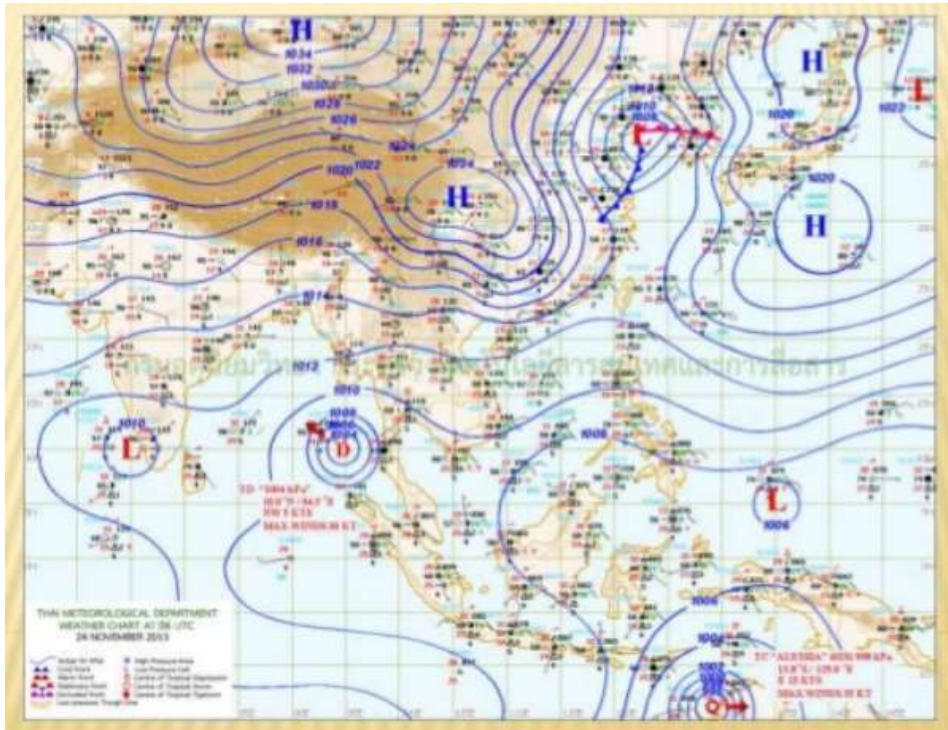


PREPARATION AND INTERPRETATION OF WEATHER MAPS



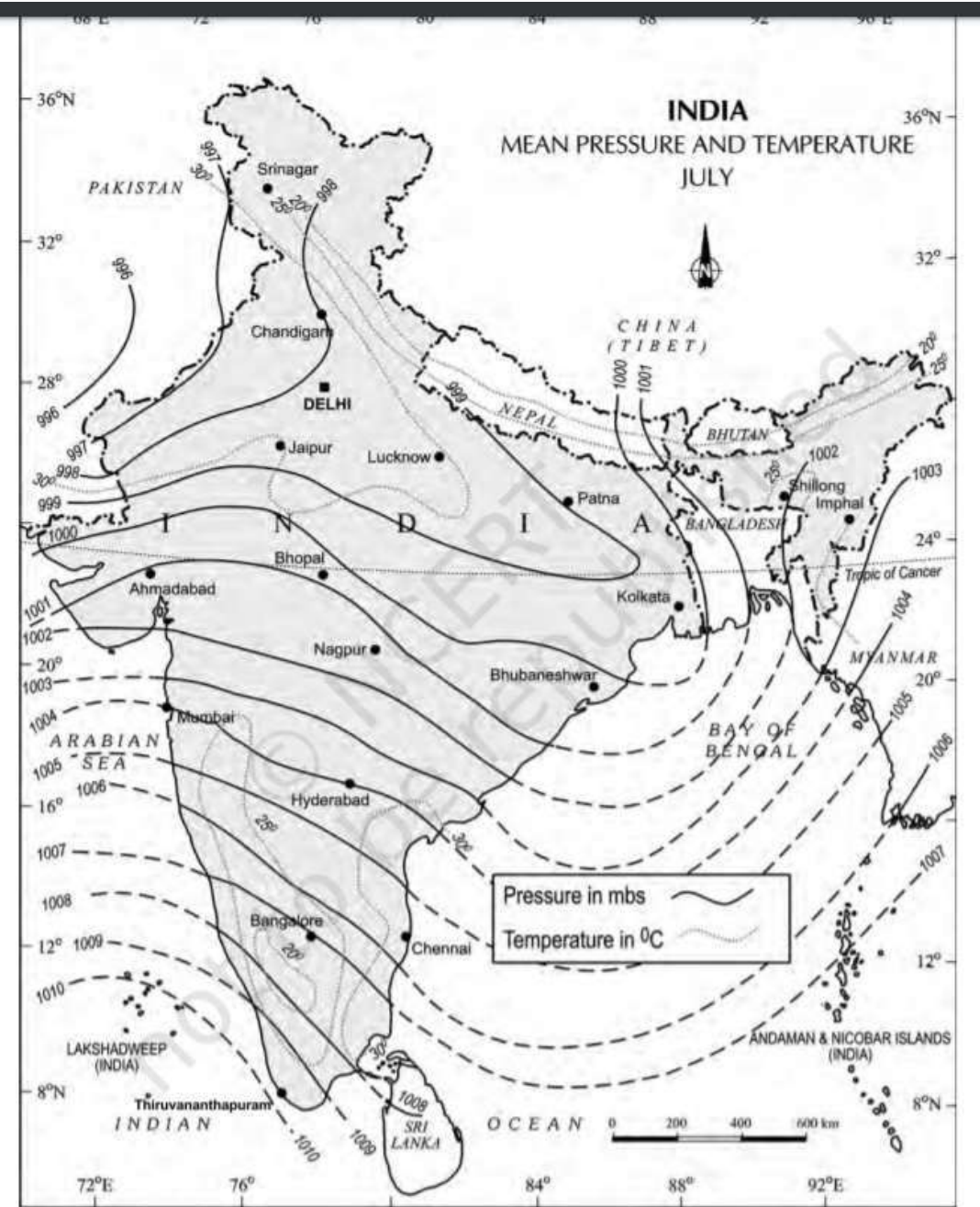
**FOR SEMESTER 2 HONS.
GEOGRAPHY
CC 4; TOPIC : 4**



Presented and Compiled By

Dr. Rajashree Dasgupta
Asst. Professor,
Dept. of Geography
Government Girls' General Degree College,
Kolkata -23

A **weather map** displays various meteorological features across a particular area at a particular point in time and has various symbols which all have specific meanings. Such maps have been in use since the mid-19th century and are used for research and weather forecasting purposes.



Meteorologists use weather maps and tools to help them see weather patterns and forecast weather.



