



name _____
team _____

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date _____

WIND

Wind (wind') is the movement of air. Wind has an important effect on the weather. Winds blow both at the surface and at the higher levels of the atmosphere.

The direction of the wind is the direction from which it comes. For example, a north wind blows from north to south, while a southeast wind blows from southeast to northwest.

Prevailing winds The prevailing winds are the chief wind belts on earth. They are caused by the uneven heating of the atmosphere and the rotation of the earth. The uneven heating causes the warmer air to rise. The rotation of the earth causes winds in the northern hemisphere to be deflected (bent) to the right. The reverse happens in the southern hemisphere. (See CORIOLIS FORCE.) The prevailing winds from both the northern and the southern hemispheres together are called the general circulation.

The area within 30° north and south of the equator is where the trade winds are generated. Air at the surface is heated by the sun. The hot air rises as high as 18,000 m [60,000 ft]. The rising air is replaced by surface air. This rising and replacing of air produces a belt of winds on either side of the equator called the trade winds. The trade winds blow in a general east to west direction.

Near the equator, there is an area of calm winds called the doldrums. The doldrums occur because the air at the equator is rising instead of blowing along the surface. At about 30° north and south of the equator, the rising air from the doldrums moves downward back to the surface. The downward-moving air produces no winds. This region is called the horse latitudes.

Between 30° and 60° north and south of the equator, winds blow in a general west to east direction. These winds are called the prevailing westerlies. The prevailing westerlies are caused by the movement of surface air from the equator toward the poles. The prevailing westerlies play an important role in the weather of the United States.

The polar easterlies are winds that occur between the poles and 60° north and south of the equator. The polar easterlies are caused by the movement of heavy, cold air from the polar regions toward the equator. The polar

easterlies blow in a general east to west direction.

Secondary circulation Winds that occur within the general circulation are part of the secondary circulation. These winds are usually associated with areas of high and low atmospheric pressure. Air flows into low pressure areas and out of high-pressure areas. In the northern hemisphere, air circulates around a high-pressure system in a clockwise (anticyclonic) direction. Winds circulate around a low-pressure system in a counterclockwise (cyclonic) direction. In the southern hemisphere, these directions are reversed.

Local winds Local winds occur in certain parts of the world. They are often affected by some geographic feature like a mountain or ocean. Monsoons are local winds caused by the heating of land during the summer, which is followed by cooling during the winter. The cooler, heavier ocean air blows onto land during the summer. During the winter, the cooler air over the land blows offshore. Monsoons have a great effect on the climate of southern Asia. (See MONSOON.)

Other local winds include chinooks, foehns, siroccos, and northers. Dry winds that blow down the sides of mountains are called chinooks in the western United States and foehns in the Alps. A sirocco is a local wind which carries hot air from the Sahara to the Mediterranean region of Europe. A norther is a bitter, cold, north wind that comes before the arrival of a polar high-pressure area. During the winter, northers often cause a great decrease, or drop, in the temperature of the air.

Measurement of wind The speed and direction of wind is measured by an instrument called an anemometer. The wind direction can also be determined by a weather vane. Jet-stream winds are measured by instrument-laden weather balloons called radiosondes. The Beaufort scale is a table which has numbers to measure wind speed. The numbers range from 1 to 17. For example, a Beaufort scale wind of 4 is named a moderate breeze. A moderate breeze blows at 20 to 28 km [13 to 18 mi] per hour. A Beaufort scale wind of 11 is named a storm. A storm wind blows at 103 to 117 km [64 to 73 mi] per hour. Meteorologists have also found ways of measuring the windchill factor. The windchill factor is an indication of how much colder the wind makes the air feel.

What is Wind?

What is the difference between local winds and prevailing winds?

