WEATHER MAP INTERPRETATION

Weather map and synoptic chart

Weather map is another tool for a geographer. It contains the state of condition of various weather elements (Table no. 3.12) at a particular hour of a day. The hour of the day at which the observations are made is given at the top of the map. The date is also mentioned along with it.

Uses of weather map

However, the map, as such, does not include the information about all the elements of daily weather. It incorporates the isobars drawn at 2 millibar interval and related location of high and low, the amount of cloud cover present in the sky, the direction and velocity of wind, the amount of rainfall, and some other weather phenomena, such as, haze, fog, mist, squall, depression, limit of south-westerly monsoon wind, sandstorm, thunderstorm, dust devil etc. Over the oceanic and sea-areas the condition of the sea is also marked.

TABLE 3.12

Wind	Cloud			Weather
	Amount	Low or Medium	High	
5 knots	1/8 Sky covered	◔	◔	Haze ∞
10 knots	1/4 Sky covered	◔	◔	Dust devil
15 knots	3/8 Sky covered	◑	◑	Mist =
50 knots	1/2 Sky covered	◑	◑	Shallow fog = =
	5/8 Sky covered	◕	◕	Fog ≡
SEA CONDITION	3/4 Sky covered	◕	◕	Squall ▽
Cm Calm	7/8 Sky covered	●	●	Dust or
Sm Smooth	Overcast	●	●	Sandstorm
Sl Slight	Sky obscured	⊗		Hail △
Mod Moderate				Drifting snow
Ro Rough				Drizzle ,
V. Ro Very rough				Rain •
Hi High				Snow ✳
V. Hi Very high				Shower ▽
Ph Phenomenal				Thunderstorm
				Lightning

Significance of synoptic chart

Although the information in a weather map about various weather elements seem to be comprehensive, they do not include anything about the present or past temperature conditions, about the types of clouds covering the sky at various levels, about the humidity and about many other pertinent information. To obtain a more elaborate data about the conditions of all other weather elements usually a synoptic chart is used with station models prepared for different I.M.D. stations. Such station models include about 15 information of the past and present weather condition giving the amount of temperature, pressure, rainfall, type of cloud cover etc. The synoptic information sheet (table 3.13) depicts both past and present weather (fig. no. 3.92).

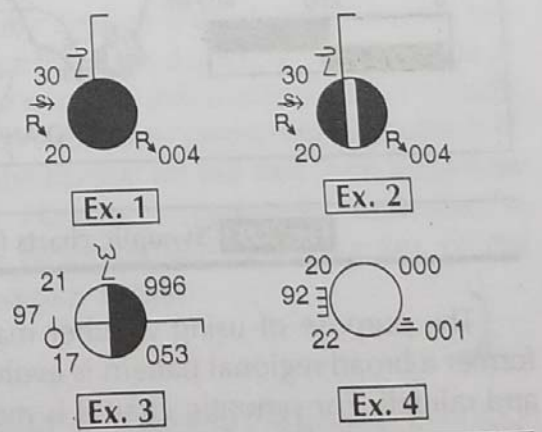


Fig. 3.92 Station models

Fig. 3.93 Synoptic charts for Different Stations in India (isobars in millibar)

Difference b/w weather map & Synoptic chart

The purpose of using weather map is different from that of using a synoptic chart. In the former a broad regional pattern is evolved in connection with the pattern of isobars, cloud cover and rainfall. For synoptic chart it is more specific, more technical and the nature of elements is elaborate and station-based (fig. no. 3.93), but determining a regional pattern becomes more difficult and complex in that, though it is more informative than a weather map.

Along with the weather map two other maps of the same area on a much smaller scale are also given just below the frame of the weather map. These are the maps depicting the departure of the minimum and maximum temperature from normal. The negative and positive values of such departures are given and isopleths drawn on the basis of such departures give a regional pattern of increasing or decreasing temperature in comparison with the normal for the day. Zero departure line is also drawn where the temperature remains normal. However, a correlation between the weather map and departure of temperature maps may prove fruitful as the causes of the occurrence of low and high may be matched with such departure zones.

Interpretation of Weather map

The interpretation of a weather map is a sequential way of determining the general condition of weather of the day and the preconditions for the next few hours. If the study is made for a few consecutive days, the regional trend of changes of various weather phenomena can be understood.

Pressure condition

Pressure condition is the basic atmospheric control on which the local and regional wind circulation depend. A general trend of isobars, their proximity to each other, loops formed by isobars, the circularity and formation of other enclosing isobars, location of barometric low or high over the continent or ocean etc. help to determine the prevalent control over the weather of the day. Not only that, the location of a low pressure and high pressure over the continent or ocean can also depict the seasonal trend of pressure system over the Indian sub-continent following the northing or southing of the sun, even if the date is not mentioned. It should, of course, take into account the prevalent direction of wind movement and the other associated weather phenomena.

In general, during the summer (pre-monsoon hot weather) there develops a low pressure over the north-west of the Indian sub-continent, whereas, in the south of the sub-continent higher

pressure prevails over the Indian ocean. The opposite is true during the post-monsoon season when a high pressure system develops over the Indian sub-continent and a low pressure develops over the Indian ocean. But variations from these general trends are also frequent particularly during the formation of cyclones over the Bay of Bengal or the Arabian sea.

A cross section across the isobars may reveal the nature of pressure gradient which determines the velocity and direction of wind, i.e., steeper the gradient, higher the velocity and vice versa. Moreover, the general direction of movement of winds will be from high to low pressure areas. A very gentle pressure gradient with only two or three isobars on the sub-continent favours a gentle breeze with haphazard direction. A major low pressure with circular and enclosed isobars may give rise to a cyclonic circulation of winds whirling in anticlockwise direction surrounding the low. Similarly, a high pressure over central India during the season of retreating monsoon may cause anti-cyclonic divergence of winds. A trough, on the other hand, during the summer monsoon with its axis being located, more or less, over the Ganga plain is indicated by the opposite direction winds on both sides of the trough axis. If the trough is located towards the foot hills of the Himalayas, the monsoon seems to be weaker than the season when the trough axis is located towards the Bihar-plateau.

The difference of the pressure status between land and ocean may creat loops on isobars with a sudden bend of the isobars along the littoral region.

2. Wind Condition

As mentioned earlier wind direction and velocity are given in weather maps. Wind flags are attached to the circle of the cloud cover. It comes from the direction of the flag and moves towards the circle of cloud cover. In Indian weather maps the velocity of the wind is given at an interval of 5 knots, i.e., 5, 10, 15, 20, 25 etc. A direction without any bar or flag means that the velocity is so low that it is not measurable. Therefore, it can be taken as a calm condition.

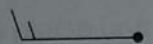
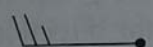
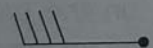
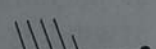
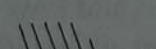
In general, wind movement over the Indian sub-continent is south-westerly in the summer monsoon season, northerly and north westerly during the post-monsoon, north-easterly in the winter and haphazard without any major prevalent direction during the pre-monsoon season. But it does not necessarily mean that all the stations will show such a prevalence of wind direction following the trend of wind movement of the season. Even stations at close proximity may show different directions. However, the prevalence is determined on the basis of the maximum number attained by a particular direction. For this purpose, on the basis of the frequency for eight directions (E, W, N, S, NE, SE, NW, SW) a wind rose diagram may be prepared. This will explain the general trend of occurrence of a particular direction diagrammatically. Stream lining can be proved effective in determining the prevalent direction of wind. For this purpose different symbols may be given to different sets of stream lines. Ultimately from the spread of stream lines and their encroachment the prevalent direction is determined.

Besides, the change in wind velocity may be correlated with the pressure gradient. It is often noted that wind-velocity changes with the change in spacing of isobars, that is, with the change in pressure gradient.The isobar, from which the steeper or gentler gradient starts, may be shown as the boundary on a sketch map between areas of higher and lower velocities. This will show the relationship between the nature of the gradient of slope and wind velocity. The northern limit of summer monsoon is indicated by NLM. That should be mentioned specifically.

Some other small sketches for cyclonic circulation, anti-cyclonic divergence, opposite inward direction of winds flanking a trough-axis, or opposite outward direction of winds flanking a ridge-axis may be drawn for better representation.

