

Paper code: GGY HC – 2026

Part- I

Group- A: Climatology

Topic: Planetary Winds: Meaning, Classification, and Characteristics

The winds blowing almost in the same direction throughout the year are called **permanent winds**. These winds are also called as **invariable** or **planetary** winds because they involve larger areas of the globe. On average, the location of the high and low-pressure belts is considered to be stationary on the globe (though they are seldom stationary). Consequently, winds blow from high-pressure belts to low-pressure belts. The direction of such winds remains more or less the same throughout the year though their areas change seasonally. Thus, such winds are called **permanent** winds. Since these winds are distributed all over the globe and these are related to thermally and dynamically induced pressure belts and rotation of the earth and hence they are called **planetary** winds. These winds include trade winds or tropical easterlies, westerlies, and polar winds or polar easterlies.

- a) **Trade winds:** Trade winds blow in a belt lying between 5°N-30°N in the northern hemisphere and 5°S-30°S in the southern hemisphere. These are extremely steady winds blowing from subtropical high-pressure areas towards the equatorial low-pressure belt. These winds should have blown from the north to south in Northern Hemisphere and south to north in Southern Hemisphere, but, they get deflected to the right in Northern Hemisphere and to the left in Southern Hemisphere due to Coriolis effect and Ferrel's law. Thus, they blow as northeastern trades in Northern Hemisphere and southeastern trades in Southern Hemisphere. These winds are called trade winds because of the fact that they helped the sea merchants in sailing their ships as the direction of the trade winds remains more or less constant and regular. They are also known as **tropical easterlies**, and they blow steadily in the same direction. They are noted for consistency in both force and direction. It may be pointed out that the zone of trade winds is called **Hadley Cell** on the basis of the convective model prepared by Hadley for the entire earth.

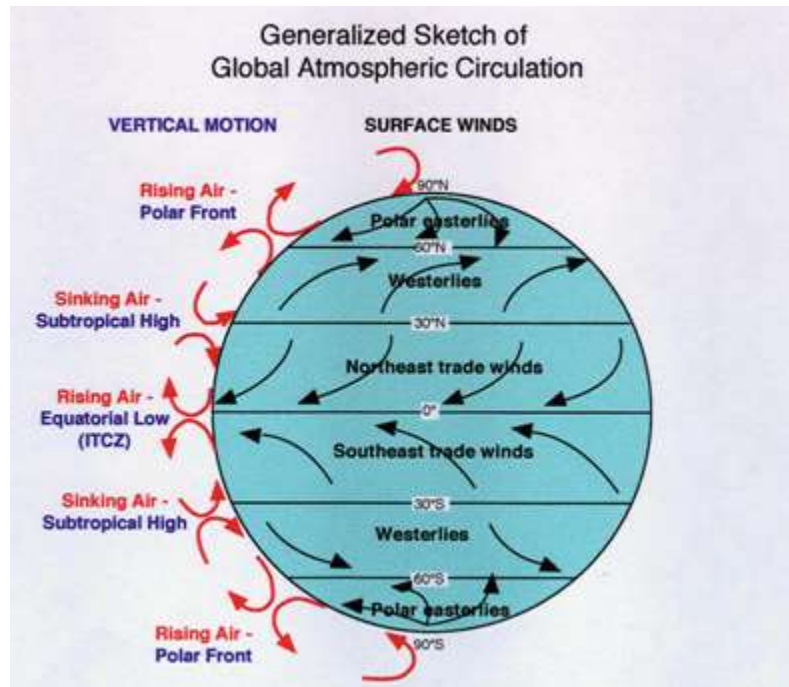


Fig: Generalised global pattern of planetary winds

b) **Westerlies:** The permanent winds blowing from the subtropical high-pressure belts (30°-35°) to the sub-polar low-pressure belts (60°-65°) in both the hemispheres are called **westerlies**. The general direction of the westerlies is south-west (SW) to north-east (NE) in the northern hemisphere and north-west (NW) to the south-east (SE) in the southern hemisphere. The general characteristic features of the westerlies are largely modified due to cyclones and anticyclones associated with them. Because of the dominance of land in the northern hemisphere, the westerlies become more complex and complicated and become less effective during summer seasons and more vigorous during winter seasons. These westerlies bring much precipitation in the western parts of the continents because they pick up much moisture while passing over the vast stretches of the oceans. The westerlies become more vigorous in the southern hemisphere because of the lack of land and dominance of the oceans. Their velocity increases southward and they become stormy. They are also associated with boisterous gales. The velocity of the westerlies become so great that they are called **roaring forties** between the latitudes of 40°-50° S, **furious fifties** at 50° S latitude and **shrieking sixties** at 60° S latitude.

c) **Polar Winds:** The polar easterlies are the dry, cold prevailing winds that blow from the high-pressure areas of the polar highs at the north and south poles towards low-pressure areas within the Westerlies at high latitudes. These winds blow within the latitudinal belt of 60° - 65° in both the hemispheres. Cold air subsides at the pole creating the high pressure, forcing a southerly (northward in the southern hemisphere) outflow of air towards the equator. This outflow is then deflected westward by the Coriolis effect, therefore these prevailing winds blow from the east to the west. Since the winds originate in the east, they are then known as **easterlies**. Unlike the westerlies in the middle latitudes, the polar easterlies are often weak and irregular.
