Lecture 7

GLY102

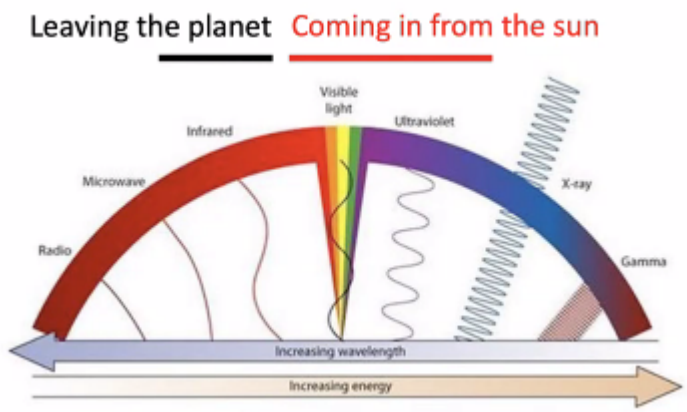
2/23/2021

Review

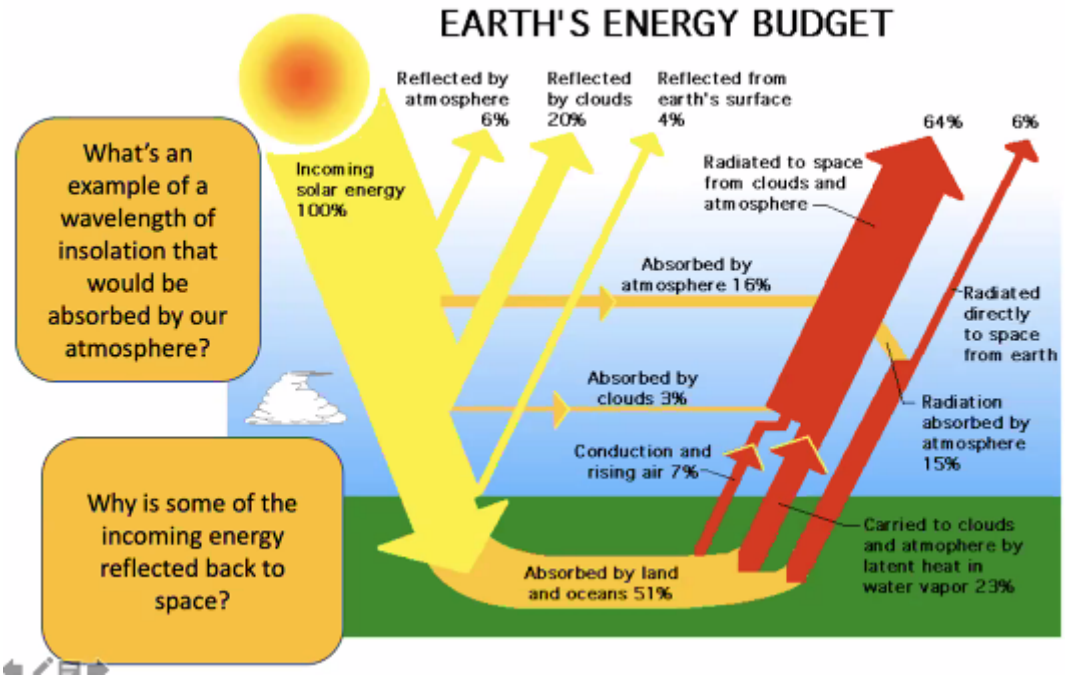
Anomaly Equation

Weather - Climate = Anomaly
OR
Recent Data - Average = Anomaly

Electro magnetic spectrum



Earth's Energy Budget



Atmospheric Circulation

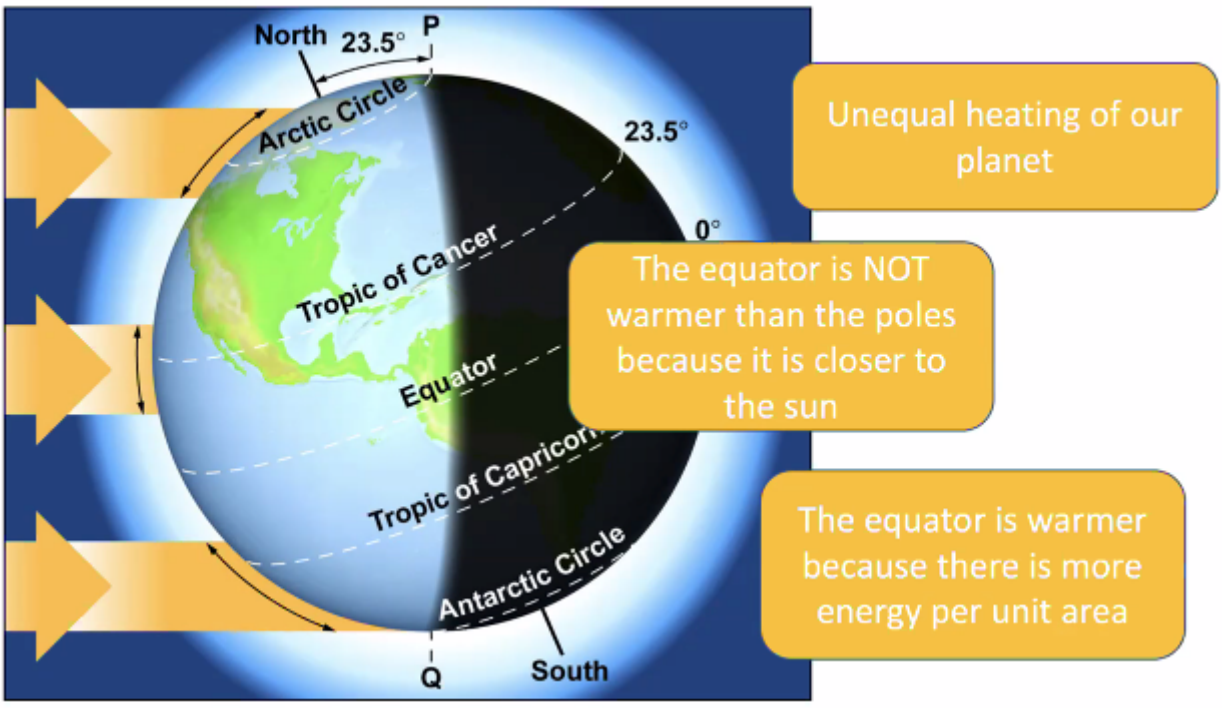
