

19.1 Understanding Air Pressure

A. Air Pressure Defined

- ◆ 1. **Air pressure** is the pressure exerted by the weight of air.
- ◆ 2. Air pressure is exerted in all directions—down, up, and sideways. The air pressure pushing down on an object exactly balances the air pressure pushing up on the object.

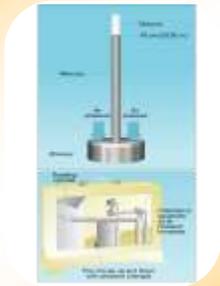
19.1 Understanding Air Pressure

B. Measuring Air Pressure

- ◆ 1. A **barometer** is a device used for measuring air pressure.
- ◆ 2. When air pressure increases, the mercury in the tube rises. When air pressure decreases, the mercury in the tube falls.

A Mercury Barometer

[How it works](#)



19.1 Understanding Air Pressure

C. Factors Affecting Wind

- ◆ The underlying cause of wind is the unequal heating of Earth's surface.
- ◆ [What is wind?](#)
- ◆ Three factors combine to control wind: pressure differences, the Coriolis effect, and friction.
- ◆ [Bill Nye on wind](#)

19.1 Understanding Air Pressure

C. Factors Affecting Wind

- ◆ 1. Pressure Differences
 - a. A **pressure gradient** is the amount of pressure change occurring over a given distance.
- b. **Isobars** - lines on a map that connect places of equal air
 - 1. Widely spaced isobars indicate a weak pressure gradient and light winds.
 - 2. Close isobars represent strong winds

Isobars

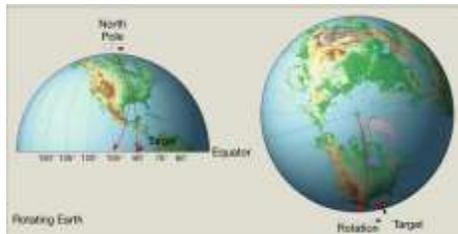


19.1 Understanding Air Pressure

C. Factors Affecting Wind

◆ 2. Coriolis Effect

- The effect Earth's rotation has on all free-moving objects such as water and wind.
- In the Northern Hemisphere, all free-moving objects are deflected to the right.
- In the Southern Hemisphere, they are deflected to the left.
- [video](#)



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C. Factors Affecting Wind

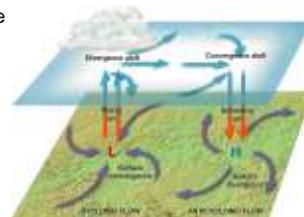
◆ 3. Friction

- Friction acts to slow air movement close to the ground, which changes wind direction.
- The roughness of terrain determines the angle of airflow across the isobars.
- Jet streams** are fast-moving rivers of air that travel between 120 and 240 kilometers per hour in a west-to-east direction, above the friction layer. [video](#)

19.2 Pressure Centers and Winds

A. Highs and Lows

- Cyclones (lows)** are centers of low pressure in which wind blows counterclockwise
- Anticyclones (highs)** are centers of high pressure in which winds blow clockwise .



Cyclonic and Anticyclonic Winds



19.2 Pressure Centers and Winds

A. Highs and Lows

- ◆ Weather and Air Pressure
- 3. Rising air is associated with cloud formation and precipitation,
- 4. sinking air produces clear skies/ fair weather

19.2 Pressure Centers and Winds

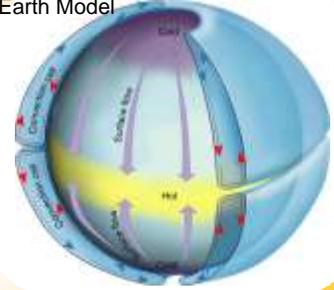
B. Global Winds

- ◆ 1. The atmosphere balances these differences by moving warm air toward poles and cool air toward the equator.

Circulation on a Non-Rotating Earth

◆ 2. Non-Rotating Earth Model

On a hypothetical non-rotating planet two large thermally produced cells would form.



19.2 Pressure Centers and Winds

Global Winds

◆ 3. Rotating Earth Model

- In a Rotating Model each of the two cells break into two smaller cells. The Coriolis effect causes winds to blow in different directions in each of the cells.

This dynamic produces the following types of winds on the earth:

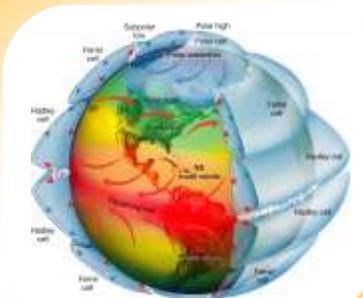
19.2 Pressure Centers and Winds

Global Winds

◆ Rotating Earth Model

- Trade winds** blow in an easterly direction on each side of the equator.
- Westerlies** blow in a westerly direction in the middle latitudes.
- Polar easterlies** are winds that blow from the polar high toward the subpolar low..

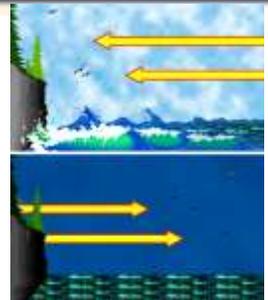
Circulation on a Rotating Earth



19.3 Regional Wind Systems

• A. Local Winds

- ◆ 1. **Sea Breezes**
- During the day, warm air rising from land pulls cooler air off the sea inland.
- 2. **Land breezes**
- During the night, the warmer sea pulls cooler air from land.



19.3 Regional Wind Systems

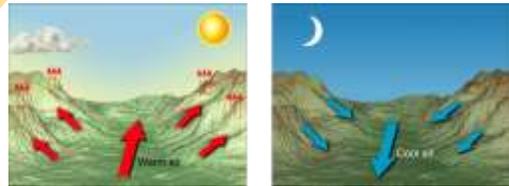
Local Winds

◆ 3. Valley and Mountain Breezes

- In mountainous regions during daylight hours, because this warmer air on the mountain slopes is less dense, it glides up along the slope and generates a valley breeze.

After sunset the pattern may reverse.

Valley and Mountain Breezes



19.3 Regional Wind Systems

How Wind Is Measured

◆ 1. Wind Direction

- The **prevailing wind** is the wind that blows more often from one direction than from any other.

◆ 2. Wind Speed

- An **anemometer** is an instrument that resembles a cup and is commonly used to measure wind speed.

19.3 Regional Wind Systems

C. El Niño and La Niña

◆ El Niño

- **El Niño** is the name given to the periodic warming of the ocean that occurs in the central and eastern Pacific.
- At irregular intervals of three to seven years, these warm countercurrents become unusually strong and replace normally cold offshore waters with warm equatorial waters.

El Niño Conditions



19.3 Regional Wind Systems

El Niño and La Niña

◆ La Niña

- Researchers have come to recognize that when surface temperatures in the eastern Pacific are colder than average, a La Niña event is triggered that has a distinctive set of weather patterns.