History

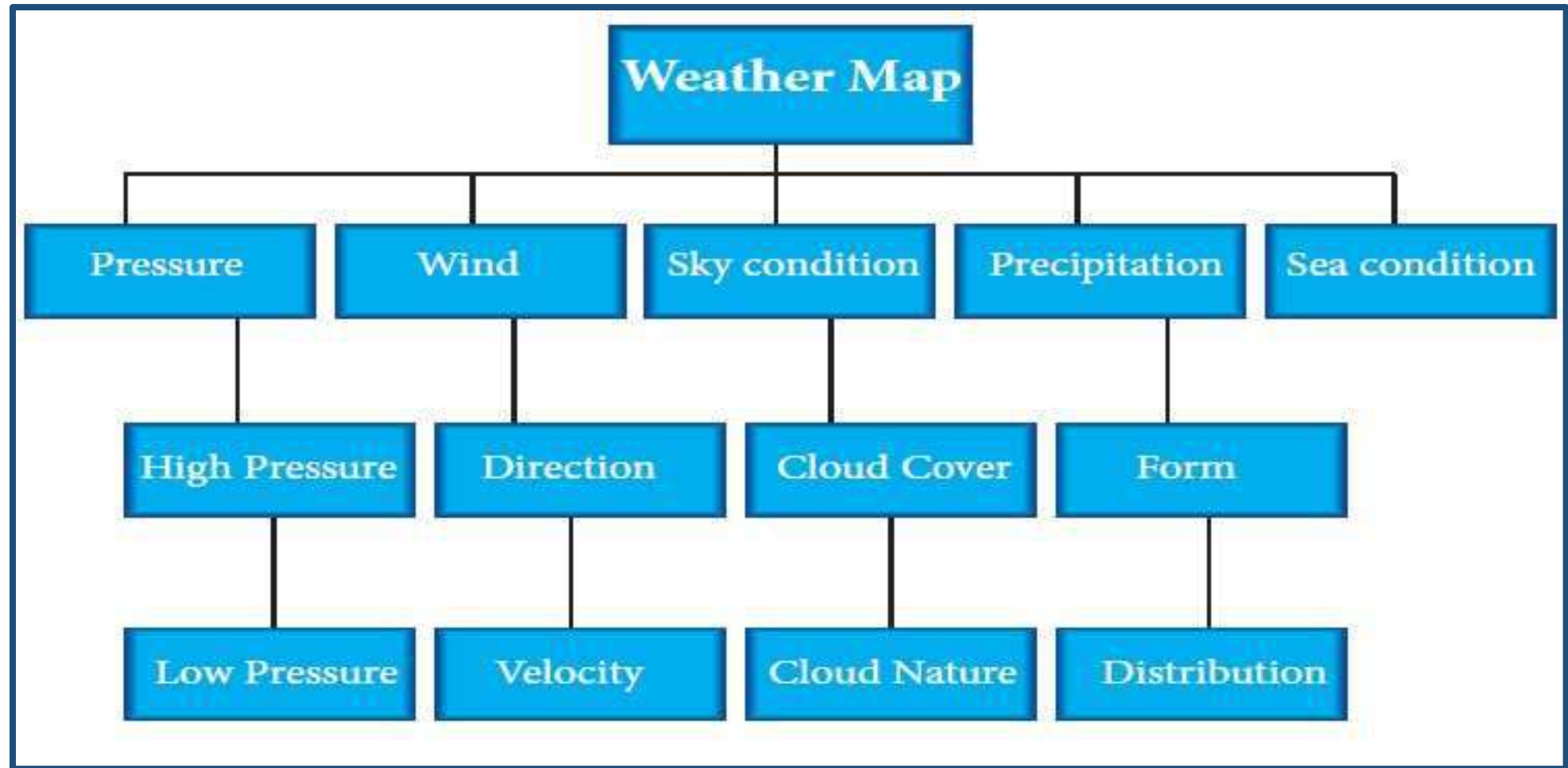


Sir [Francis Galton](#), the inventor of the weather map.

The use of weather charts in a modern sense began in the middle portion of the 19th century in order to devise a theory on storm systems. During the [Crimean War](#) a storm devastated the French fleet at [Balaklava](#), and the French scientist [Urbain Le Verrier](#) was able to show that if a chronological map of the storm had been issued, the path it would take could have been predicted and avoided by the fleet.

In [England](#), the scientist [Francis Galton](#) heard of this work, as well as the pioneering weather forecasts of [Robert Fitzroy](#). After gathering information from weather stations across the country for the month of October 1861, he plotted the data on a map using his own system of symbols, thereby creating the world's first weather map. He used his map to prove that air circulated clockwise around areas of high pressure; he coined the term 'anticyclone' to describe the phenomenon. He was also instrumental in publishing the first weather map in a [newspaper](#), for which he modified the [pantograph](#) (an instrument for copying drawings) to inscribe the map onto printing blocks. [The Times](#) began printing weather maps using these methods with data from the [Meteorological Office](#).

PREPARATION FOR CONSTRUCTION OF WEATHER MAPS



Schematic representation of weather map elements













The weather charts are prepared daily based on weather observations collected by the Indian Meteorological Department (IMD). The basic knowledge of weather elements is needed to interpret the weather maps. The essential weather elements to interpret the given weather maps are:

WEATHER SYMBOLS

Standardised by the World Meteorological Organisation and the National Weather Bureaus

○ Pure Air	▽ Shower of snow	┌ Hoar Frost
∞ Haze	▽ Shower of snow (Sleet) and Rain	∞ Glazed Frost
= Mist	✱ Soft Hail	∨ Soft Rime
≡ Fog v<1Km	△ Small Hail	∇ Hard Rime
≡ Shallow Fog	▲ Hail	↙ Gale
≡ Ground Fog	⚡ Distance Lightening	☉ Sunshine
≡ Frost Fog	⚡ Thunderstorm	⊕ Solor Halo
· Drizzle	⊕ Drifting snow (High Up)	☾ Lunar Halo
· Rain	⊕ Snowstrom	⊙ Solor Corona
✱ Snow	⊕ Drifting Snow (Near the Ground)	☾ Lunar Corona
✱ Sleet	∞ Dust or Sandstorm	☾ Rainbow
△ Granular Snow	☼ Dust Devil	☾ Aurora Borealis
△ Grains of Ice	☼ Snow Lying	☾ Mirage
→ Ice Needles	☾ Dew	☾ Zodiacal Light
▽ Shower of Rain		

Figure 8.8 Meteorological Symbols (Approved by the International Meteorological Organisation, Warsaw, 1935)

Beaufort No.	Wind	Arrow	Speed km/hr	Common effects
0	Calm		0	Calm, Smoke rise vertically.
1	Light air		1-5	Direction of wind shown by smoke drift, but not wind vanes.
2	Light breeze		6-11	Wind felt on face; leaves rustle; ordinary vane move by winds.
3	Gentle breeze		12-19	Leaves and small twigs in constant motion, wind extends light flag.
4	Moderate breeze		20-28	Raises dust and loose papers, small branches are moved.
5	Fresh breeze		29-38	Small tree in leaf begin to sway, crested wavelets from an inland waters.
6	Strong breeze		39-49	Large branches in motion; whistling heard in telegraph wires umbrellas used with difficulty.
7	Moderate gale		50-61	Whole tree in motion, inconvenience felt when walking against wind.
8	Fresh gale		62-74	Breaks twigs off trees; generally impedes progress.
9	Strong gale		75-88	Slight structural damage occurs (chimney pots and slates removed.)
10	Whole gale		89-102	Seldom experienced inland; trees uprooted, considerable structural damage occurs.
11	Storm		103-117	Very rarely experienced, accompanied by widespread damage.
12	Hurricane		118 plus	Most destructive.