The diagram below shows the Earth, the three arrows coming from the left are the sun's energy. The height is the same, same amount of energy.

The distance from the sun for the north compared to the equator is miniscule and negligible.

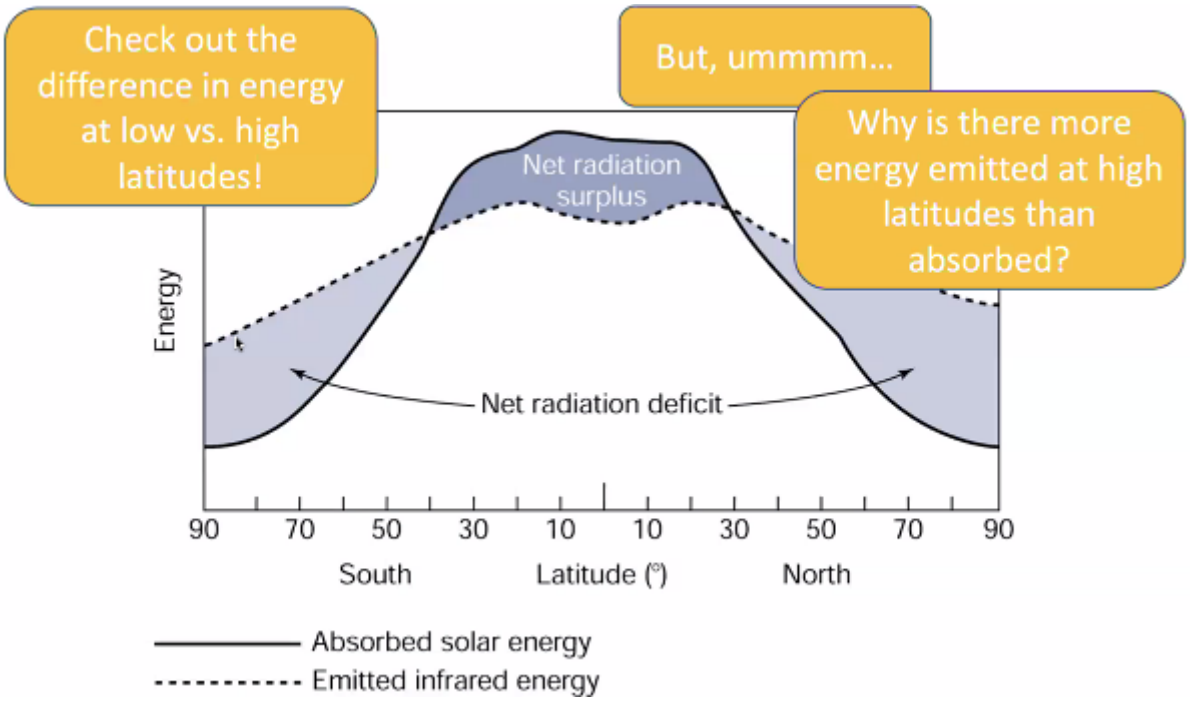
The middle of the earth gets warmer because it has a higher amount of energy per unit.

