

Earth's Atmosphere

The Early Atmosphere

- As the earth was forming, _____ added _____ to the early atmosphere -called "outgassing."
- Gases were carbon dioxide, ammonia, water, nitrogen, methane, hydrogen, and carbon monoxide.
- Photosynthetic plants add _____ to the atmosphere
- As photosynthetic cells evolved, they were able to capture the sun's energy and convert it into _____
- They also converted _____ into _____ which changed composition of Earth's atmosphere.
- _____ produce CO₂ needed for _____.
 - As oxygen breathing animals evolved, they supplied the CO₂ needed for photosynthesis.

Atmosphere

- The atmosphere forms a _____ between Earth and space and provides _____ that are _____.
- It protects us from _____, chunks of rock and metal from space and radiation.
- It also _____ and helps to _____ Earth's temperatures.
- It also provides _____ essential to life. _____

Earth's Atmosphere

- About _____% of our current atmosphere is composed of _____ (N₂) and _____ (O₂).
- The remaining 1% consists of _____ (Ar), _____ (CO₂), and _____ (H₂O) and other trace gases.
- Atmospheric gases, such as water vapor, CO₂, and ozone _____ from place to place.
 - Water vapor over _____ is much less than over water
 - CO₂ has _____ due to the _____ of fossil fuels
 - Ozone layer _____ at higher altitudes

Ozone

- Ozone is created when the sun's energy splits _____ and the single O combines with another O₂ to make O₃ (ozone).
- The ozone layer _____ sun's UV _____ so Earth's _____ receives less energy.
 - The ozone layer varies seasonally with it being the thinnest in the spring. Recently, _____ has seen a large drop in the _____ of ozone
 - _____ and other _____ are depleting this layer.

Air Pressure

- Air pressure is the _____ by the weight of a column of air on a surface.
 - Air pressure changes with _____.
 - _____ near the earth's surface
 - Density _____ as altitude increases.
 - As the density _____ the amount of _____ in the air drops.
 - Many _____ choose to train at a higher altitude so they are used to performing with less oxygen.

Atmospheric Layers

Troposphere

- Contains _____
- Layer that _____
- Layer where _____ happens - Contains almost all of earth's water vapor – _____
- Temperature _____ as altitude _____
- Temperature stops increasing at the _____

Stratosphere

- Contains the _____
- Temperature mainly _____ as altitude _____ to allow the ozone molecules to absorb UV rays
- Temperature stops increasing at the _____

Mesosphere

- Air is _____
- Most _____ burn up in this layer
- Very little _____ is absorbed
- Temperature _____ with altitude
- Temperature stops decreasing at the _____

Thermosphere

- No _____ marks the end of the atmosphere, _____ with space
- Temperature _____ rapidly with _____

Ionosphere

- Not a _____
- Region of electrically _____ particles and ions
- _____ waves travel to the ionosphere and bounce off ions and return to earth
- _____ – colorful display of light produced when charged particles from the sun are attracted to the Earth's magnetic poles. These particles cause the ions in the ionosphere to _____.
- Aurora Borealis – _____

Energy Transfer in the Atmosphere

- _____ – transfer of thermal energy by electromagnetic waves
- _____ energy is transferred to from the Sun to the earth by radiation
- Solar radiation is _____ or _____ directly or indirectly

Greenhouse Effect

- The process of absorption of radiation of earth's energy results in the greenhouse effect.
- This is the _____ of Earth's surface by greenhouse gases
- Greenhouse effect _____ the earth's surface by 30°C.
- Without it, life on earth would _____ exist.
- An increase of greenhouse gases (methane and CO₂) can lead to heating of the atmosphere – _____
 - Increasing levels of _____ may lead to global warming.
 - Added CO₂ from burning of _____ and _____ traps more of the sun's energy because the _____ can't escape.
 - Global warming is when the earth's average temperatures _____ due to _____.

Properties of the Atmosphere

Temperature

- Temperature is the measure of _____ of particles.
- The higher the _____, the more _____, the _____ the particles move
- Temperature is measured in _____ (F°), _____ (C°), and _____ (K).

Temperature inversion – _____ in temperature with _____ in an atmospheric layer.

- _____ on _____ and _____ on the _____.
- Causes –
 - _____
 - _____ – smog is indicator

Air or Barometric Pressure is...

- Pressure that _____
- A _____ is used to _____ air pressure.
- The height of the _____ indicates air pressure.

Humidity

- The amount of _____ in _____
- _____ – is the ratio of the amount of water vapor in the air to the maximum amount of water vapor that can exist.
 - Expressed at a _____ 60% humidity – 60 out of 100% contains water vapor
- Humidity Terms –
 - _____ – when the _____ of water vapor in air has reached its _____. (cannot hold any more water)
 - _____ – the temperature at which _____ begins to form
- Water vapor condenses to form dew, frost, clouds or fog.

