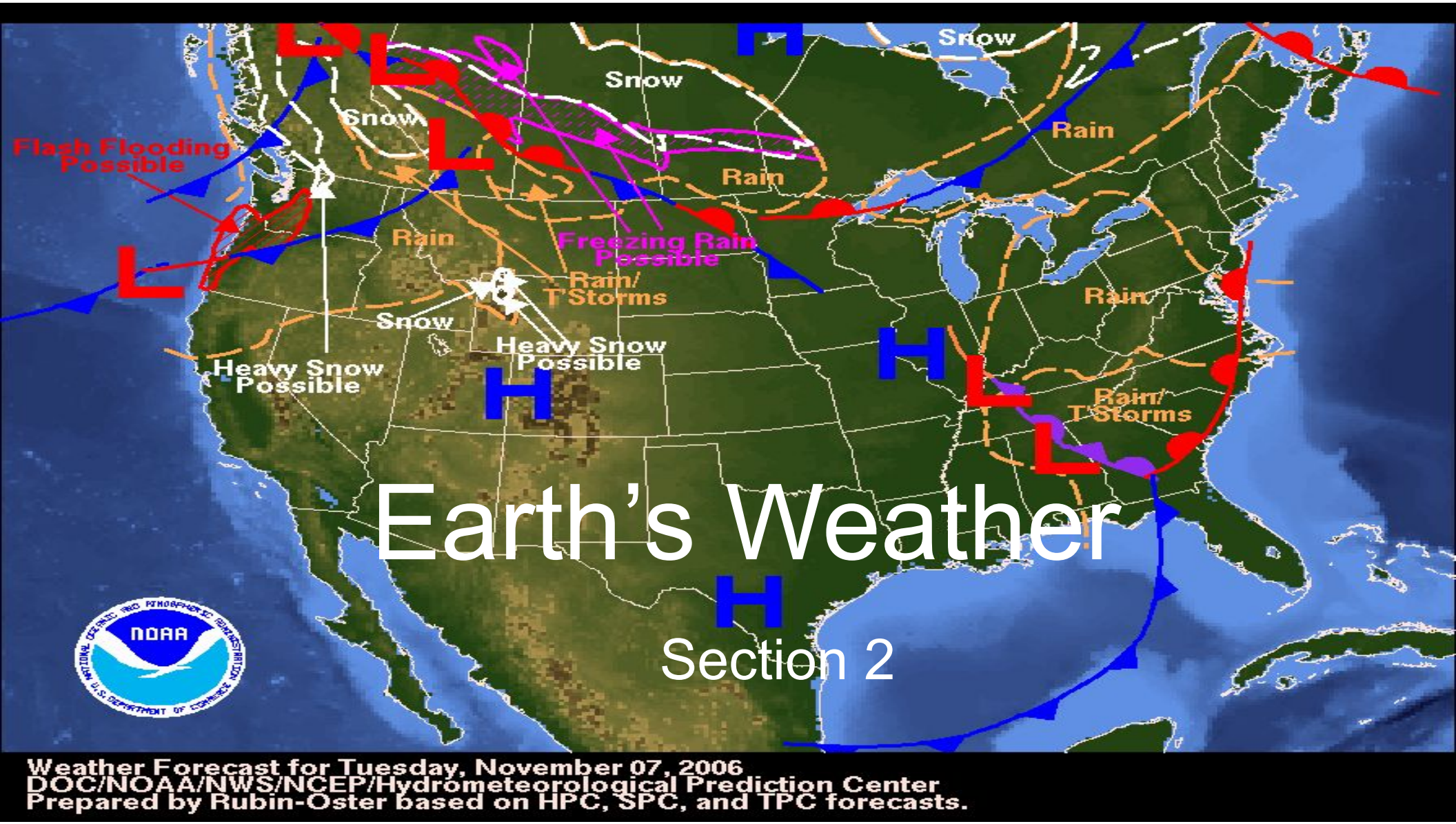
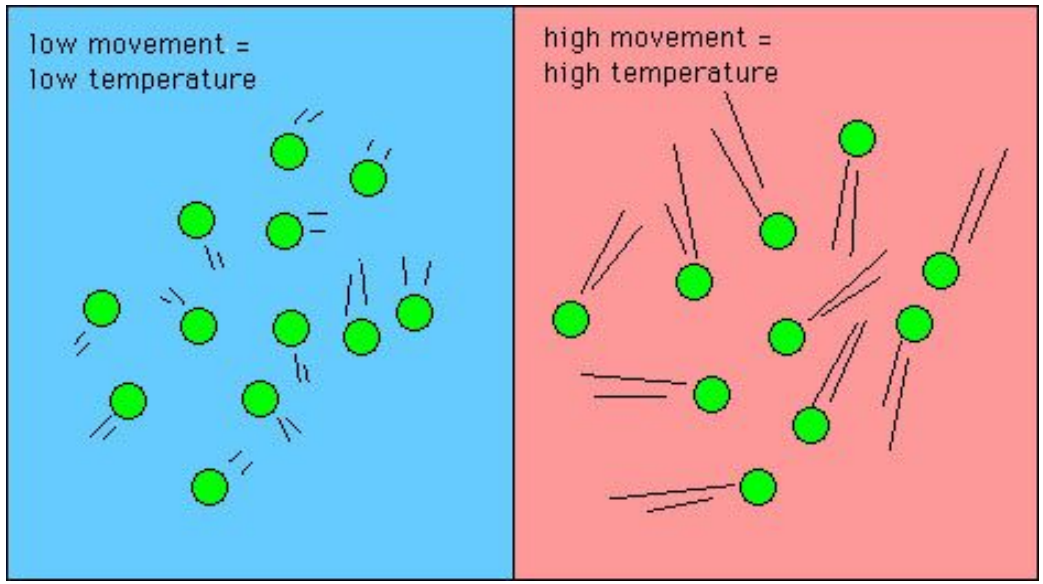