A. Beaufort's scale (1806) indicating the various types of wind velocities with a specific range of wind speed associated with a specific observation made about the plants and trees, human beings etc. should be used for understanding and interpreting the effects of a particular wind velocity. The following table depicts the range of wind speed and related observations :

Beaufort scale for wind speed

Beaufort no.	Wind	Arrow	Speed m.p.h.	Speed km. p.h.	Common effects
0	Calm		0	0	Calm, smoke rises vertically.
1	Light air		2	3.34	Direction of wind shown by smoke drift, but not by wind vanes.
2	Light breeze		5	8.35	Wind felt on face ; leaves rustle; ordinary vane moved by wind.
3	Gentle breeze		10	16.7	Leaves and small twigs in constant motion, wind extends light flag.
4	Moderate breeze		15	25.05	Raises dust and loose paper, small branches are moved.
5	Fresh breeze		21	35.07	Small trees in leaf begin to sway, crested wavelets form on in land waters.
6	Strong breeze		28	46.76	Large branches in motion; whistling heard in telegraph wires, umbrellas used with difficulty.
7	Moderate gale		35	58.45	Whole tree in motion ; inconvenience felt when walking against wind
8	Fresh gale		42	70.14	Breaks twigs off trees; generally impedes progress.
9	Strong gale		50	83.5	Slight structural damage occurs (chimney, pots and slates removed).
10	Whole gale		59	98.53	Seldom experienced inland; trees uprooted, considerably structural damage occurs.
11	Storm		69	115.23	Very rarely experienced, accompanied by widespread damage.
12	Hurricane		above 75	125.25	Most destructive.

3 Sky condition

The sky condition in such weather maps is shown by the amount of cloud cover in the sky (in octal), and occurrence of features like haze, thunderstorm, hail, squall etc. However, the actual sky condition is revealed only through the amount of cloud. Whether the type of cloud present in the sky is low, medium or high is also indicated by symbols, for low and medium cloud it is marked by solid black and for high cloud it is by using screen of vertical lines within the circle. These symbols or screens of black have a clock-wise rotation form 1/8 of sky cover to the overcast condition. An obscured sky is also marked symbolically by a cross.

For representation of the nature of distribution of cloud as sky-cover an isoneph map may be prepared. This will identify the zones having the same amount of cloud cover. For this purpose interpolation between the actual cloud covers should be done. The cloud amounts may be converted into percentages which will give a simpler impression.

Zones of cloudless sky and zones of overcast are particularly important because of the extreme variability in the chances of occurrence of rainfall. Moreover, the advent of the summer monsoon and its advancement over the sub-continent is marked by cloud and rain in the areas of its arrival and cloudless sky in the areas yet to be reached by it. Moreover, the overcast sky may cause a rise in night temperature.

A haze is usually developed over an urban area which is highly industrialized. A thunderstorm gives rise to a troubled weather for the next few hours. A squall is another violent blast of wind. Squall and thunderstorms may occur during pre-monsoon season.

4 Precipitation

The occurrence of rainfall during the last 24 hours is marked by its amount in centimetre. Less than 1 cm. of rainfall is marked by symbols of dot and dash. Rainfall may occur due to the incoming summer monsoon, due to the formation of a cyclone, due to the occurrence of thunderstorm, due to the retreating monsoon over south India, due to westerly disturbances during winter, due to the formation of local convection cell over the southern part of West Bengal etc. So many causes are there. The interpreter is to judge which one is the right cause for a particular sequence of rainfall. As mentioned earlier the limit line for the advancement of summer monsoon is preceded by cloudless and rainless condition, whereas it is succeeded by the overcast sky and occurrence of widespread rain. Rainfall due to cyclone or other depressions may cover considerable areas. Rainfall related to thunderstorm or convective cell is a localised phenomenon. The cyclonic precipitation moves regionally along with the movement of the storm. For instance, a storm may form over the Bay of Bengal and may move towards north, north east, north-west, west or south-west across the coast of Bangladesh, West Bengal, Orissa, Andhra Pradesh or Tamilnadu. Similar cyclonic storms may also form in the Arabian sea and they affect the west coast. However, such storms die out soon or lose their intensity after they encroach over the sub-continent. Drizzle may occasionally precede a cyclone. Many other occurrences of such minor forms of precipitations related to the particular weather condition are often observed.

Hail storm is another form of precipitation which occurs in association with thunderstorm. Snowfall is another form of precipitation particularly observed in the Himalayan mountains during winter season.

For the purpose of obtaining an idea about the regional distribution of rainfall, isohyets at suitable interval may be drawn interpolating between the various amounts of rainfall at different stations. If rainfall occurrences are limited in extent over a part of the sub-continent, isohyets may be drawn only for the region where rainfall has occurred. On a separate sketch map these isohyets

will be drawn. Rainfall zones may be identified and tinted with any colour of variable intensity for different lower to higher value zones, higher the rainfall, darker the colour given.

Moreover, if the occurrence of rainfall is very much regional, the zones, where there is no rainfall, should also be marked. In such rainfall distribution maps a distinct regional trend is noticed.

Sporadic occurrence of rainfall should only be marked by their amount and location on a separate sketch map of the Indian sub-continent.

The occurrence of other forms of precipitation may also be shown at their respective locations on a sketch map of the sub-continent. Besides, bar graphs can also be drawn on the basis of the frequency of such events.

5. Other Weather Phenomena

Solar and lunar halo, corona etc. are a few weather phenomena which are not shown in the weather map.

However, various storms may be given importance as they can cause a substantial change in weather conditions within a short span of time. Therefore, sketches for the distribution of deep depression, thunderstorm, sandstorm, dustdevil etc. should also be prepared. The associated weather phenomena of these storms, such as, rainfall, lightning, hail etc. should be incorporated in such sketches.

During winter fog or mist may form depending on the condensation of the moist air, the difference between them being identified on the basis of the range of visibility, the fog having less than 1000 metre and the mist having 1000 to 2000 metre range of visibility. They have different symbols.

6. Sea condition

The oceanic areas in the west, south and east of peninsular India are influenced by the impact of the weather features. The tropical cyclones have their origin over the Arabian sea and over the Bay of Bengal. These occur frequently as they are mostly embedded in the oceanic areas of tropical latitudes. From the oceanic areas they move towards the interior of the Indian sub-continent across the west coast and east coast of India and they die out ultimately over the land areas.

Besides, any strong winds blowing over the oceanic areas can cause roughness on the sea. The weather maps identify variable intensity of roughness on the sea surface due to the fetch of strong wind, otherwise, the sea surface remains normal, i.e. 'calm' or 'smooth'. Obviously, predictions about such information of roughness of the sea are of great importance to the sailors and fishermen in particular.

The sea conditions are shown by abbreviations of descriptive terms expressing the variable character of sea surface ranging form 'calm' to 'very rough'.

For representation of such features a sketch map showing the wind flags, sea condition indicated by abbreviations along with curved arrow with an outline of Indian coast may prove useful. Thus both the cause and effect of the particular sea condition may be shown diagrammatically.

7. Identification of season

If the date of the given weather map is not mentioned at the top, the student may require to identify the season from a broad perspective on the basis of the relevant condition of various elements of weather. For this purpose the particular study should incorporate the following points

which will help the student identify the prevalence of one of the four major seasons observed in the climate of the Indian sub-continent.

1. The prevalent direction of wind should be determined and if they follow any particular trend typical for any of the seasons, the season may be easily identified; e.g. prevalent south-westerly rain-bearing winds will indicate the season of summer monsoon;
2. If the northern limit of summer monsoon wind (N.L.M.) is indicated by dashed lines, the season obviously belongs to the summer monsoon ;
3. Summer monsoon will be determined by low pressure on land and high over the Indian ocean preferably with loops and trough over the Ganga plain;
4. Prevalent north-easterlies with high pressure on the sub-continent and low over the oceanic areas in the south indicate the winter season; in such a season fog and /or mist may occur; snowfall over the Himalayan belt is also probable; rainfall over Jammu and Kashmir, Punjab, Haryana is not unlikely ;
5. The season of returning monsoon is dominated by the withdrawal of summer monsoon in the form of prevalent north-westerlies and northerlies. In this season Tamilnadu coast may have cloud cover and rainfall with a divergent wind circulation over central India;
6. During the pre-monsoon season no major prevalence in wind direction is observed as winds are rather haphazard and most of the directions may contribute significantly or almost equally in the frequency of occurrence; sandstorm and/or duststorm may occur over Rajasthan, Uttarpradesh etc.; pre-monsoon squall may occur over northern, central or eastern region, thunderstorm over the eastern region, southern West Bengal is not unlikely; small and localised low pressure systems may develop over northern, eastern and central India and these may coalesce to form a widespread low pressure system;
7. Though the presence of the criteria mentioned above help to identify the season, a given date at the top of the weather map speaks more specifically about the season.

