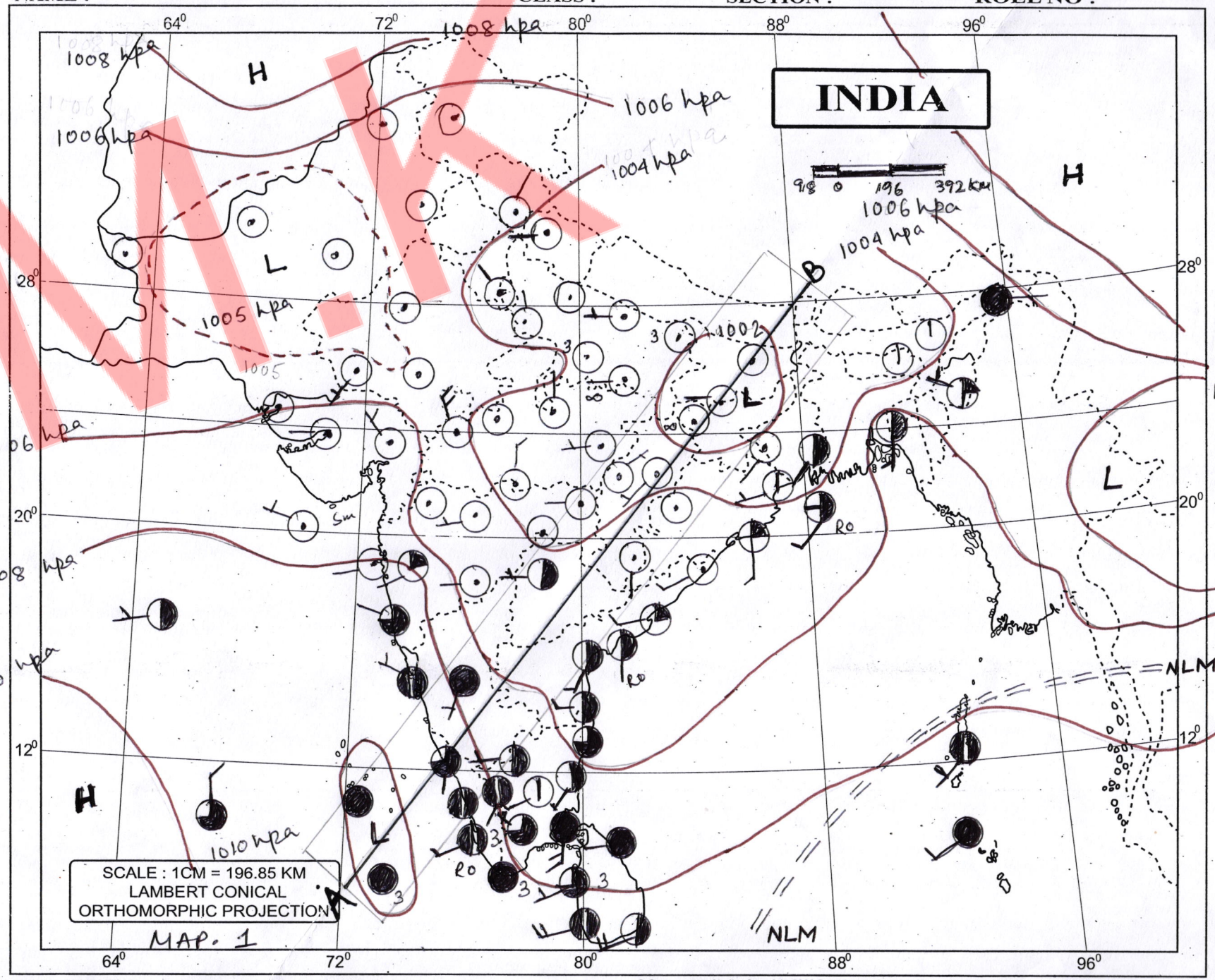
WIND	CLOUD			WEATHER
5 KNOTS	AMOUNT	LOW OR MEDIUM	HIGH	Haze ∞
10 KNOTS	1/8 Sky Covered	⦶	⊖	Dust devil ℰ
15 KNOTS	1/4 Sky Covered	◔	⦶	Mist =
50 KNOTS	3/8 Sky Covered	◔	⊕	Shallow fog = =
SEA CONDITION	1/2 Sky Covered	◑	⦶	Fog ≡
Cm Calm	5/8 Sky Covered	◕	⊕	Squall ∀
Sm Smooth	3/4 Sky Covered	◕	⦶	Dust or sand storm
Sl Slight	7/8 Sky Covered	●	⦶	Hail △
Mod Moderate	Overcast	●	⦶	Drifting Snow
Ro Rough	Sky obscured	⊗		Drizzle ,
V. Ro very rough				Rain •
Hi High VHi very high				Snow *
Ph Phenomenal				Shower ▽
				Thunderstorm
				Lightning

INDIAN DAILY WEATHER REPORT

WEATHER MAP AT 0830 HRS. I.S.T (0300 HRS. G.M.T.)

NAME : CLASS : SECTION : ROLL NO :



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EXAMPLE OF WEATHER MAP INTERPRETATION:

INDIAN DAILY WEATHER REPORT, 01 June, 1998:

The given weather map of Indian sub-continent depicts the weather condition of various elements of weather recorded at 8.30 hrs. IST on 1st June, 1998. Here, different weather elements are shown through different meteorological symbols. The primary characteristics as shown by the map are:

i)	Low pressure :	1002 hpa (Above Bihar and surroundings)
ii)	High pressure :	1010 hpa (Relative : Over Ocean)
iii)	Isobaric pattern :	Monsoon trough developed South-western India
iv)	Wind :	Westerly and south-westerly winds dominant, gentle to moderate breeze
v)	Cloud :	South Indian states particularly, Kerala, Tamil Nadu and Andaman & Nicobar are cloudy.
vi)	Rainfall :	Maximum rainfall occurred 3 cm.
vii)	Sea :	Calm and smooth

From the above characteristics it can be said that the pre-monsoon climatic conditions are present over Indian and NLM Line i.e. Northern Limit of Monsoon Line is found over Andaman and Nicobar Island which indicate entrace of monsoon in this part of India. [Map-I]

PRESSURE CONDITION:

In the given weather map it has been found that air pressure is low over land surface while it is high over seas. The lowest value of isobar is 1002 hpa and highest is 1010 hpa. The durinal range of air pressure is [1010 hpa - 1002 hpa] = 08 hpa.

