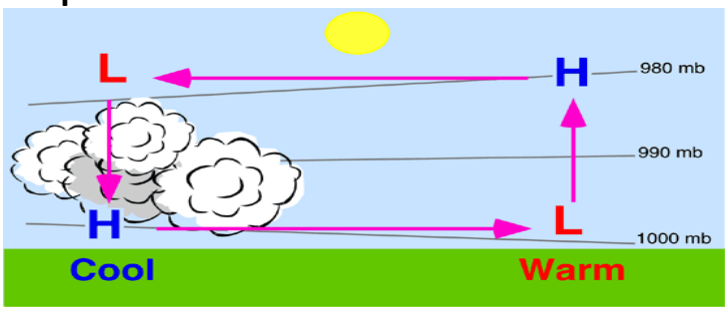
Earth and Space – The Atmosphere

- *The layer of air surrounding the Earth*
- *Our atmosphere covers our planet because of the gravitational field of our planet*
- *Atmospheric circulation is the global-scale movement of the layer of air surrounding the Earth*

Atmospheric circulation

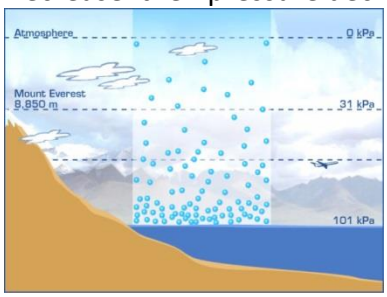
- *AC occurs due to **density changes** and **temperature.***
- *Warm air moves towards the poles where it is cooled then circles back to the equator.*
- *This means that warm air rises and cold air descends.*

Simple air circulation



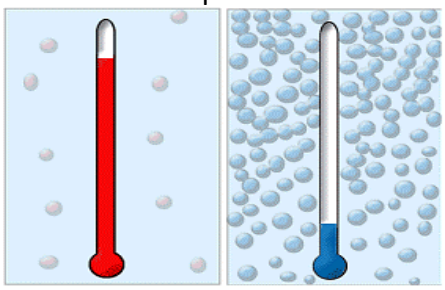
Atmospheric pressure

- Air is a fluid and travels from an area of high pressure (cold) to an area of low pressure (warm)
- If the number of air particles
  - Increase : then pressure increases
  - Decrease: then pressure decreases



- There is a natural thinning of our atmosphere with altitude and therefore a natural decrease in pressure
- If temperature of the air

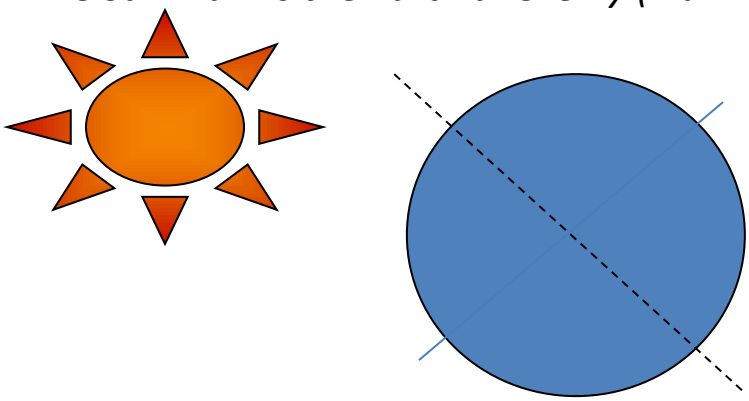
– Increase: (the molecules are flying every which way) the pressure will decrease
– Decreases: the pressure will increase