8. Forecasting

Prediction can be made about the future weather, i.e., what will be the weather of tomorrow, on the basis of understanding the weather of today. Major concentration in this regard should be given on the movement of cyclones and anticyclones as revealed by the pattern of isobars. Forecasts may be of short term, i.e., for the next 12 hours, or may be of long term i.e., for the next 24 to 48 hours. However, a synoptic chart is more useful in this regard as that contains more information about the stations of observation. Weather maps can also give a comprehensive view point towards forecasting the weather. The following aspects should be studied to obtain the idea about the future weather.

Movement of lows and highs : Usually the lows and highs move with the prevailing westerlies at an average velocity of about 30 to 35 miles (48–56 km)/hr. in winter and about 20 to 25 miles (32–40 km)/hr. is associated with the cyclones in pre-monsoon, monsoon & post-monsoon seasons. There are large individual variations from the average.

It tends to move with the same velocity and direction as during the next 12 to 24 hours in the absence of other indications. Strong winds in front of a low retard it. A low tends to move parallel to the isobars in the warm sector but to cross the isotherms, that is , to move toward an area of higher temperature it tends to travel towards the area where the greatest fall of pressure is occurring. Highs move towards the area where the greatest rise in pressure in occurring.

The distribution of pressure around the system under consideration influences its movement,

the tendency is to move towards a region of gentler gradient and away from a region of steeper gradient. Consideration must be given to whether the low is increasing or decreasing in intensity or is likely to do so within the forecast period. A low with a marked pressure gradient but with weak winds around it will increase in intensity.

Forecasting about other phenomena : An overcast sky covered with low clouds may bring forth showers of rainfall within a few hours if the wind velocity is low. A higher velocity of wind, on the other hand, may take away the clouds elsewhere.

The prediction about the formation of a thunderstorm is not possible from simple weather maps as they do not incorporate any data about the type of cloud or formation of convective cell over an area. However, once the thunderstorm cloud is formed, as indicated by the conventional symbol for thunderstorm on weather map, it is apt to bring one or two showers of heavy rainfall with lightning and thunder. Such storms may bring hail stones if they are large enough and formed near the surface.

A cyclone or depression often brings rainfall. All low pressure systems do not necessarily reach the cyclonic or hurricane velocity. Therefore, the interpreter should check if the gale-velocity is reached. Moreover, how much fall of pressure occurs between the periphery and the centre of a low pressure is also important for a tropical cyclone. However, these maps do not have any information about the amount of dew point temperature which is also significant in this regard. Usually, a well-developed low with low velocity of wind will increase in intensity.

For nocturnal showers along the coast the following observations are important

1. Location of principal build-ups.
2. Time of beginning and dissipation of coast clouds.
3. Periods of principal showers along the coast.
4. Distances that showers cover towards inland.

Forecasts over open Sea : It is usually effective for aircrafts following some route over open sea. The prediction of movement of individual clouds and squall lines can be made for terminal conditions at seaports. The position of individual clouds is of little importance unless the pilot encounters the solid wall of cumulonimbus. But these features are not given in weather maps.

Example interpretation : 1

Monsoon condition

The given weather map (fig. no. 3.94) has shown the condition of various elements of weather over the Indian sub-continent. This weather map may be interpreted under the following sub-titles :

1. Pressure condition
   a) Extent and range of isobars
   b) Location of bar-low
   c) Location of bar-high
   d) Gradient of pressure
2. Wind condition
   a) Prevalent direction of wind
   b) Maximum and minimum velocity of wind
   c) Special feature of wind system
3. Co-relation between pressure and wind condition

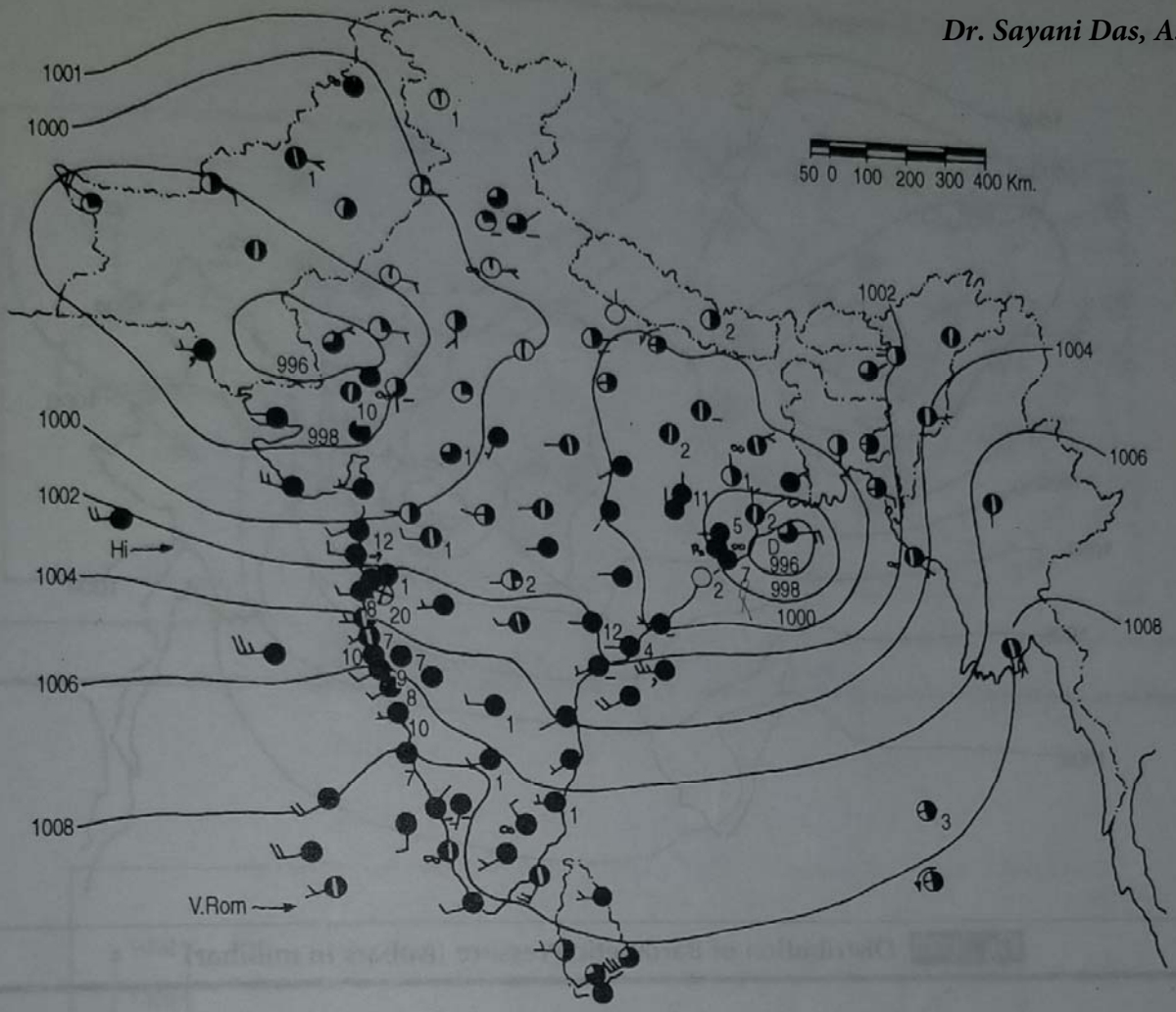


Fig. 3.94 Weather map no. 1 (isobars in millibar)

4. Distribution of cloud cover
5. Occurrence of rainfall and its distribution
6. Co-relation between cloud cover and rainfall occurrence
7. Special weather phenomena and their significance
8. Sea condition
9. Departure of maximum and minimum temperature from normal and their significance
10. Correlation among various weather elements
11. Identification of season

1. *Pressure condition*

a) Extent and range of isobars : In the given weather map the isobars range from 996 mb. to 1008 mb. (fig. no. 3.95). The lowest value is observed at enclosed isobars over the northern part of the Bay of Bengal and in the western part of Rajasthan surrounding Barmer, whereas, the highest value is observed over the southern part of the Arabian sea, Kerala, northern part the of Indian ocean and over the Andaman sea.

