

1. NORMAL SEA LEVEL PRESSURE AND WIND ROSES
2. REPRESENTATIVE WEATHER MAPS

1. Normal Sea Level Pressure and Wind Roses

Atmospheric pressure is the pressure of the stationary atmosphere and the value gained by multiplying the mass of the air on the unit area by the acceleration of its gravity. Atmospheric pressure is widely used in weather forecasts and others as an important indicator.

Atmospheric pressure constantly changes, depending on the meteorological condition. It also varies, depending on the altitude of the observation point. As these two elements of variation in atmospheric pressure are tied in with one another, it would not be possible to indicate a difference in meteorological condition even if the values of pressure observed at different altitudes were compared. To indicate a meteorological condition with accuracy, the value observed at a given point is converted in terms of pressure on the sea surface for use. This converted value is known as pressure reduced to the mean sea level or sea level pressure.

The Japan Meteorological Agency observes pressure four prescribed times (0300, 0900, 1500 and 2100 hours) a day and regards the mean of the observed values as mean pressure.

The wind is represented in terms of two elements—the direction in which it blows (wind direction) and its speed (wind speed). Since the wind direction constantly varies, its changes are observed for about one minute before the direction is determined.

The wind rose represents the frequency in percentage of the wind direction expressed with one of 16 directions and the frequency in percentage of calm (which suggests a situation in which there is no or little wind with the velocity standing at less than 0.3m/s) on the basis of the wind direction records observed at eight fixed times (0000, 0300, 0600, 0900, 1200, 1500, 1800 and 2100 hours) a day.

The wind speed is not uniform. Even if strong winds blow instantaneously, there are many cases in which the winds, when averaged, are not very strong. To indicate the wind speeds, the expressions, such as maximum peak gust, maximum wind speed and mean wind speed, are used, and the anemometer suitable for measuring each type of velocity is put to use. The Dines pressure-tube anemograph with which the velocity is computed from the pressure exercised by winds is used to measure the instantaneous velocity and others, whereas the Robinson cup anemometer with which the velocity is determined with the amount of the air which blows off in a prescribed span of time (generally, 10 minutes) is used to measure the mean velocity.

The day in which a maximum wind speed of more than 10 meters is registered in an optional duration of 10 minutes is generally known as a stormy day. The number of these days is indicated in the Wind Roses.

To obtain the mean velocity, the daily mean wind speed is computed from the wind speeds recorded with an anemometer for 24 hours, and the value thus calculated is used in computing the monthly and annual mean wind speed. Mean wind speed values are published for the decade extending from 1961 to 1970. The annual changes in mean wind speed at 10 selected points are indicated by graph.

Sources

1. Japan Meteorological Agency, Climatic Table of Japan, Pt. 1, Monthly Normals (1941–1970), 1972.
2. Japan Meteorological Agency, Climatic Table of Japan, Pt. 2, Monthly Normals by Stations (1941–1970), 1972.
3. Japan Meteorological Agency, Monthly Meteorological Reports, every month in 1961–70.
4. Japan Meteorological Agency, Data of Wind Direction from Meteorological offices, every day from 1961–1970.

2. Representative Weather Maps

The weather map represents the distribution of atmospheric pressure, weather in various places, wind conditions and other elements. It provides information with which to recognize weather conditions at a given point and forecasts subsequent changes in weather.

Winter Type (West high, east low): This is the type in which the northwesterlies blow across the sky of Japan. The typical weather brought about by this weather type is that the sky over the Japan Sea side becomes covered with thick clouds bringing snow, whereas on the Pacific Ocean side, the weather is continuously fine and dry. This type makes its appearance in late October at the earliest and lingers around through January till a little beyond the middle of February. Even in April, it sometimes makes its appearance. In this pattern, the weather, which has been spring like once again gets cold. This is generally known as a return of the cold rigors of winter.

