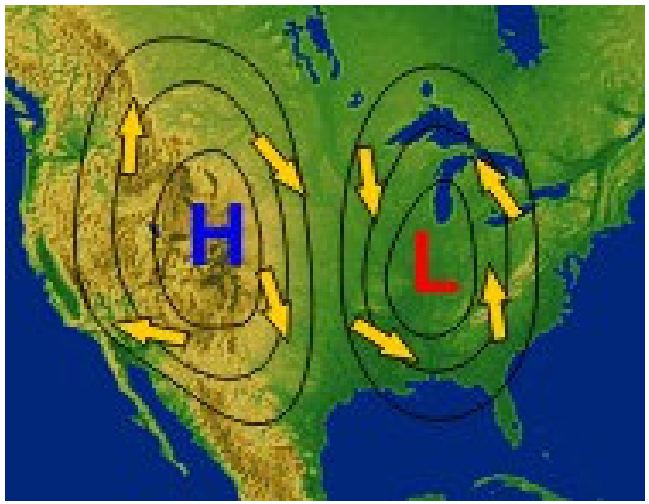
Ch 19.2 Pressure Centers and Winds

• Pressure centers are the most common features on a weather map. Knowing the basic facts about centers of high and low pressure can increase your understanding of present and forthcoming weather.

Highs and Lows



• Lows, or **cyclones** are centers of low pressure.

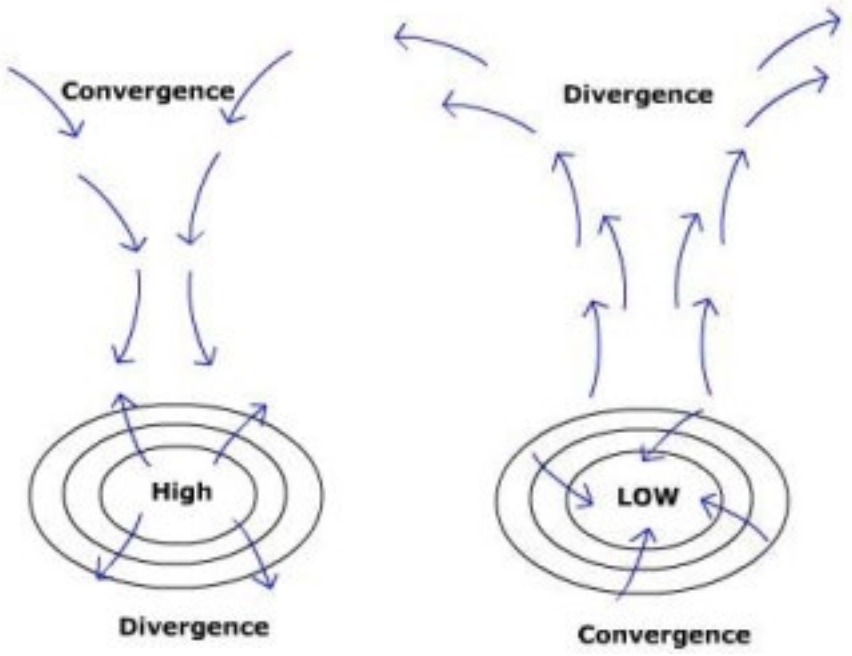
• Highs, or **anticyclones** are centers of high pressure.