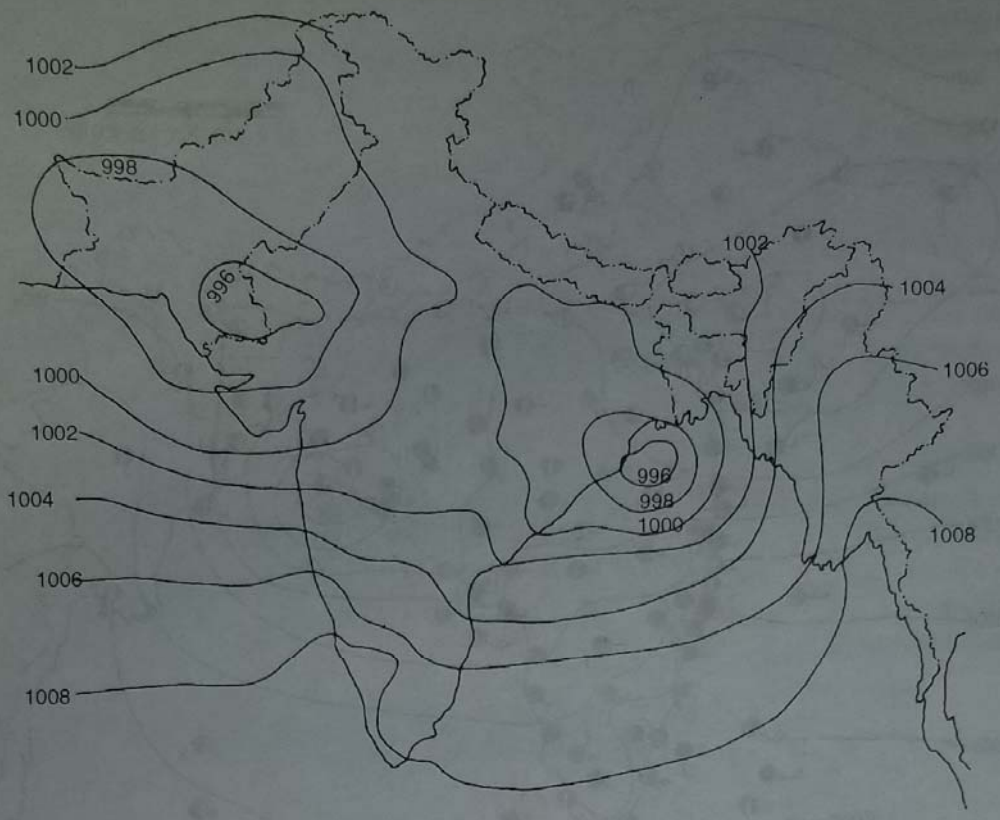


Fig. 3.95 Distribution of Barometic Pressure (isobars in millibar)

b) ***Location of bar low :*** Two low pressure zones (fig. no. 3.96) have been recognised over the area by enclosing isobars, one over western Rajasthan and Pakistan and the other over the northern part of the Bay of Bengal off Orissa coast. The low pressure zone over the bay has formed a depression with two other enclosing isobars extending the influence upto the eastern part of Uttar Pradesh. The western low pressure zone is less strong, though well recognised.

c) ***Location of bar high :*** The northern part of the Indian ocean has shown a high pressure zone delineated by 1008 mb. isobar.

This reveals the fact that there was high over the ocean and low over the sub-continent on the day when the weather- observations were made.

d) ***Gradient of pressure :*** In general, the pressure gradient is gentler over the southern part of the Arabian sea and over the Andaman sea in the south of 1006 mb. isobar.

In the north of it, the gradient is steeper and the maximum steepness is observed in the southern periphery of the depression over the Bay of Bengal (fig. no 3.97).

2. Wind Condition

a) ***Prevalent direction of wind :*** From the stream lines it is observed that the prevalent direction is from west and south west (fig. no. 3.98).

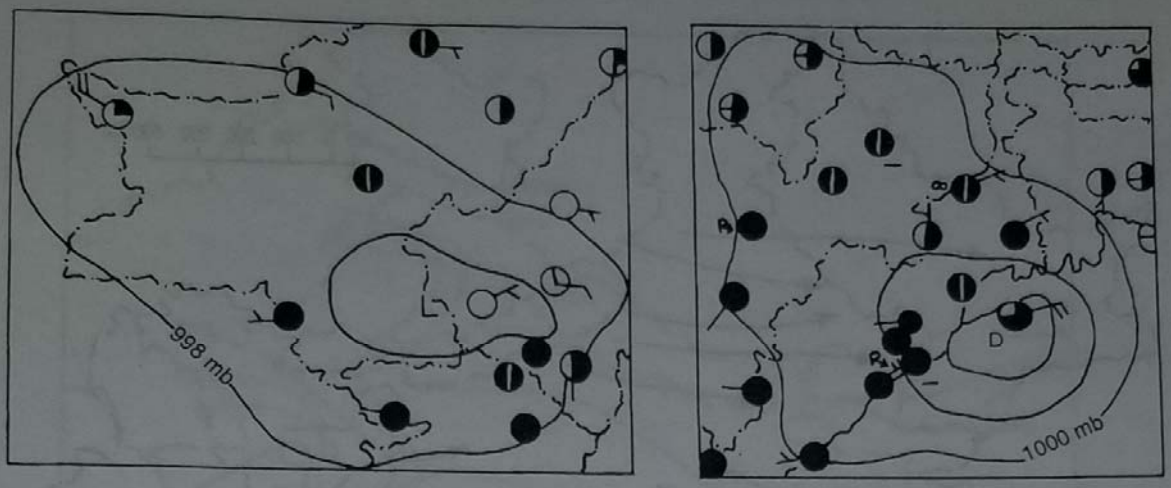


Fig. 3.96 Location of Low Pressure Zones

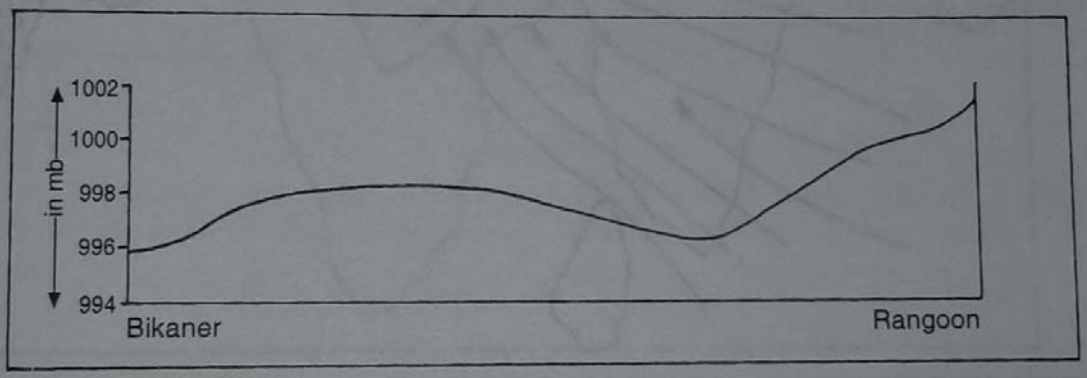


Fig. 3.97 Profile of Pressure Variation (Bikaner to Rangoon)

b) ***Maximum and minimum velocity of wind :*** Table no. 3.15 reveals that the maximum wind velocity was 25 knots on the given day. It is observed for the winds from westerly direction (fig. no. 3.99). The minimum velocity (5 knots) is observed in the winds from south-east and north-east. This attaches relatively more importance to the westerly winds over the other winds from other directions.

c) ***Special feature of wind system :*** Over north India, central India, north-eastern India and north-western part of the sub-continent winds are not very strong and have a light breeze character. On the contrary, towards the southern part of the peninsula and also in the middle part, as well as over the northern part of the Bay and over the Arabian sea, winds are stronger and have a strong breeze character.

3. ***Correlation between pressure and wind condition :*** In general, higher velocity of winds has been observed on the areas with steeper gradient of pressure.

In the surroundings of the two low pressure zones, one forming a depression, winds have shown a whirling character. Obviously, these are anti-clockwise in direction.