The other two spread their energy across more area. Hence, the unequal heating of our planet.

"The equater is warmer because there is more energy per unit area."



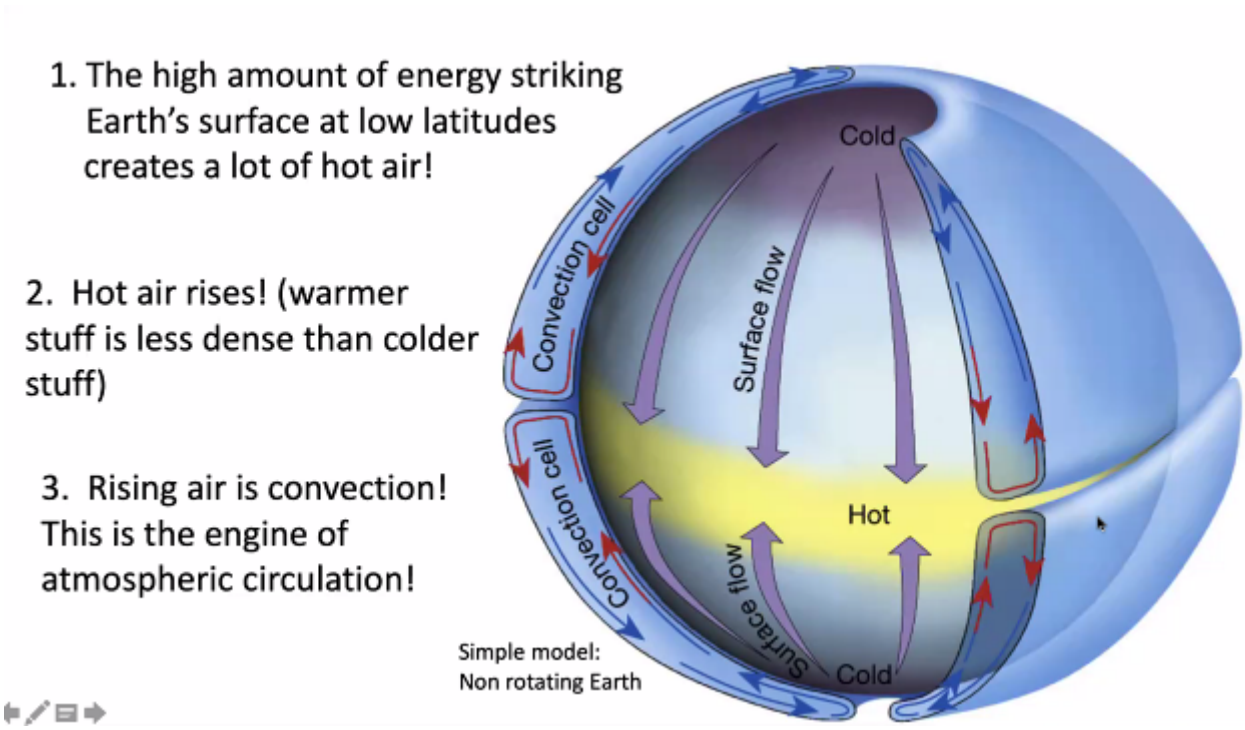
The earth emits more energy from the latitude than it absorbs, because of Earth's currents. This is where the Atmospheric Circulation comes in.