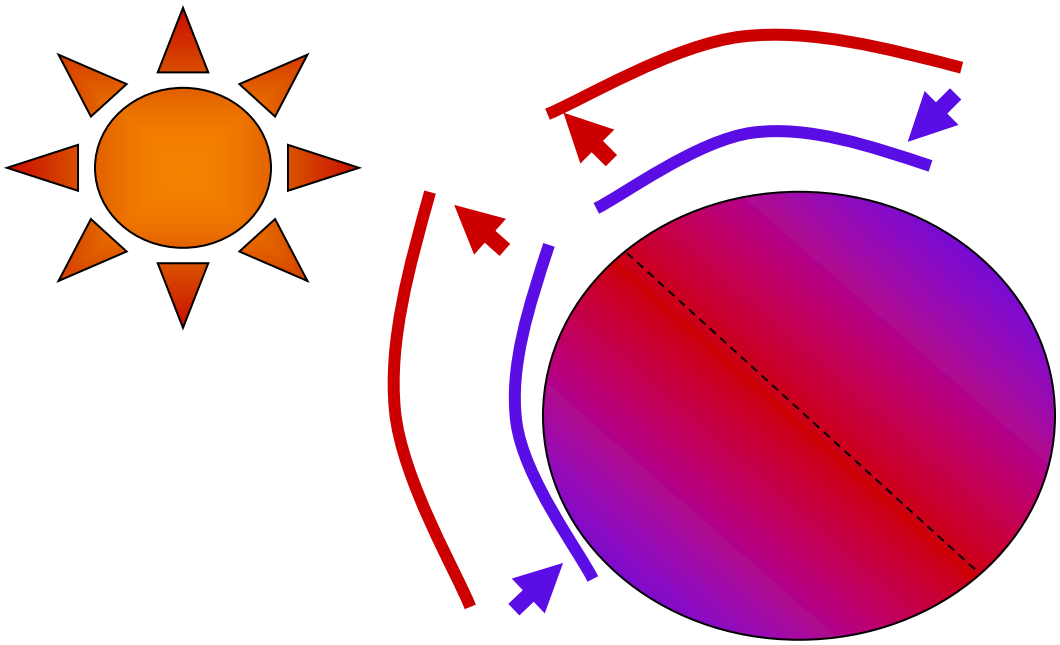
– **Warm air is therefore less dense than cold air

Global Scale Atmospheric Circulation

The Sun warms the Earth unevenly (warmer at the equator)



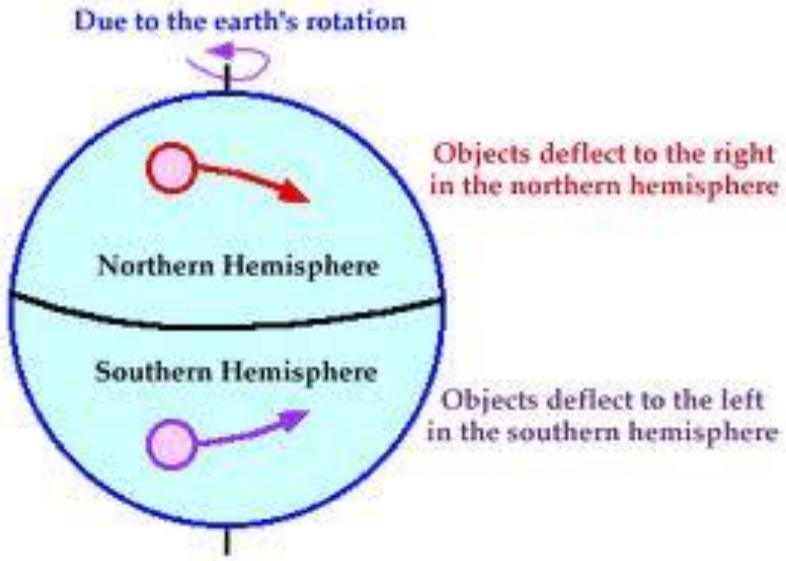
The temperature variation brings on a difference pressure and will make the warm air rise



