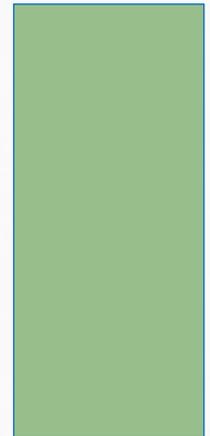


AIR PRESSURE AND WIND

AG EARTH SCIENCE – CH. 19





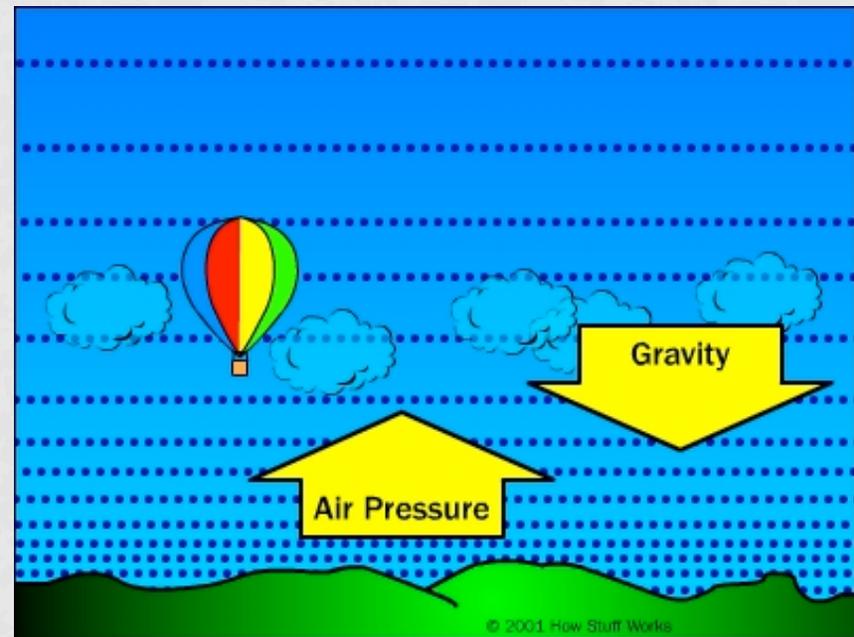
CH. 19.1 VOCABULARY

Understanding Air
Pressure



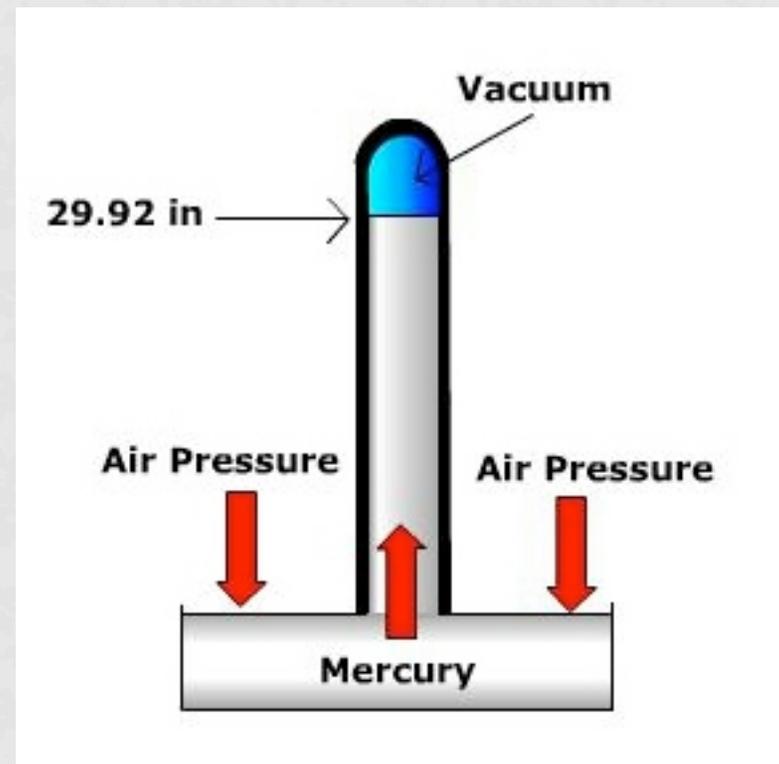
AIR PRESSURE

- The force exerted by the weight of a column of air above a given point



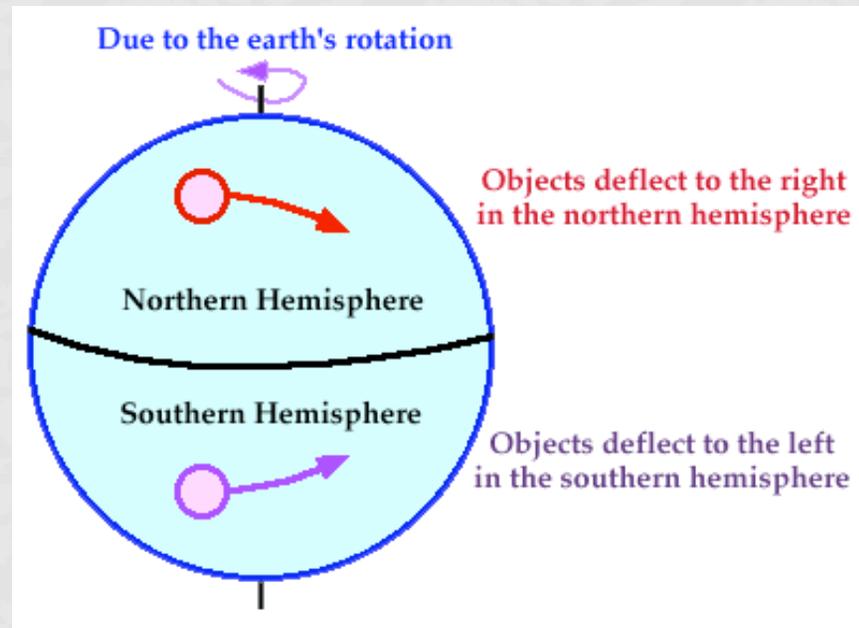
BAROMETER

- An instrument that measures atmospheric pressure



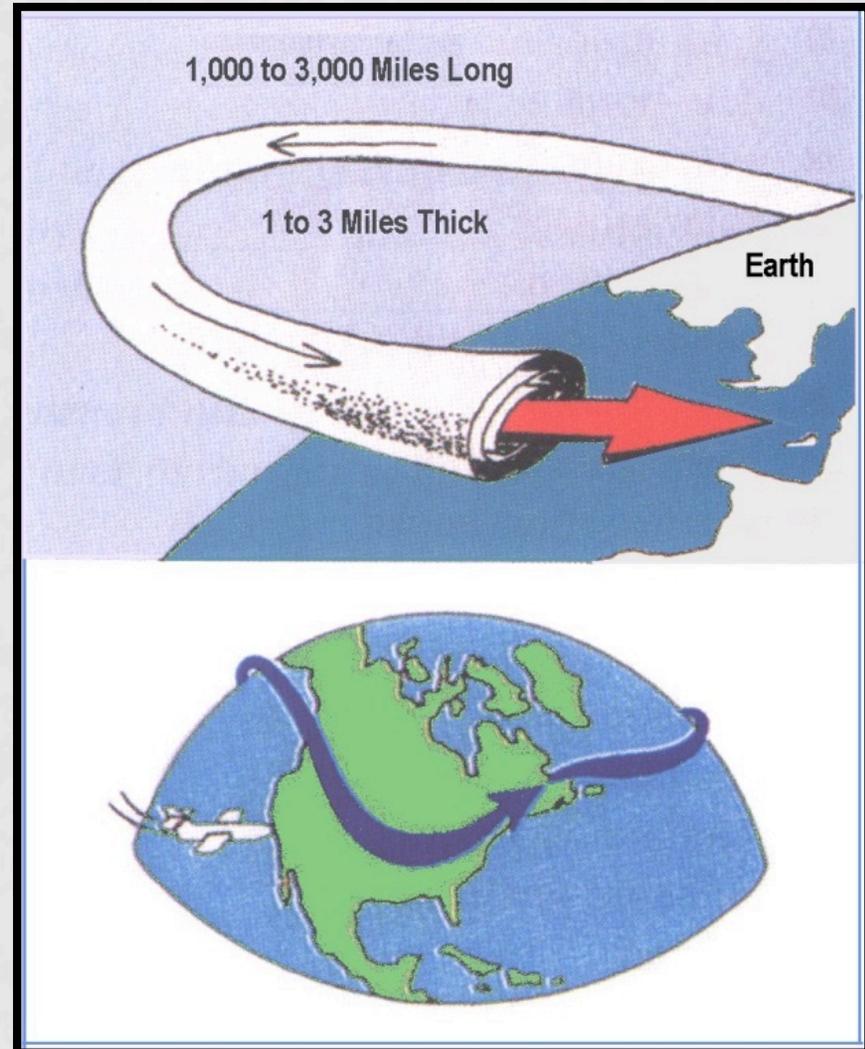
CORIOLIS EFFECT

- The apparent deflective force of earth's rotation on all free moving objects, including atmosphere and oceans.