Earth's Weather

Section 2

A. Weather—the atmosphere's condition in terms of temperature, cloud cover, wind speed and direction, humidity, and air pressure

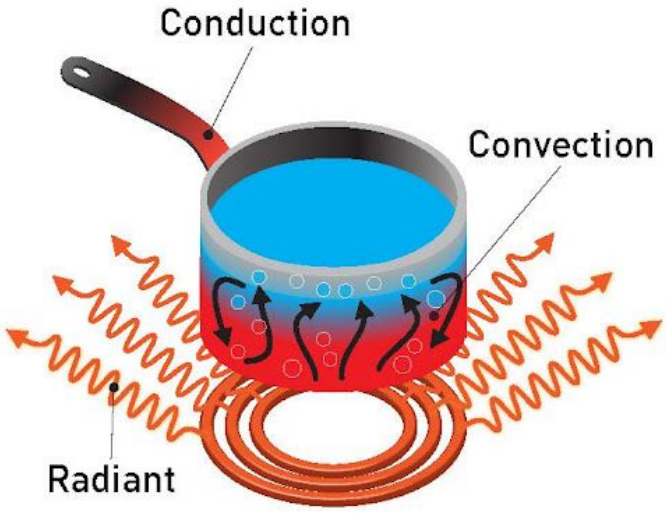
1. Temperature—a measure of how fast air molecules are moving
   - **a.** When molecules are moving rapidly, temperature is high.
   - **b.** When molecules are moving slowly, temperature is low.