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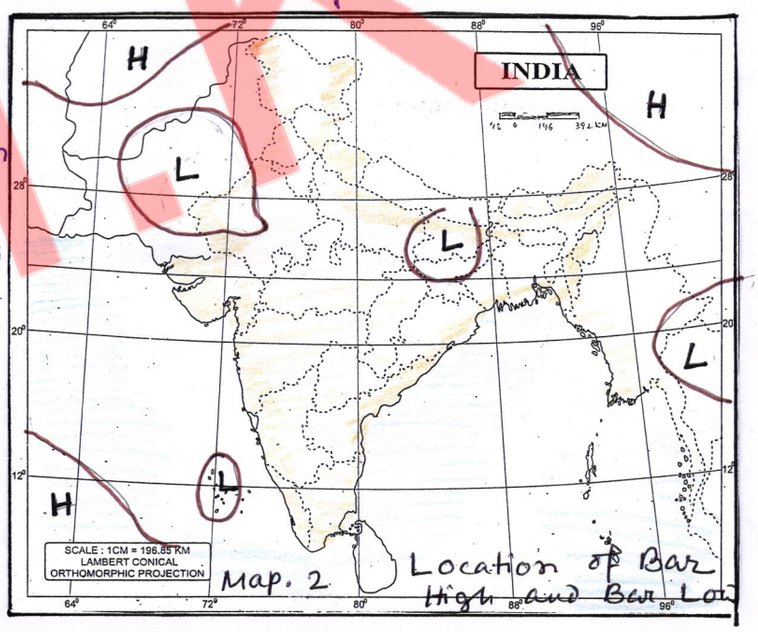
i) LOCATION OF BAR HIGH :

A belt of relatively high pressure is recorded over the southern part of the Arabian Sea (1010 hpa) while one high pressure zone has been observed over Afganistan (1008 hpa) and another belt has been found over china [1008 hpa Above Arunachal Pradesh of India]

ii) LOCATION OF BAR LOW :

The minimum pressure of this map is 1002 hpa. Which is present over the state of Bihar and Jharkhand. This low pressure cell is developed due to some of the local reason. Another low pressure zone has also been recognised over Pakistan and parts of Rajasthan (India). This zone is enclosed by 1005 hpa isobar. Two more low pressure areas have also found in this map. One low pressure cell has developed over Lakshadweep surrounded by 1006 isobar while another low pressure zone is developed over southern part of Mayanmar [1004 hpa]. Therefore, four low pressure areas have been recognised over the area by surrounding relatively low isobars. In this time (June), the sun is inclined towards northern hemisphere, so landsurface become more heated resulting low pressure over land surface. Apart from that the geological condition may be responsible to produce low pressure of an area.



Map. 2 Location of Bar High and Bar Low

iii) Trend of Isobars :

Trend of isobar generally depends on temperature. Besides the temperature other factors which determines their trend are ocean current, wind direction etc. As the land surface is made of heterogeneous material, so there capacities of taking and releasing heat are different. For this reason isobars of landsurface not always follow the axis rather they move through meandering path. Because of the land-sea contrast the isobars also trend to bend.

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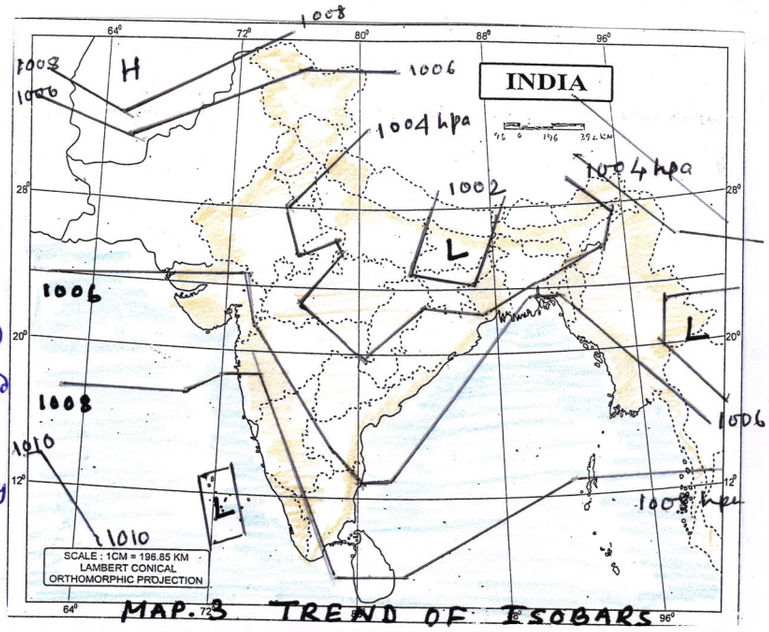

MAP. 3 TREND OF ISOBARS

In the given map the high pressure area in the south western part of India is surrounded by 1010 hpa isobar. After that a low pressure centre has observed but the isobar lines maked by 1008 hpa, 1006 hpa and 1004 hpa took a wavy pattern and covered the southern, central and east-ern India. the other isobars situated in northern and north-eastern India are not in a very wavy form. The bend of these isobars are from North-West to North-East.