JET STREAM

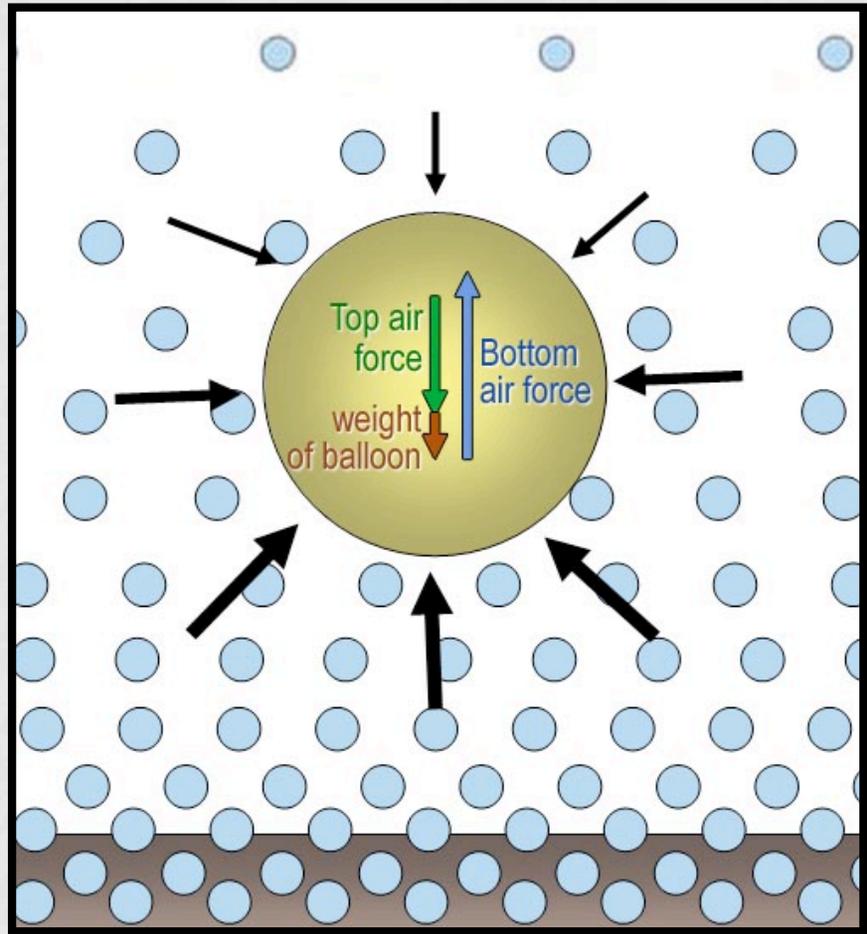
- Swift (120-240km/hr) high-altitude winds.





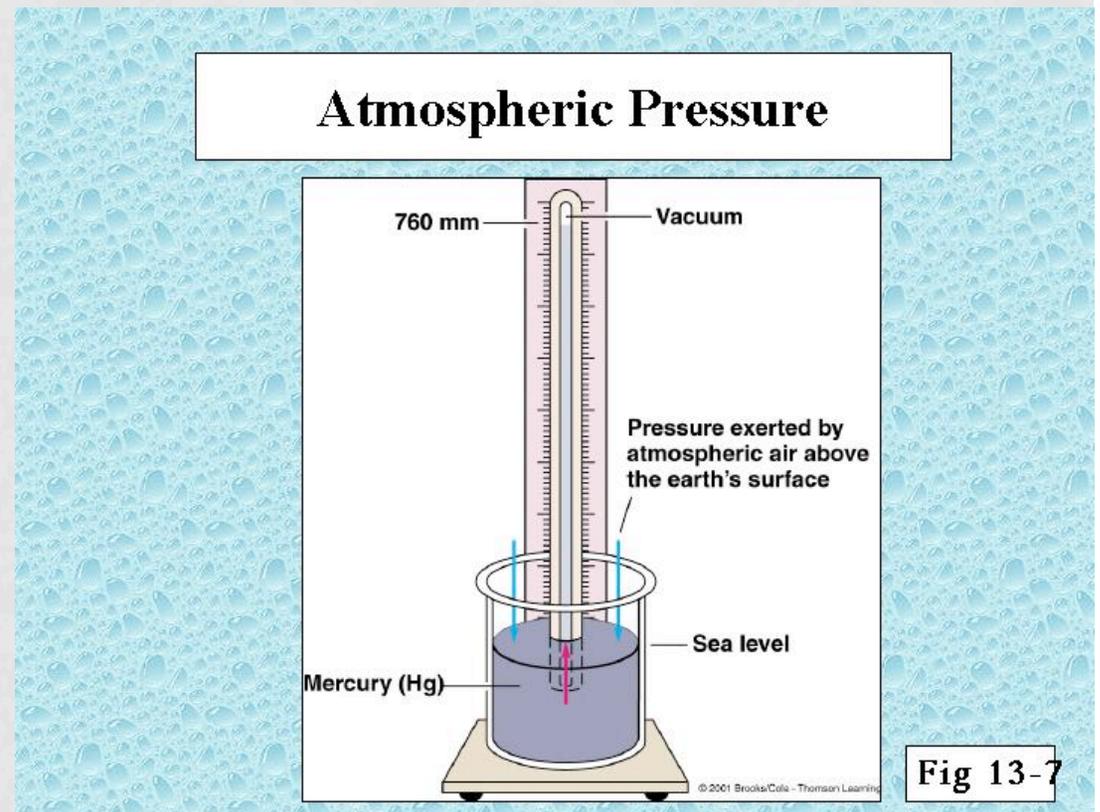
AIR PRESSURE DEFINED

- Air pressure is simply the “weight of air above”.
- 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.



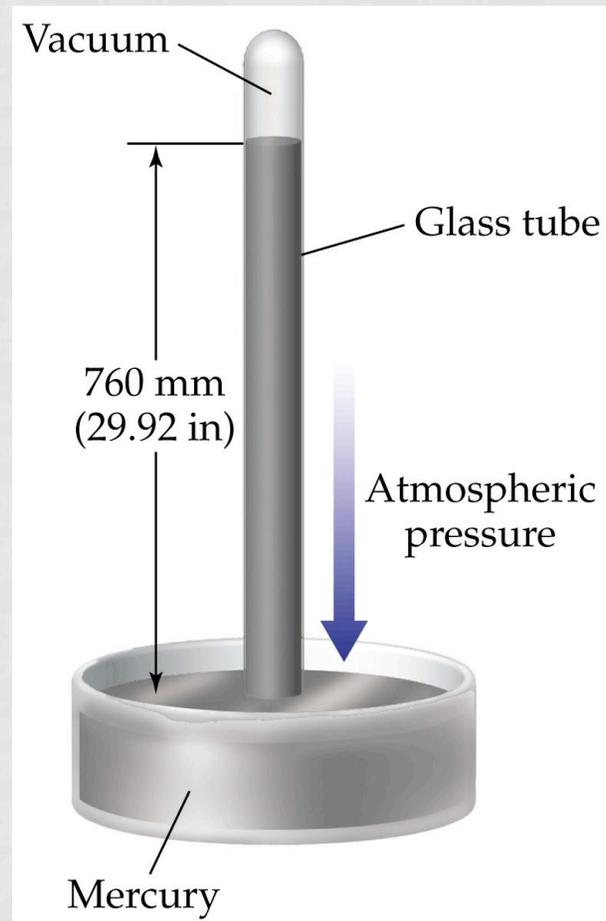
MEASURING AIR PRESSURE

- When meteorologists measure atmospheric pressure, they use a unit called a millibar.
- Standard sea level pressure is 1013.2 millibars or 29.92 inches of mercury



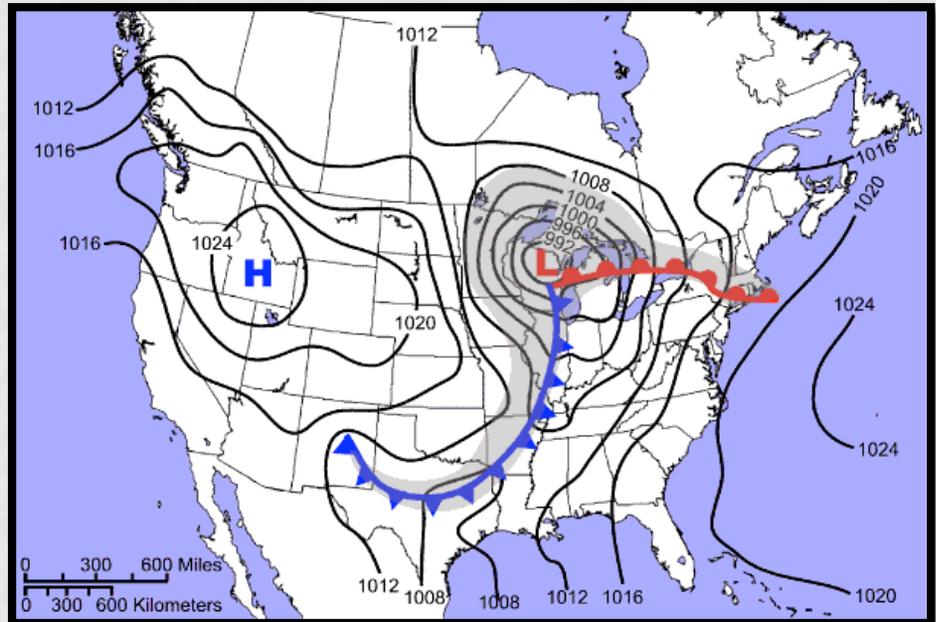
MEASURING AIR PRESSURE

- Barometer – a device used to measure air pressure
- When air pressure increases, the mercury in the tube rises. When air pressure decreases, so does the height of the mercury.



FACTORS AFFECTING WIND

- Wind is the result of horizontal differences in air pressure. Air flows from areas of higher pressure to areas of low pressure.
- The unequal heating of earth's surface generates pressure differences. Solar radiation is the ultimate energy source of most wind.