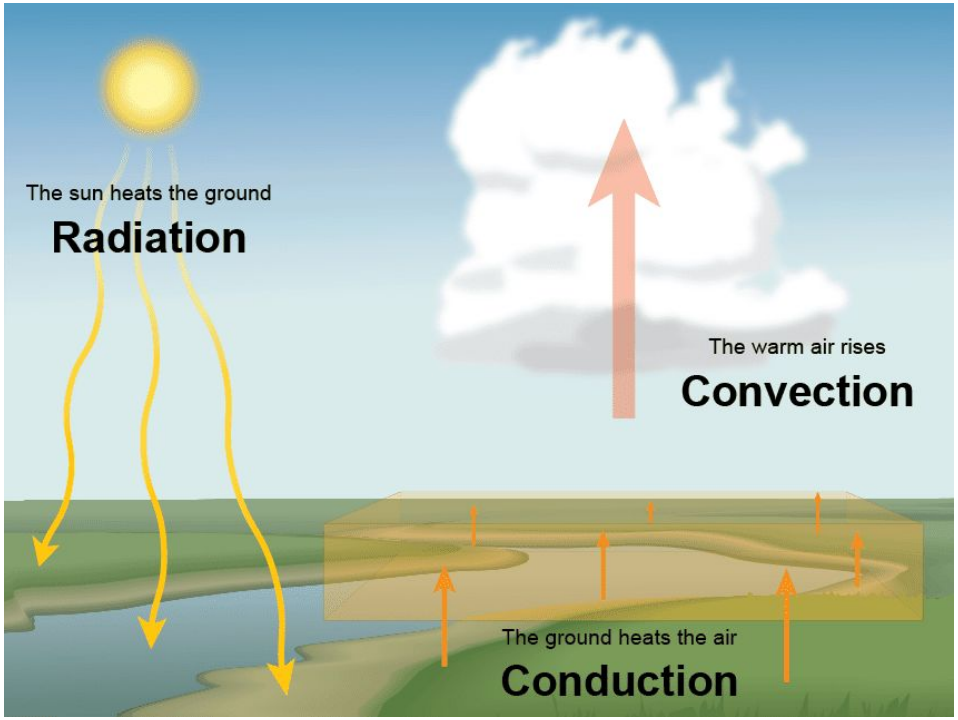


2. Energy is transferred between fast-moving molecules and slower-moving molecules.

   a. Conduction—transfer of energy when molecules collide

   b. Convection occurs when warm air rises and cool air sinks.