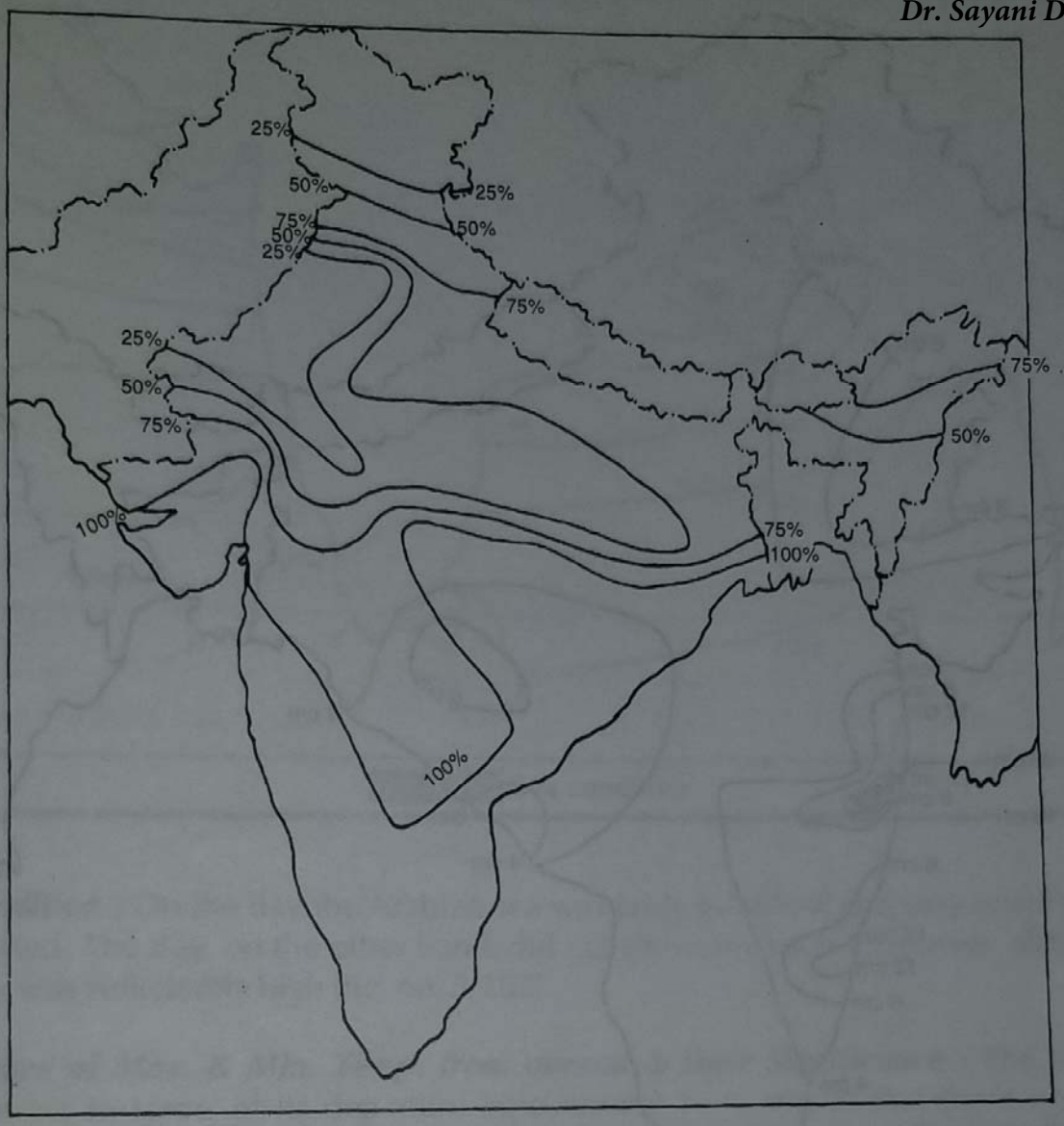


Fig. 3.100 Isoneph Map (distribution of cloud cover)

4. ***Distribution of cloud cover :*** On the day when the observations were made, almost the entire southern half of the sub-continent had cloud cover of considerable amount. In most of the areas the sky was overcast with clouds. Some other areas adjacent to them were having low clouds covering 25% to 75% of the sky.

   Over Jammu and Kashmir, northern and western part of Uttar Pradesh, over part of Rajasthan there were very insignificant cover of cloud.

   A continuum of overcast was specially noted along Konkon coast and over the coast of Orissa (fig. no. 3.100).

5. ***Occurrence of Rainfall :*** Rainfall was fairly wide-spread over the peninsula, though it was sporadic over north India. An isohyet map (fig. no. 3.101) has been prepared to show the distribution of rainfall. The map shows concentration of rainfall along the Konkan coast and in the surroundings of the eastern depression. The occurrence of rainfall was also noted over Port Blair (3 cm.).

   The highest amount of rainfall received was 20 cm. in Ratnagiri area, whereas, the lowest was below 1 cm. (less than 0.75 cm.) over north India.

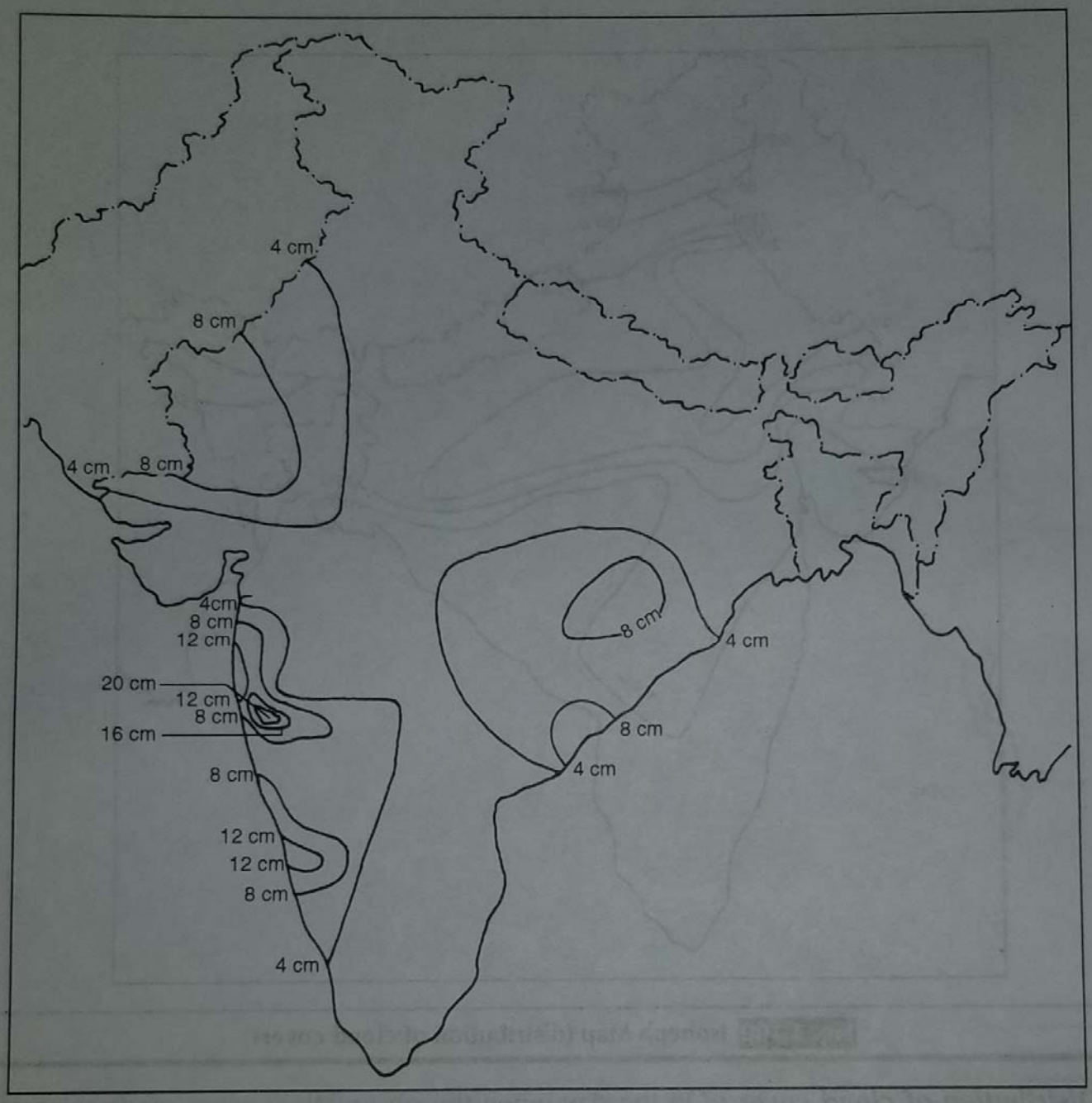


Fig. 3.101 Isohyet map (distribution of rainfall)

6. ***Correlation between cloud cover and rainfall occurrence :*** As mentioned earlier the Konkan coast has a dense cloud cover along with another counter part over the Orissa coast. Consequently, these two areas have shown the greatest concentration of rainfall. The areas with low cloud cover did not receive any rainfall in general, except for a few sporadic occurrences.