The bend of the isobars are more sharp / prominent in coastal areas due to land-sea contrast.

- From the observation of isobar lines two trough axis have been found. The first trough axis extends from Bihar to Tamil Nadu and the second trough axis extends from Indian Ocean to Bihar.

iv) PRESSURE GRADIENT :

In the given weather map pressure increases from north-east to south-west i.e. from Indo-Gangetic plain to southern plateau region. The pressure gradient is not same everywhere, if the isobars are closely spaced that indicate steep pressure gradient while sparsely spaced isobars indicate gentle pressure gradient. A pressure gradient is simply the rate at which pressure falls horizontally per unit distance. Therefore the magnitude of pressure gradient varies inversely with the spacing of isobars.

The isobaric section as well as the map itself show that pressure gradient is not uniform throughout the sub continent.

A line (AB) has been drawn to identify the pressure gradient zones. The line extends from Lakshadeep to Nepal. On the basis of the line a pressure gradient profile has been drawn and the area is divided into three pressure gradient zones.

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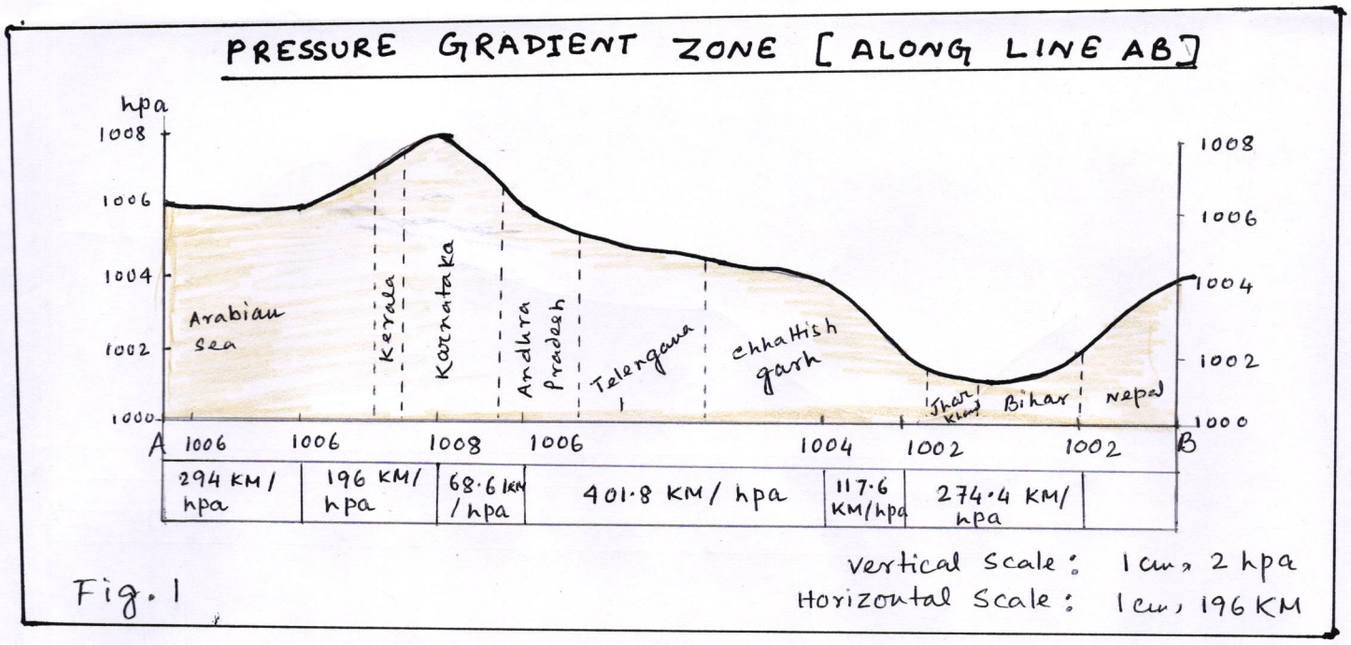
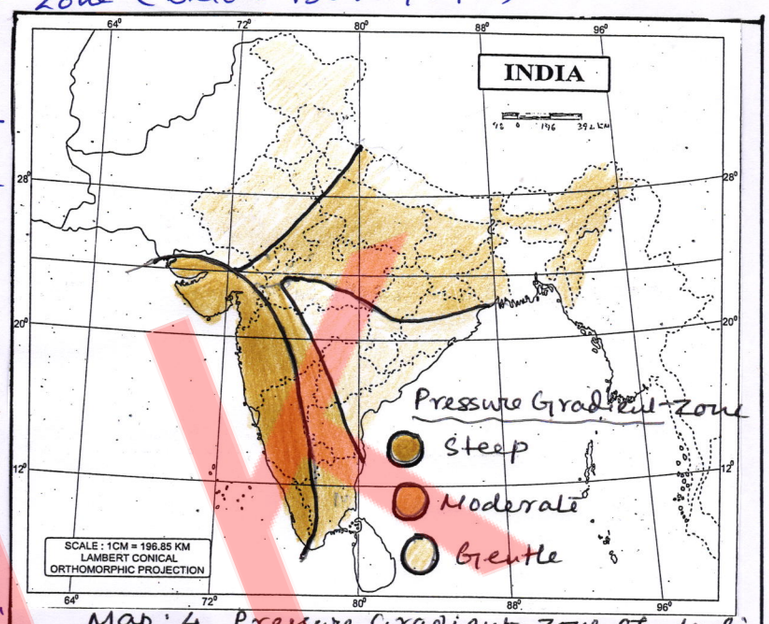


Fig. 1

Which are :

1. Steep pressure gradient zone (Below 150 km/hpa)
2. Moderate pressure gradient zone [150 km/hpa - 300 km/hpa]
3. Gentle pressure gradient zone [Above 300 km/hpa]



Map: 4 Pressure Gradient zone of India

1. STEEP PRESSURE GRADIENT ZONE :

Steep pressure gradient has been observed in the parts of Karnataka, Andhra Pradesh, 36 garh, Maharashtra, Assam, and Arunachal Pradesh. Pressure changes rapidly in this area. [Below 150 km/hpa]

2. MODERATE PRESSURE GRADIENT ZONE :

This occupies the largest area covering the parts of the state of Maharashtra Tamil Nadu, Orissa, West Bengal, Gujarat, western part of Madhya Pradesh, and central part of 36 garh. Here, the pressure gradient ranges between 150 km/hpa and 300 km/hpa.