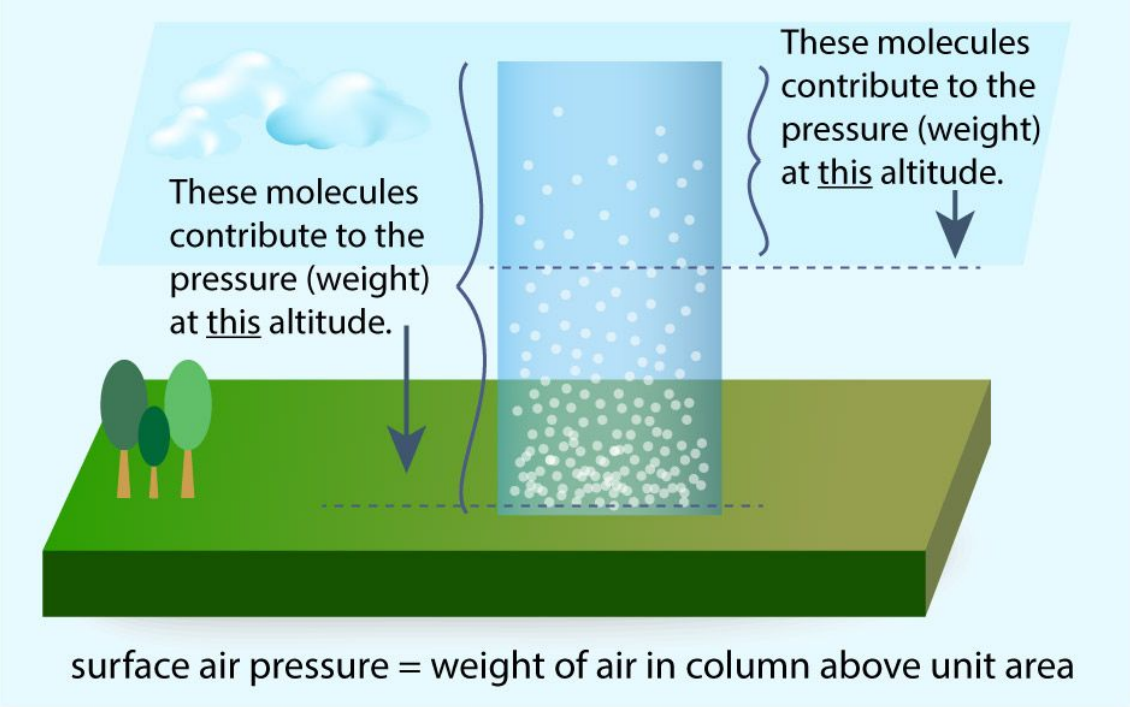


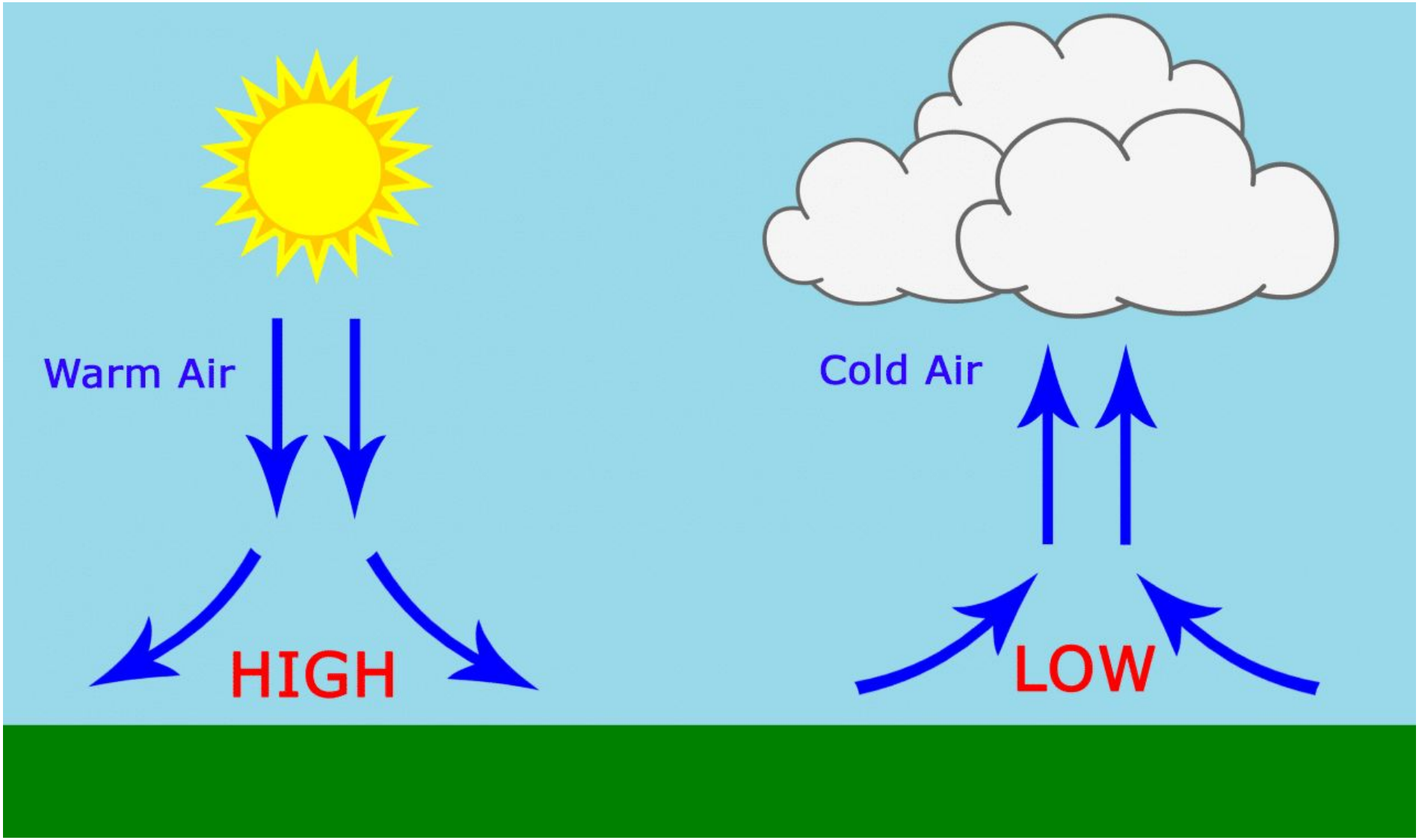


