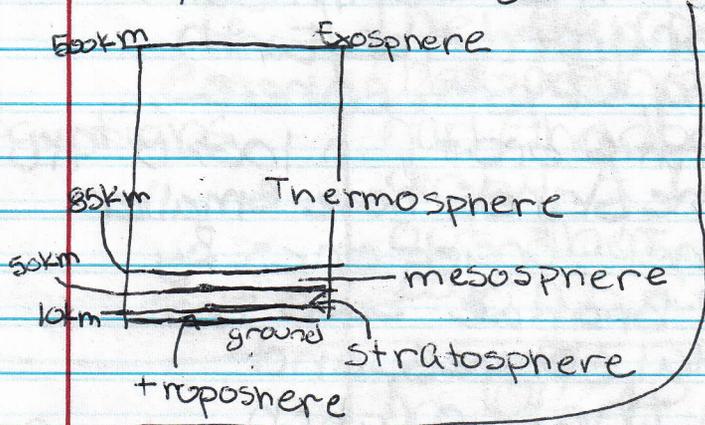


Weather Orientation

• Layers of Earth's Atmosphere



• troposphere

- The lowest layer
- 99% of Earth's water vapor
- 75% of Earth's atmospheric gases
- rain, snow, and clouds occur here

• Stratosphere

- contains ozone layer
- ozone = 3 oxygen atoms bonded together

• mesosphere

- where shooting stars occur (meteor)

• Thermosphere

- thickest atmospheric layer
- high temperatures

• ionosphere

- a layer of electrically charged particles in the meso and thermospheres that absorb ^{AM} radio waves in the day and reflect them at night

• Exosphere

- the outer most layer of air, 1
- very few molecules, space shuttle wings don't work

• radiation

- when the sun's radiation ^(heat) reaches Earth:
 - 6% reflected by the atmosphere
 - 25% reflected from clouds
 - 4% reflected from Earth's surface
 - 15% absorbed by the atmosphere
 - 50% absorbed by Earth's surface
- energy transferred in the form of rays or waves (can travel through space)

• conduction

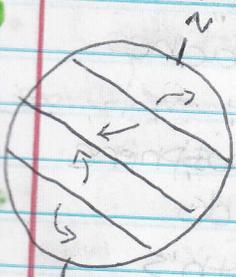
- the transfer of energy that occurs when molecules bump in to each other
- air in the atmosphere is warmed as it moves over land or water (direct contact, conduction) (through solids)

• Convection

- the transfer of heat by the flow of material
- when warm, less dense air rises and cool, dense air sinks (through liquids) creates convection current.

- Earth's atmosphere distributes the sun's heat by radiation, conduction, and convection + holds sun's energy in at night supports life
- Earth's curve + the sun's rays
 - The equator receives more direct sunlight than the poles
 - The equator gets more energy per m^2
 - The poles get less energy because the Sun strikes them at an angle, so the light is more spread out

- Earth's rotation + global winds

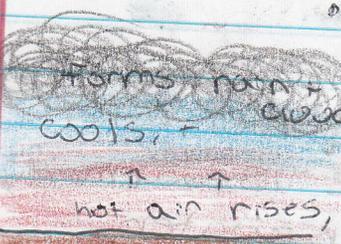


- Coriolis effect - the effect of Earth's rotation that makes moving air and water appear to turn right north of the equator and left south of the equator

- the moving air is caused by the sun's uneven heating
 - hot air rises, cool air sinks

- Doldrums

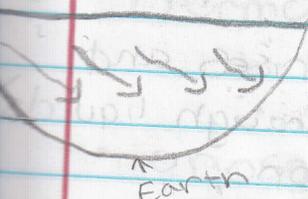
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- near the equator the sun heats the air, which causes it to rise, creating a low pressure zone with little wind

- The hot air cools as it rises, causing cloudy, rainy weather to develop

- Westerlies



- near 30° north + south latitude Earth's rotation pushes air from west to east as it moves toward the poles

- In the U.S. they move weather along the Oklahoma-Texas border

- Polar Easterlies



- near the poles cold air sinks and moves away. Earth's rotation moves the wind from east to west

- Trade winds

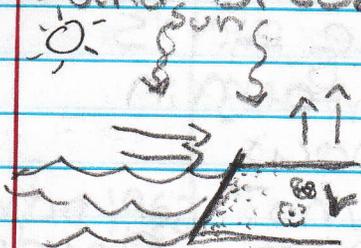
- The hot air rising from equatorial doldrums moves



toward the poles and cools, sinks. It then flows back toward the low pressure of the doldrums deflected by the Coriolis Effect.

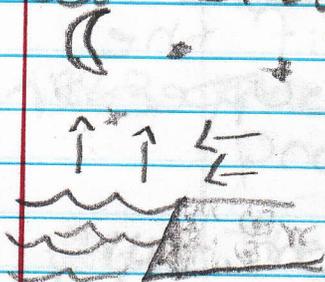
- Early sailors relied on the winds to navigate global trade routes.

• Land Breeze



- During the day the sun warms the land more than the sea (convection).
- The warm land air rises and the cool sea air blows in.