Mapping the Climatic Data

Much of the climatic data is represented by line symbols. The most common of these are the isometric lines. These lines are depicted on the map as isopleths. The Isopleth can be interpolated for places having the same mean values of temperature, rainfall, pressure, sunshine, clouds, etc. Some of these lines and their uses are mentioned below:

Isobars : Lines connecting places of equal air pressure.

Isotherms : Lines connecting places of equal temperature.

Isohyets : Lines connecting places of equal amount of rainfall over a given period of time.

Isohels : Lines connecting places of same mean daily duration of sunshine.

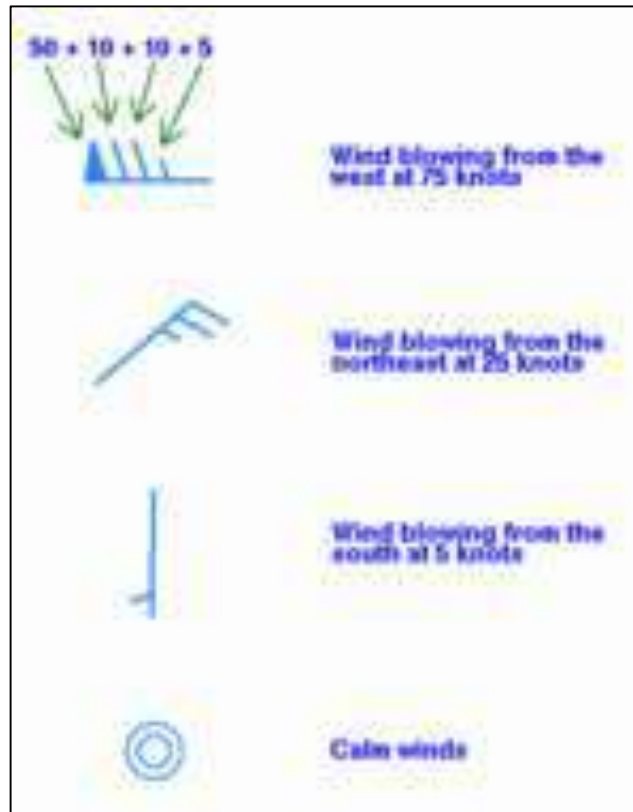
Isonephys : Lines connecting places of same mean value of cloud cover.

- Maps using [isotherms](#) show temperature gradients, which can help locate [weather fronts](#).
- [Isotach](#) maps, analyzing lines of equal [wind](#) speed, on a constant pressure surface of 300 or 250 [hPa](#) show where the [jet stream](#) is located.
- Use of constant pressure charts at the 700 and 500 hPa level can indicate [tropical cyclone](#) motion. Two-dimensional [streamlines](#) based on wind speeds at various levels show areas of convergence and [divergence](#) in the wind field, which are helpful in determining the location of features within the wind pattern.
- A popular type of surface weather map is the [surface weather analysis](#), which plots [isobars](#) to depict areas of [high pressure](#) and [low pressure](#). Cloud codes are translated into symbols and plotted on these maps along with other meteorological data that are included in synoptic reports sent by professionally trained observers.

Preparation of Weather Maps

Station model

A station model is a symbolic illustration showing the weather occurring at a given reporting station. Meteorologists created the station model to plot a number of weather elements in a small space on weather maps. Maps filled with dense station-model plots can be difficult to read, but they allow meteorologists, pilots, and mariners to see important weather patterns. A computer draws a station model for each observation location. The station model is primarily used on surface-weather maps, but can also be used to show the weather aloft. A completed station-model map allows users to analyze patterns in air pressure, temperature, wind, cloud cover, and precipitation.



- ❑ Station model plots use an internationally accepted coding convention that has changed little since August 1, 1941. Elements in the plot show the key weather elements, including [temperature](#), [dewpoint](#), wind, cloud cover, air pressure, pressure tendency, and precipitation.
- ❑ Winds have a standard notation when plotted on weather maps. More than a century ago, winds were plotted as arrows, with feathers on just one side depicting five knots of wind, while feathers on both sides depicted 10 knots (19 km/h) of wind. The notation changed to that of half of an arrow, with half of a wind barb indicating five knots, a full barb ten knots, and a pennant flag fifty knots.
- ❑ Because of the structure of the SYNOP code, a maximum of three cloud symbols can be plotted for each reporting station that appears on the weather map. All cloud types are coded and transmitted by trained observers then plotted on maps as low, middle, or high-étage using special symbols for each major cloud type. Any cloud type with significant vertical extent that can occupy more than one étage is coded as low (cumulus and cumulonimbus) or middle (nimbostratus) depending on the altitude level or étage where it normally initially forms aside from any vertical growth that takes place.
- ❑ The symbol used on the map for each of these stages at a particular observation time is for the genus, species, variety, mutation, or cloud motion that is considered most important according to criteria set out by the World Meteorological Organization (WMO).
- ❑ If these elements for any étage at the time of observation are deemed to be of equal importance, then the type which is predominant in amount is coded by the observer and plotted on the weather map using the appropriate symbol.

WEATHER MAPS INTERPRTATION

Weather Map Interpretation

- The weather map is a symbolic representation of the atmospheric conditions of an area at a given time. On a weather map, you will find isobars and symbols related to pressure, direction and velocity of winds, clouds, precipitation and sea condition on a base map with political boundaries. These details are recorded at different weather stations at specified time.
- Meteorological Departments forecast weather conditions by evaluating these weather elements shown on a weather map. This weather map is used in predicting weather conditions for a day, a week or a month in advance, which helps in taking precautions and safety measures. Weather forecasts help farmers, fishermen and crew of ships. It also helps air flights in predicting atmospheric condition a few hours ahead.
- Weather maps are the collection of weather information from various meteorological stations pertaining to the particular map area.