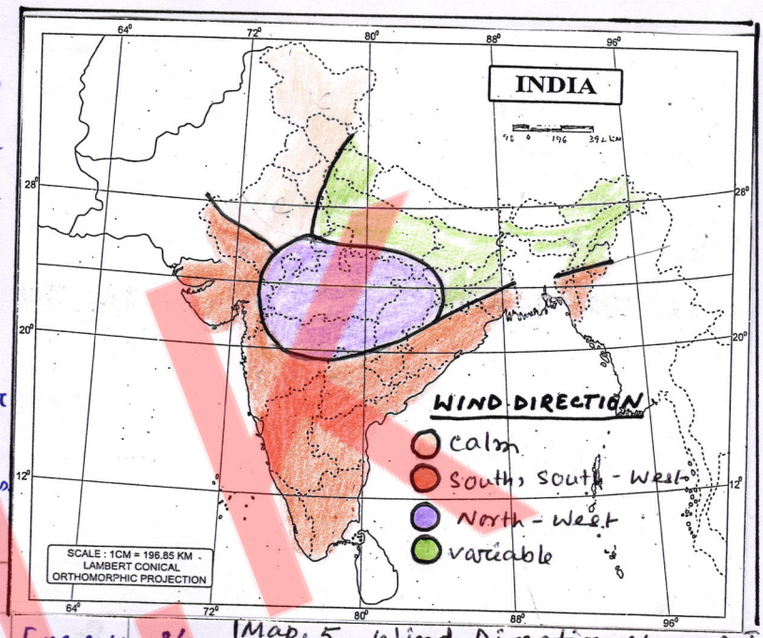
3. Gentle Pressure Gradient Zone :

Rajasthan, eastern part of Madhya Pradesh, Uttar Pradesh, South of Orissa, Telengana, Andhra Pradesh, Southern part of 36 garh, eastern part of Maharashtra, Punjab, Himachal Pradesh, Haryana are included in gentle pressure gradient zone. In this category rate of Pressure change per unit hpa is above 300 km.

WIND CONDITION :

Normally wind flows from high pressure areas to low pressure areas. The speed of wind is determined by the rate of change of pressure gradient. Steep pressure gradient always indicate high wind speed. The direction of wind is therefore related to the trend of isobar and their spacing.

i) **WIND DIRECTION:** From the given map, it has been observed that wind generally flows from different direction and particularly from west (28.2%) and south-west (14.1%) direction. Table. 1 and Fig. 2 [wind rose diagram] show that about 25.6% of the stations have recorded calm condition. Apart from that south and north westerly winds have been recorded at 10.3% and 11.5% stations respectively. The remaining stations recorded mostly local winds blowing either from north, east, north-east or south-east directions. Therefore, westerly

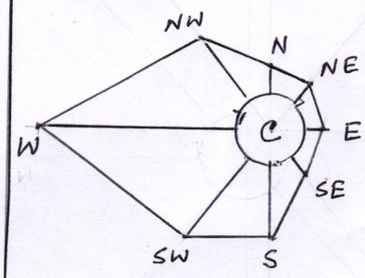


Map. 5 Wind Direction Map of India

Table. 1

WIND DIRECTION	Tally Mark	Frequency	%
calm	~~IIII~~, ~~IIII~~, ~~IIII~~, ~~IIII~~	20	25.6
North	III	03	3.8
North-East	II	02	2.6
East	I	01	1.3
South-East	II	02	2.6
South	~~IIII~~, III	08	10.3
South-West	~~IIII~~, ~~IIII~~, I	11	14.1
West	~~IIII~~, ~~IIII~~, ~~IIII~~, ~~IIII~~, II	22	28.2
North-West	~~IIII~~, IIII	09	11.5
Total		78	100

WIND ROSE DIAGRAM



1cm, 10% of days

Fig. 2

wind is dominantly followed by south-westerly, southerly and north westerly winds and is characteristic of the

South-West monsoon season. From the wind rose diagram and wind direction zone map it has been found that three types of wind direction zone may be demarcated in Indian sub-continent which are —

i) South, south-west and west wind zone

ii) North-West wind zone

iii) variable wind zone

i) SOUTH, SOUTH-WEST AND WEST WIND ZONE :

South, south-west and west winds are found eastern and western coastal areas of India. Both the effects of Arabian Sea branch and Bay of Bengal branch can be easily identified. Coastal and interior coastal Kerala, Coastal Maharashtra, Gujarat, coastal Andhra Pradesh, Central Tamil Nadu, Orissa, and Andaman and Nicobar islands are the regions with dominant westerly, south westerly and southerly winds have been recorded.

ii) NORTH - WEST WIND ZONE :

North-westerly winds are recorded in Gujarat, Maharashtra, Madhya Pradesh, and in the state of Himachal Pradesh.

iii) VARIABLE WIND ZONE :

variable winds are found in north-east India particularly Arunachal Pradesh, Nagaland, Tripura, Uttar Pradesh, and eastern part of Madhya Pradesh.