Low Pressure Appears Over the Eastern China Sea: The extratropical cyclone which has generated over the Eastern China Sea advances to the northeast or east in the neighborhood of Japan. This type of cyclone, when generated, gets just as strong as a small typhoon and gives an impression that a sudden storm has developed because of its swift movement. This type of weather makes its appearance in all seasons with the exception of midsummer, and its appearance is particularly frequent in January through April. When this type of cyclone passes off the south coast of Honsyū, it sometimes snows in various parts of the Pacific Ocean side.

In a type of weather similar to the above, a cyclone which has generated either in the Eastern China Sea or in the west of the Japan Sea moves over the north of Japan in a northeast direction. This is known as the Japan Sea Cyclone Type. This type frequently makes its appearance from early winter through early spring. When this type of cyclone violently spawns over the Japan Sea in early spring, streams of warm air flow in on the cyclone, with the result that warm weather sets in at various places along the Pacific Coast south of the Kantō Region as if it were spring or early summer. The foehn phenomenon on the Japan Sea side gives rise to floods and landslides, fires and disasters at sea.

Northeast Pattern: This is the type in which an anticyclone leans and hangs over the north of Honsyū from the Asian continent and a cyclone moves east off the south coast of Honsyū. Except for midsummer, this type of weather is prevalent all year round, especially in autumn and winter. In this pattern, it often gets cloudy or drizzles throughout the country.

Moving High Type: In this type, an anticyclone moves over Japan from west to east with a front situated far south from the south coast of Honsyū. This is a typical weather pattern in spring and autumn and it uncommonly makes its appearance in winter. This pattern brings about fine weather all over Japan, but this weather does not last long because the anticyclone is a type that moves.

Belting Type High: This is the type in which moving anticyclones pass off the south coast of Honsyū or over its inland one after another. In a weather map, the isobars are seen running across from east to west like belts. This pattern frequently makes its appearance in the middle of autumn. Fine weather continuously prevails over west Japan and the Kanto Region which are enclosed by a belt of anticyclones which stretches from east to west, whereas the weather is changeable in north Japan across which troughs of atmospheric pressure pass.

Baiu Pattern: In this type, the front running across Japan and its periph-

ry from east to west spawns in the transition from early summer to midsummer. This front is known as the Baiu front. It is generated at the point where the subtropical air mass over the south of Japan comes in contact with the subpolar air mass over the north. In late May when the subpolar air mass is still powerful, the Baiu front crosses the vicinity of Okinawa from east to west. With a subtropical air mass spawning later, the front moves northward little by little. The Baiu front extends over Honsyū from east to west from late June to mid-July. Immediately before the height of summer, it goes north to the periphery of Hokkaidō. The long spell of rain, which is known as Baiu or Tuyu, represents the rain which falls when this front is stationary. In some years, no conspicuous Baiu phenomena has been observed in Hokkaidō and the north area of the Tōhoku Region. When a cyclone develops near China and advances along the Baiu front, localized torrential rains occur.

Summer Type (South high, north low): There are anticyclones over the sea south to Japan and cyclones north of Japan. This pattern frequently makes its appearance in early summer and midsummer. Particularly, it lasts a long time in midsummer and presents a typical summer weather map. High humidity tends to give rise to a heat thunderstorm. When anticyclones over the Pacific Ocean spawn, it does not rain for many days particularly in west Japan, sometimes giving rise to a drought.

Heat and Frontal Thunderstorm: When thunder is generated by the two elements of heat and frontal thunderstorms, it is called the heat and frontal thunderstorm. Bringing about a violent thunderstorm, it frequently makes its appearance in midsummer.

Typhoon: This represents the pattern in which a typhoon comes close to Japan. It mostly prevails from summer to autumn.

Autumn Type (Autumn rain front): When the subpolar air mass pushes the Pacific Ocean air mass southward in the last days of summer, there appears a front at the point where these air masses are in contact with each other. This pattern is frequently seen from September to October, and unsettled rainy weather prevails. Bearing a close parallel to Baiu which makes its appearance from early summer to midsummer, this phenomenon is known as "Syūrin," or a long spell of rain in autumn.

