Topic Page: Winds

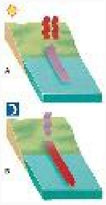


Image from: **Onshore winds (A) generally occur during the day....** in *Philip's Encyclopedia*

Summary Article: **wind**
From *The Columbia Encyclopedia*

flow of air relative to the earth's surface. A wind is named according to the point of the compass from which it blows, e.g., a wind blowing from the north is a north wind.

Wind Direction and Velocity

The direction of wind is usually indicated by a thin strip of wood, metal, or plastic (often in the shape of an arrow or a rooster) called a weather vane or weathercock (but more appropriately called a wind vane) that is free to rotate in a horizontal plane. When mounted on an elevated shaft or spire, the vane rotates under the influence of the wind such that its center of pressure rotates to leeward and the vane points into the wind.

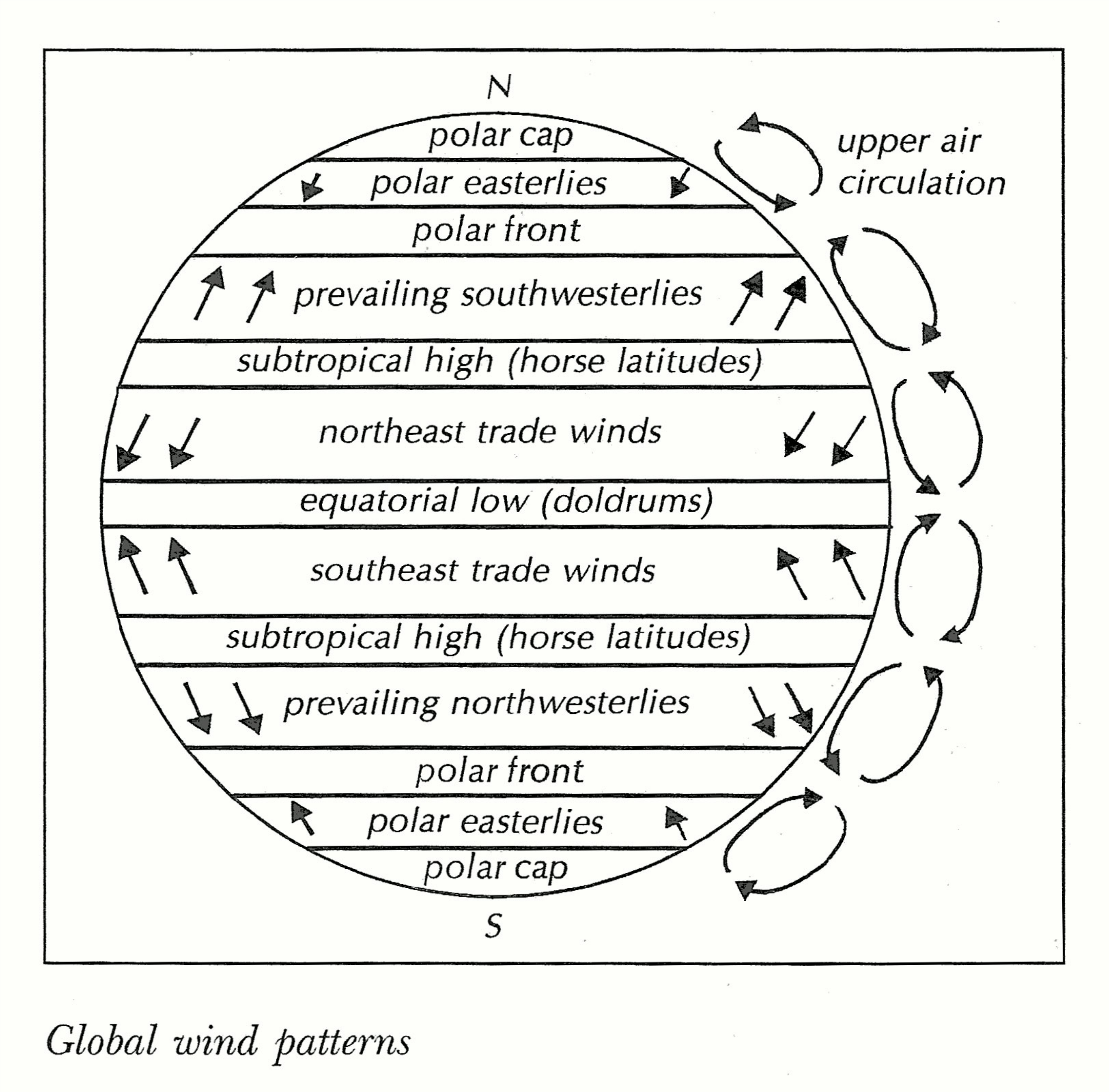
Wind velocity is measured by means of an anemometer or radar. The oldest of these is the cup anemometer, an instrument with three or four small hollow metal hemispheres set so that they catch the wind and revolve about a vertical rod; an electrical device records the revolutions of the cups and thus the wind velocity. The pressure tube anemometer, used primarily in Commonwealth nations, is conceptually a Pitot tube mounted on a wind vane. As the wind blows across the tube, a pressure differential is created that can be mathematically related to wind speed. Doppler radar can be used to measure wind speed by shooting pulses of microwaves that are reflected off rain, dust, and other particles in the air, much like the radar guns used by the police to determine the speed of an automobile. Although the U.S. National Weather Service has estimated that tornado winds have reached a velocity of 500 mph (800 kph), the highest wind speeds ever documented, 318 mph (516 kph), were measured using Doppler radar during a tornado in Oklahoma in 1999.