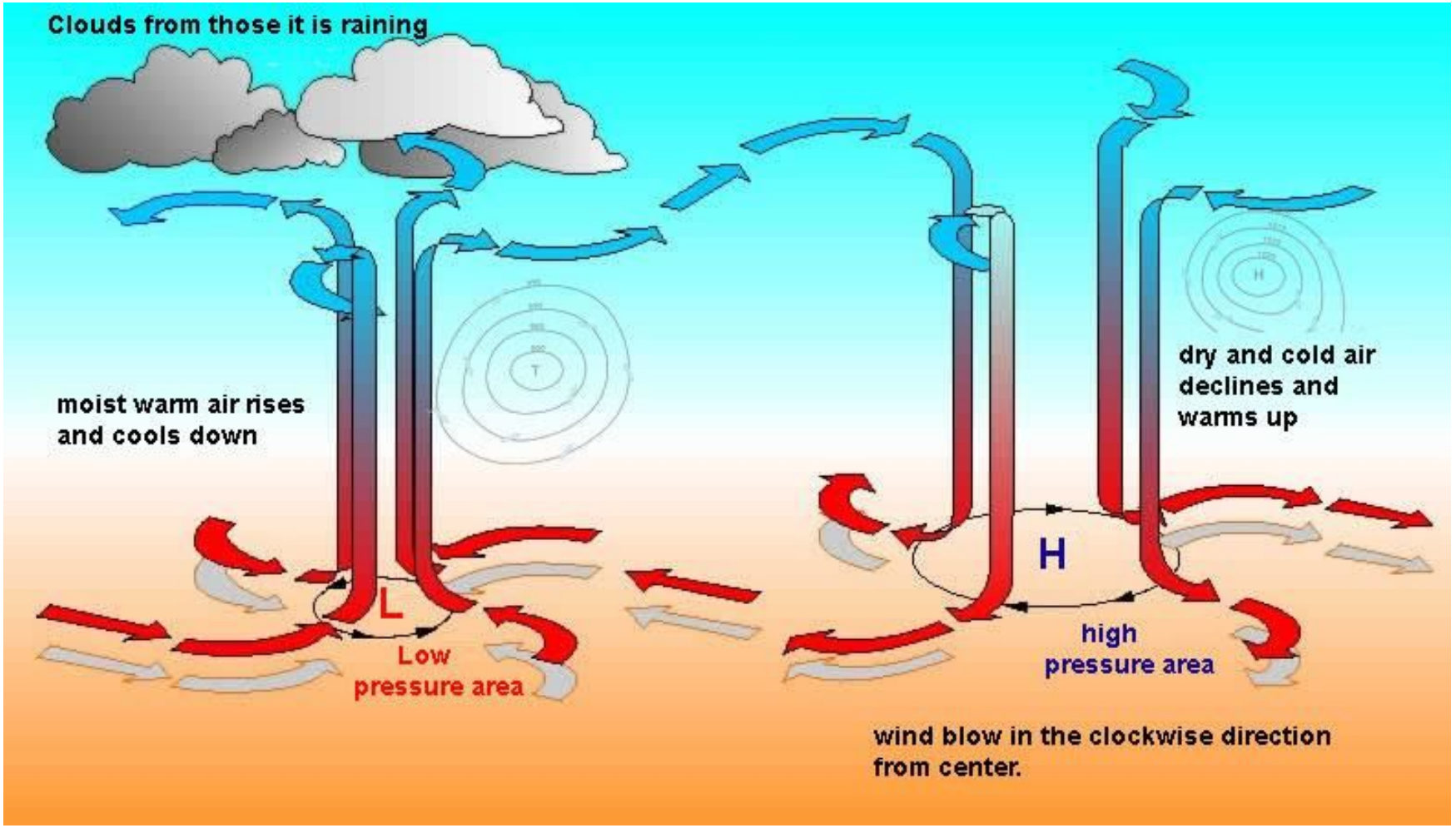
3. Air pressure—air weight that varies over Earth's surface