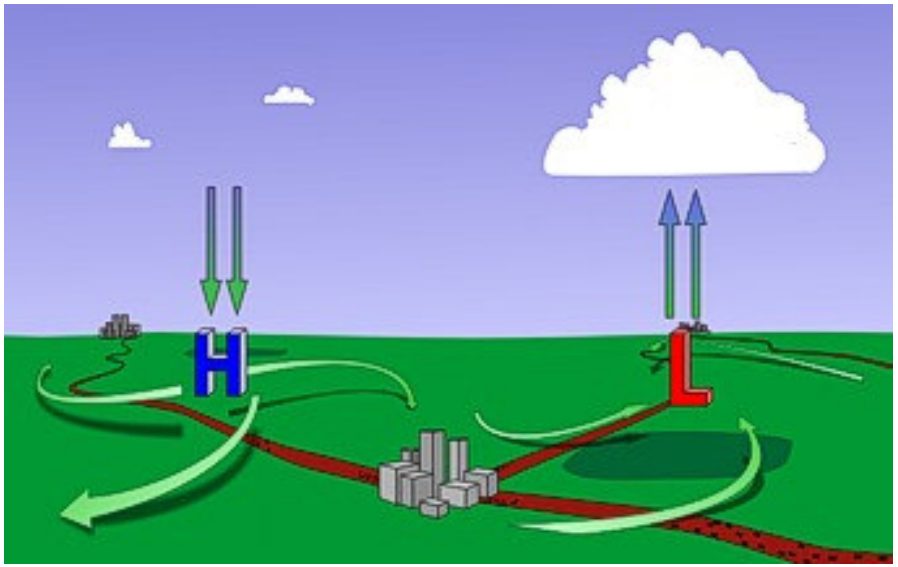
• In cyclones, the pressure decreases from the outer isobars toward the center.

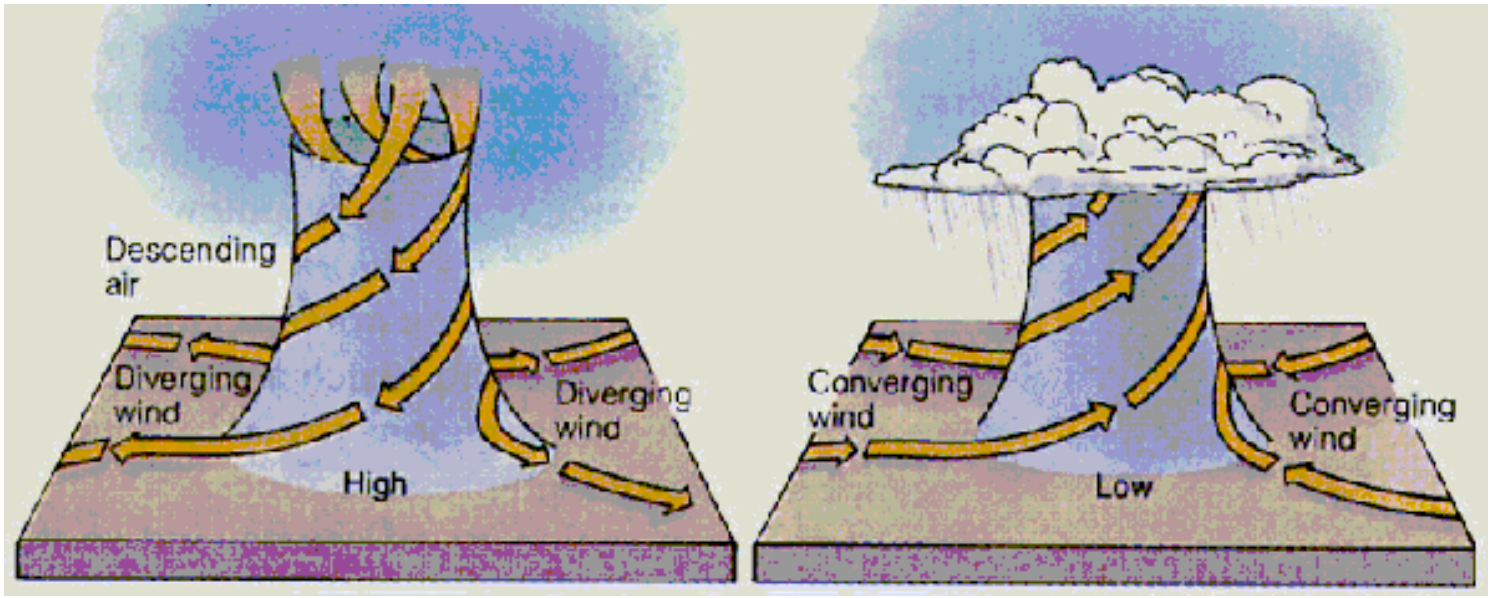
• In anticyclones, just the opposite is the case – the values of the isobars increase from the outside towards the center.

