

# Wind System

## What is Wind?

The wind is the horizontal movement of air caused by:

1. Heating by the Sun
2. Rotation of earth on its axis

The formation of the wind system begins with the sun's radiation, which is absorbed differently on the earth's surface. The earth's surface is heated differently because of scenarios like cloud cover, mountains, valleys, water bodies, vegetation and desert lands.

As a result of this uneven heating, there are bound to be earth surfaces that vary a lot in temperature. Air on surfaces with higher temperatures will then begin to rise because it is lighter (less dense). As the air rises, it creates low atmospheric pressure. Air on surfaces with cooler temperatures sink (do not rise). The sinking creates higher atmospheric pressure. This behaviour of warm gases or liquids moving upward and being replaced by cooler particles is called **Convection**. The energy moving during convection is called **convectioal current**.

To know how [Cyclones](#) are formed through high-pressure winds, visit the linked article.

A good example is how a tropical depression forms, where warm air over hot tropical waters rise, and high-pressure cold air quickly rushing to fill the space.

## Types Of Winds

### Local Winds

Local winds are those that are created as a result of scenery such as mountains, vegetation, water bodies and so on. They can move from mild to extreme winds in just hours. Good examples of local winds are sea breezes and land breezes, and mountain and valley breezes. Local winds cover very short distances.

### Permanent Winds

They are really large air masses that are created mainly as a result of the earth's rotation, the shape of the earth and the sun's heating power.

#### **Trade winds:**

This is the belt extending as far as 30° north and south latitude of the Inter-Tropical Convergence Zone (ITCZ).

#### **Westerlies:**

This is the belt extending from 30° to 60° latitude from the ITCZ.