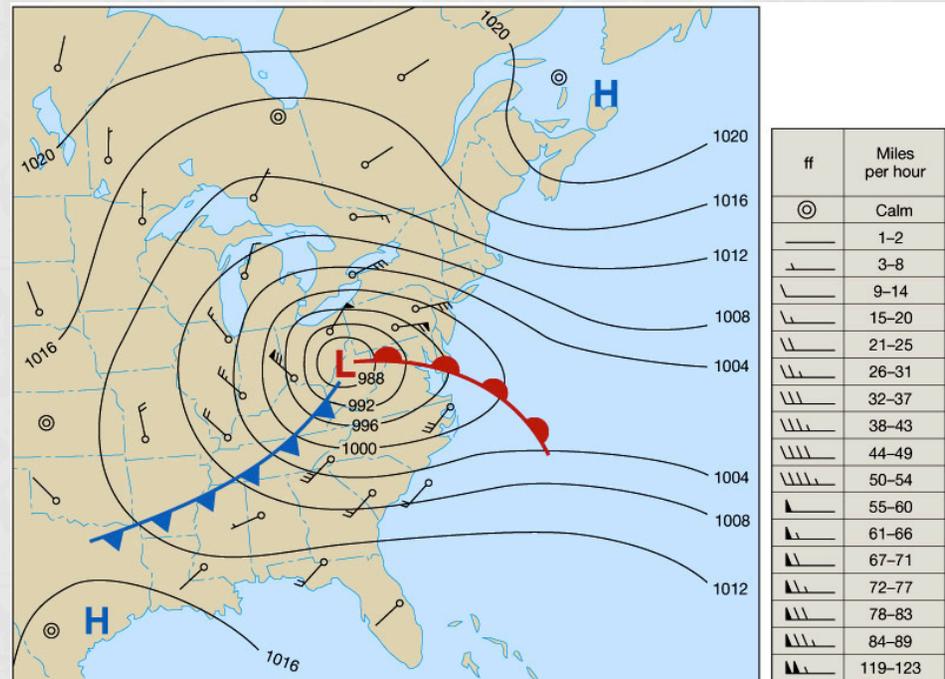
FACTORS AFFECTING WIND

- Three factors combine to control wind – (1) pressure differences, (2) the Coriolis effect, and (3) friction.



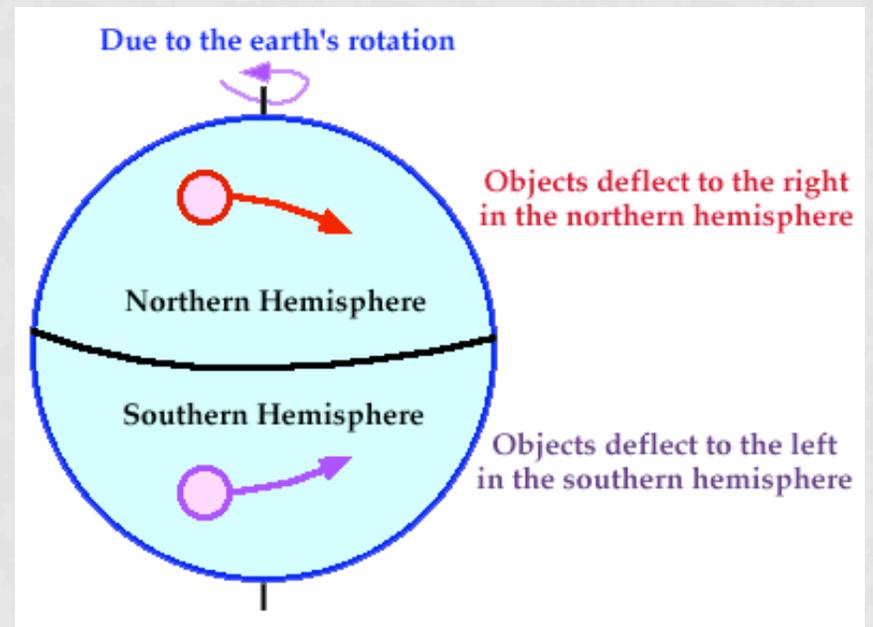
FACTORS AFFECTING WIND

- Pressure Differences
 - Wind is created from differences in pressure – the greater these differences are, the greater the wind speed.
 - pressure gradient - The amount of pressure change occurring over a given distance
 - Closely spaced isobars indicate a steep pressure gradient and high winds. Widely spaced isobars indicate a weak pressure gradient and light winds.



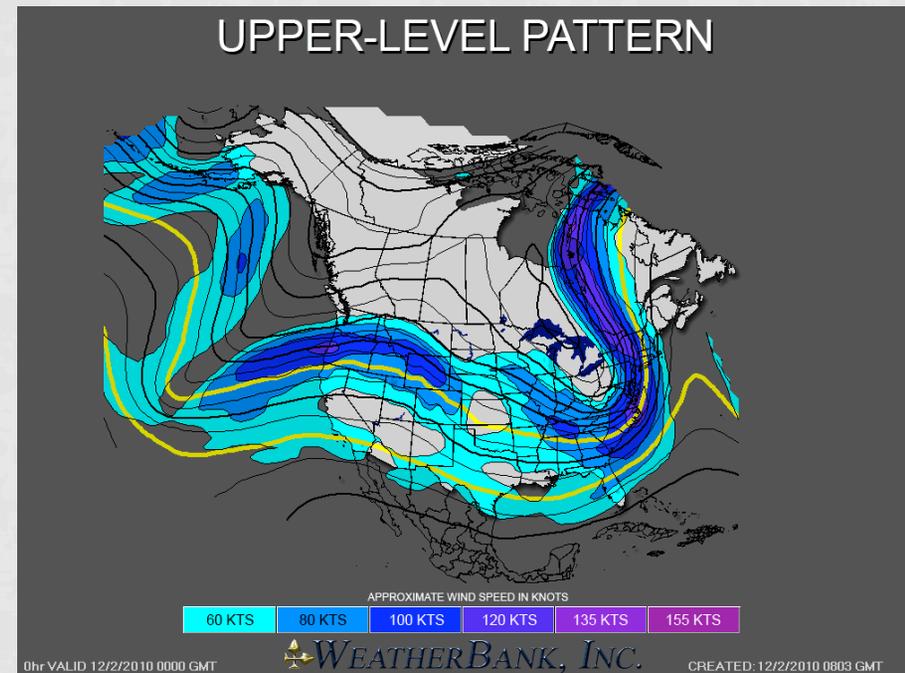
FACTORS AFFECTING WIND

- Coriolis Effect
 - The Coriolis effect describes how Earth's rotation affects moving objects.
 - All free-moving objects or fluids, including the wind, are deflected to the right of their path of motion in the Northern Hemisphere and to the left in the Southern Hemisphere.



FACTORS AFFECTING WIND

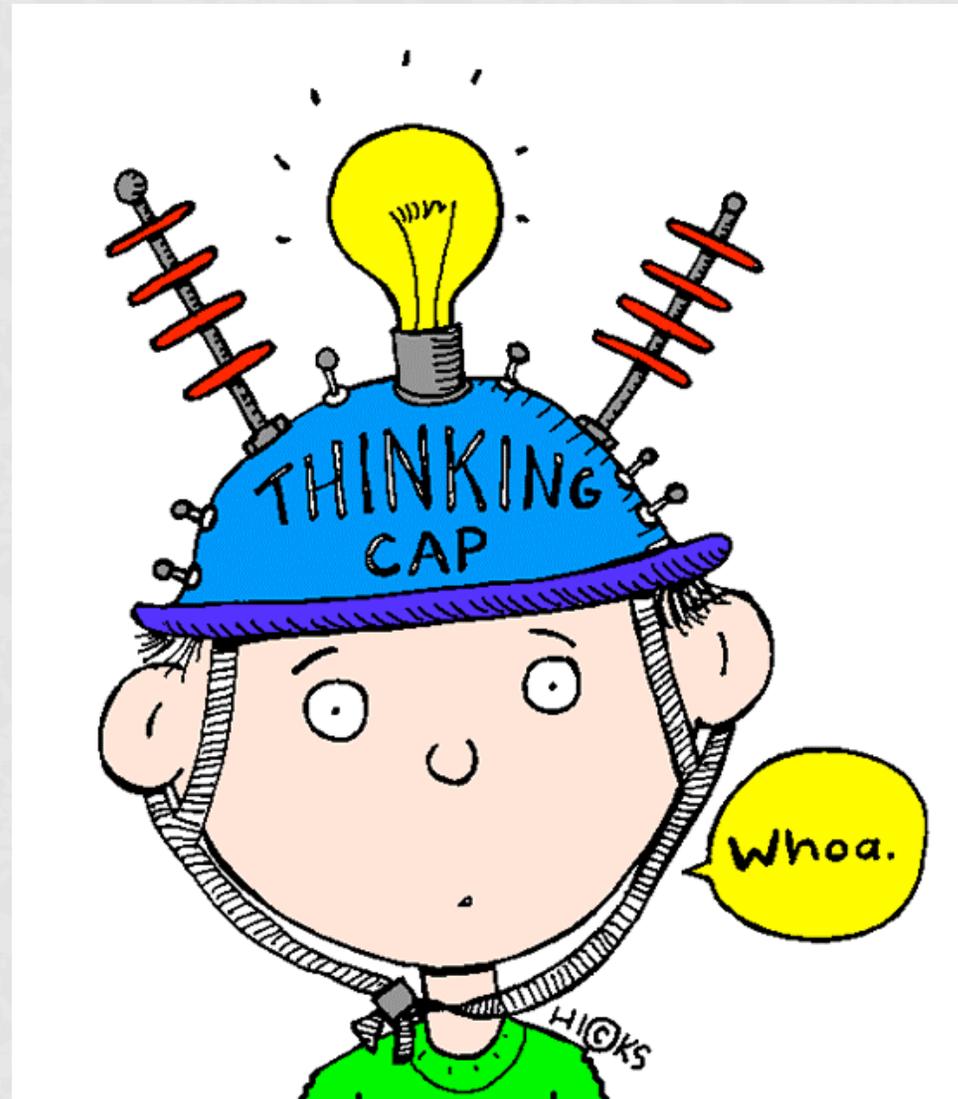
- Friction
 - Friction acts to slow air movement
 - Jet stream - Swift (120-240km/hr) high-altitude winds.