Properties of the Atmosphere: Water Cycle

- _____: any form of water that falls back to Earth’s surface from clouds...includes rain, snow, sleet
- _____: Surface water converted into water vapor
- _____: Water vapor converted into liquid water
- _____: the evaporation of water through pores in plant’s leaves.
- _____: water that flows over Earth’s surface
- _____: water that enters the ground
- _____: water found underground between soil and rock.

Clouds

- Clouds are formed when _____ rises and water vapor condenses into tiny droplets of liquid as it cools.
- Occur in _____.
- Occur at three levels – _____

High Level:

Cirrus

- _____
- _____ and _____
- Found at 20,000 feet and higher
- Occur in _____ weather

Cirrostratus

- _____

Cirrocumulus

- _____

High to Mid Level:

Cumulonimbus

- _____
- Associated with _____ or severe weather
- Forms from _____ clouds
- Low altitude cloud that grows _____ rather than _____

Mid level clouds

Alto cumulus

- _____

Altostratus

- _____

Low Level:

Cumulus

- _____
- Look like _____
- Indicate _____ weather
- Tend to only last _____
- Appear in _____

Stratus

- Means “ _____ ”
- _____
- Look like _____
- Often result in _____

Nimbostratus

- *Nimbo* means – _____
- _____
- _____ clouds

Stratocumulus

- Brings _____
- _____

Fog

- Fog is a _____
- Form when _____

Smog

- Type of _____
- Caused by _____

Clouds produce different types of Precipitation

- Rain: _____
 - Comes from _____ and _____ clouds
- Snow: Precipitation in the form of _____ called snowflakes
 - Comes from _____
- Hail – precipitation of _____
 - Forms from _____ Clouds
- _____ – rain that freezes as it _____
- _____ – rain that freezes after _____

WEATHER AND CLIMATE

WEATHER: _____

CLIMATE: _____

- Countries and Islands close to the _____ usually have warmer climates because they have very _____ sun rays that hit them.

_____ – Study of atmospheric phenomena or “meteors” (anything high in the sky)

- Cloud droplets and precipitation are _____
- Smoke, dust and haze are _____

_____ - people who study meteors

Air masses: An air mass _____ a region.

Weather Systems

- Weather results when _____ with different _____ and temperatures _____, change and collide.

Global Wind Systems –

- If the earth _____ rotate, two large air currents would cover the earth.
- The colder more dense air would _____ towards the surface and force the warm air _____.

Coriolis Effect

- The rotation of the earth causes things to move in a _____ around the earth rather than a straight path.

Wind Systems

Polar Easterlies

- Zone between 60°S and the north pole and 60°N and the south pole
- Begin as _____
- Typically _____
- Often _____ and _____
- Areas around both 60° are very stormy areas called _____.

Westerlies

- Located between 30 ° N and 60°N and 30°S and 60°S
- Winds originate in the _____
- Surface winds travel in a _____ towards the pole
- _____

Trade Winds

- Between 30°N and 30°S latitude
- Air in this region sinks, _____ and moves towards the equator in a _____ direction.
- _____ – _____ surface winds creating an area of _____ pressure

Jet stream

- Belt of _____ in the upper troposphere
- Caused by great _____ in _____

Monsoon

- _____ that is characterized by a _____ of direction and change in precipitation

How wind is created

- Wind is created because of _____.
- When pressure differs from one area to another, a _____ exists.
- Air flows from _____ pressure...called _____.
- Hot air _____ and cooler air _____ to take its place

FRONTS

Cold Front

- _____ moving _____ air moves under a _____ air mass and pushes it _____.
- _____ are formed, _____, _____, _____ precipitation.
- Severe weather is _____
- Represented by _____

Warm front

- A mass of _____ air moves toward and _____ a _____ mass of cold air.
- As the warm air is pushed up over the cool air, it _____ and forms _____.
- Represented by _____.

Stationary Front

- Two air masses meet but _____.
- Instead, the air masses move _____ along the front.
- _____ and _____
- Represented by _____ and _____

Occluded Front

- When a _____ mass gets caught between _____ air masses
- _____ and _____ are common
- Represented by _____

WEATHER MAPS

- Weather maps are used to show _____.
- These maps use dif. _____ to indicate things like weather conditions, wind speed, and cloud coverage.

ISOBARS

- The _____ on weather maps that indicate _____ air pressure.
- When isobars are _____, the wind is _____.
- When isobars form a _____ loop, the center is called a _____.
- _____ pressure (L) centers = _____. _____ pressure (H) centers = _____ weather.
- The _____ that appears on the line tells you what the air pressure is along that line.

SEASONS

- Seasons are _____.
 - The Earth is tilted _____°
- _____
 - Occurs _____ a year when the sun is at 23.5°S and 23.5°N
 - Summer Solstice – _____ – Daylight is _____ in N. Hemisphere
 - Winter Solstice – _____ – Daylight is _____ on S. Hemisphere
- _____
 - Halfway between the solstices – _____ and _____ are equal
 - Mark the beginning of _____
 - _____ – Start of Spring
 - _____ – Start of Autumn

Seasons in the N. Hemisphere

- Winter: _____
- Summer: _____
- Fall and Spring: _____

Earth's Surface Features Affect Climate

Mountains:

- Air has to rise over mountains and when it does, it _____ forming _____.
- When mountains are near oceans, air is humid and the clouds cannot hold the precipitation causing lots of _____.
- On the _____ of the mountain, the _____ heats back up as it falls forming _____ conditions.