Pre Monsoon Months

Weather Map Interpretation

On the basis of the above information, we can analyse a weather map and understand the general pattern of weather conditions prevailing in different parts of the country. In Fig. 8.10 the general weather conditions prevailing in India during the month of May are plotted. There is a general increase of pressure towards the north and north-east. Two low-pressure centres can be identified with one over Rajasthan and the other over the Bay of Bengal. The low pressure centre is well developed over the Bay of Bengal marked by concentric isobars, with the lowest air pressure being 996 mb. The southern part of India has overcast skies. The central part of India, on the other hand, has generally clear skies. In the southern part of the eastern coast, the winds are mostly from the land to the sea, flowing in an anti-clockwise direction. Also, read Fig. 8.12 and find out the temperature and pressure conditions in July.

In Figures 8.11 and 8.13, the general weather conditions during winters in the month of January are plotted. There is a general increase of pressure towards the north from south. Most of the country has clear skies with a high-pressure region developing to the eastern side of India. The highest pressure isobar of 1018 mb passes through Rajasthan.

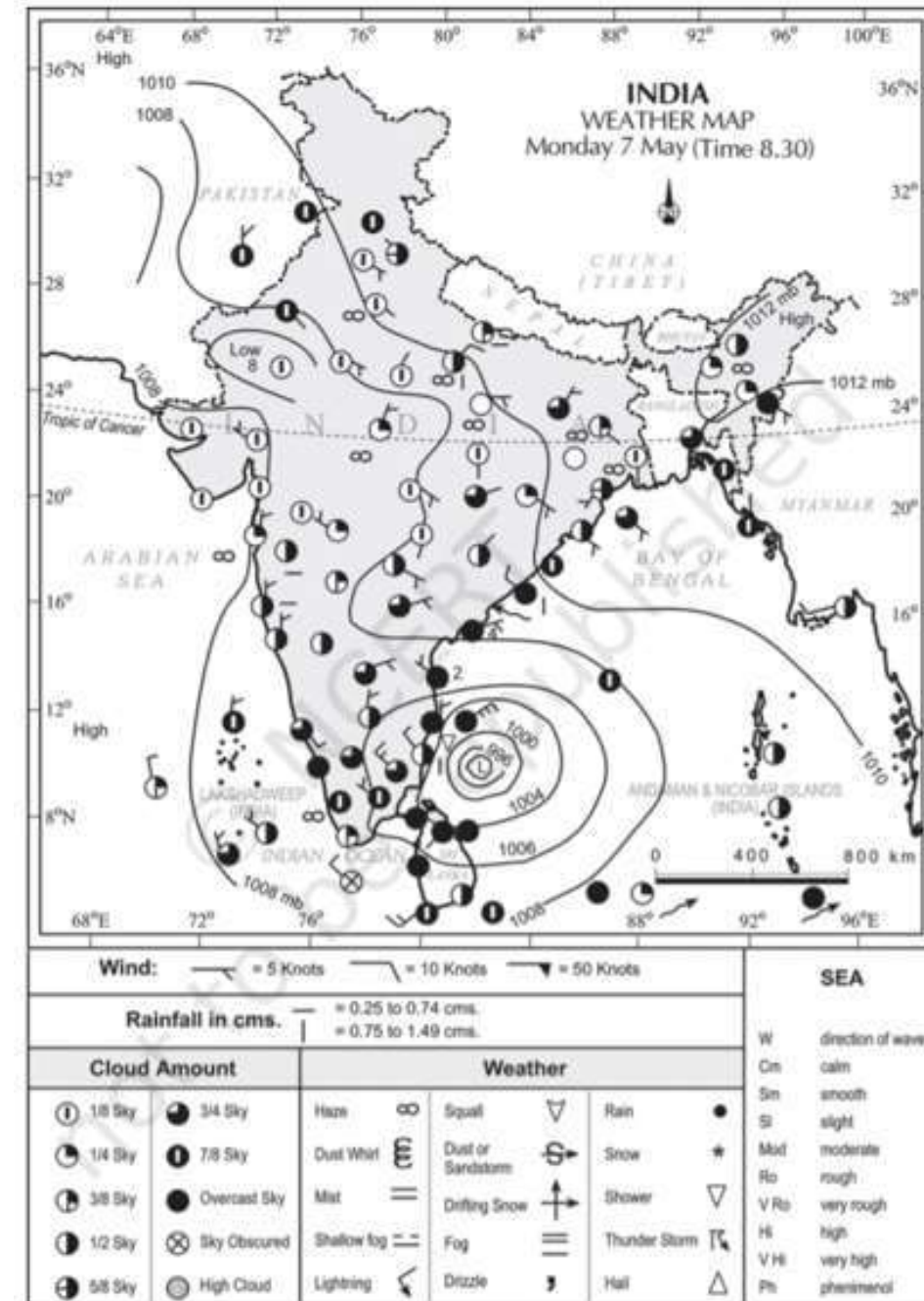
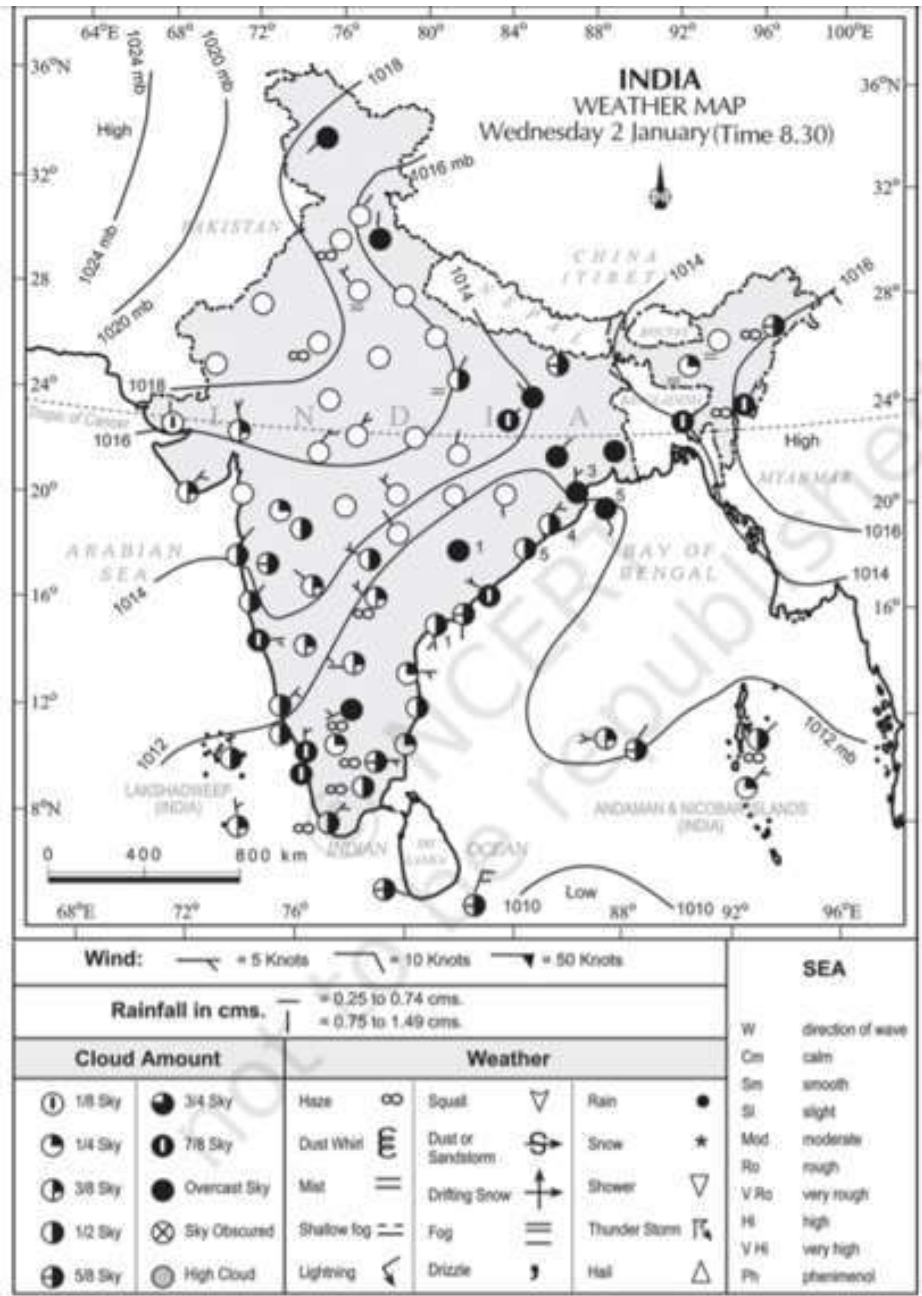
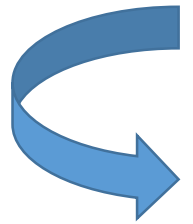