The atmosphere helps distribute the energy to the poles.

Most of the energy is at the equator, but the oceans and atmosphere moves that energy elsewhere.

The following is described as the "engine of Atmospheric Circulation":



AS the air rises, the temperature of that rising air decreases.

What happens when hot air rises?

- It cools

- It condenses into:
  - Rain
  - Snow
  - Thunder
    - Hot air rising into the troposphere that cools and condenses which then leads to the rain

1918: The Western Front

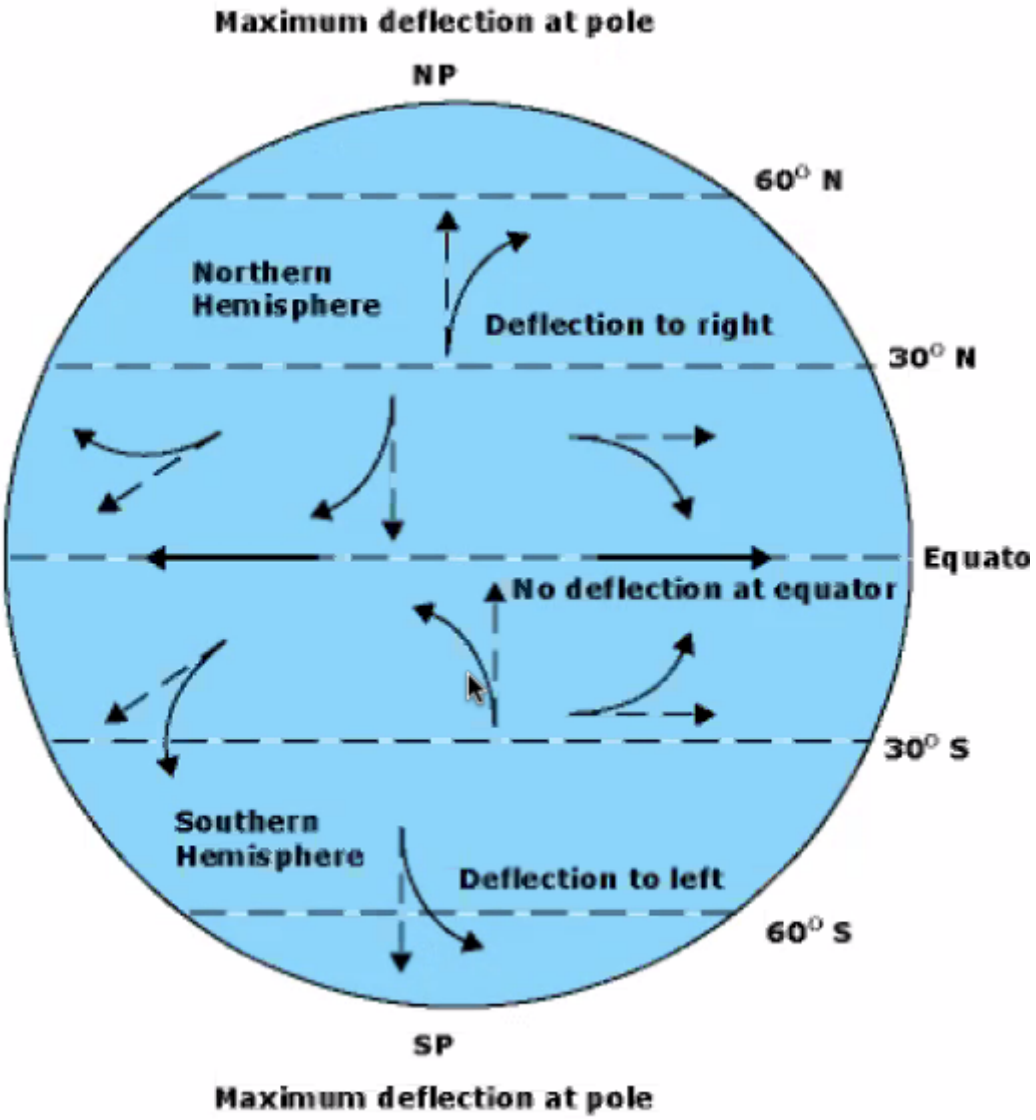
German artillery tries to shell Paris from 120 km

Always misses to the right of Paris, but why?