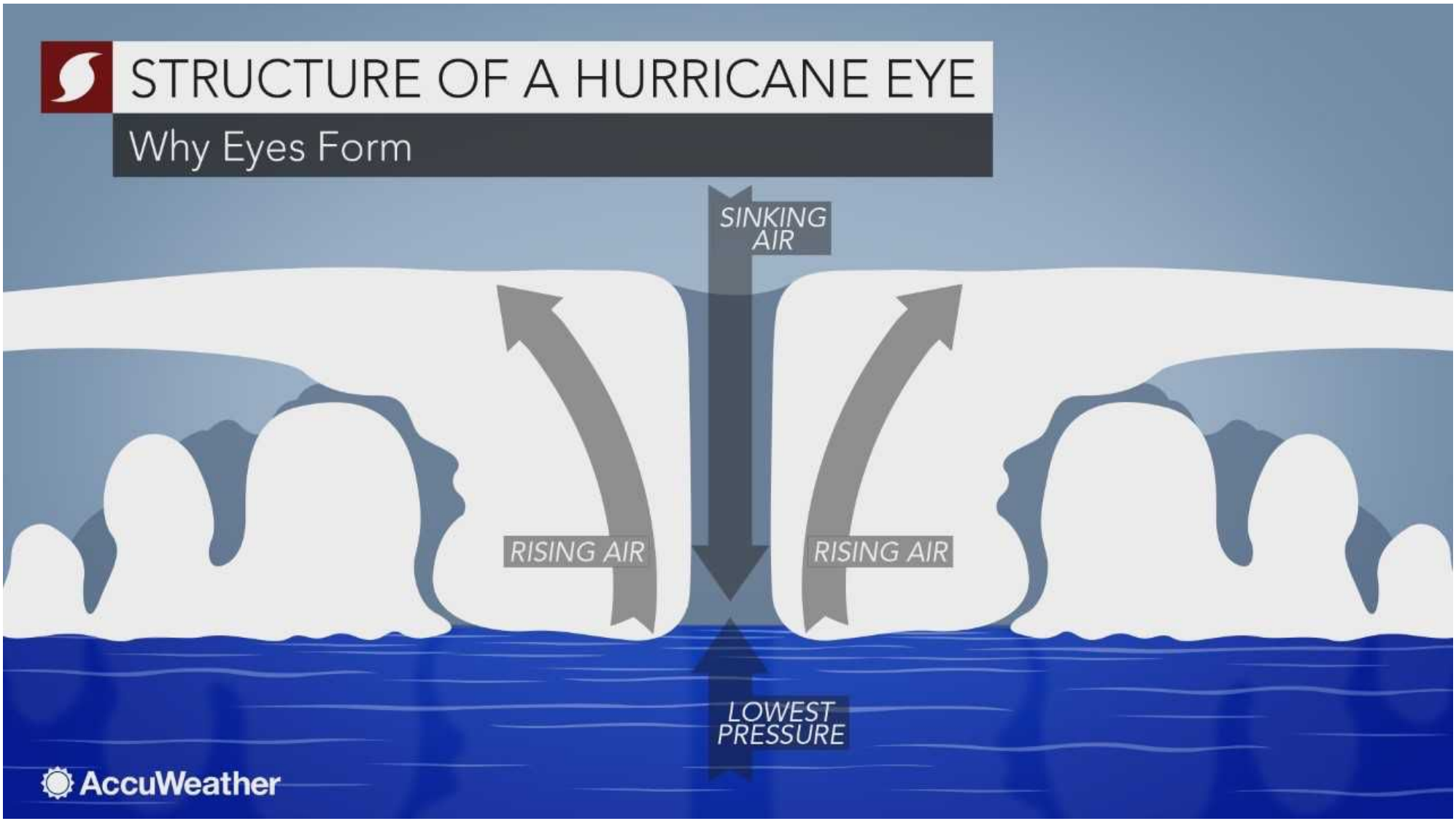
   a. Warmer air is less dense and exerts less pressure.