Figure 8.10 Indian Weather Map (for the month of May)

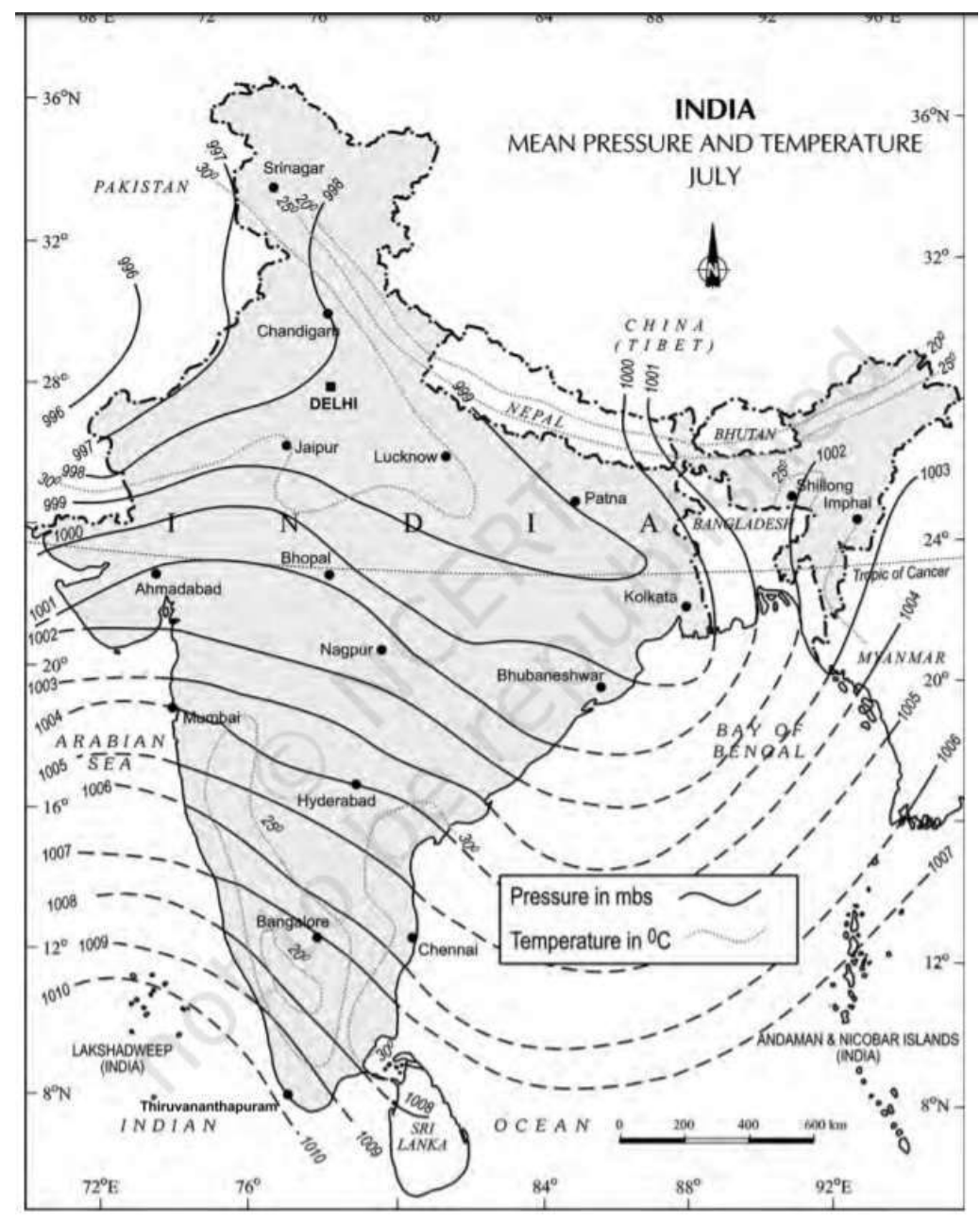
January

Temp. & Pressure Conditions



July

Temp. & Pressure Conditions



Monsoon Months

Weather Map Interpretation

The Indian daily weather map is a political map of India, which also includes Pakistan, Afghanistan, part of China, Nepal, Bhutan, Myanmar and Sri Lanka with weather symbols indicating recorded weather data, isobars and keys for symbols.

Weather Map Interpretation – Monsoon Season (Example 1)

Weather map interpretation includes study and interpretation of all the weather parameters. The given weather map depicts the observed weather conditions on Monday 1st June 1992 at 08.30 Hrs I.S.T (0300 HRS GMT). Generally in India this observation is predicted as the southwest monsoon season that gives rain.

The key elements for weather map interpretation are:

Range of Isobars: From the given weather map it is observed that the isobars range from 1002 mb to 1010mb. The lowest value of 1002 mb is found over Bihar and West Bengal as an enclosed isobar. The 1010 mb is the highest value and is observed in the extreme south western part of the Arabian Sea.