VELOCITY OF WIND :

Wind speed is directly proportional to the gradient of pressure but due to frictional force the speed of of wind is controlled. In the given map highest velocity of wind is 20 knot. The following table shows different velocities of winds.

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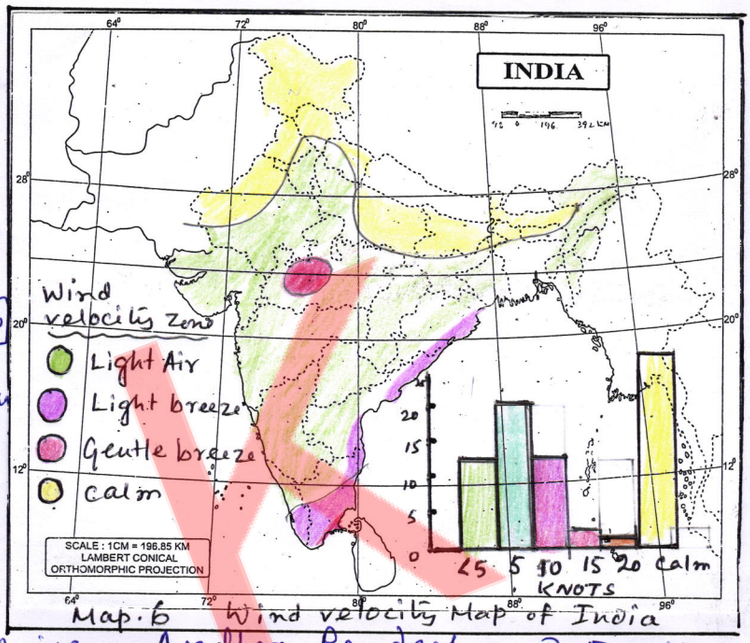
36 percent stations experience calm conditions. Highest velocity of the given map is 20 Knots which has been recorded at Indian ocean while in India gentle breeze of 15 Knots has been recorded at Tamil Nadu and Madhya Pradesh. On the basis of the data of wind velocity, India is divided in to following categories →

Table. 2			
WIND VELOCITY	Tally Mark	Frequency (f)	Percentage (%)
Calm 0	~~IIII~~, ~~IIII~~, ~~IIII~~, ~~IIII~~, ~~IIII~~, III	28	36
Below 5 Knot	~~IIII~~, ~~IIII~~, III	13	16.6
5 Knot	~~IIII~~, ~~IIII~~, ~~IIII~~, ~~IIII~~	20	25.7
10 Knot	~~IIII~~, ~~IIII~~, III	13	16.6
15 Knot	III	03	3.8
20 Knot	I	01	1.3
Total		78	100

i) Light air zone [less than 5 Knots to 5 Knots]

ii) Light breeze zone (10 Knots)

iii) Gentle breeze zone (15 Knots)



Map. 6 Wind velocity Map of India

In light air zone, no particular area has been identified rather it dispersed in overall India. Light breezes have been recorded at eastern coastal areas of India such as Orissa, Andhra Pradesh and Tamil Nadu. Apart from that dispersed pattern of light breeze air has also been found. Gentle breeze with 15 Knots wind velocity have been recorded at Madhya Pradesh and Tamil Nadu.

SKY CONDITION :

Sky condition can be determined by condition of cloudiness and obscured sky.

i) **CLOUDINESS** : Cloudiness means cloud cover area of the sky. The amount of cloud in sky depends on the amount of water vapour in the wind and rate of condensation. In India clear sky is found over the state of Rajasthan, Jammu & Kashmir, Bihar and Uttar Pradesh. Generally sky of north India is more or less clear while south India particular states of Kerala, Tamil Nadu and Karnataka have maximum clouds.

M.K.

Table. 3

Amount of cloud	Sign	Tally Mark	Frequency	Percentage
No cloud	⊙	卌, 卌, 卌, 卌, 卌, 卌, 卌 III	38	48.7
1/8 Part	◔	卌	05	6.4
2/8 Part	◔	卌	05	6.4
3/8 Part	◔	II	02	2.6
4/8 Part	◑	卌, I	06	7.7
5/8 Part	◑	III	03	3.8
6/8 Part	◕	卌, I	06	7.7
7/8 Part	◕	卌, I	06	7.7
8/8 Part	●	卌, II	07	9.0
Total			78	100

9 Percent sky of Indian sub continent is totally covered with cloud while 48.7 percent stations have been recorded clear sky. On the basis of the above data India is divided into following categories:

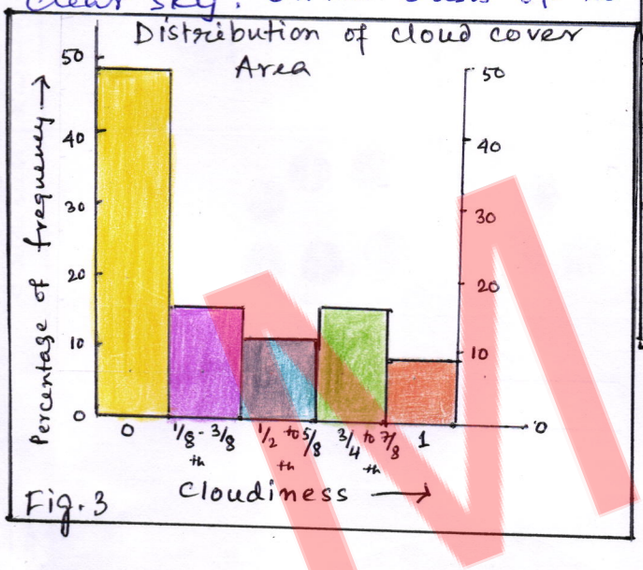
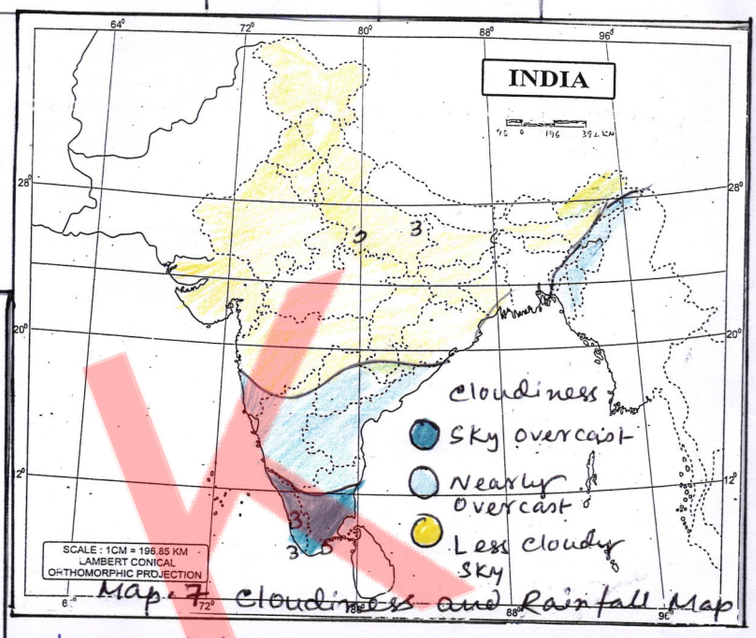


Fig. 3



Map. 7 Cloudiness and Rainfall Map

1. Sky overcast (7/8 to 8/8 th)
2. Nearly overcast sky (1/2 to 5/8 th)
3. Less cloudy sky (1/8 - 3/8 th)

1. SKY OVERCAST:

Southern India particularly Kerala, Tamil Nadu, Lakshadeweep, Andaman Nicobar island and eastern part of Assam have completely cloudy sky.

2. NEARLY OVERCAST SKY:

Nearly overcast sky has also been observed in south Indian states particularly Karnataka, Goa, Andhra Pradesh, Orissa, South Bengal and parts of Nagaland.

3. LESS CLOUDY SKY:

Maximum area of India have clear and less cloudy sky. Whole north Indian stations recorded clear or less cloudy sky such as states of Rajasthan, Gujarat, Uttar Pradesh, Himachal Pradesh, Haryana, Punjab, Jammu and Kashmir, Madhya Pradesh, Bihar, Uttaranchal, etc.

RAINFALL :

In this map rainfall occurs in southern states of India particularly Kerala, southern part of Karnataka, Tamil Nadu. Rainfall also received in Assam and Uttar Pradesh. In these states rainfall recorded 1 cm to 3 cm. Lakshadweep also received 3 cm. rainfall.

CORRELATION BETWEEN AIR PRESSURE, WIND, CLOUDINESS AND RAINFALL :

To study the correlation between air pressure, wind, cloudiness and rainfall a transect chart has been prepared.