• When the pressure gradient and the Coriolis effect are applied to pressure centers in the Northern Hemisphere, wind blow counterclockwise around a low and blow clockwise around a high.

- When air converges (come together) horizontally, it must increase in height to allow for the decreased area it now occupies. This increase in height produces a taller and heavier air column, (a high). The converging air aloft causes air to subside (sink) toward the surface and diverge (spread out).
- A surface low can only exist only as long as the column of air above it exerts less pressure than the surrounding regions. This surface of converging air over a low rises upward to balance subsiding air of a high.





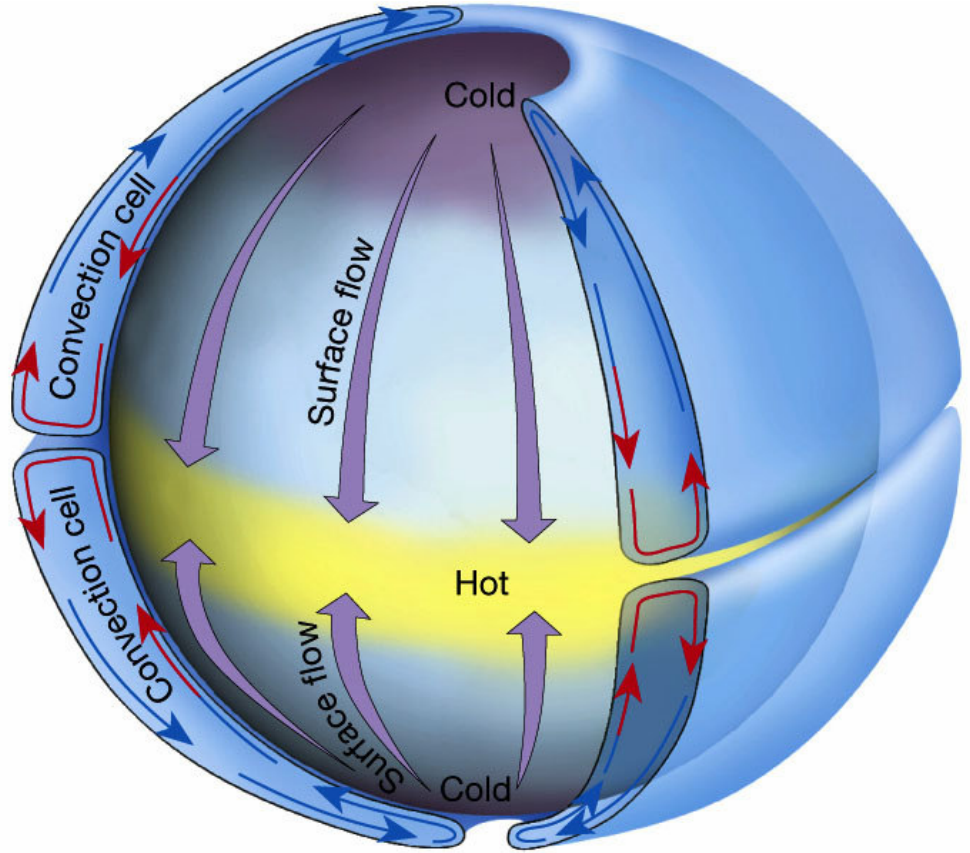

Descending
air
Diverging
wind
Diverging
wind
High
Converging
wind
Converging
wind
Low

Global Winds

- The underlying cause of wind is the unequal heating of Earth's surface.
- In the tropical regions, more solar radiation is received than is radiated back to space.
- It is the opposite regions near the poles, less solar energy is received than is lost.
- The atmosphere balances these differences by acting as a giant heat-transfer system.
- This system moves warm air toward high latitudes and cool air towards the equator.

