

Chapter 6: Air Pressure & Global Winds

Convection currents are continuous movements of water caused by the expansion of the water as its temperature rises. These currents arise in the atmosphere above warm land masses or seas, giving rise to sea breezes and land breezes, respectively.

What causes wind?

Wind is caused from air flowing from high pressure to low pressure

The wind is deflected to the right in the Northern hemisphere and directed to the left in the Southern Hemisphere. The wind does not travel exactly from high pressure to low pressure centers because of the rotation of Earth.

Low Pressure system: The atmospheric pressure is lower than the surrounding area. They form under areas of wind divergence which occur in upper levels of the troposphere. Less dense, lower air pressure

High Pressure Systems: The atmospheric pressure at the surface of the Earth is greater than the surrounding area. Winds flow outward from the higher pressure area towards the lower pressure area. Gravity affects the force because of the compression of air with a greater density at the center.

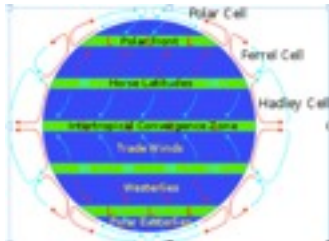
Coriolis Effect: Deflects anything that flies or flows across Earth's surface from going in a straight path. Earth rotates eastward so, objects curve to the right in the Northern hemisphere and to the left in the Southern hemisphere. Coriolis Force is zero along the equator.

Air pressure: Air pressure is the amount of pressure that air exerts upon a certain area or region. Changes in air pressure are measured using an instrument called a barometer.

Wind Measured: Is measured by its speed and direction. wind speed is measured by anemometers and red by anemometers – usually three cups that capture the wind rotating around a vertical axis. The wind direction is measured with weather vanes.

Global Patterns of Movement: Winds are named after the direction from which they blow. There are six major wind belts, three in each hemisphere. All belts move north in the northern summer and south in the northern winter

- Polar easterlies:
 - Blow irregularly from east and north.
 - Dry, cold weak prevailing winds
 - Blow from high pressure systems at N & S poles towards the low pressure systems in the westerlies
 - Poles to ~ 60° S or N
- Westerlies:
 - Prevailing winds in the middle



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latitudes

- ~60° S or N to ~30° S or N
- Blowing from the high pressure area in the horse latitudes towards the poles
- Blow from west to east
- Steer extratropical cyclones
- Strong winds, strongest in western hemisphere
- Stronger in southern hemisphere because they're mostly over water
- Trade winds:
 - Blow from the northeast toward the equator
 - 30° N or S to the equator
 - Northeast trade winds blow mostly northeast to the equator
 - Southeast trade winds blow mostly southeast to the equator
 - Found in the tropics closer to Earth's surface (lower troposphere)
 - Stronger in the winter
 - Act as the steering flow for tropical storms that form over Atlantic, Pacific

Polar Front: between the polar easterlies and westerlies. It arises from the cold polar air meeting the warm tropical air. Where mid-latitude cyclones form. Low pressure area. Wind flow is pushed up away from the Earth's surface.

Subtropical Highs: between the Westerlies and the Trade winds. High pressure area. Receives little precipitation. Once the air reaches Earth's surface it moves towards the poles or the equator as part of the prevailing trade winds or westerlies. NH - "calms of Cancer" SH- "calms of Capricorn". Warm and dry.

Inter-tropical Convergence Zone (ITCZ): at the equator where the northeast and southeast trade winds come together. Appears as a band of clouds, usually thunderstorms. Moves north and south following the sun during the year

Seasonal Shift: All belts move north during the northern summer and south during the northern winter.

Land and sea breezes: land gains & loses heat faster than water. The land warms faster than water during the day. The warm air becomes thinner and rises drawing cooler air from the sea. The cold air during the night that lays over the land is pushed out over the sea.

Monsoon: Describes seasonal changes in atmospheric circulation and precipitation associated with the asymmetric heating of land and sea. During the summer the continents heat more rapidly than the oceans. Wet season is produced when the warm, thin air rises and the cold moist ocean air moves outward from the continents. Major monsoon systems: West African and Asia- Australian monsoons

Earth's Gravitational Force: Pulls the air downwards and produces a density distribution. The heavier air is below the lighter air. In a high pressure area, cold and heavy air sinks

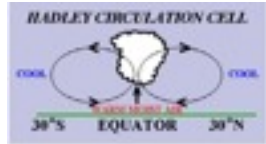
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from a higher level, creating wind that moves towards a low pressure area where it rises and completes the wind circulation.

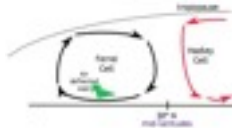
Pressure gradient Force: responsible for causing the movement of air. Created by the unequal heating of the Earth's surface when incoming solar radiation concentrates at the equator. The differences in barometric pressure are what create the pressure gradient force. Barometric pressure readings are lower in less dense, hot temperatures and higher in more dense and colder temperatures. Isobars between high and low pressure areas show the pressure gradient. Close isobars = strong winds/ steep pressure gradient, spread apart isobars = light winds/ gradual pressure gradient

Friction Force: Slows wind as it travels over the Earth's surface. Decreases as height increases. Without friction the wind would move parallel to the isobars at high speeds.

Hadley cell: The rising air that reaches the tropopause moves poleward, becoming a westerly wind due to the Coriolis force. The poleward moving air speeds up and piles up forming an area of high pressure at the surface (subtropical highs). Once the air sinks and reaches the surface, some flows to the equator. Which would form the trade winds.



Ferrel Cell: Some of the diverging air at the surface near 30°N moves poleward and is deflected to the east because of the Coriolis force resulting in the prevailing westerly winds at the surface. @ 60°N the air rises cools and condenses and forms clouds and precipitation. Around the polar front.



Polar Cell: sinking air at the poles warms and results in a high pressure over the poles. The poleward moving air gets pulled by the Coriolis force forming the polar easterly winds. The cold polar wind meets the warm subtropical air forming the polar front. The warm air from the subtropics pushes over the cold equatorward moving polar air.