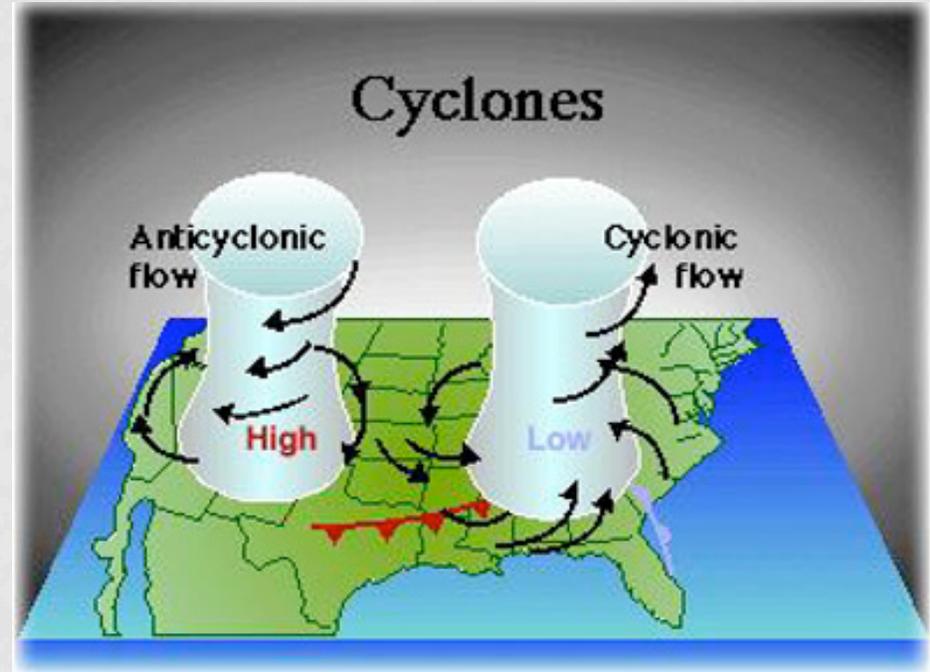
CH. 19.2
VOCABULARY

Pressure Centers and
Wind



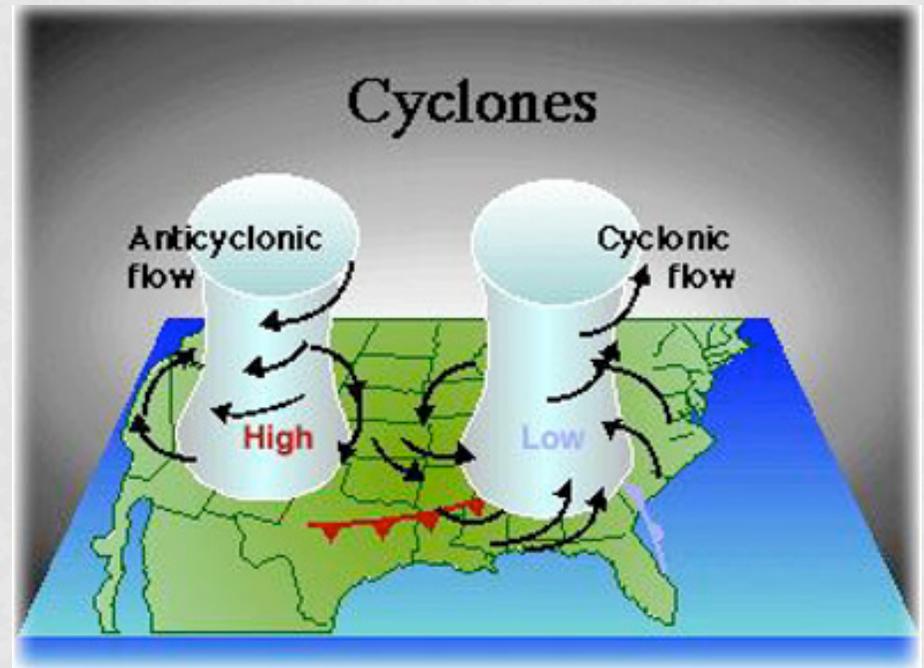
CYCLONE

- A low-pressure center characterized by a counterclockwise flow of air in the Northern Hemisphere.



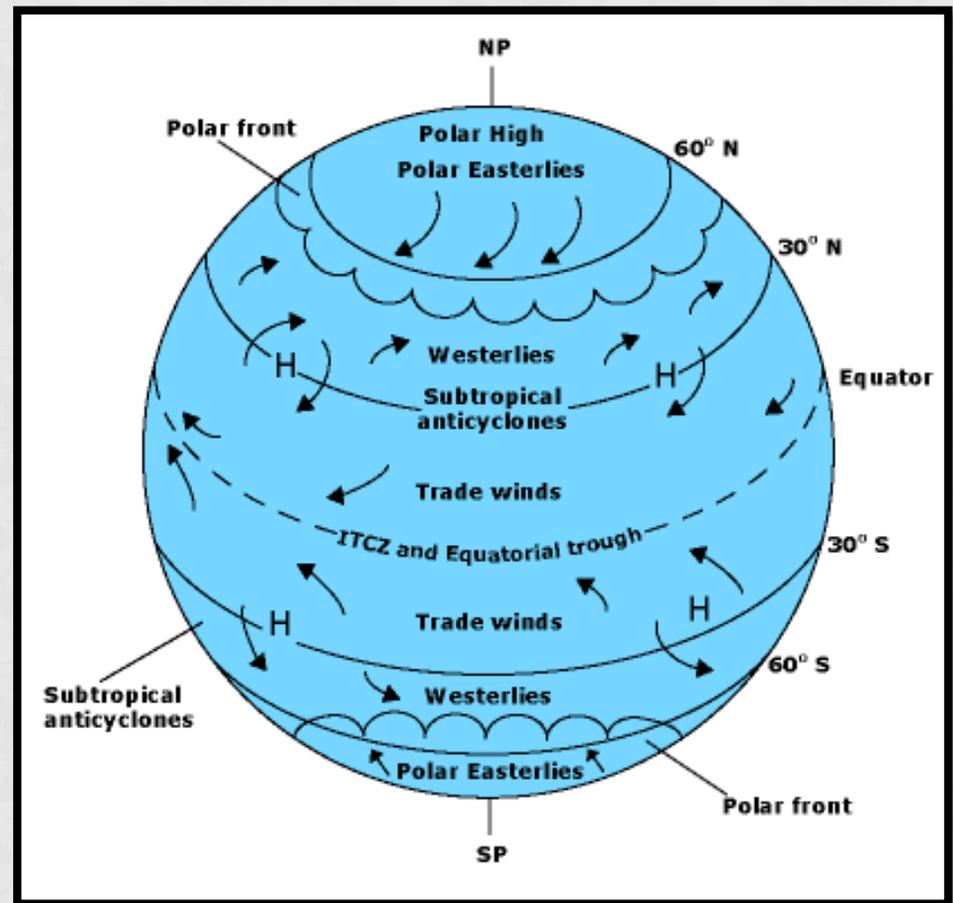
ANTICYCLONE

- A high-pressure center characterized by a clockwise flow of air in the Northern Hemisphere.



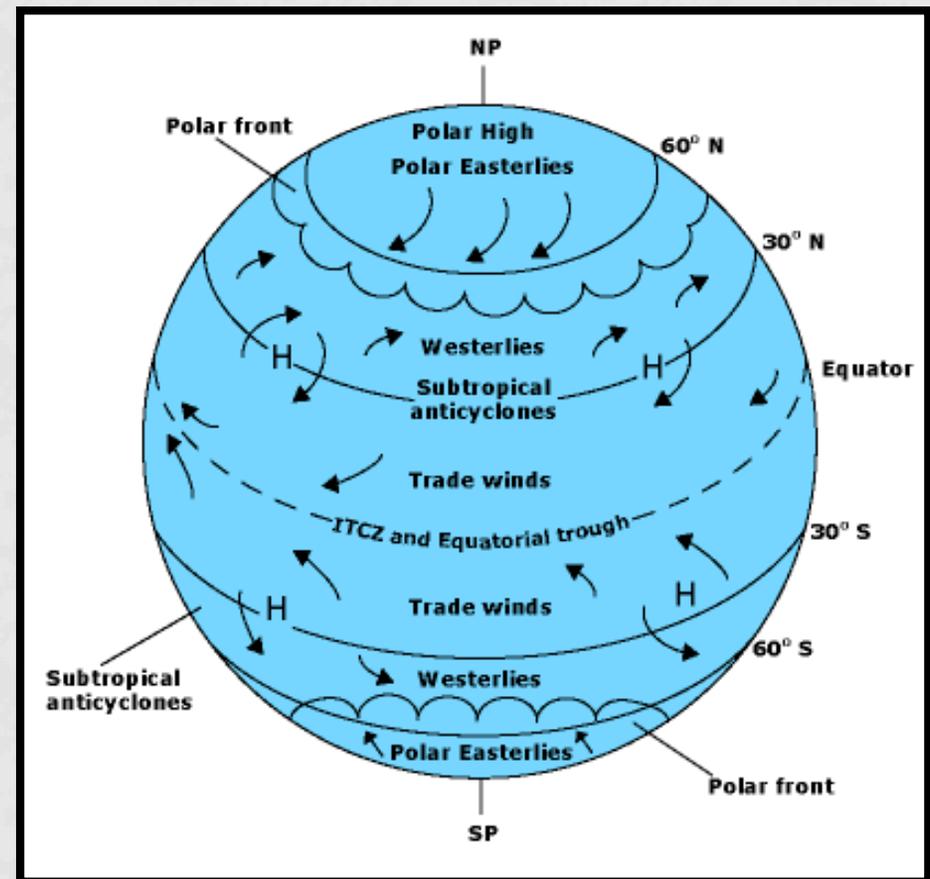
TRADE WINDS

- Two belts of winds that blow almost constantly from easterly directions and are located on the north and south sides of the subtropical highs.