The Coriolis Effect Explained

- Different deflection in the northern vs. southern hemisphere
- Deflection to right in northern hemisphere
- Deflection to left in southern hemisphere
- Critical to air circulation

One will get deflected away from the equator as it travels in the air above the Earth.

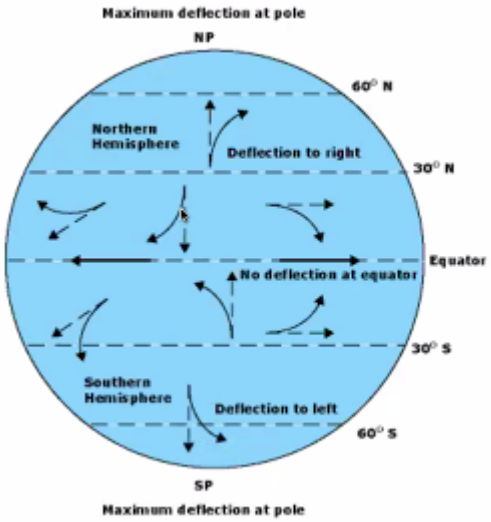


- Different deflection in the northern vs. southern hemisphere

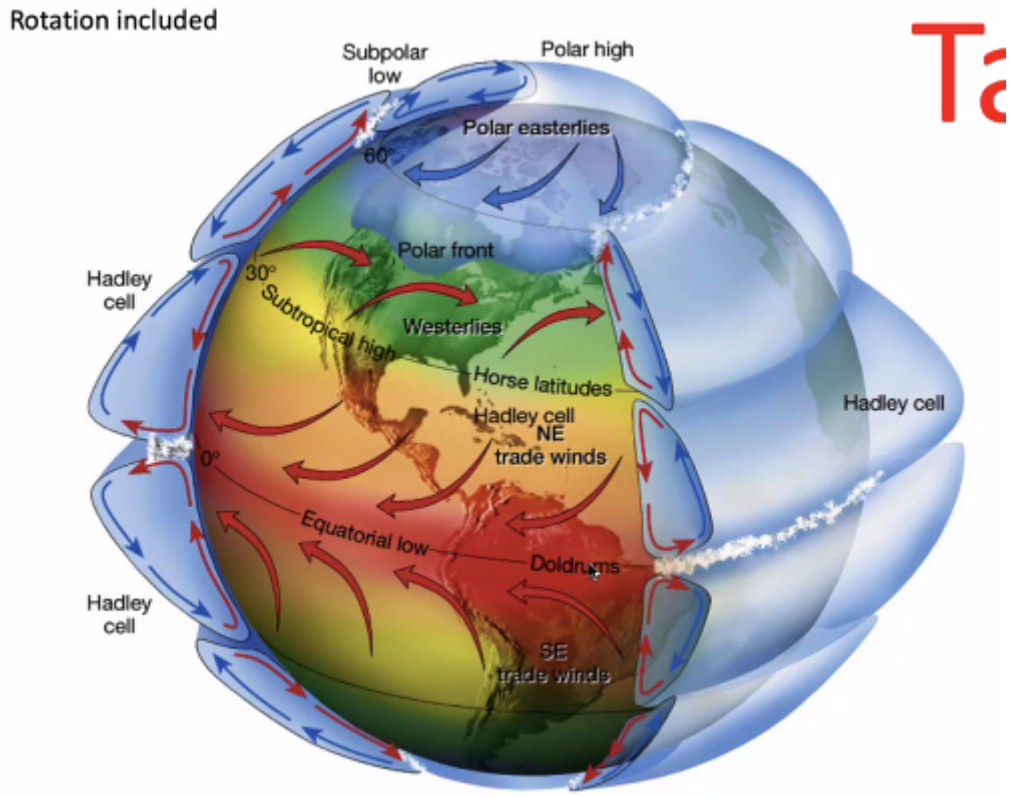
- Deflection to right in northern hemisphere

