

Circulation in the Atmosphere

Convection Cells

Within the troposphere are convection cells.

- Air heated in a relatively warm ground region rises, creating a **low pressure zone**.
- Air from the surrounding area is sucked into the space left by the rising air.
- Air flows horizontally at top of the troposphere through **advection**.
- Air cools until it descends.
- Air reaches the ground and creates a region where relatively cool, dense air is sinking (**high pressure zone**).
- Air flowing from areas of high pressure to low pressure creates winds.
 - The greater the pressure difference is between pressure zones, the faster the wind speed is.

Study Tip

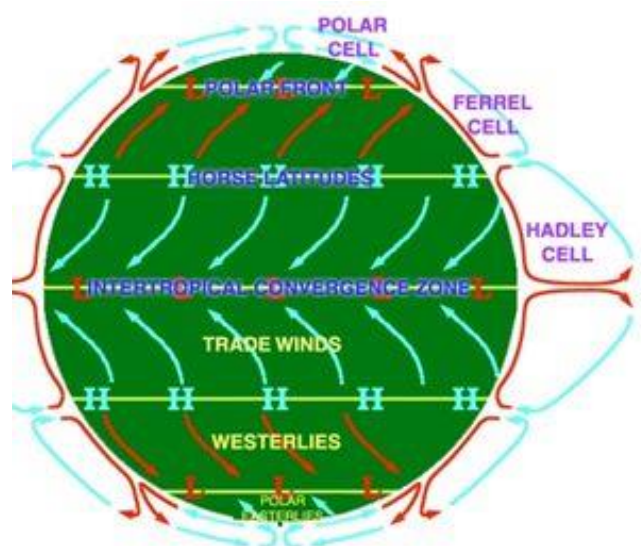
Think of the atmosphere as a fluid. Within this fluid would be the convective currents caused by temperature and density differences.

Air Pressure Zones

- Warm air can hold more moisture than cool air.
- As the warm air rises, it cools and it cannot hold all the water it contains. Water vapor may condense into clouds or precipitation.
- When cool air descends, it warms up and evaporates water on the ground.
- Air moving between high and low pressure zones creates global wind belts, and smaller pressure systems create localized winds that affect the weather and climate of a local area.

Atmospheric Circulation and Convection

- As more solar energy hits the equator, warmer air starts to form a *low pressure zone*.
- As less solar energy hits the poles, colder air starts to form a *high pressure zone*.
- This would be a convection cell in each hemisphere, due to the differences in pressure. However, the Earth rotates, and the **Coriolis Effect** creates three convection cells in each hemisphere, instead of one.



- **Northern Convection Cells (Polar, Ferrell, Hadley)**
 - The *Polar Cell* (between 60°N and the North Pole) is where cold air descends.
 - The *Ferrell Cell* (between 30°N and 60°N) shares its southern, descending side with the *Hadley Cell*, and its northern, rising side with the *Polar Cell*.
 - The *Hadley Cell* (between 0° and 30°N) is the lowest northern convection cell.
- In the southern hemisphere, there are three mirrored convection cells.

Concept Check

- How are convection cells created, and how do they affect the weather?
- What are the main types of convection cells?
- How does the Coriolis Effect complicate things?