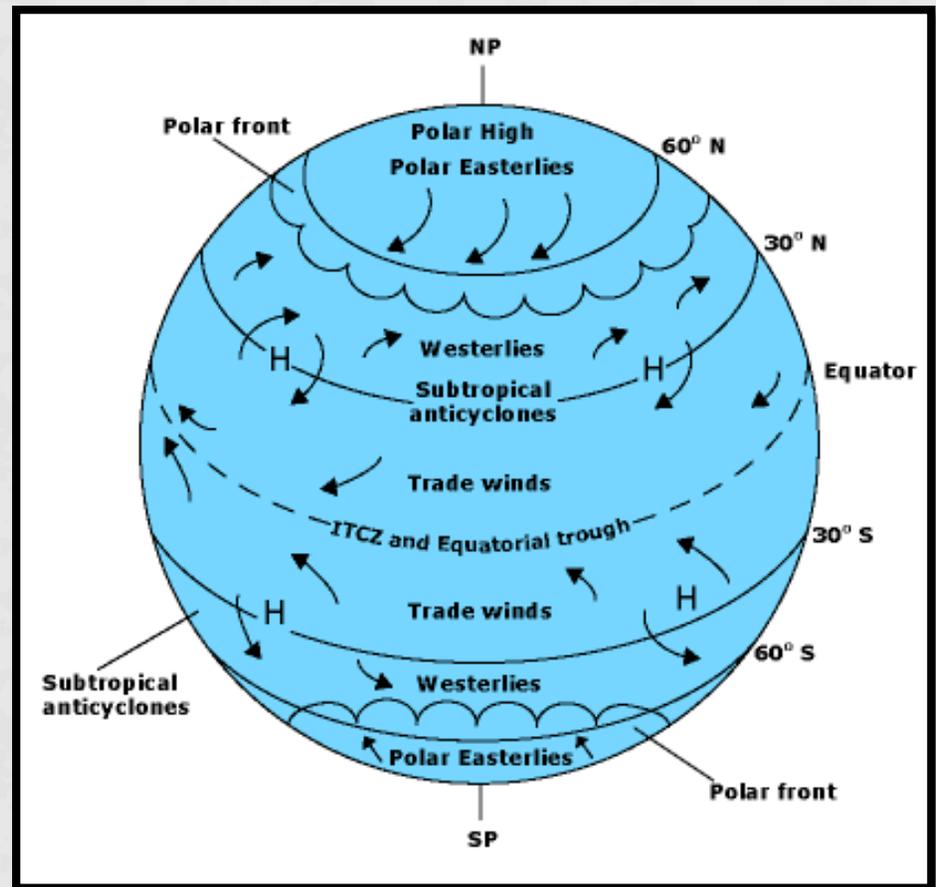
WESTERLIES

- The dominant west-to-east motion of the atmosphere that characterizes the regions on poleward side of the subtropical high.



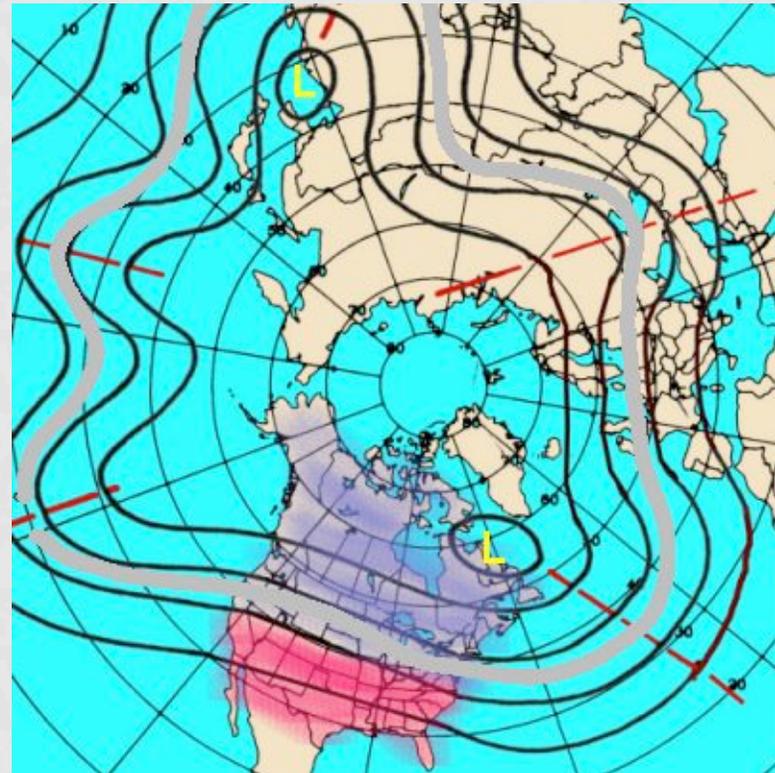
POLAR EASTERLIES

- In the global pattern of prevailing winds, wind that blow from the polar high toward the subpolar low. (not constant like trade winds)



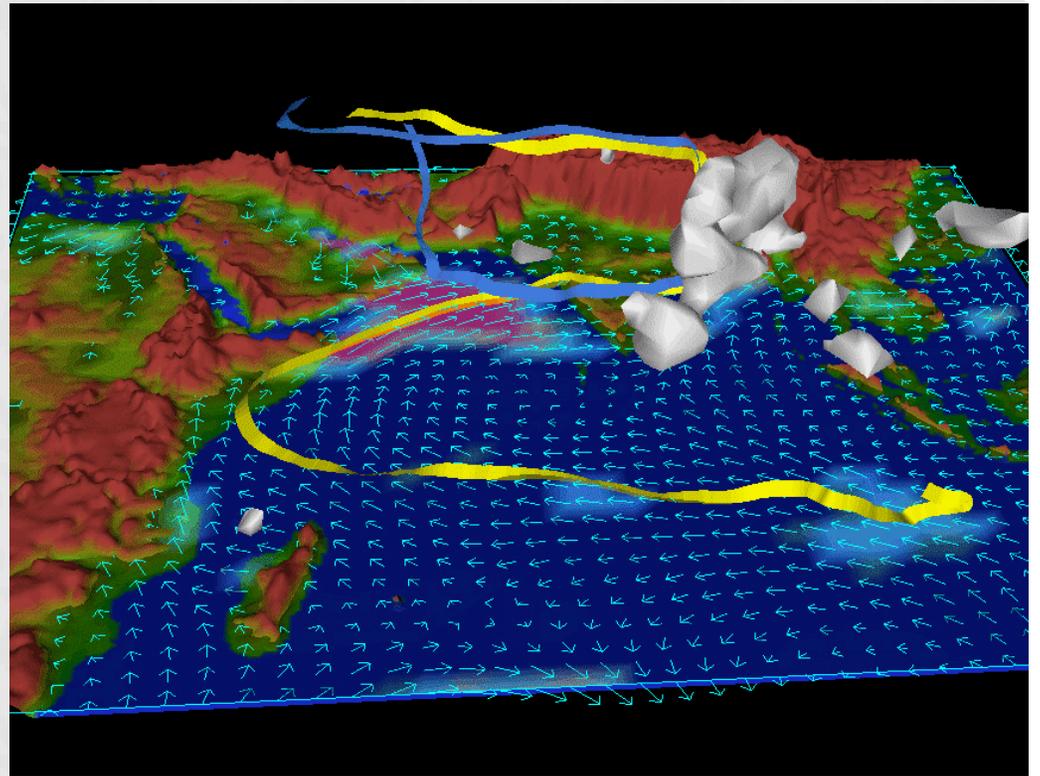
POLAR FRONT

- The stormy frontal zone separating cold air masses or polar origin from warm air masses of tropical origin



MONSOON

- Seasonal reversal of wind direction associated with large continents, especially Asia.