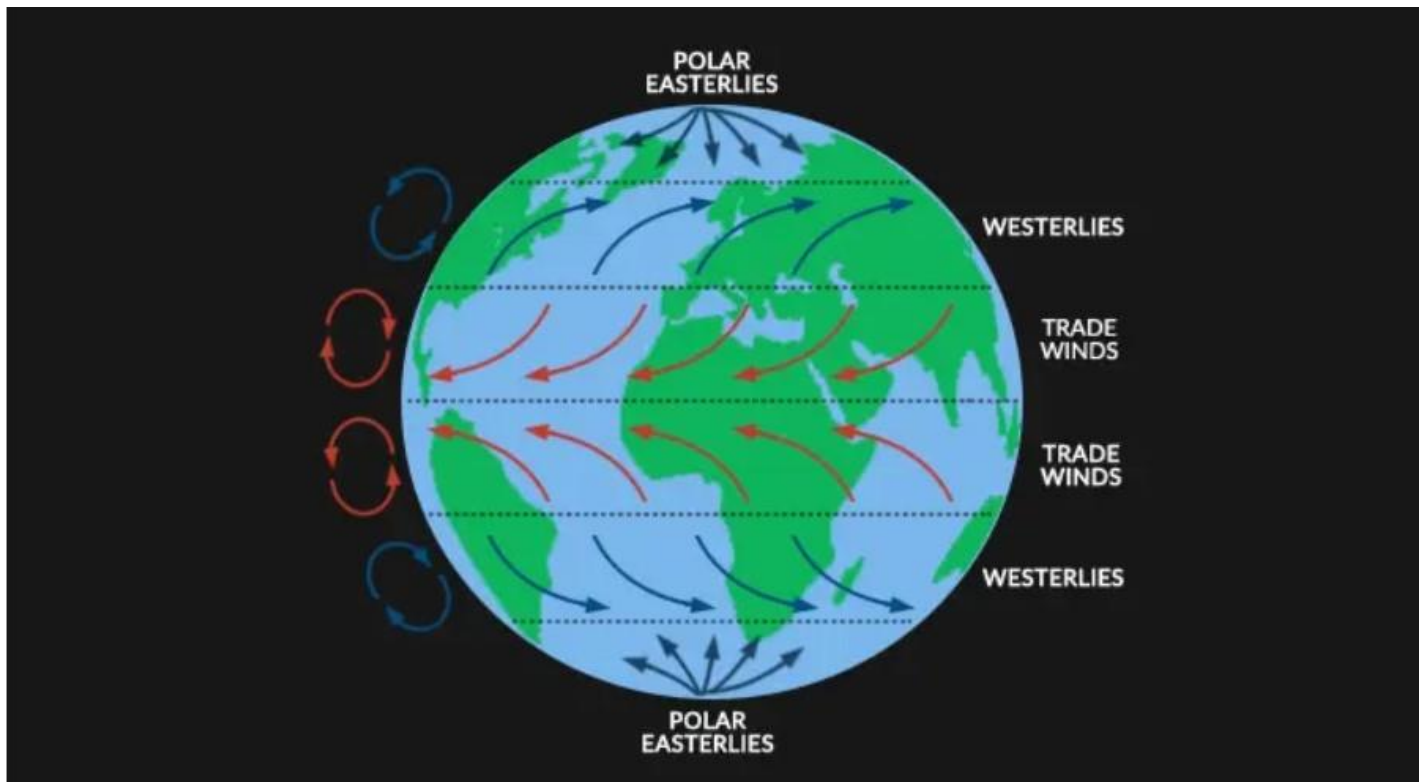
#### **Easterlies:**

This belt covers from 60° latitudes to the north and south poles.

## Coriolis Force

It is an apparent force caused by the earth's rotation. The Coriolis force is responsible for deflecting winds towards the right in the Northern Hemisphere and towards the left in the Southern Hemisphere. This is also known as 'Ferrel's Law'.

As the winds blow from the north and south towards the equator, their flow path is deflected by the earth's rotation. When moving objects are viewed in a reference frame, their path looks curved. This is the *Coriolis Effect*, and it is simply caused by the earth's rotation. This effect makes wind systems in the southern side of the equator (southern hemisphere) spin clockwise and wind systems in the northern side (north hemisphere) spin counter-clockwise.



## Wind Measurement

Winds come in all directions or speeds. They are measured by their directions and speeds.

Depending on the cause of the winds, they can blow in many directions. Some good examples of wind direction are the Easterly winds, which blow from east to west, and westerly winds which blow from west to east. There are also winds that blow from the north, southwards and also those from the south blowing northwards.

### **Anemometers**

Anemometers measure the direction of winds.

### **The Wind Vane**

Another instrument in wind measurement is the wind vane.

## Front

This is the boundary between two large air masses. It is the meeting point between cold, dense air and warm light air. At a front, warm is pushed upwards because of its less density. A front can be very intense or mild, depending on the temperatures of the two air masses meet. Air masses with extreme temperatures will produce a fierce front, whereas air masses with little temperature difference will produce a very mild front.

## Prevailing Winds

This is simply a term used for winds that are most frequent in its' direction and speed over a specific geographic region. Different geographic areas have different prevailing winds because of the factors that shape them.

Eg: the trade winds, the westerlies, and the polar easterlies.

## Jet Stream

This was discovered in the 1940s (during World War II). Pilots noticed that their flying speeds were significantly reduced when flying against some areas in the upper troposphere. Jet streams can be found in the upper troposphere. They are very strong winds.

These are a narrow belt of high altitude (above 12,000 m) westerly winds in the troposphere. Their speed varies from about 110 km/h in summer to about 184 km/h in winter. A number of separate jet streams have been identified. The most constant are the mid-latitude and the sub-tropical jet stream.

Jet Streams develop where air masses of differing temperatures meet. So, usually, surface temperatures determine where the Jet Stream will form.

## Beaufort Wind Force Scale

In 1805, a British Naval Officer invented this scale to measure wind force. The scale has a read of 0 up to 12 to classify wind force.