Coriolis Effect

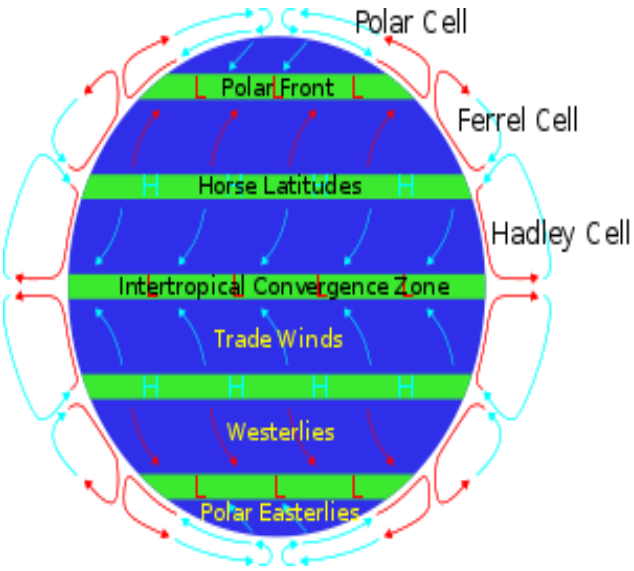
Rotation of earth causes wind to deviate from destination

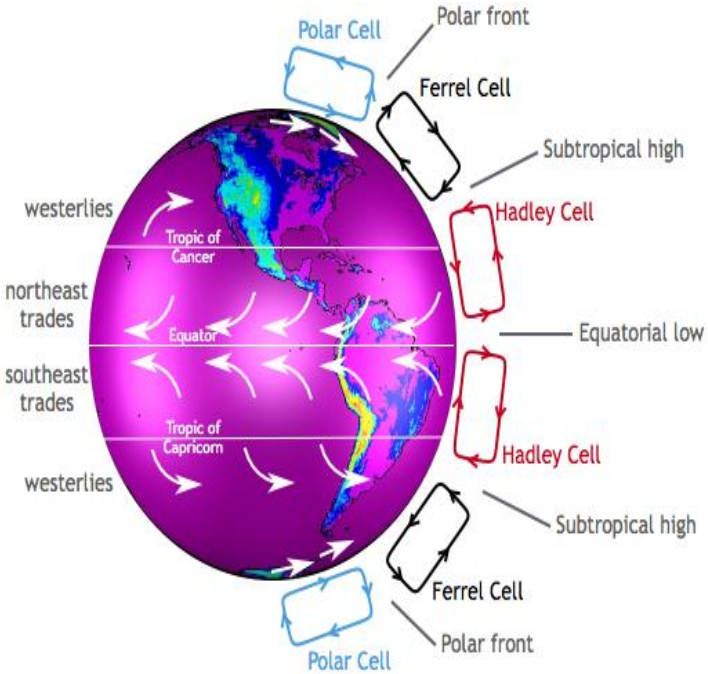
- *Winds deviating to the right in the Northern Hemisphere*
- *Winds deviating to the left in the Southern Hemisphere*



Circulation cells

Winds form loops called circulation cells





Hadley cells	Ferrel cells	Polar cells
Warm air rises at equator and moves to the 30th parallel	*Warm air rises from the 30th parallel moves towards the 60th parallel*	*Warm air rises from the 60th parallel moves towards poles*
Collides with winds from Ferrel cells and moves back to the equator	*Collides with the winds from polar cells and moves back to 30th parallel*	*Air cools at the poles and moves back to 60th parallel*
Creates the trade wind	*Creates the westerlies (from west to east)*	*Creates the polar easterlies (from east to west)*

Prevailing Winds

Major wind currents that blow in a particular direction.

1- Polar easterlies: *in polar regions and blow from east to west*
2- Trade winds*: near equator blow from west to east*
3- Westerlies- *in middle latitudes blow from west to east*

Other winds

- Jet streams
  - Subtropical Jet stream
    - *Around the 30th parallel*
    - *Travels at 400 km/h 11 km above the surface*
  - Polar jet stream
    - *Around the 60th parallel*
    - *Travels at 300 km/h*

Weather Makers: Air Masses, anticyclones and cyclones

Air masses

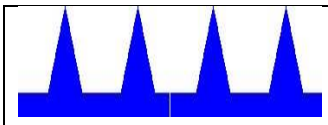
- *Large expanse of air with relatively uniform temperature and humidity.*
- *Air mass characteristics:*
    - *Humidity (humid or dry)*
    - *Temperature (cold or warm)*