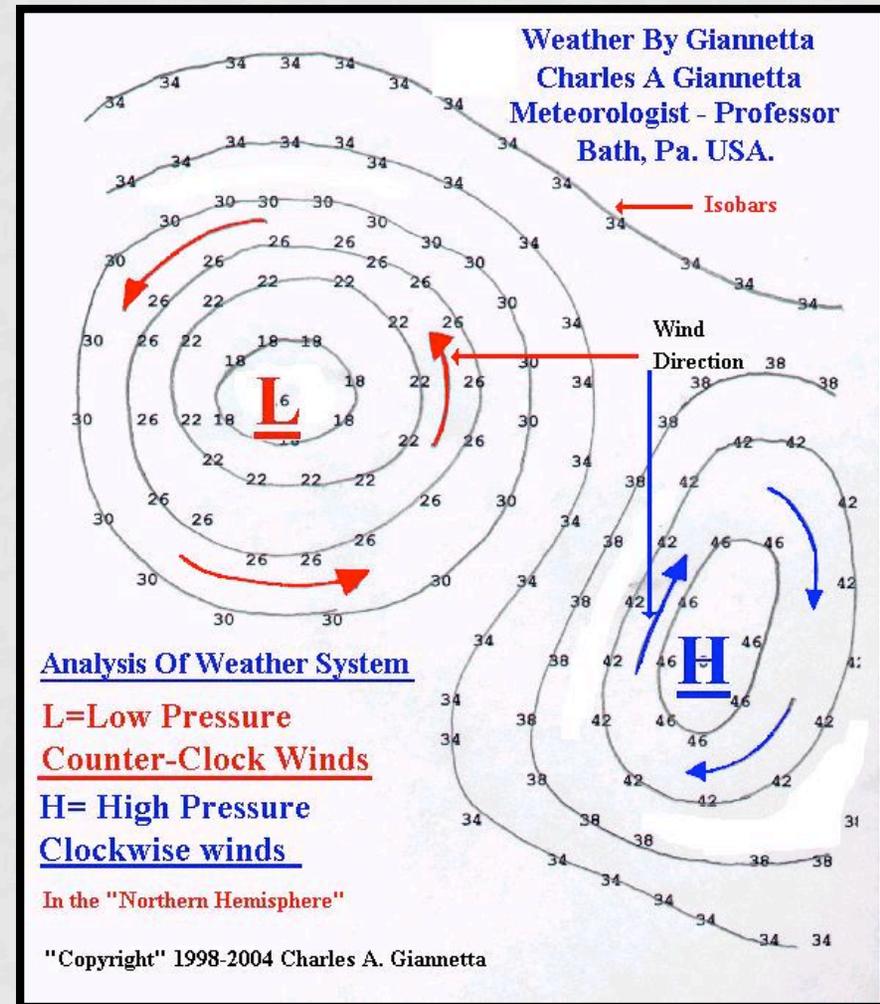




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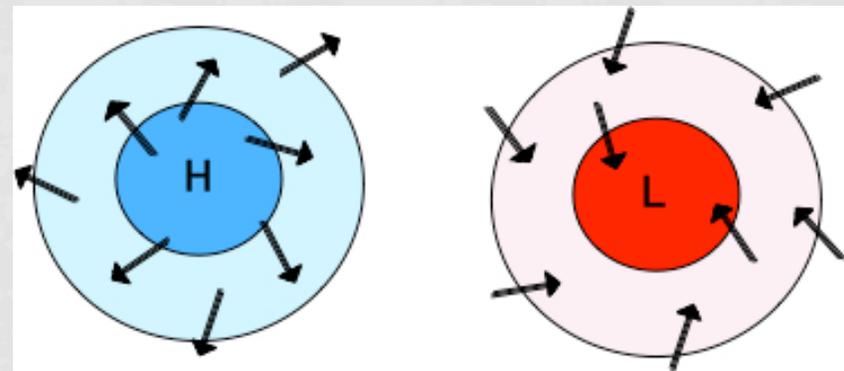
HIGHS AND LOWS

- Lows or cyclones (“moving in a circle”) are centers of low pressure.
- Highs or anticyclones are centers of high pressure
- In cyclones (low pressures), the pressure decreases from the outer isobars toward the center. In anticyclones (high pressures), just the opposite is the case – the value of the isobars increase from the outside toward the center.

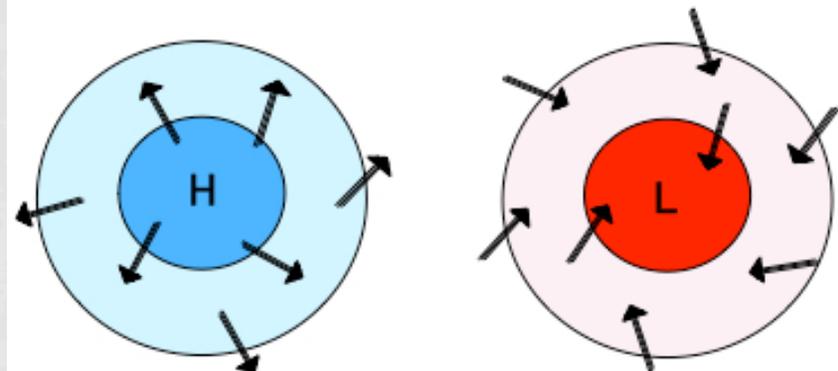


CYCLONIC AND ANTICYCLONIC WINDS

- When the pressure gradient and the Coriolis effect are applied to pressure centers in the Northern Hemisphere, winds blow counterclockwise around a low. Around a high, they blow clockwise.
- In either hemisphere, friction causes a net flow of air inward around a cyclone and a net flow of air outward around an anticyclone.



Northern Hemisphere Surface Circulation

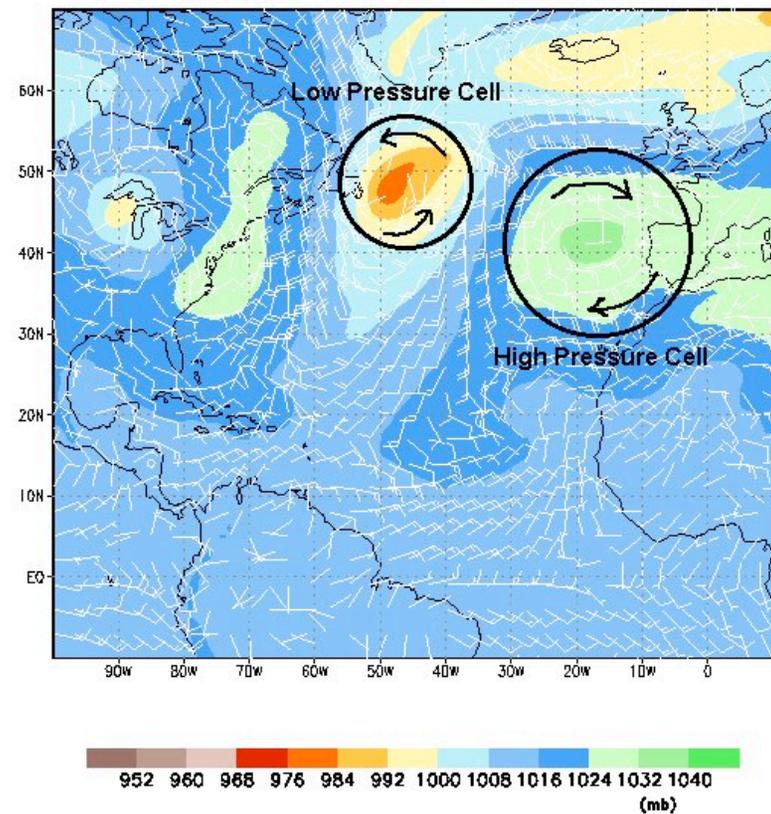


Southern Hemisphere Surface Circulation

WEATHER AND AIR PRESSURE / FORECASTING

- Rising air is associated with cloud formation and precipitation, whereas sinking air produces clear skies.
- Weather reports emphasize the locations and possible paths of cyclones (low pressure) and anticyclones (high pressure).
- The cyclones (low pressure systems) are the primary “villians” of bad and/or unpredictable weather.

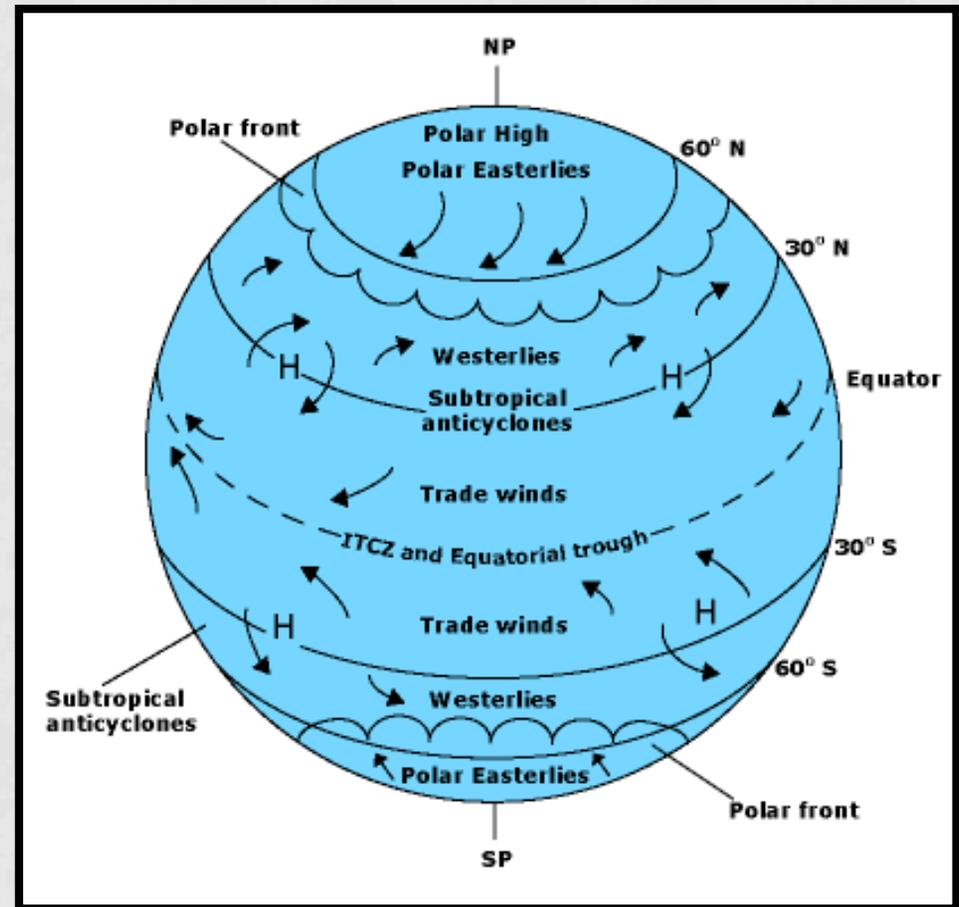
AVN Surface Pressure(mb) and 10m wind
0 hr forecast valid for 12GMT06APR1999