Location of Low Pressure: In this weather map, four low pressure zones are identified. Low pressure prevails in Bihar and West Bengal, North Western Pakistan, Assam, Eastern part of India and Lakshadweep Island.

Location of High Pressure: The high pressure prevails over Afghanistan with 1008mb and the other high pressure prevails over the south western part of the Arabian Sea with 1010 mb.

INDIAN DAILY WEATHER REPORT WEATHER MAP AT 08.30 HRS .I.S.T. (0300 HRS. G.M.T) Monday 1 June 1992 (11 Jyaishta 1914 Saka)

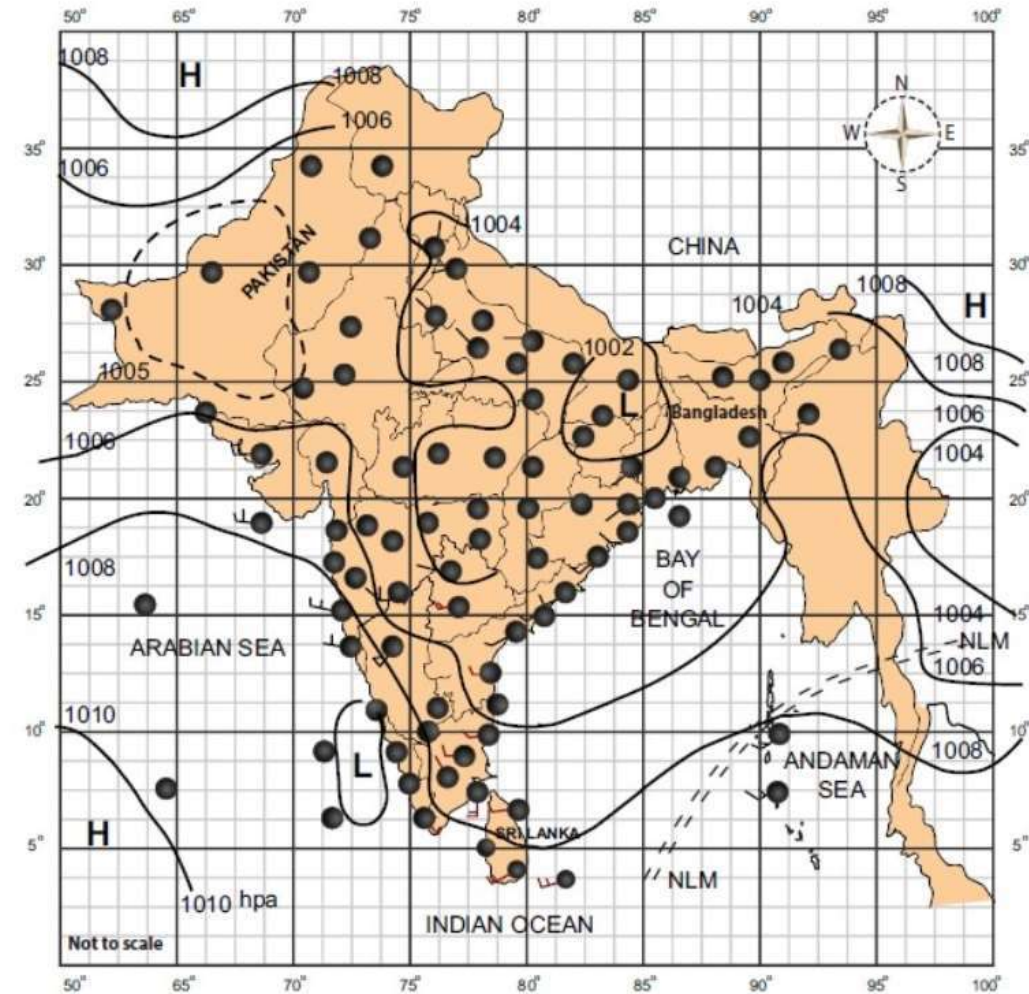


Figure 12.4 Example 1 (Monsoon Season)

Contd.....

Gradient of Pressure: On this map, the pressure gradient is steep along the western coast of India.

Wind Direction: The wind moves from west to east in the extreme southern part of India, The wind flows from North West to the south east in the rest of the Plateau region. The wind velocity ranges from 5 – 15 knots in most of the places on the given day.

The wind is not strong in North but comparatively strong in south.

Cloud Cover: Clear sky is noticed in the North and north western part of India. Eastern coastal states are partly clouded and the southern states show extreme cloudiness and or overcast.

Sea Condition: Northern Limit of Monsoon prevails over the Andaman Sea.

Precipitation: The rainfall occurred in Assam and Meghalaya because low pressure prevails in near Assam, southern parts of Karnataka, Kerala and Lakshadweep.

Departure of Maximum and Minimum temprature from Normal

Day temperature is above normal in the west, Karnataka and eastern parts of India. Below normal in the places like northwest India and extend over the adjoining areas.

Conclusion: The general prevalence of the South Westerly winds the location of low pressure over the land and high pressure over the ocean, the occurrence of rainfall over South and eastern part of India. This season is observed as the monsoon season.

Monsoon Months

INDIAN DAILY WEATHER REPORT
WEATHER MAP AT 08.30 HRS .I.S.T. (0300 HRS. G.M.T)
Monday 1 June 1992 (11 Jyaishta 1914 Saka)