In some cases, the daily weather map does not show any of these typical patterns of air pressure distribution. It sometimes represents a transitional pattern or a combination of some of these patterns.

The classification and designation of the patterns of atmospheric distribution and the identification of the types of weather maps differ to some extent, depending upon the viewpoint.

Salient Points of the Legend and Map Compilation

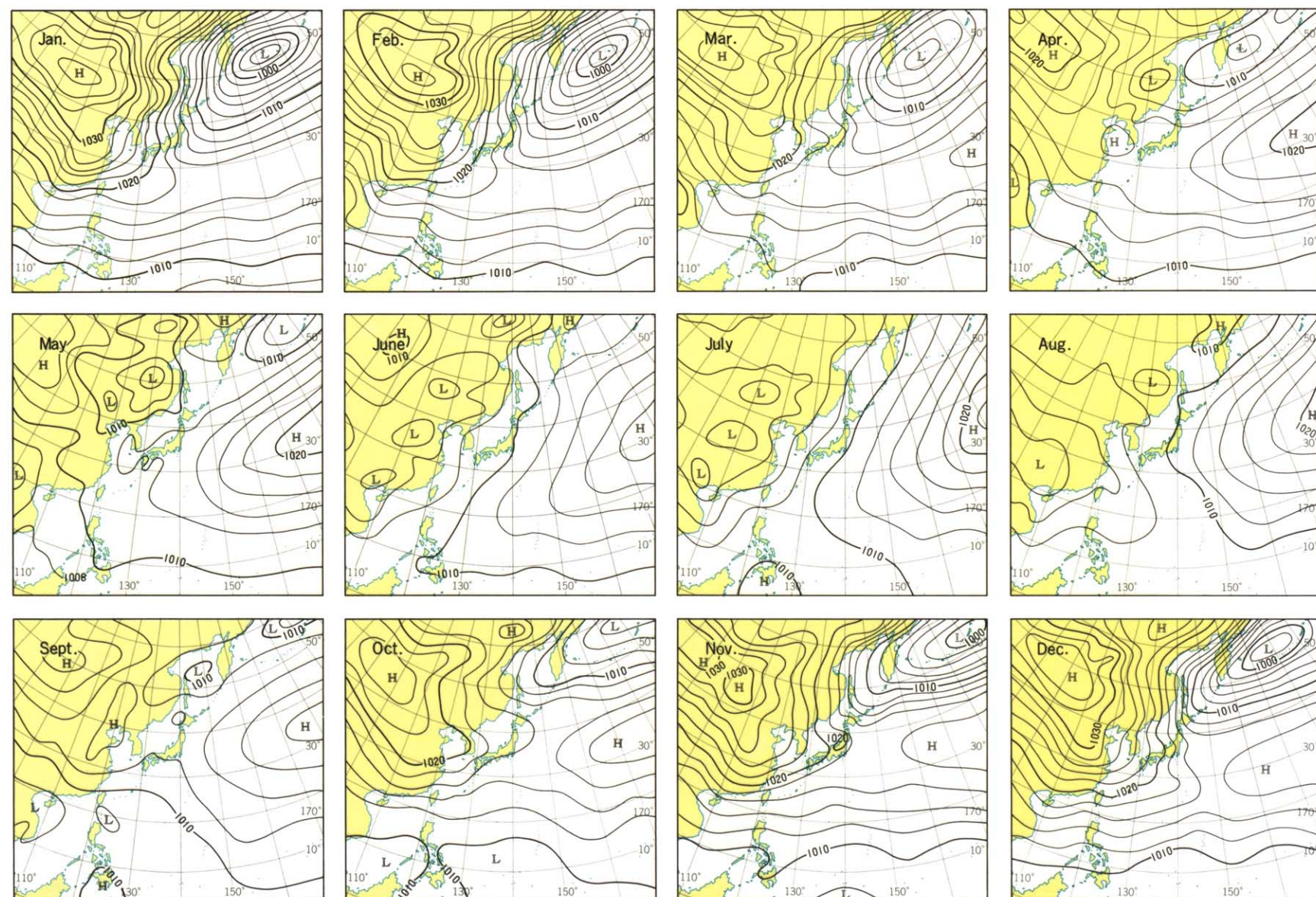
12 typical weather maps were selected from among the daily weather maps prepared from 1966 to 1970 and arranged in the order of their preparation.