7. ***Special weather phenomena and their significance :*** The occurrence of a thunderstorm has been noted over the coast of Orissa in north-west of Kataka. This Thunderstorm is perhaps linked with the depression formed over the area. The area has shown sufficient rainfall too.

The occurrence of haze has been particularly noted over Agra, Ahmedabad, Tiruchirapally, Cochin and one or two other areas. This occurrence of haze may be related to industrial pollution in those areas.

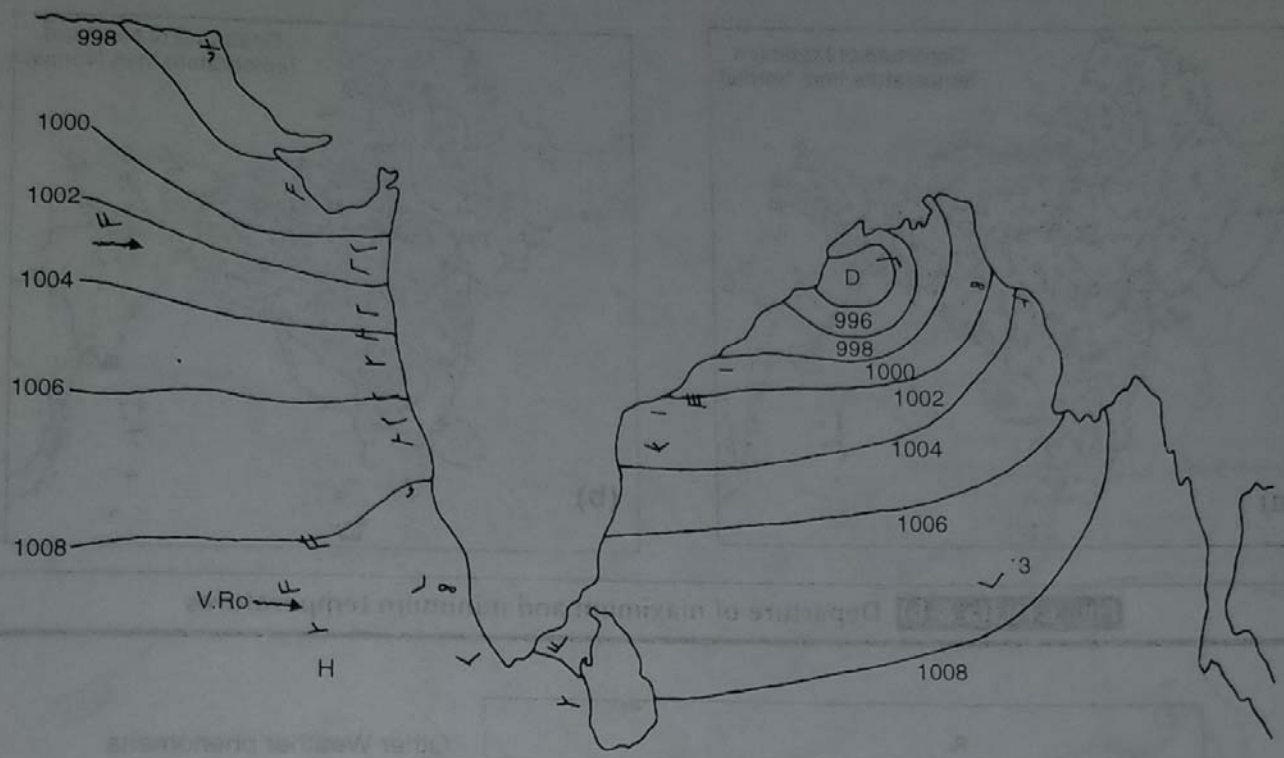


Fig. 3.102 Sea condition

8. ***Sea condition :*** On the day the Arabian sea was fairly turbulent and very rough conditions were noted. The Bay, on the other hand, did not show any such roughness, although wind velocity was sufficiently high (fig. no. 3.102).

9. ***Departure of Max. & Min. Temp. from normal & their Significance :*** The temperature phenomena in terms of its departure from normal have shown that there were positive departure over the eastern part of India and over Rajasthan and Gujarat. This positive departure from normal may be linked up with the formation of low pressure zones. For the minimum temperature also positive departure was noted over north-western India. Over the Malabar coast the positive departure of both minimum and maximum may be linked with the loops in the isobars (fig. no. 3.103a & b).

10. **Correlation among various weather elements :** A transect chart showing vertical correlation among various weather elements with pressure gradient at the base shows that the low pressure area has higher velocity of wind and maximum concentration of clouds. A thunder storm is also centred over there with another developed over slightly higher pressure area. Rainfall occurrence is also associated with the areas of greater cloud cover (fig. no. 3.104).

11. ***Identification of season*** **:** The general prevalence of the south-westerly winds, the location of low pressure over the land and high over the ocean, the occurrence of rainfall over peninsular India, particularly along Konkan coast, as associated with the overcast condition, low cover of clouds over north India indicate that the observations were made during the early part of the summer monsoon period.