/OMB/EMC/NCEP/NWS

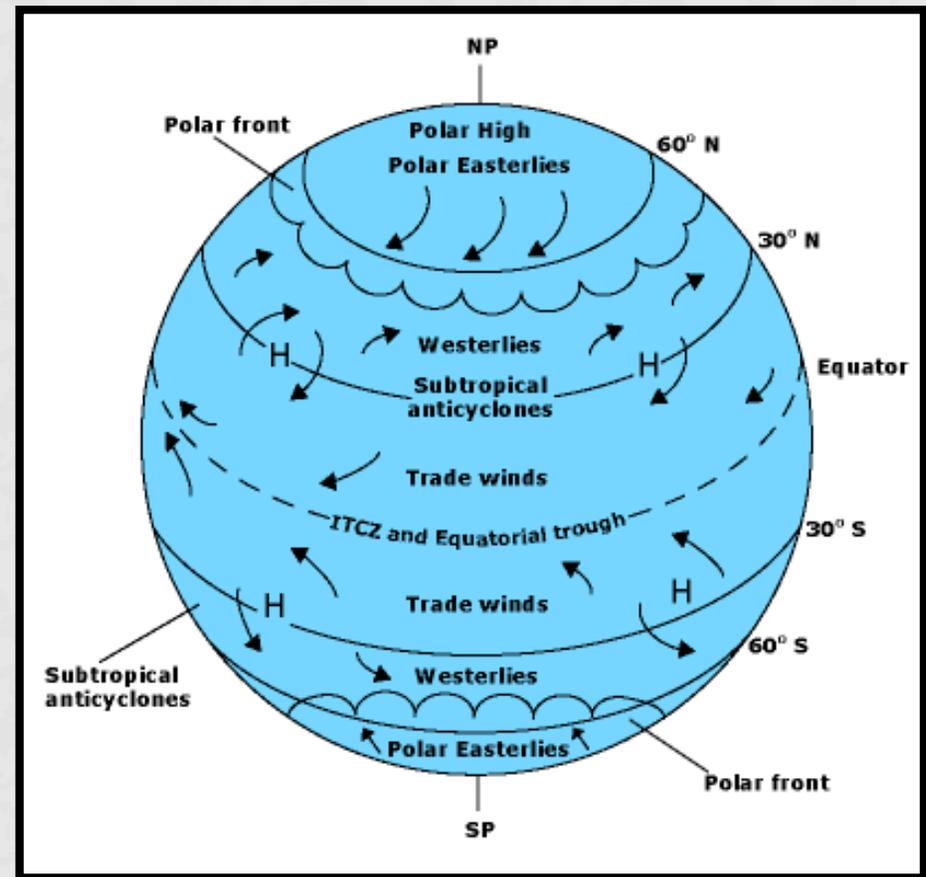
GLOBAL WINDS

- The underlying cause of wind is the unequal heating of the Earth's surface.
- The atmosphere balances these differences by acting as a giant heat-transfer system. This system moves warm air toward high latitudes and cool air toward the equator.
- Trade winds – two belts of winds that blow almost constantly from easterly directions. Located between equator and subtropical highs.



GLOBAL WINDS

- Westerlies – west-east motion of the atmosphere. Located in middle latitudes (example: U.S.A.)
- Polar easterlies – blow from polar high toward the subpolar low.
- Polar front – The interaction between polar cold air masses and warm tropical air masses.
- Monsoons - Seasonal reversal of wind direction associated with large continents, especially Asia.