The weather symbols used on this map are partial revisions of those which are generally used in Japan and carried in the weather maps of newspapers. They are not in accord with the international system.

Sources

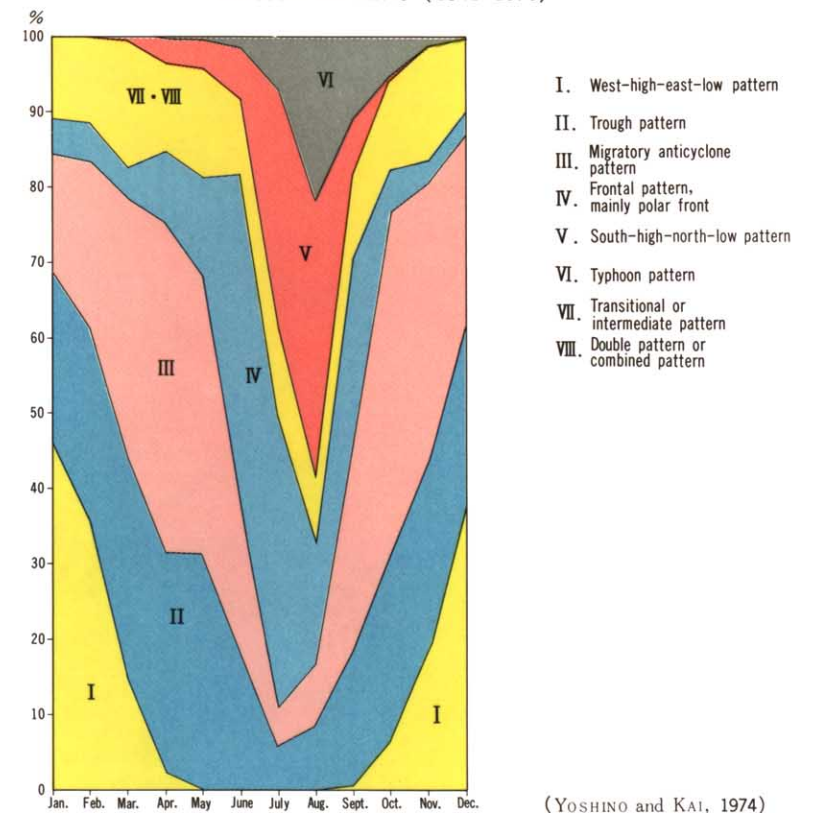
1. Various data from Japan Meteorological Agency.
2. Japan Meteorological Association, Collection of Weather Maps, 1966–1970.
3. Masatoshi YOSHINO and Keiko KAI, Climatological Notes 16, University of Tsukuba, 1974.

NORMAL MONTHLY SEA LEVEL PRESSURE IN THE FAR EAST (1951–1960)



(Compiled from Climatic Atlas of Japan)

MONTHLY CHANGE OF OCCURRENCE FREQUENCIES OF PRESSURE PATTERNS (1941–1970)



(YOSHINO and KAI, 1974)

NORMAL SEA LEVEL PRESSURE AND WIND ROSES

Normal sea level pressure
 1010.0mb
 1012.5
 1015.0

Wind rose
 10%
 Frequency of each wind direction in sixteen points in percentage
 The red figure represents the frequency of calm in percentage
 The blue figure represents the number of days with maximum wind speed 10 m/s and over

Normal sea level pressure : average for the period 1941-1970
 Wind rose : based on the records for the Period 1961-1970

1:8,000,000

Mean wind speed