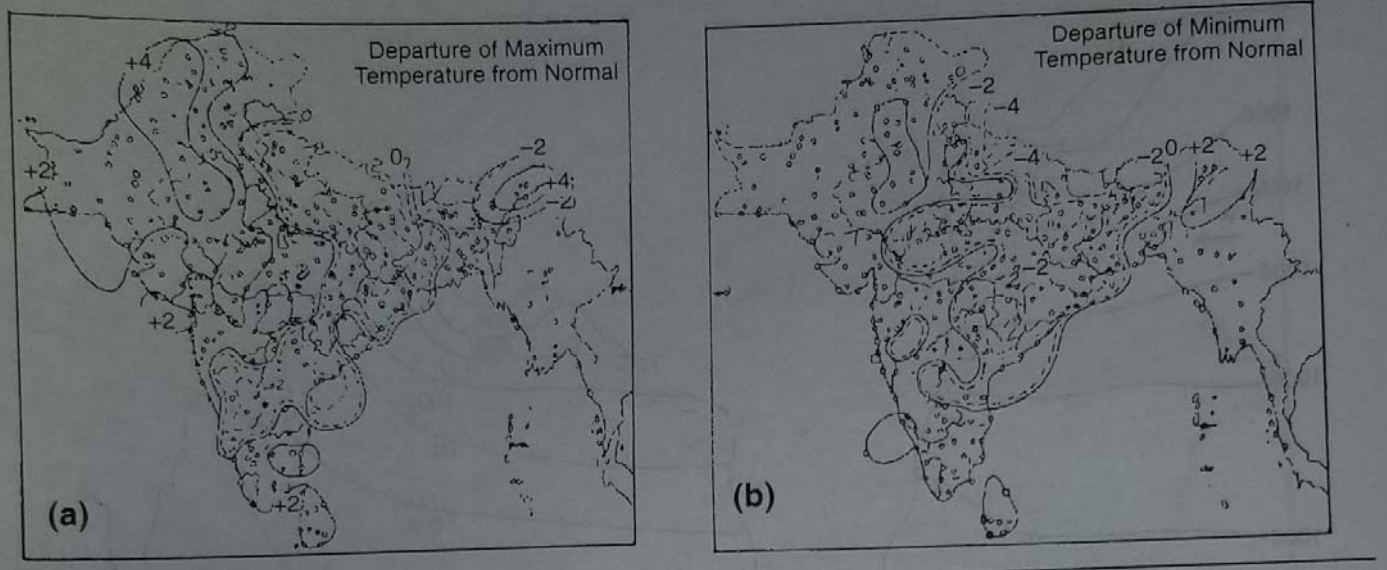


Fig. 3.103(a & b) Departure of maximum and minimum temperatures

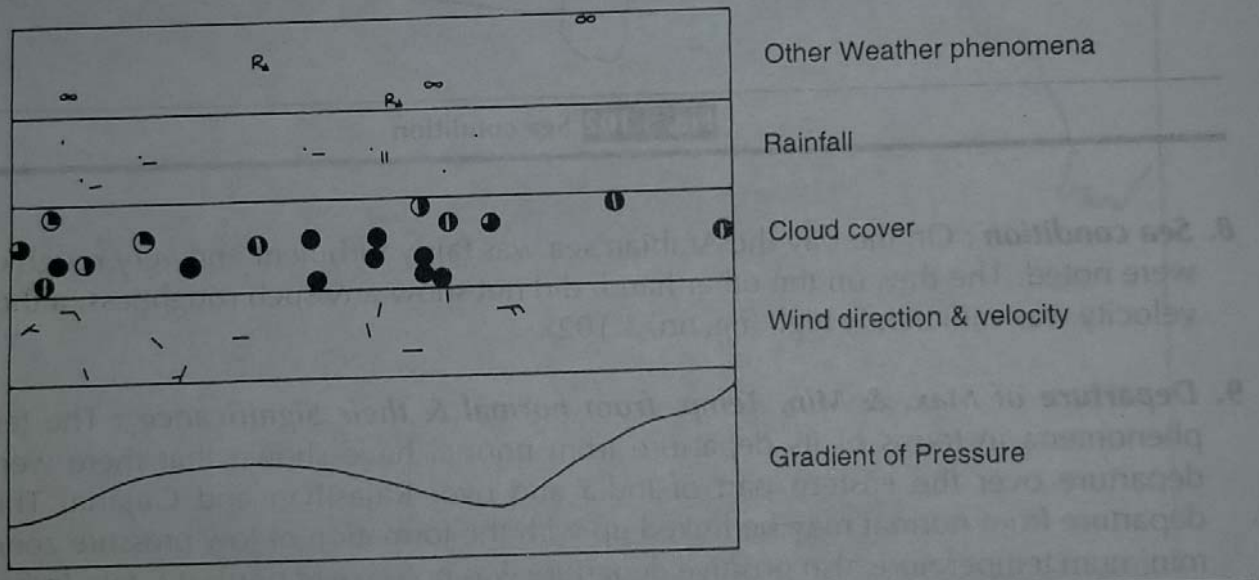


Fig. 3.104 Correlation among various weather elements

Example interpretation : 2

Winter Condition

The given weather map (fig. no. 3.105) shows the condition of various elements of weather over the Indian sub-continent. This weather map may be interpreted under the following sub-titles :

1. ***Pressure Condition***

   a) ***Extent of isobars :*** In the given weather map the isobars range from 1012 mb. to 1020 mb. The lowest value is observed over the Andaman sea, whereas, the highest value is observed at an enclosed isobar over the middle part of the Indian sub-continent.

   b) ***Location of bar low :*** Two low pressure zones have been recognised over the area by enclosing isobars, one over the middle of Pakistan and other over the north-west of the

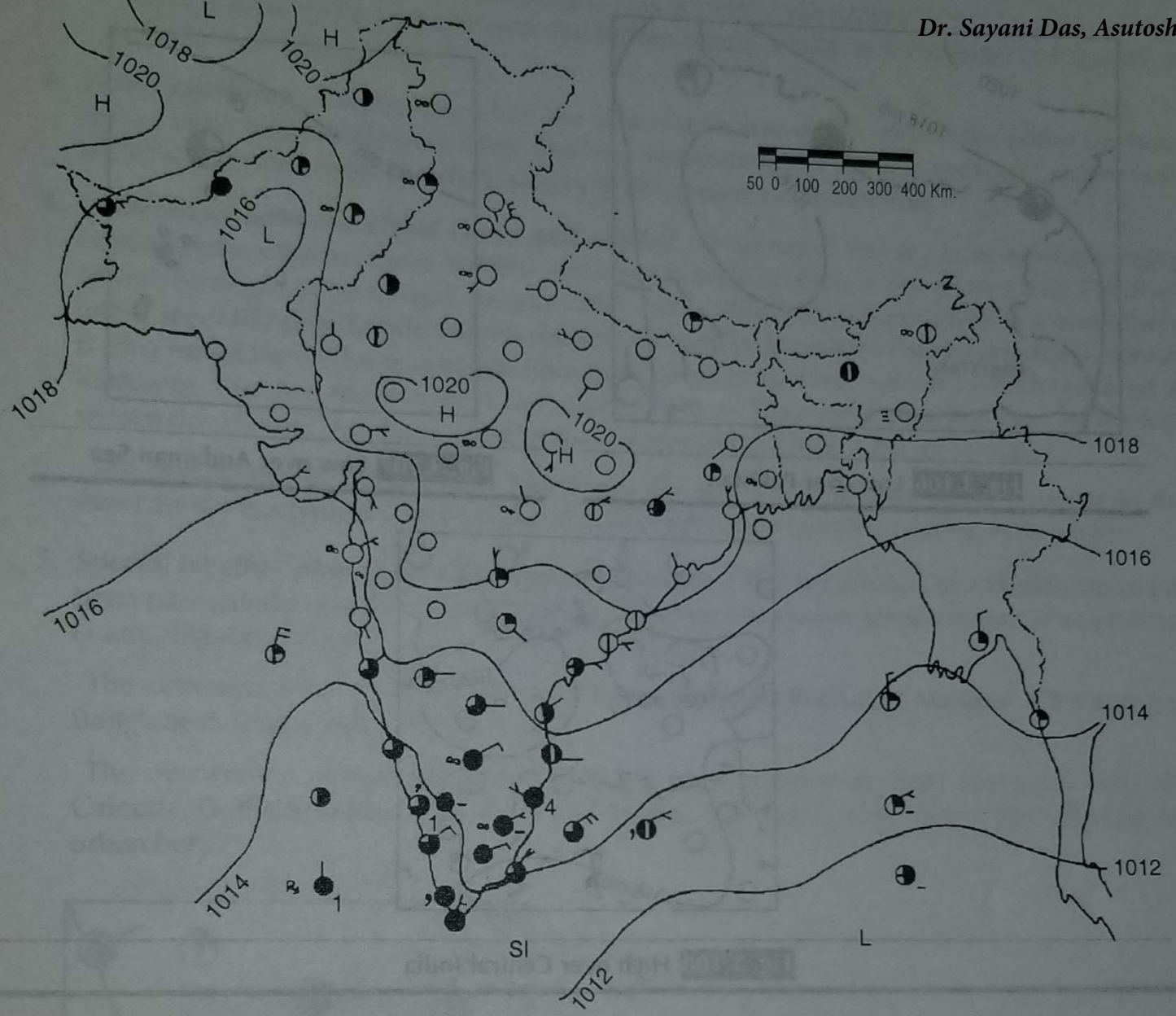


Fig. 3.105 Weather Map No. 2 (isobars in millibar)

sub-continent. Besides another low pressure zone is well recognised at the south of the Bay of Bengal over the Andaman sea as delineated by 1012 mb (fig. no. 3.106 & 3.107).

c) ***Location of bar high :*** The middle part of Indian sub-continent has shown a high pressure zone (fig. no. 3.108) enclosed by the 1020 mb. isobar and two other high pressure zones are shown at the north-western part of this sub-continent as delineated by 1020 mb. isobar.

d) ***Gradient of pressure :*** The gradient of pressure is gentle almost throughout India. The cross section connecting Simla and Tiruchirapally (fig. no. 3.109) has revealed this feature. However, over Madhya Pradesh there is a high pressure marked by 1020 mb. It may be noted here that the pressure gradient across the loop of the isobars along Konkan coast and western Maharashtra is steeper.

2. *Wind Condition*

a) ***Maximum and minimum velocity of wind :*** It reveals that the maximum wind velocity was 20 knots on the given day and is observed from north-east direction. The minimum velocity is observed (less than 5 knots) in the winds from the west. This attaches relatively

another off the Coromondal coast. However, in general, winds are moving from continental area to the Indian ocean. This is largely controlled by the location of high over central India and low over the Indian ocean, which is a characteristic feature of winter condition.

3. ***Cloud condition*** : On the day when the observation was made, almost the entire southern part of India had cloud cover. Over that area somewhere the sky was overcast , somewhere for 50% and north-west of India had very small amount of cloud cover.

4. ***Correlation between cloud cover and rainfall :*** In general, the sky over northern India, central India, western India, eastern India was cloudless. Only a few places over Pakistan, Nepal, southern West Bengal, Assam valley had a little bit of cloud cover, but in southern India, specially over Tamilnadu the sky was overcast with clouds. The occurrence of rainfall is also noted here. The maximum amount of rainfall recorded is 4 cm., which occurred at Kuddalor. Besides, there were a few places such as Trivandrum, Kalikot etc., which had shown drizzles and Madurai, Tiruchirapally recorded less than 1 cm. of rainfall.

   The occurrence of rainfall over Tamilnadu (fig. no. 3.111) and Kerala in response to the overcast sky is a typical feature of the season of retreating monsoon during early winter.

5. ***Special weather phenomena and their occurrence*** : The occurrence of a thunderstorm has been particularly noted over Lakshadwip. The area has shown some amount of rainfall too (1 cm.) (fig. no. 3.112).

   The occurrence of fog and mist have been noted over Imphal of Manipur, Chittagong of Bangladesh respectively (fig. no. 3.113).