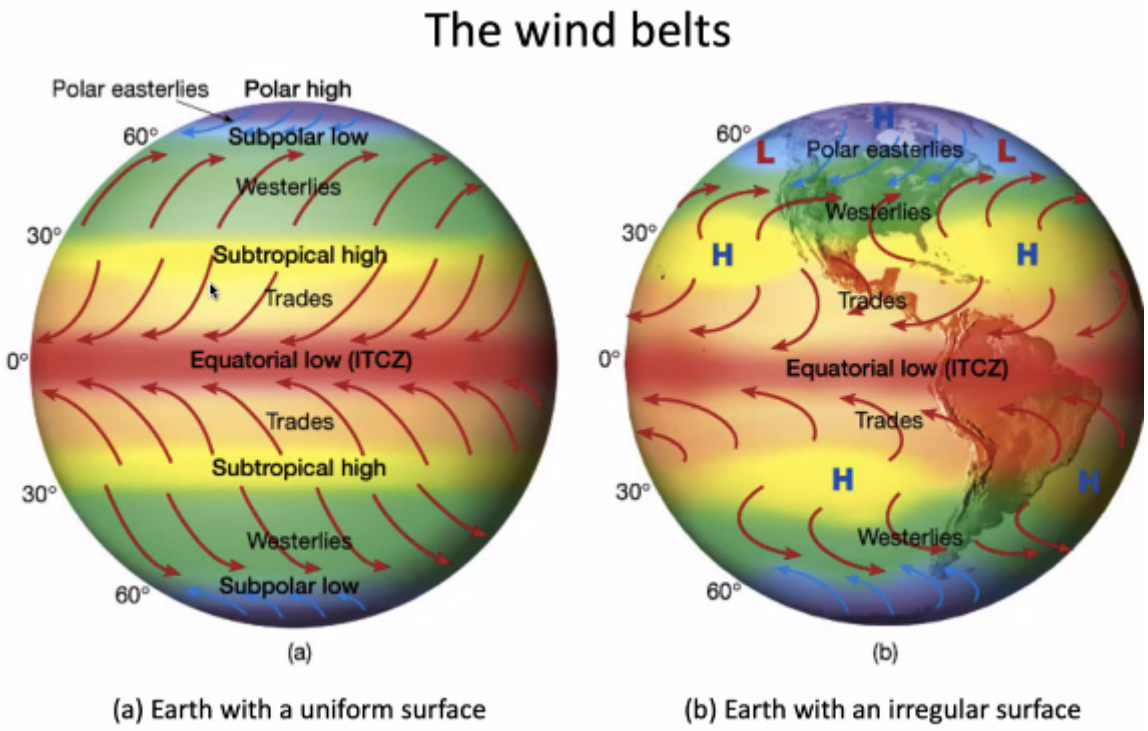
- Deflection to left in southern hemisphere

-Critical to air circulation!



The direction that a hurricane spins depends on these properties and the Coriolis Effect.





(a) Earth with a uniform surface

(b) Earth with an irregular surface

Surface wind patterns

- Winds named for the direction they come from (e.g., westerlies, wind coming from the west!)
- Why is there convergence of air at the equator? Low pressure! There's low pressure because it is warm there.

ITCZ - The easterly trade winds of both hemispheres meet at an area near the equator called the *"**I**nter**T**ropical **C**onvergence **Z**one"*

Trade Winds - These are found from 0-30 degrees latitude (aka Tropical Easterlies)

Prevailing Westerlies - These are found from the 30-60 degrees latitude (aka Westerlies)

Polar Easterlies - These are found from the 60-90 degrees latitude.