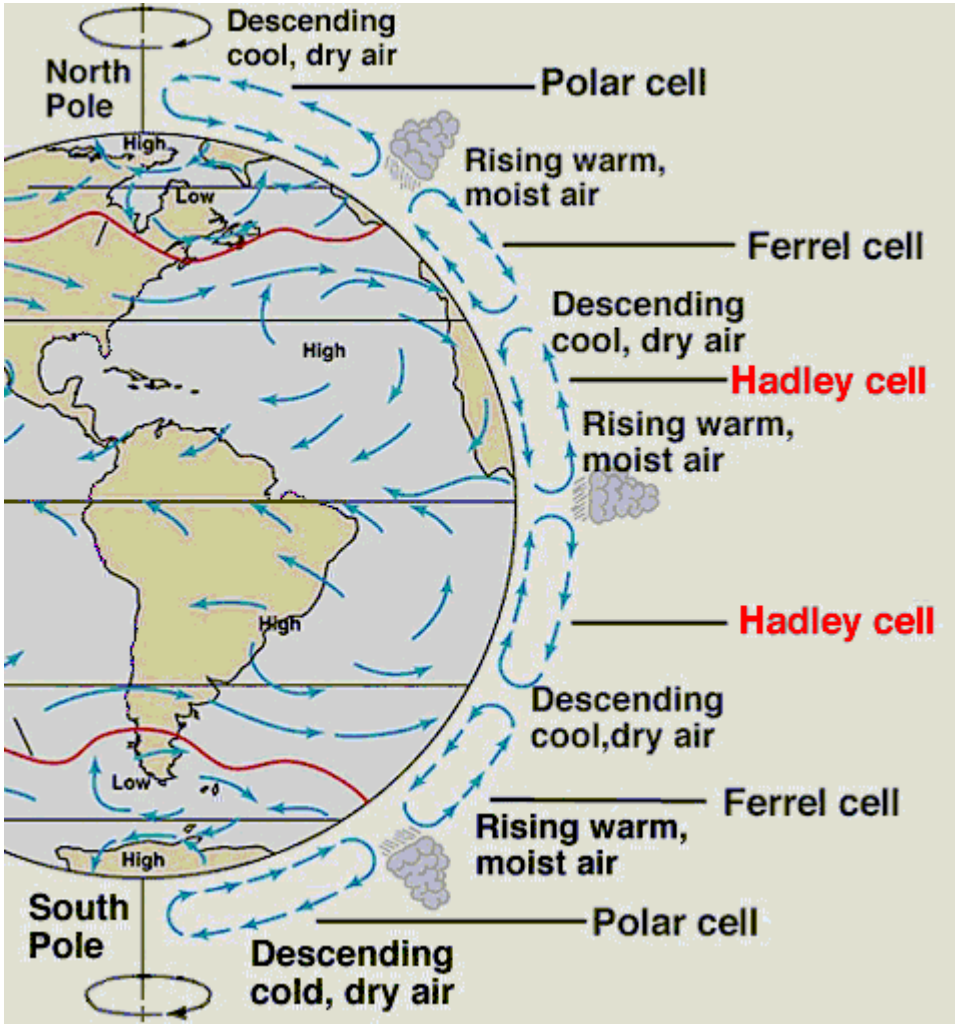
Non-Rotating Earth Model

- On a hypothetical non-rotating planet with a smooth surface, two large thermally produced cells would form, see picture to the right.
- The heated air at the equator would rise until it reached the boundary between the troposphere and the stratosphere.
- There the air would be deflected toward the poles. Eventually, the upper-level airflow would reach the poles, sink, spread out in all direction, and move back toward the equator.
- Once at the equator, it would be reheated and start the process over again



Rotating Earth Model

- With the effect of rotation, the two-cell **convection** system would break down into smaller cells.
- The three cells would carry on the task of redistributing heat on the Earth.
- At the equator air is heated by sunlight, it rises and moves toward the 30 degrees north/south latitude, and sinks, (Hadley cell).
- Winds for each **Hadley cell** called **trade winds** blow toward the equator and is deflected to the right by the **Coriolis effect** depending on the hemisphere the trade wind is located in.
- At the 30 degree north latitude, the cool winds from the **Ferrel cell** descends, warms, generates the prevailing **westerlies**, and blows the dominant west-to-east motion.



- The cold **Polar cell** winds blow south toward the 60 degrees north latitude, and is deflected to the right by the **Coriolis effect**.