GLOBAL ATMOSPHERE CONVECTION CURRENTS

In nature all things flow down gradients from high to low

H → L
ex1. ball sitting on a hillside --> rolls down the hill

(high potential energy goes to low potential energy)

ex2. high temperature --> low temperature

(high kinetic energy moves to low kinetic energy)

ex3. high concentration --> low concentration

(dye in water spreads out until its equal)

ex4. high pressure --> low pressure

(pressurized air in a balloon pushes out into lower pressure air)
CONVECTION MODEL

- Explains the circulation of the atmosphere
H = high pressure
L = low pressure
→ = direction of air flow
Why do I care?

Convergence and divergence make the difference between a grey day and a sunny day.

Center of Convergence - where air comes together at the area of lowest pressure, causing the air to rise and create clouds, and precipitation.

Center of Divergence - where air heads away from the area of highest pressure. This causes air to fall, and clouds to dissipate and leave clear skies.
where planes fly to avoid turbulence from convection currents
Convection Currents and Hadley Cells

- Warm/moist air rising
- Cold/dry air falling
- Clouds form
- Clouds dissipate
- Moist
- Dry
- Rainy
- Sunny
- Center of divergence
- Center of convergence
- Tropopause
- Warm/moist air rising
- Cold/dry air falling
- Where planes fly to avoid turbulence from convection currents.
Ground

Clouds form

Clouds dissipate

tropopause
THIS MODEL WORKS FOR INDIVIDUAL CLOUDS OR STORMS BUT IT CAN ALSO BE EXTENDED TO EXPLAIN ALL GLOBAL CLIMATE PATTERNS
Air converges near the equator. This is called the **intertropical convergence zone (ITCZ)**.
ITCZ - INTERTROPICAL CONVERGENCE ZONE

continuous line of clouds/storms where the trade winds converge.

This line of clouds is visible at all times of the year from space.
GLOBAL CONVECTION CURRENTS AND CIRCULATION
THE BIOMES WE DISCUSSED EARLIER RELATE TO THE LINES OF LATITUDE 0 (equator), 30N, 30S, and 60N

WE SEE BANDS OF DRY, MOIST, DRY, MOIST, DRY, MOIST
BOREAL FORESTS (moist converging air)

SUBTROPICAL DESERTS (dry descending air)

TROPICAL RAINFOREST (moist converging air (ITCZ))

LEGEND
- Oceans
- Tropical Seasonal Forest/Savanna
- Tropical Rain Forest
- Temperate Rain Forest
- Temperate Deciduous Forest
- Boreal Forest
- Temperate Grassland/Desert
- Subtropical Desert
- Woodland/Shrubland
- Alpines
- Tundra
- Polar Ice Cap
Zone's of Divergence
Earth's Ten Largest Deserts
Regions of Convergence
Home of all of Earth's Great Forests

- Tropical rainforests
- Northern Boreal Forests
- Great Basin
- Patagonian
- Kalahari
- Gobi
- Syrian Arabian
- Great Victoria
- Antarctic Polar
FYI
- in order to simplify things we have ignored the tilt of the Earth in this discussion.
- because the Earth is tilted the size of the Hadley, Ferrel and Polar cells can all change in size (zones of convergence aren't always exactly 30 degrees apart)
- The ITCZ is always moving north and south as it follows the area that has the most absorbed incoming solar energy
- Also, the polar vortex increases in size dramatically when there is no sunlight hitting the polar region

we drew the average line

this is why monsoon season exists in Southeast Asia, there are times when India, Vietnam, Philippines, etc. are within the ITCZ and times when they are outside the ITCZ.

(Wet season when they are in it and dry when they are out of it)