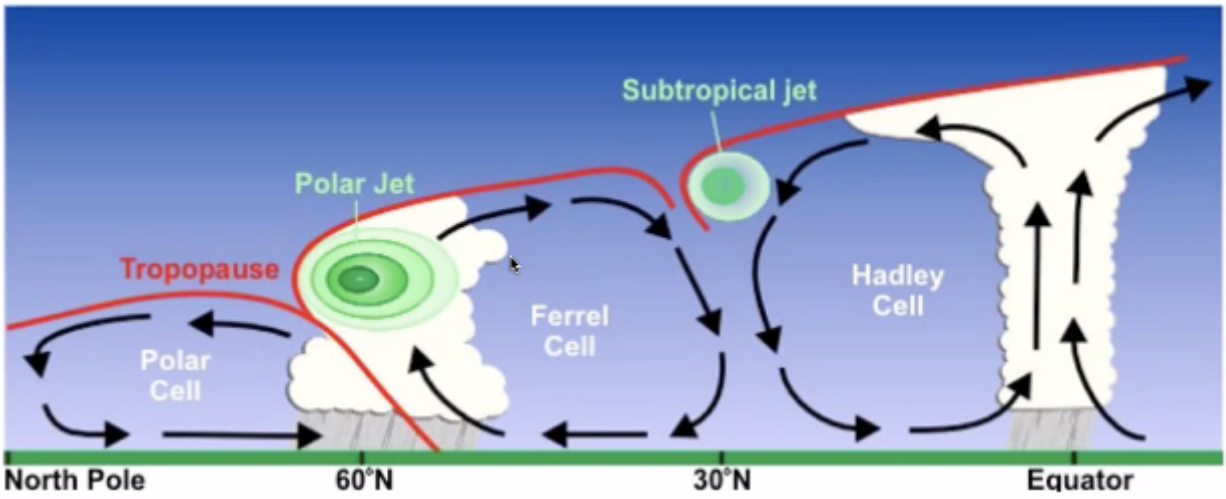
Doldrums - an area of low pressure occurring where the trade winds meet along the equator. Winds here are usually calm or very light and so ships would avoid the area...

Horse Latitudes - Located mostly over the oceans, at about 30° latitude in both of the hemispheres.
Named "horse latitudes" because ships relying on wind power stalled. Sailors threw their horses and cattle overboard to save on provisions.

Vertical convection cells

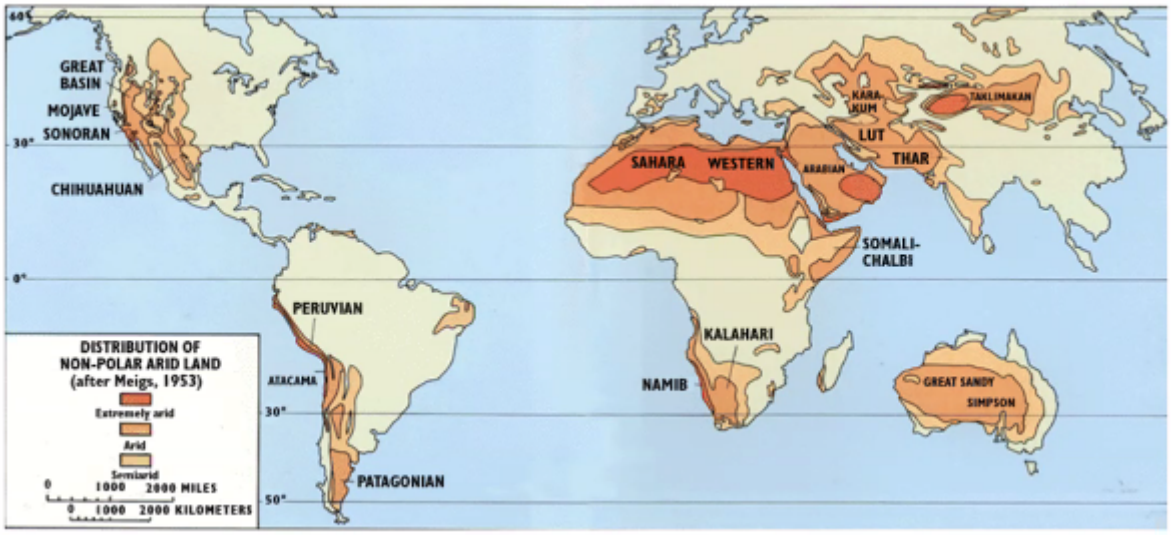
Hadley Cell - Circulation pattern of warm, moist air rising at the equator, traveling to higher latitudes, and cool, **dry** air descending around 30° North and South latitude.

Less important but still notable are the Ferrel (@ mid latitudes) and Polar (Polar Vortex) Cells.



Why are the world's major deserts located close to 30° N & S latitude? (and not at the equator where it is hottest)

At 30°, you get deserts because all of the dry air is descending from the atmosphere. It doesn't have any moisture. At the equator, there is convection and so there's a lot of moisture.



By contrast, Rain Forests are at the equator because of the convection happening there! (Intertropical Convergence Zone)