   The occurrence of haze (fig. no. 3.114) has been noted over many places of India like Calcutta, Delhi, Bombay, Agra, Pune and Bhopal. It is mainly observed in the Industrial and urban belts.

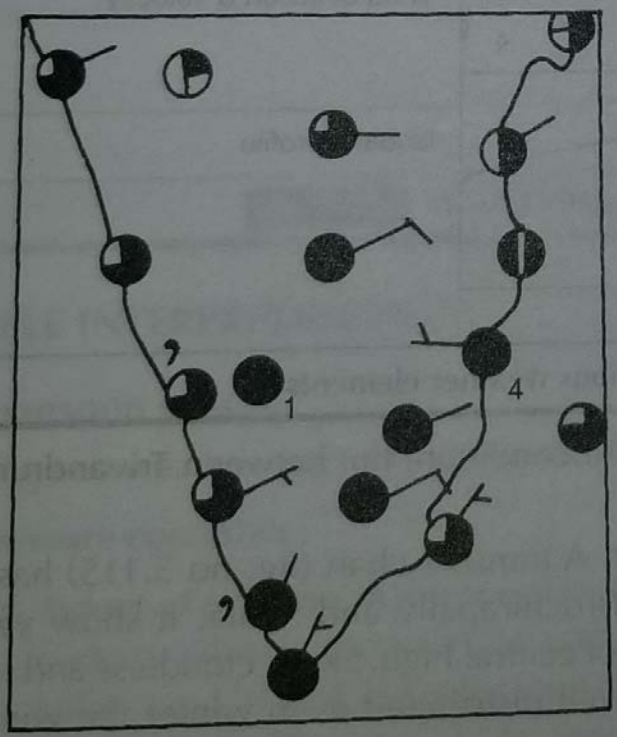


Fig. 3.111 Rainfall over Tamilnadu coast

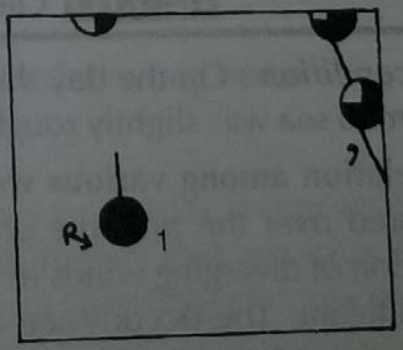


Fig. 3.112 Occurrence of Thunderstorm

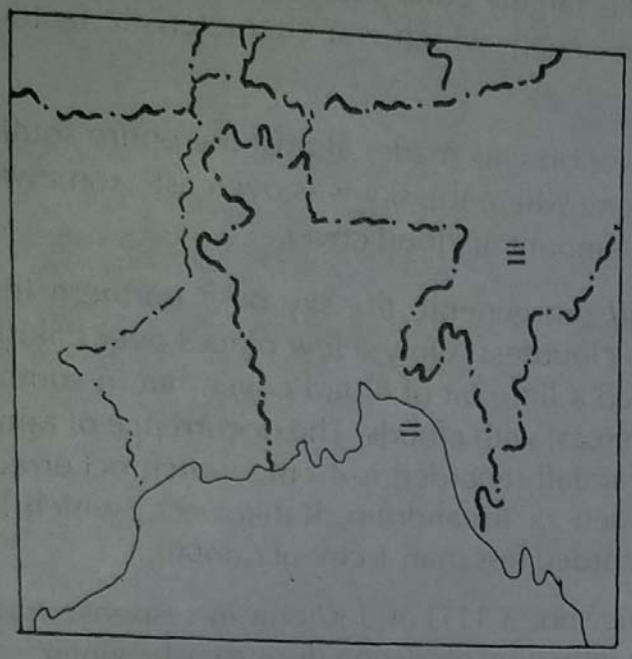


Fig. 3.113 Occurrence of Fog & Mist

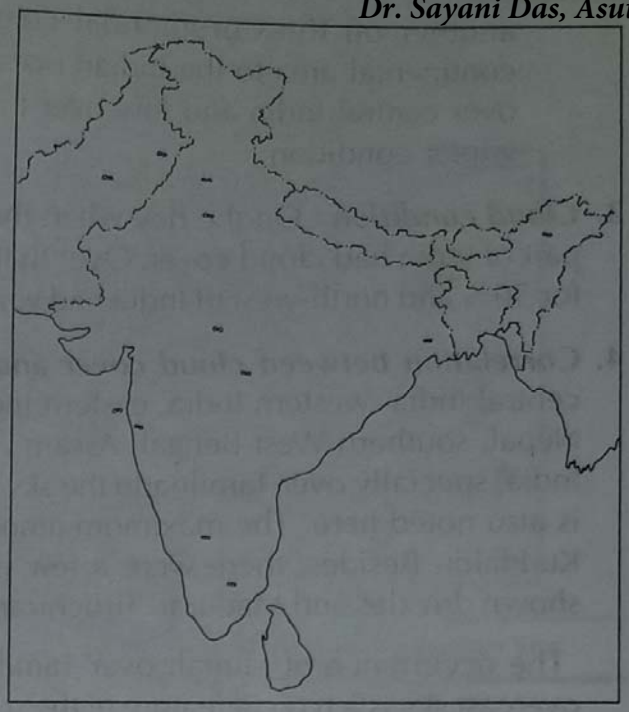


Fig. 3.114 Distribution of haze

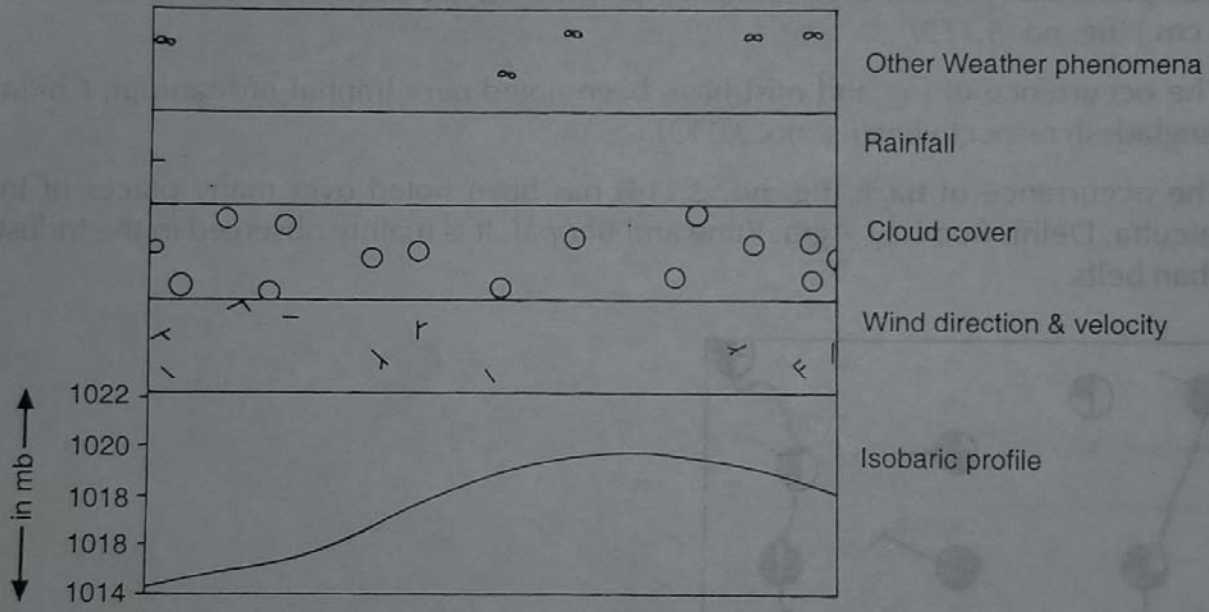


Fig. 3.115 Correlation among various weather elements

6. ***Sea condition :*** On the day the sea was in a calm condition, but between Trivandrum and Colombo sea was slightly rough (fig 3.105).

7. **Correlation among various weather elements :** A transect chart (fig. no 3.115) has been prepared over the pressure gradient between Tiruchirapally and Simla. It show variable direction of diverging winds in the surroundings of central high. Sky is cloudless and rainfall insignificant. The occurrence of haze is more well distributed as in winter the winds are heavy and hold smoke for a considerable time.

8. ***Identification of season :*** The general prevalence of north-easterly winds, the location of high pressure over the middle part of India, occurrence of fog and mist, overcast condition over the Tamilnadu, indicate that the observations were made during the early part of winter season.