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Rational*

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MATH JOKES

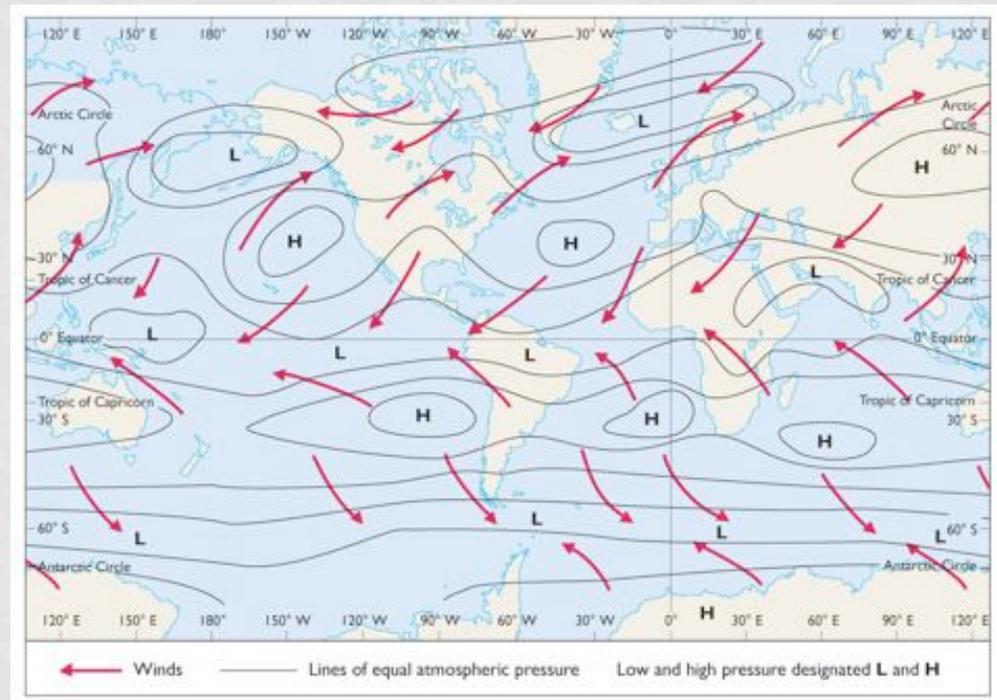
CH. 19.3
VOCABULARY

Regional Wind Systems



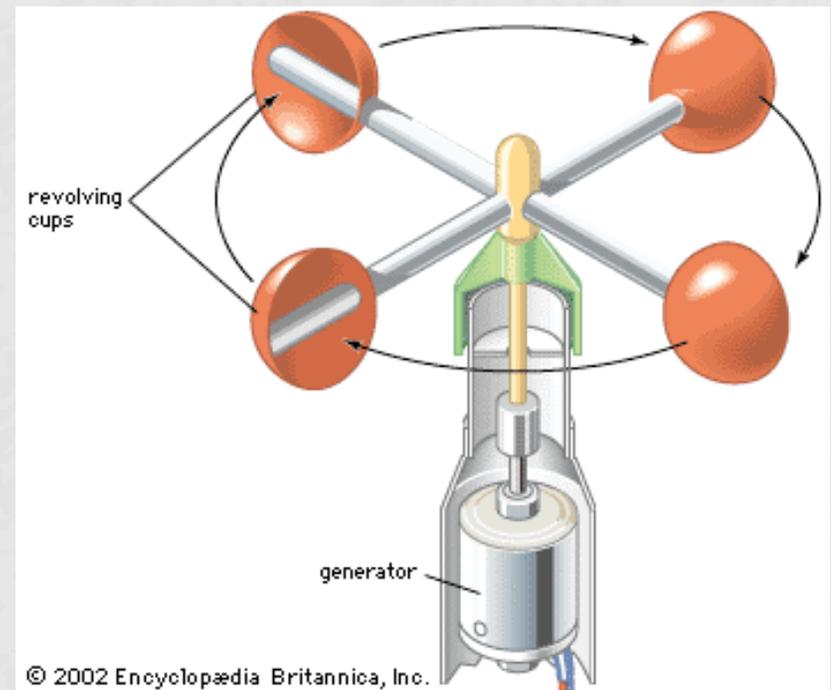
PREVAILING WIND

- A wind that consistently blows from one direction more than from another



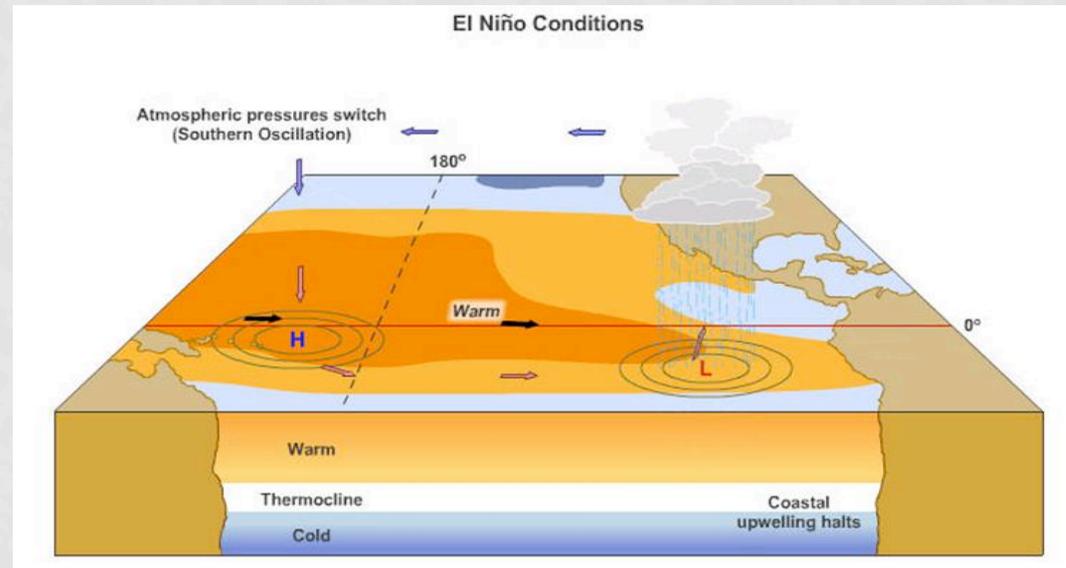
ANEMOMETER

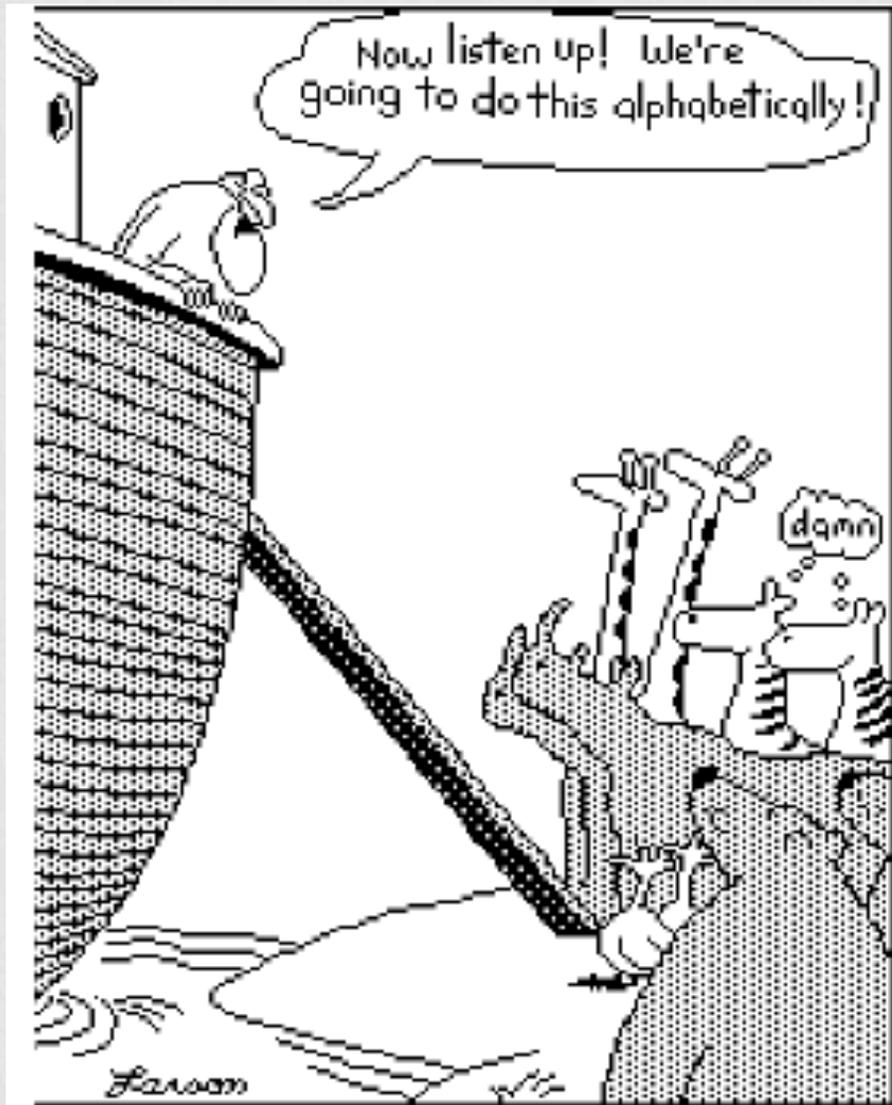
- An instrument used to determine wind speed



EL NINO

- The name given to the periodic warming of the ocean that occurs in the central and eastern Pacific; A major El Nino can cause extreme weather in many parts of the world.





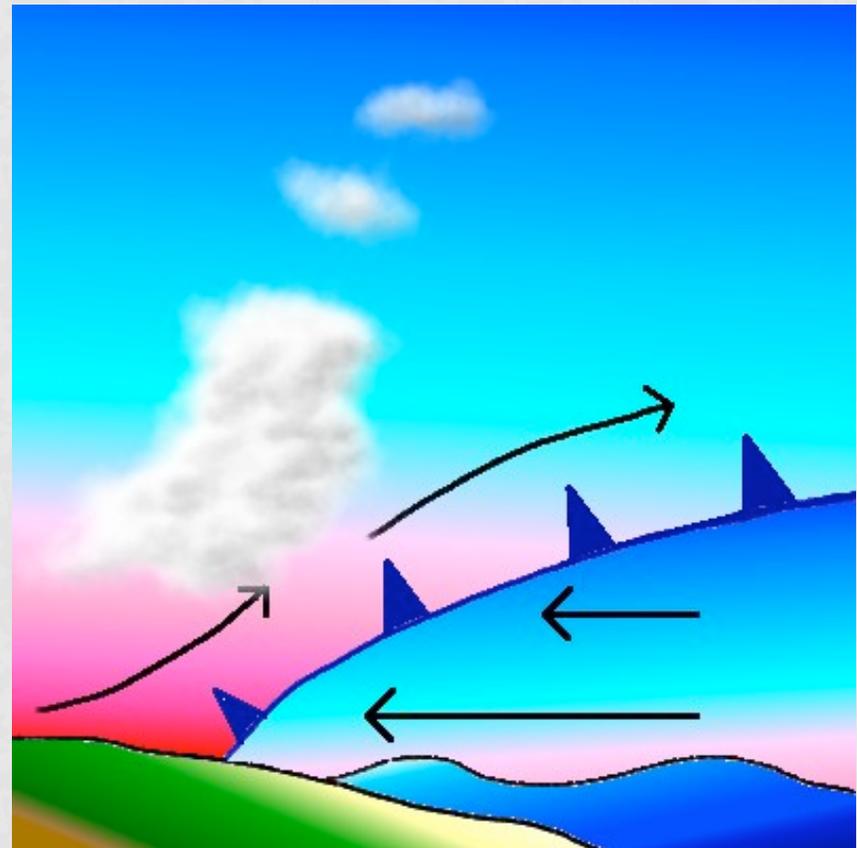
LOCAL WINDS

- The local winds are caused by either topographic effects or by variations in surface composition – land and water – in the immediate area.



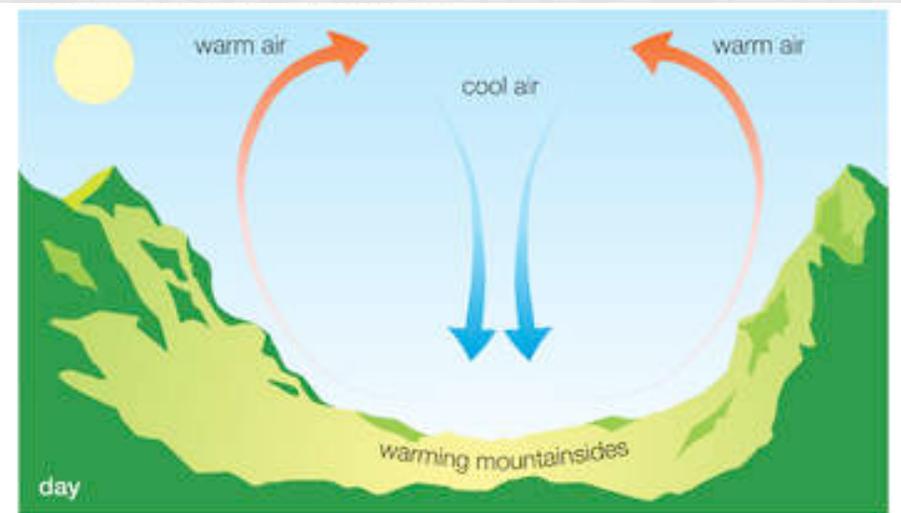
LOCAL WINDS

- Coast Sea Breezes – During warm summer months, the land surface heats up causing the air to heat, expand, and rise. This causes a low pressure area (above land), so the high pressure area of cool air above the ocean starts to move towards the low pressure system, thus causing the “afternoon sea breeze”. The reverse can happen at night when the land cools faster than the water.



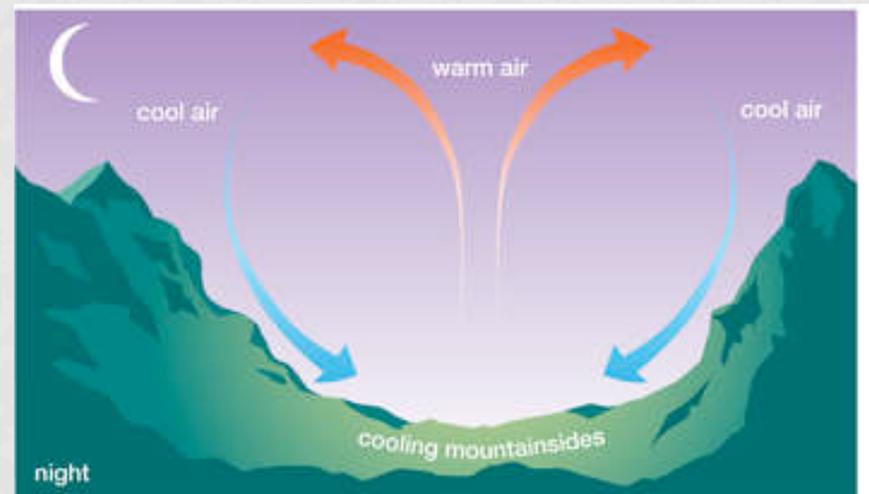
VALLEY AND MOUNTAIN BREEZES

- Valley Breeze – When the heat during the day heats up the land in the valley, the air begins to rise up from the valley floor and can funnel through and up the valley.



VALLEY AND MOUNTAIN BREEZES

- Mountain Breeze – When rapid cooling (after sunset) of the air takes place along mountain slopes, cool, dense air travels down the slopes generating a mountain breeze.



HOW WIND IS MEASURED

- Basic wind measurements are:
 - Direction
 - Speed



HOW WIND IS MEASURED

- Wind Direction
 - When wind consistently blows more often from one direction than from any other, it is called a prevailing wind.
 - In the United States, the westerlies consistently move weather from west to east across the continent.



HOW WIND IS MEASURED

- Wind Speed
 - Anemometer – (*anemo* = wind, *metron* = measuring instrument) – commonly used instrument that measures wind speed.



EL NIÑO AND LA NIÑA

- At irregular intervals of three to seven years, these warm countercurrents become unusually strong and replace normally cold offshore waters with warm equatorial waters.
- 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. (winter blows colder than normal air over the Pacific).