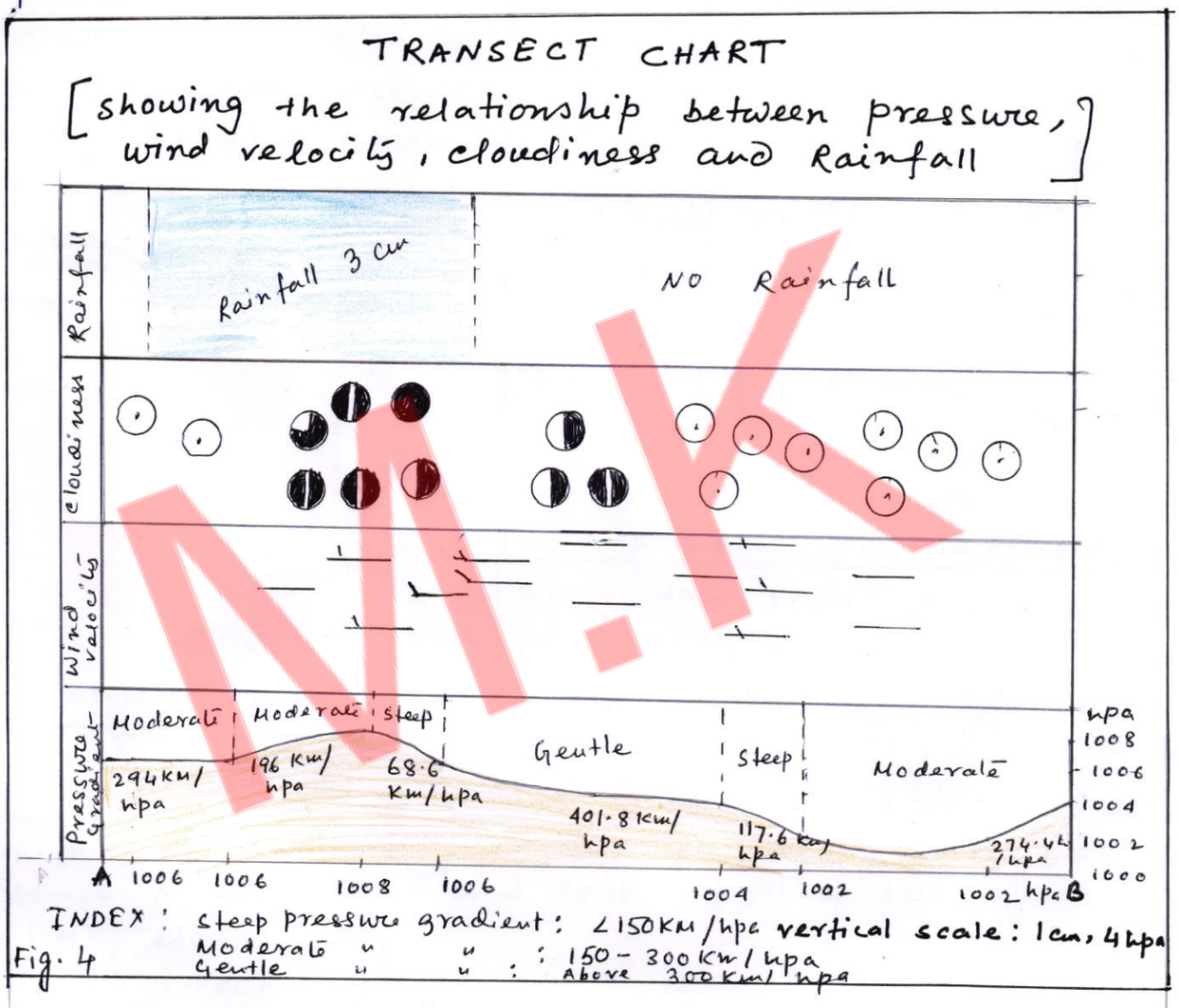


Fig. 4

From the above transect chart it has been observed that Pressure gradient is steep at parts of Karnataka and South-western part of Andhra Pradesh. (68.6 km/hpa) Steepness of pressure gradient is slightly lower at 36 garh (117.6 km/hpa) which directly affect velocity of wind. In case of Karnataka and Andhra Pradesh where steepness of pressure gradient is more wind speed is high (10 Knots) and in 36garh it is 5 Knots. wind speed is less than 5 Knots in moderate and gentle Pressure gradient area.

cloudiness has been found here over the areas of steep pressure gradient with comparatively high speed winds. In this part particularly Kerala and Karnataka maximum sky is covered with cloud 6/8 to 8/8. Rainfall also received by this area depending on the cloud coverage. But sky over 'Depression' is clear and completely cloudless. No rainfall has been observed in this area.

SEA CONDITION:

The sea conditions fluctuated between smooth to rough. The sea was calm in the western part of India, i.e. in Gujarat coast. The Indian Ocean was rough at 8°N, 76°E (Malabar coast) while Bay of Bengal was rough at 14°N, 81°E and at 20°N, 89°E.

OTHER PHENOMENA:

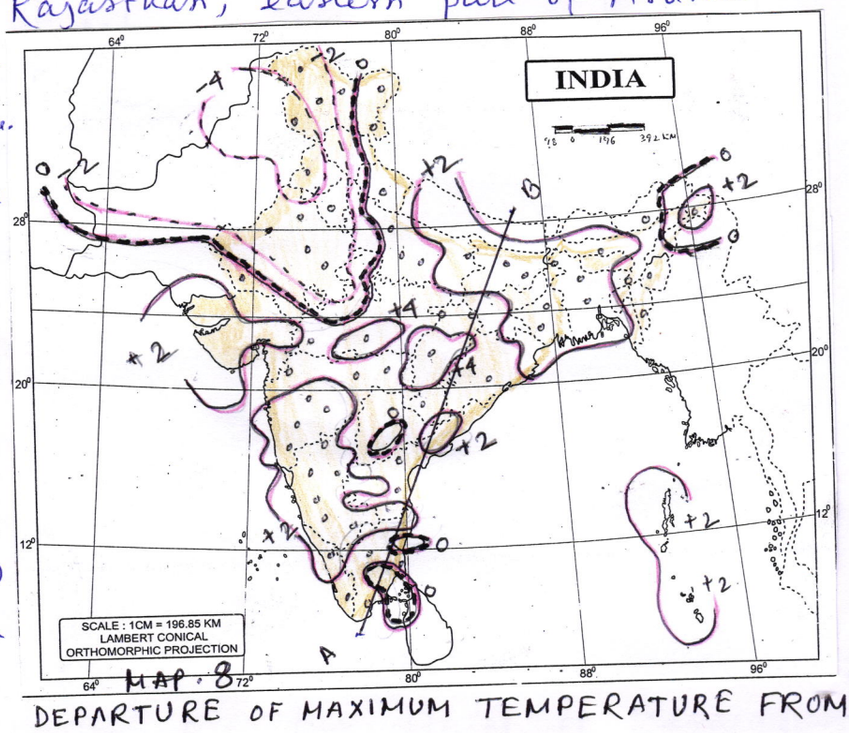
Haze is the only phenomena recorded at Jharkhand and Allahabad stations of Uttar Pradesh. No other phenomena has been observed in the map.

TEMPERATURE:

MAXIMUM TEMPERATURE:

Maximum temperature is normal over the states of Jammu and Kashmir, Himachal Pradesh, Uttaranchal, Haryana, parts of Uttar Pradesh (wn. part) north-western part of Madhya Pradesh ~~and~~ southern part of Rajasthan, eastern part of Arunachal Pradesh, southern part of Nagaland and Tamil Nadu.

The maximum temperature +2°c above normal has been found at Gujarat, Bihar, West Bengal, Assam, Tripura, Meghalaya, and eastern part of Orissa. While parts of Maharashtra, Karnataka, Kerala and Andhra Pradesh have also recorded temperature above 2°c than normal.



MAP: 8

DEPARTURE OF MAXIMUM TEMPERATURE FROM NORMAL

Maximum temperature above 4°c is found at 36garh and border area of Orissa.