Flat Plains

- Broad flat surfaces do not stop _____ flow very well. Winds can come in from many different directions.
- The mixing of winds can cause _____.

Factors affecting temperature

- _____ – As latitude increases, the average yearly temperature decreases.
- Nearness to _____ – Locations near the center of a large land mass tend to have wide ranges in temperatures, both between day and night and seasonally.
- Nearness to _____ – Large bodies of water have a “milding” effect on the temperatures of coastal areas producing low ranges in temperature, both between day & night and seasonally.
- _____ – Windward sides of mountain ranges are cooled while leeward side are warmed
- Altitude (height above sea level) – As altitude _____, the average yearly temperature _____.
- _____ – Ocean currents tend to warm temperatures of eastern coastal areas and cool temperatures of western coastal areas.

Factors affecting precipitation

- _____ – Belts of low pressure centered at latitudes of 0° and 60° N and S produce generally _____ precipitation. Belts of high pressure centered at latitudes of 30° N and S produce _____ climates; sometimes even deserts.
- Nearness to centers of _____ – Locations near the center of a large land mass tend to have _____.
- Nearness to _____ of water – Areas near large bodies of water tend to have _____ than average precipitation, especially areas on the _____ side of the water.
- Location relative to large mountain ranges – _____ sides of mountains tend to receive higher than average precipitation while _____ sides receive lower than average precipitation
- Prevailing _____ – Wind direction determine the windward and leeward side of both mountain ranges and large bodies of water.

Natural Climate Changes

- _____
 - Climate was _____ and glaciers covered the Earth’s surface
- _____
 - Happens every _____ years
 - Warming of the pacific ocean
 - Causes _____ patterns
- _____
 - Human activities, CO₂ emissions and greenhouse gasses cause a _____ in global temperature.

Storms: Thunderstorms

For thunderstorms to form three conditions must exist:

- _____
- _____
- _____

Lightning

- Lightning is a _____ - electrical charges are built up by _____ droplets and ice crystals.
- When the charges from one cloud are different from another or from the earth, the sparks _____ to _____ each other out.

Thunder

- Thunder is the _____ that is made when electrical charges move through the air as lightning.
- Lightning super-heats the air, which then _____ faster than the _____ of _____.
- We hear the shockwave created by this rapid expansion of thunder

Severe Weather

- _____ – Intense rotating updrafts lasting several hours. Anvil shaped cumulonimbus
- _____ – Violent downdraft in one area – extremely strong winds
- _____ – Precipitation in the form of ice balls
- _____ – extended periods without rain
- _____ – extended periods of above average temperatures
- _____ – rapid flooding of low lying areas

Tornado

- Tornadoes are _____.
- Tornadoes' winds are the _____ to occur on Earth.
- In the most violent Tornadoes, winds can reach _____ mph.
- Most commonly occur in the United States, especially in the _____ and states along the Gulf of Mexico.
- Tend to occur during the _____.
- Tornadoes form when _____ from the north and _____ from the Gulf of Mexico meet.
- As warm, humid air rises, _____ warm air rushes into _____ it.
- This air sometimes begins to _____ as it rises and can become a strong rotating thunderstorm.
- Typically, tornadoes start as a tapered column of water droplets, called a _____ cloud.
- As the funnel reaches the ground, it begins sucking objects _____ as air rises through the center.

Tornado Safety

- Tornadoes are very _____.
- They are very fast and cannot be “_____”.
- If a tornado is approaching, get to a _____ or _____. If that is not available, _____ under a _____ at the center of a room with _____ windows.
- If outside, lie flat in a _____ and _____ with your hands.

Severe Weather: Hurricanes

- Hurricanes are large _____ masses of clouds, wind, and rain with average diameters of about 373 Mi.
 - Also called _____ or _____.
- In the Northern Hemisphere, they occur in _____ and _____ when the ocean temp. are warmest.
- As the warm ocean water evaporates and the water vapor rises, _____ form. These build strength and become hurricanes.
- The _____ of hurricanes are _____ and _____. This can be dangerous because people think the storm has _____.
- Storm moves _____, but are extremely _____.
- To be classified as a hurricane, _____ must reach speeds _____ than _____ mph.

Hurricane Katrina

- Occurred _____ 2005
- Hurricane Katrina was the _____ strongest hurricane ever recorded and the _____ strongest hurricane ever recorded to make landfall in the U.S.
- The storm surge from Katrina was _____ high.
- More than _____ Gulf Coast residents have been displaced.
- The final death toll was at _____, primarily from Louisiana (1,577) and Mississippi (238).
- An estimated _____% of New Orleans was _____, up to 20 feet deep in places.
- Hurricane Katrina caused \$75 billion in estimated physical damages, the _____ hurricane in history.