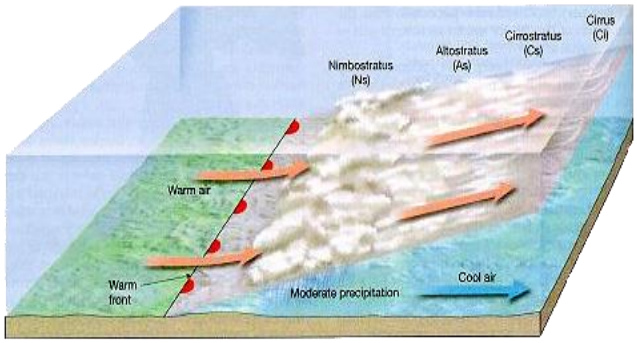
Fronts

Is a boundary separating 2 different masses of air and causes weather. The 2 fronts do not mix they cause weather patterns.

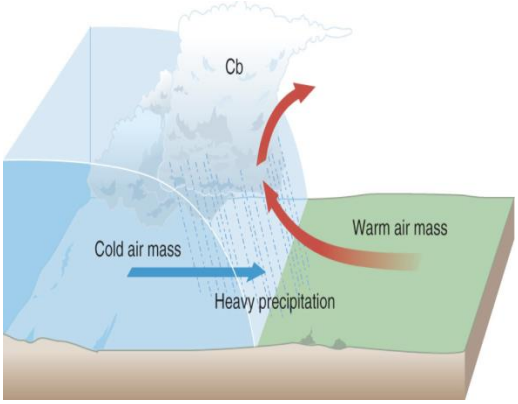
Types of fronts

Cold	Warm
Cold air meets warm air	*Warm air meets cold air*
Warm air rises rapidly, condenses causing heavy rain and wind = high pressure	*Warm air rises slowly, condenses creates clouds and dispersed showers = low pressure*
Descending cold air, prevents cloud formation	*Rising warm air creates cloud formation and rain*
-In winter clear skies and very cold *-In summer clear skies and comfortable temperature*	*-In winter warmer weather and snow* *-In summer hot, humid, cloudy with rain*

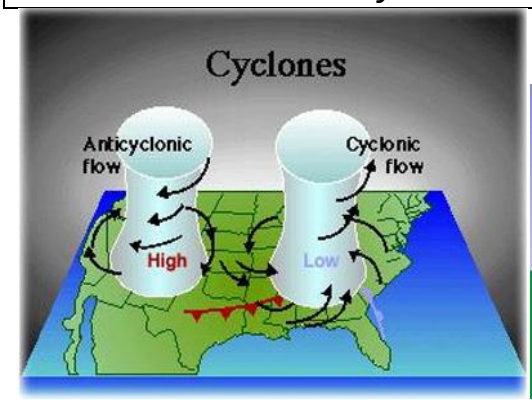


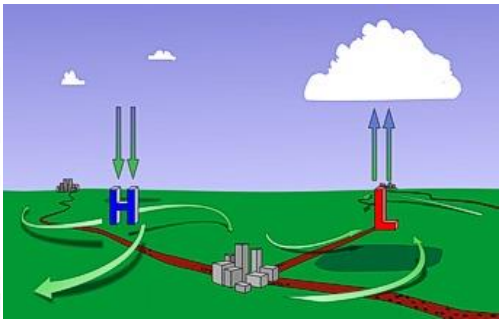
Warm front produced as warm air glides up over a cold air mass.



Anticyclones and depressions

Anticyclones (high pressure system)	Depressions (low pressure system)
an area of atmospheric circulation around a high pressure centre	*an area of atmospheric circulation around a low pressure area*
sunny skies	*precipitation*
The air turns clockwise in the Northern hemisphere and counterclockwise in the Southern Hemispheres	*The air turns counterclockwise in the Northern hemisphere and clockwise in the Southern Hemispheres*
Associated with cold fronts	*Associated with warm fronts*





Hurricanes:

A large cyclone characterized by violent winds