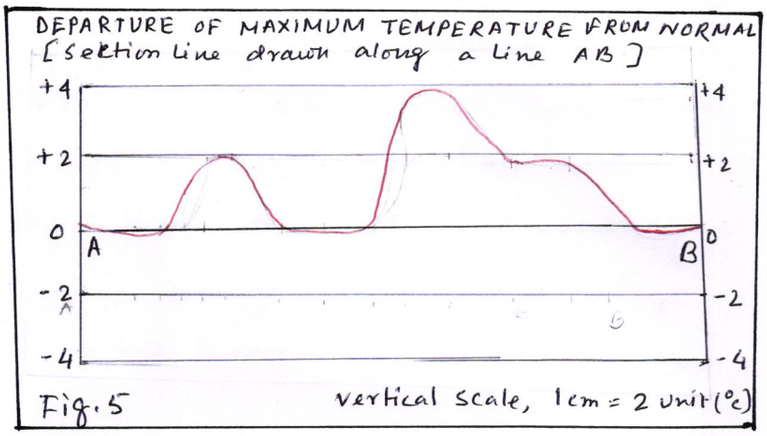
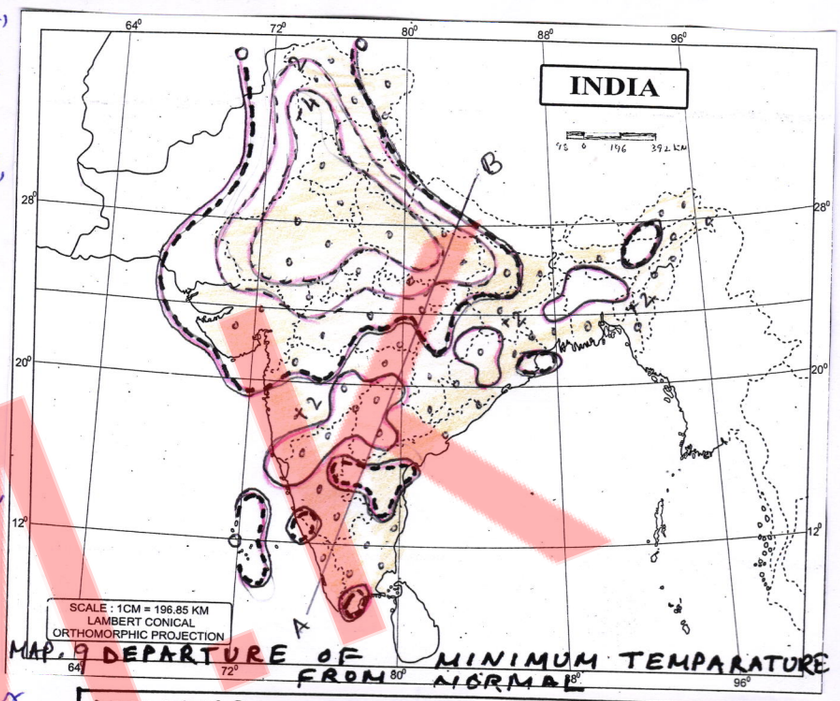


Fig. 5

The temperature −2°c below normal has been observed over Rajasthan, Haryana, parts of Himachal Pradesh and Jammu and Kashmir.

Maximum temperature −4°c normal has been found at Jammu and Kashmir, Parts of Punjab and Rajasthan.

MINIMUM TEMPERATURE : So, far minimum temperature is concerned it is normal over Maharashtra, southern part of Madhya Pradesh, 36 garh, Bihar, Uttaranchal, Himachal Pradesh, Jammu & Kashmir, Arunachal Pradesh, Orissa, Andhra Pradesh, parts of Tamil Nadu and Karnataka.



MAP. 9 DEPARTURE OF MINIMUM TEMPARATURE FROM NORMAL

Minimum temperature 2°c above normal is found at Maharashtra, Telengana, Kanataka and Goa.

Minimum temperature below 2°c normal has been found in Uttar Pradesh, Uttaranchal, Jammu and Kashmir, Rajasthan, Gujarat, Madhya Pradesh and western part of Bihar.

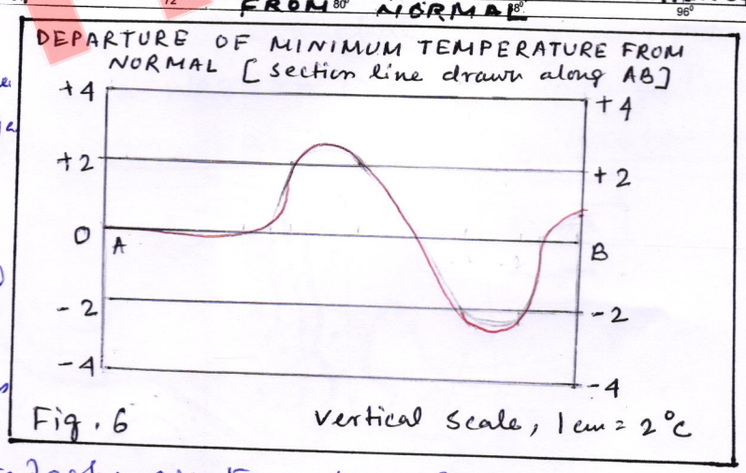


Fig. 6

Minimum temperature below −4°c than normal has been recorded at the stations of Punjab, eastern part of Uttar Pradesh, Himachal Pradesh, western part of Jammu & Kashmir and Rajasthan.

FORECAST :

Considering different aspects of the report it can be said that-

i) There is a possibility of strong wind blowing along the coast of Karnataka and Maharashtra.

ii) The dense cloud coverage over the states of Kerala,

Karnataka and Tamil Nadu indicates the increase of night temperature and possibility of rainfall.

iii) Due to low cloud cover over Andhra Pradesh, Orissa, and West Bengal there are less possibility of rainfall.

iv) North-west Indian state such as Gujarat, Rajasthan, Maharashtra, Madhya Pradesh, Uttar Pradesh, Uttarakhand, Chhattisgarh, Jammu and Kashmir, Punjab, Himachal Pradesh, Haryana have clear sky, so, it indicates to fall of night temperature as well as bright sunny days of the areas.

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