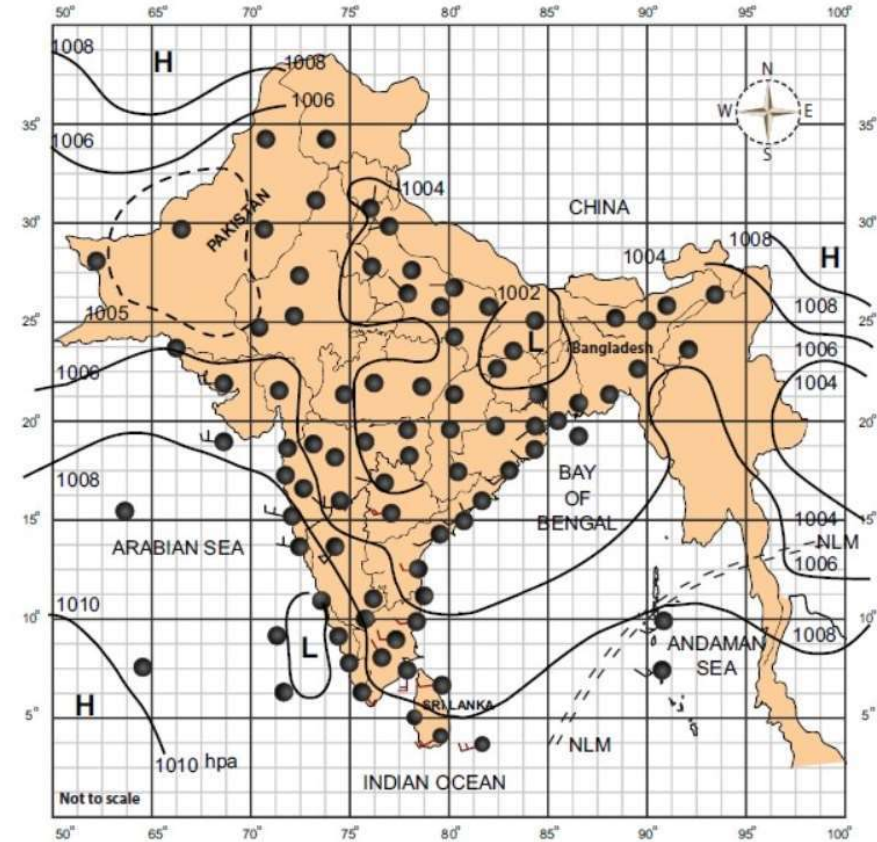


Figure 12.4 Example 1 (Monsoon Season)

Weather Map Interpretation – Post Monsoon Season

The given weather map shows the weather condition on Tuesday 5th November 1991 at 08.30 Hrs IST 0300 Hrs GMT.

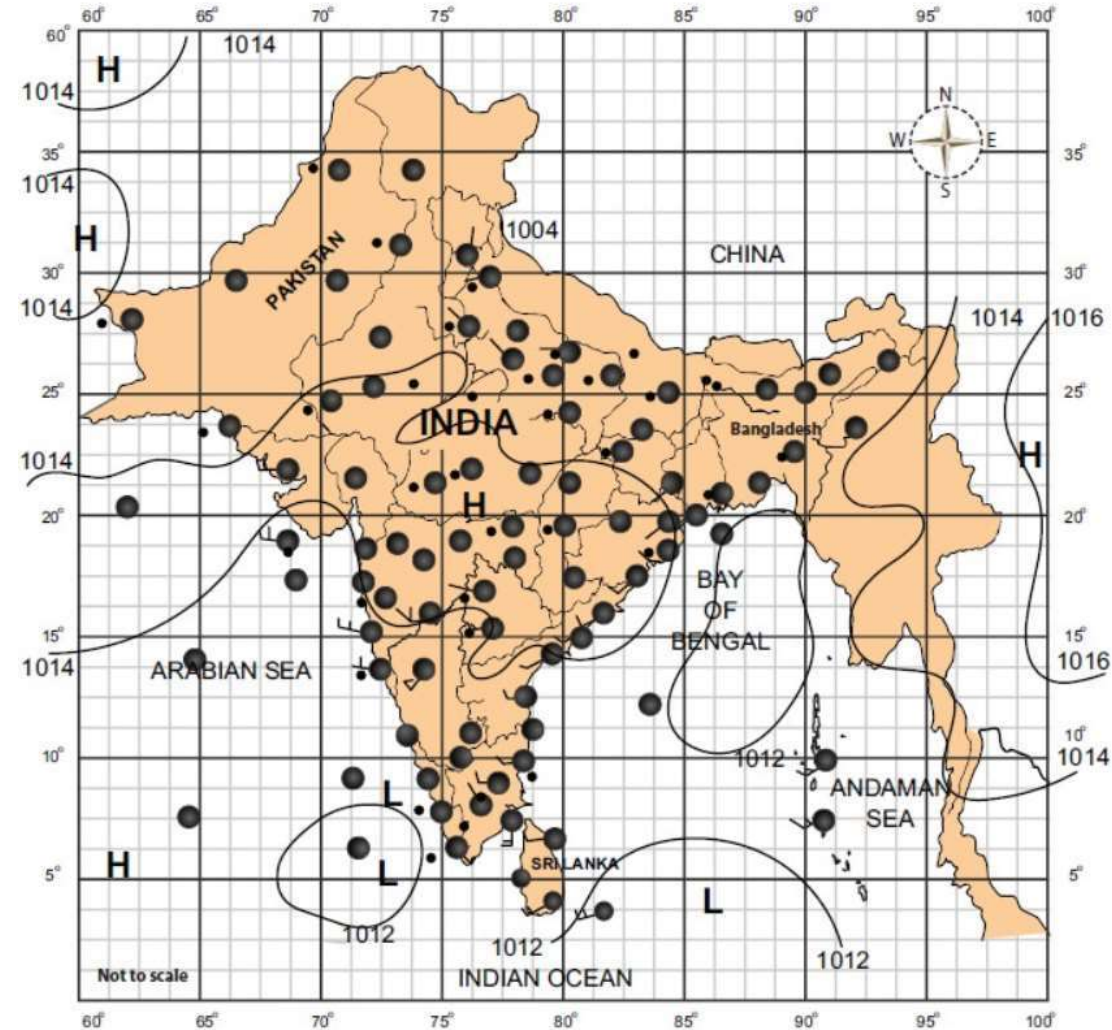
Distribution of Pressure Condition

a. **Low Pressure:** Low pressure areas exist over Northern and Southern Bay of Bengal and Lakshadweep (1012mb).

b. **High Pressure:** Central part of India, the plateau region is marked with High pressure. High pressure also prevails over Gujarat and Rajasthan. The other two high pressure areas are located in Afghanistan (1014mb), to the East of India. The pressure gradient is gentle throughout India.

c. **Wind Condition:** Calm weather prevails in north western coast of Orissa. Winds are northern in Tamilnadu, Southerly in Gujarat. In Central India, it is from the northeast.

INDIAN DAILY WEATHER REPORT
WEATHER MAP AT 08.30 HRS .I.S.T. (0300 HRS. G.M.T.)
Tuesday 1 November 1991 (14 Jyaishta 1913 Saka)