• Sea Breeze



- At night the land cools faster than the sea.
- The warm sea air rises and the cool land air blows over the sea.

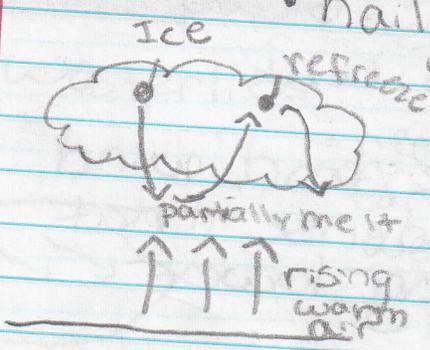
- Temperature, air pressure, and wind
 - Hot air is less dense than cold air, creating lower air pressure.
 - Wind flows from high to low air pressure.

- Temperature and humidity
 - Molecules in hot air move faster than molecules in cool air.
 - It's harder for fast moving molecules to condense, so hot air can contain more water vapor, or humidity.

• Conditions needed for:

- rain
 - Warm air rises, cools, and water vapor condenses.
 - If the surface air is warm, the water falls as rain
- snow
 - when the surface air is cold, ice crystals form in clouds + fall as snow
- sleet
 - Water droplets form in clouds, fall as rain, and freeze into small ice pellets if the ground air is cold + upper air is warm

• hail



• Ice crystals form, fall from the cloud, get pushed back into the cloud (partially melt) by rising warm air, refreeze + grow + repeat until they are too heavy to be pushed up by the warm air + fall as hail

6 major air masses in the N. Hemisphere



- air mass - a large body of air that has similar properties to the part of Earth it developed over (over land = dry, over water = wet)
- Cool/moist, cold/dry, warm/moist, hot/dry



Weather Orientation

- atmospheric pressure and wind direction
 - wind blows from areas of high pressure to areas of low pressure
 - wind blows into a low pressure area counter-clockwise in the northern hemisphere because of the Coriolis Effect (cyclone)
 - wind blows away from high pressure areas clockwise because of the Coriolis Effect (anti-cyclone)

typically have fair weather (not rising + making clouds)

four types of fronts

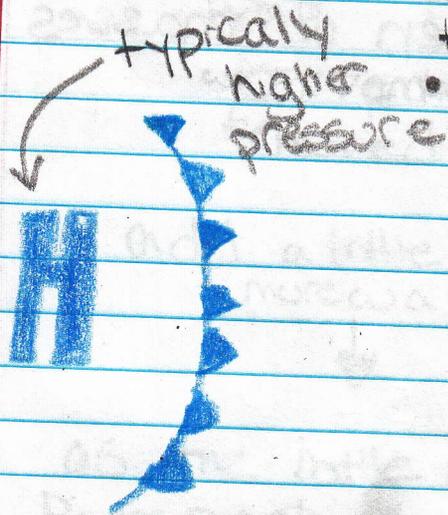
• front = a boundary between two air masses

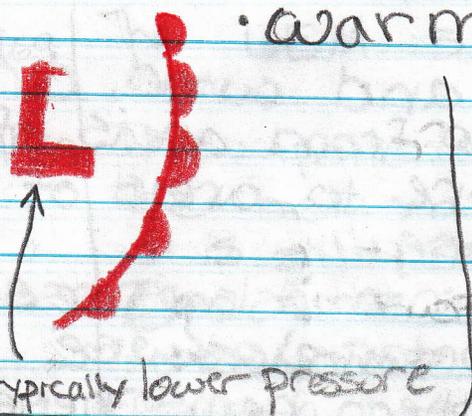
• Cold Front

• shown on a weather map with a blue line

• colder air moves toward warmer air and "p looses" it away (lifts. +)

• can cause thunderstorms + tornadoes if the temp. difference is big





• warm front

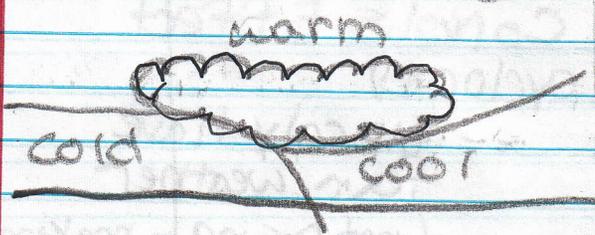
- lighter, warmer air moves toward heavier, colder air

typically lower pressure

• OOC

• Occluded front

Occlusion = closure
warm air "closed"
off from surface

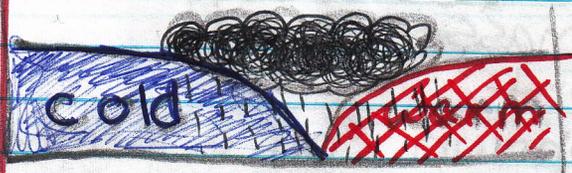


- cold air mass moves toward a cool air mass with warm air in between

• The warm air is pushed up by the meeting cold + cool air masses

• can create thunderstorms

• Stationary front



- when a boundary between air masses stops moving