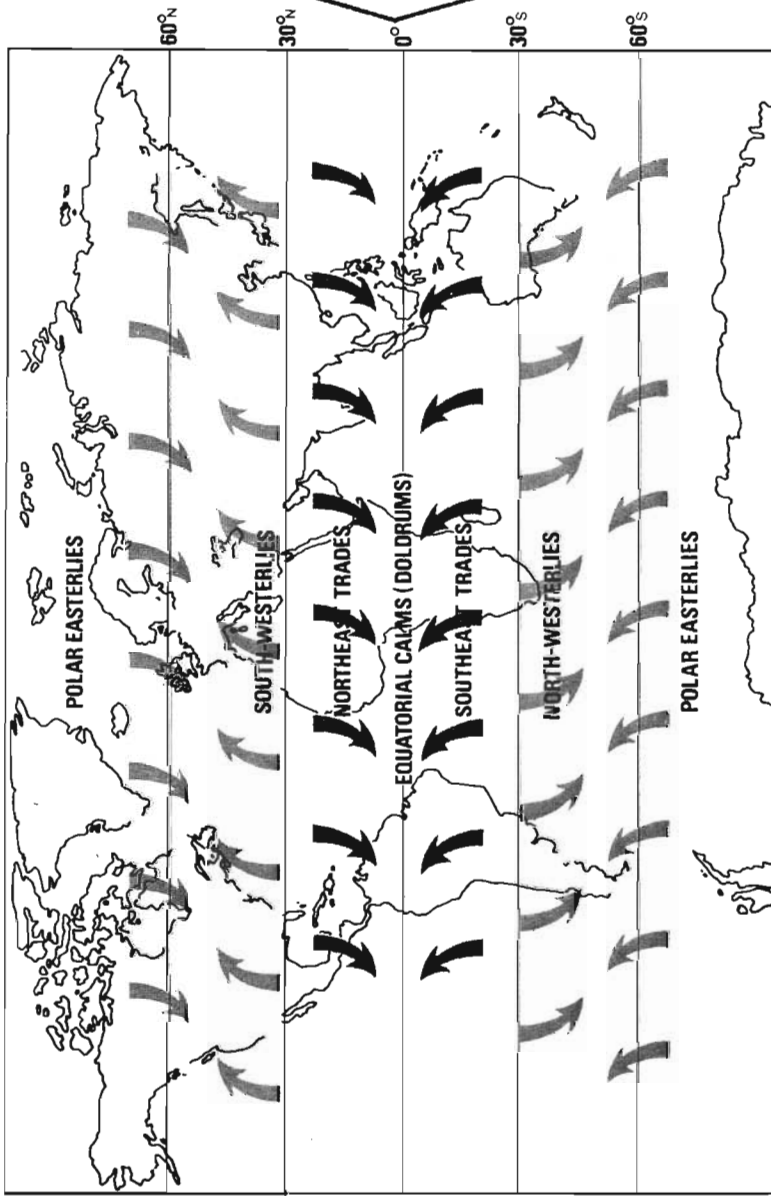
Investigation 8 - Air Pressure

What does this wind scale tell us?

The **Beaufort Wind Scale** is a series of numbers, ranging from 0 to 17, used to indicate wind speeds. The scale was devised in 1805 by British Rear Admiral Sir Francis Beaufort. Beaufort defined the numbers in terms of the effect of various winds on sailing vessels.

BEAUFORT WIND SCALE

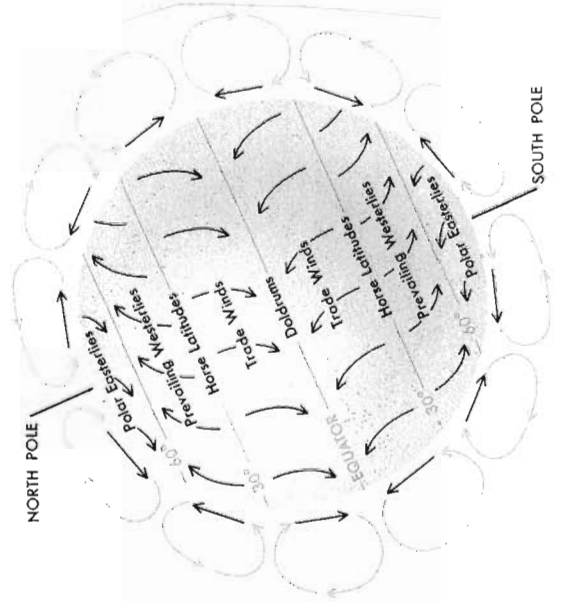
Beaufort Number	Name	Miles per Hour	Effect on Land
0	Calm	less than 1	Calm; smoke rises vertically.
1	Light Air	1-3	Weather vanes inactive; smoke drifts with air.
2	Light Breeze	4-7	Weather vanes active; wind felt on face; leaves rustle.
3	Gentle Breeze	8-12	Leaves and small twigs move; light flags extend.
4	Moderate Breeze	13-18	Small branches sway; dust and loose paper blow about.
5	Fresh Breeze	19-24	Large branches sway; waves break on inland waters.
6	Strong Breeze	25-31	Small trees sway; umbrellas difficult to use.
7	Moderate Gale	32-38	Whole trees sway; difficult to walk against wind.
8	Fresh Gale	39-46	Twigs broken off trees; walking against wind very difficult.
9	Strong Gale	47-54	Slight damage to buildings; shingles blown off roof.
10	Whole Gale	55-63	Trees uprooted; considerable damage to buildings.
11	Storm	64-73	Widespread damage; very rare occurrence.
12-17	Hurricane	74 and above	Violent destruction.



The map (above) shows the prevailing wind belts on earth. These winds are caused by the uneven heating of the atmosphere and the rotation of the earth. Prevailing winds were very important to seamen on sailing ships.

Explain how the tilt of the Earth affects the wind.

Explain the arrows that we see on this Wind Belt Map.



GENERAL CIRCULATION OF AIR AROUND THE EARTH

Prevailing winds result from the general circulation of air around the earth, shown at the right. In this drawing, the circulation has been greatly simplified. At the equator, air is heated by the sun and rises, as shown by the blue arrows. In the upper atmosphere, this air flows away from the equator. When the air returns to the earth's surface, it flows across the surface, as shown by the black arrows. This moving surface air produces the six belts of prevailing winds around the earth. The turning of the earth causes the prevailing winds to blow toward the east in belts where the air moves away from the equator. In belts where the air moves toward the equator, the prevailing winds blow toward the west.