The first successful attempt to standardize the nomenclature of winds of different velocities was the Beaufort scale, devised (c.1805) by Admiral Sir Francis Beaufort of the British navy. An adaptation of Beaufort's scale is used by the U.S. National Weather Service; it employs a scale ranging from 0 for calm to 12 for hurricane, each velocity range being identified by its effects on such things as trees, signs, and houses. Winds may also be classified according to their origin and movement, such as heliotropic winds, which include land and sea breezes, and cyclonic winds, which blow counterclockwise in low-pressure regions of the Northern Hemisphere and clockwise in the Southern Hemisphere.

Prevailing Winds and General Circulation Patterns

Over some zones around the earth, winds blow predominantly in one direction throughout the year and are usually associated with the rotation of the earth; over other areas, the prevailing direction changes with the seasons; winds over most areas also are variable from day to day so that no prevailing direction is evident, such as, for example, the day-to-day changes in local winds associated with storms or clearing skies. Around the equator there is a belt of relatively low pressure known as the doldrums, where the heated air is expanding and rising; at about lat. 30°N and S there are belts of high pressure known as the horse latitudes, regions of descending air; farther poleward, near lat. 60°N and S, are belts of low pressure, where the polar front is located and cyclonic activity is at a maximum; finally there are the polar caps of high pressure.

The prevailing wind systems of the earth blow from the several belts of high pressure toward adjacent low-pressure belts. Because of the earth's rotation (see Coriolis effect), the winds do not blow directly northward or southward to the area of lower pressure, but are deflected to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. The wind systems comprise the trade winds; the prevailing westerlies, moving outward from the poleward sides of the horse-latitude belts toward the 60° latitude belts of low pressure (from the southwest in the Northern Hemisphere and from the northwest in the Southern Hemisphere); and the polar easterlies, blowing outward from the polar caps of high pressure and toward the 60° latitude belts of low pressure.



Global wind patterns

This zonal pattern of winds is displaced northward and southward seasonally because of the inclination of the earth on its axis and the consequent migration of the belts of temperature and pressure. In addition, the pattern is considerably modified by the distribution of land and water, especially in the temperate regions, where temperature differences between land and water are greatest. In winter, areas of high pressure tend to build up over cold continental land masses, while low-pressure development takes place over the adjacent, relatively warm oceans. Exactly the opposite conditions occur during summer, although to a lesser degree. These contrasting pressures over land and water areas are the cause of monsoon winds.

Superimposed upon the general circulation of winds are many lesser disturbances, such as the extratropical cyclone (the common storm of the temperate latitudes), the tropical cyclone, or hurricane, the tornado, and the derecho; each of these storms moves generally along a path that follows the direction of the prevailing winds.

See also chinook; climate; roaring forties; sandstorm; sirocco; weather.

Localized Influences on Wind Patterns

The diurnal, or daily, heating and cooling of land near a lake or ocean of fairly constant temperature causes air to blow toward the relatively warmer land during the day (sea breeze) and toward the relatively warmer water at night (land breeze). These breezes are shallow and seldom penetrate far inland or attain high velocity. Similar diurnal changes occur on mountain slopes, the air in the valley becoming heated and expanding so that it moves up the slope in the daytime, the cold air settling into the valley at night. Friction with the earth's surface, eddies caused by surface irregularities, and inequalities of heating with consequent convection currents tend to reduce wind velocity near the earth's surface and cause winds to blow in gusts.

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