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Post Monsoon Season

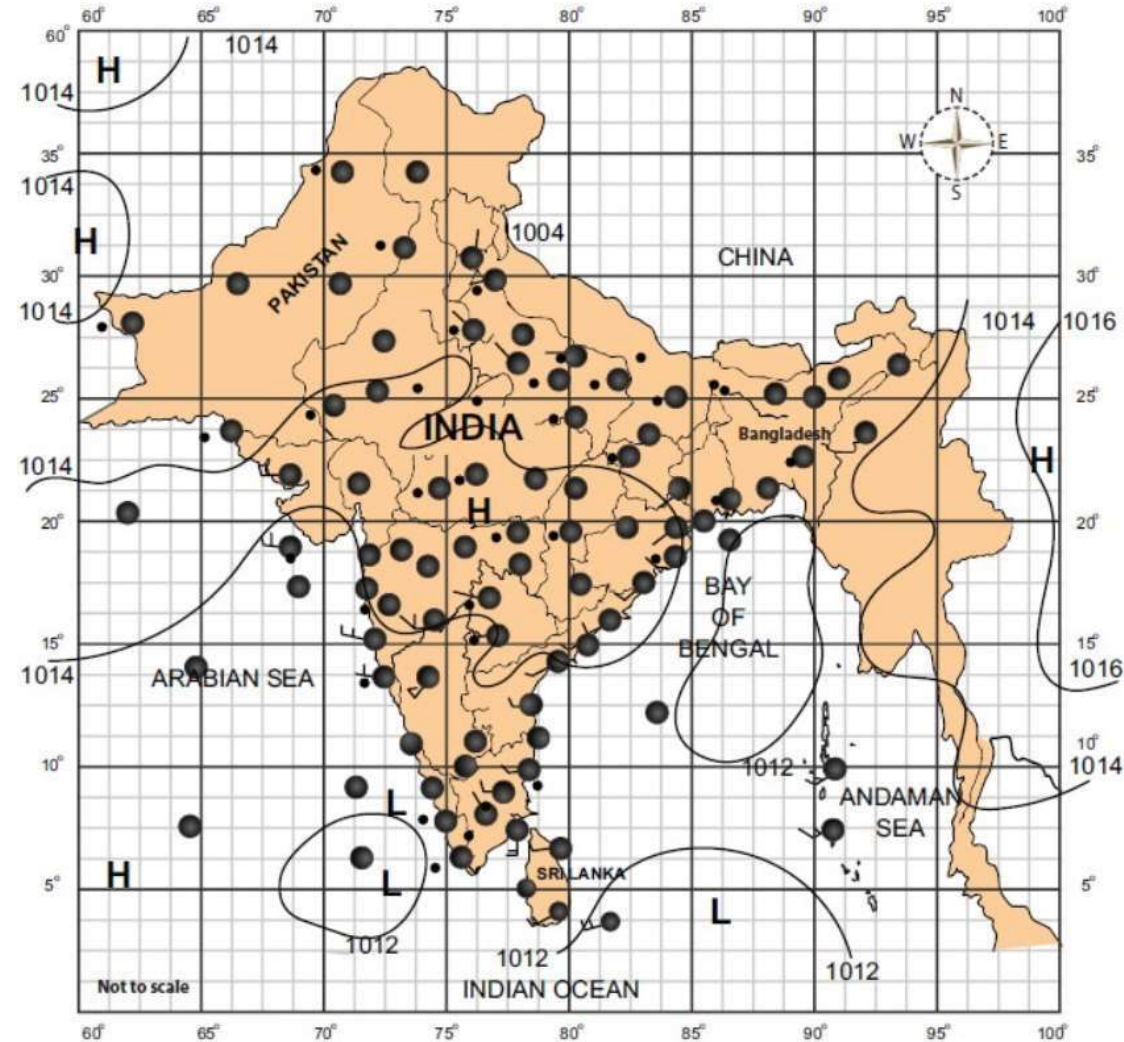
Sky Cover: Sky cover is almost clear in North. In the South, it is partially cloudy. Sea condition is moderate. Haze is found near north eastern part of India.

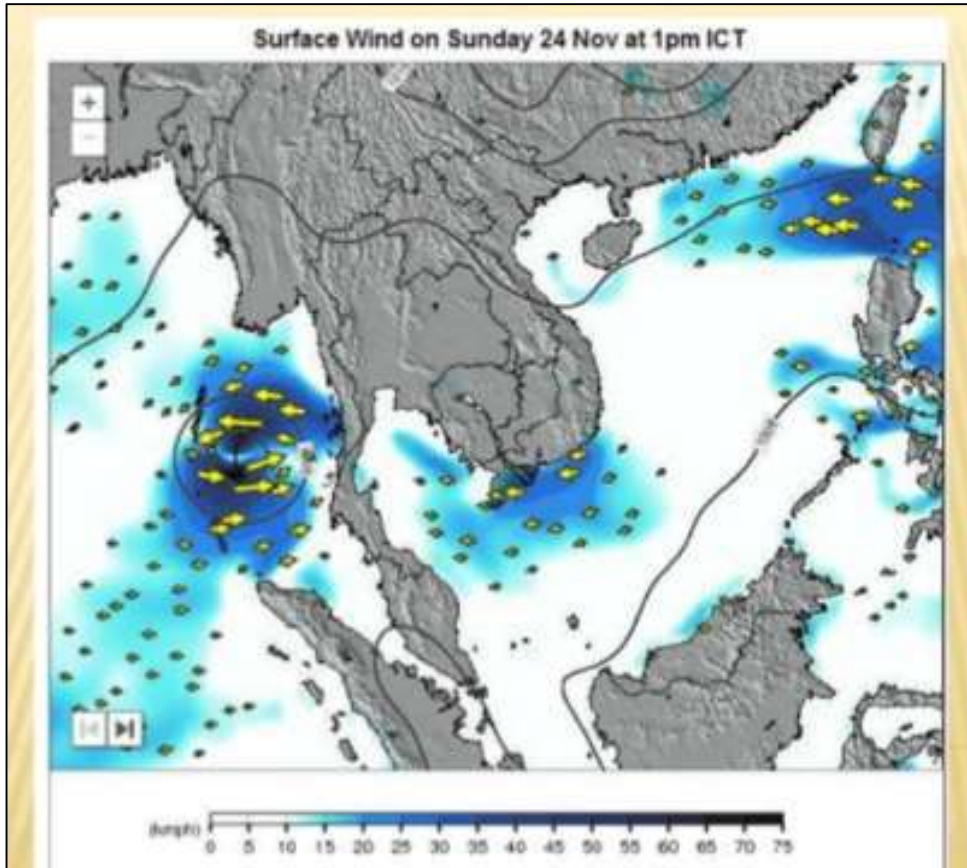
e. **Precipitation:** Rain or thundershowers have occurred at a few places in coastal Andhra Pradesh, Tamil Nadu and South Interior Karnataka at one or two places in Telangana, Rayalasaema and Kerala.

f. **Departure of Maximum and Minimum temperature from Normal:** South west states record above normal temperature, eastern states have below normal temperature, except of the northwestern part of Rajasthan.

Conclusion: Low pressure prevails in sea and High pressure inland, so it indicates north east monsoon.

INDIAN DAILY WEATHER REPORT
WEATHER MAP AT 08.30 HRS .I.S.T. (0300 HRS. G.M.T)
Tuesday 1 November 1991 (14 Jyaistha 1913 Saka)





References :

- [1. http://ncert.nic.in/textbook/pdf/kegy308.pdf](http://ncert.nic.in/textbook/pdf/kegy308.pdf)
- [2. https://en.wikipedia.org/wiki/Weather_map](https://en.wikipedia.org/wiki/Weather_map)

THANK YOU