   b. Cooler air is more dense and exerts more pressure.



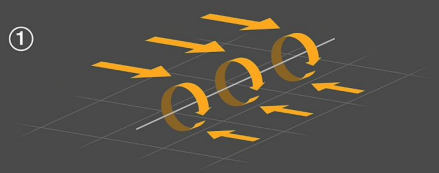

Warm Air
HIGH
Cold Air
LOW


Clouds from those it is raining
moist warm air rises
and cools down
L
Low
pressure area
H
high
pressure area
dry and cold air
declines and
warms up
wind blow in the clockwise direction
from center.

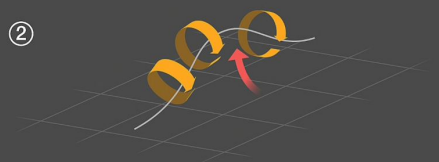

STRUCTURE OF A HURRICANE EYE
Why Eyes Form
SINKING AIR
RISING AIR
RISING AIR
LOWEST PRESSURE
AccuWeather

How a Tornado Forms

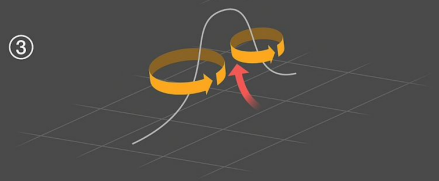
While tornadoes can differ in size, strength, and location, they all share certain characteristics. They are spawned from a type of rotating storm called a supercell thunderstorm.



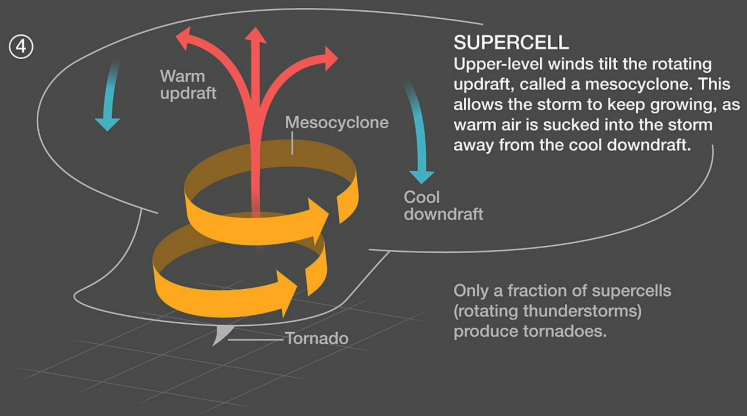
① **WIND SHEAR**
Fast-moving winds roll air below into a horizontal vortex—a spinning tube—above opposing surface winds.



② **UPDRAFT**
Warmed by the sun, buoyant air near the ground begins to lift a section of the horizontal vortex into a vertical position.



③ **STORM**
The stronger of the two vortices created by the updraft becomes the heart of the thunderstorm. The other one dies.



④ **SUPERCELL**
Upper-level winds tilt the rotating updraft, called a mesocyclone. This allows the storm to keep growing, as warm air is sucked into the storm away from the cool downdraft.

Only a fraction of supercells (rotating thunderstorms) produce tornadoes.

NG STAFF. SOURCE: GABE GARFIELD, NATIONAL WEATHER SERVICE AND COOPERATIVE INSTITUTE FOR MESOSCALE METEOROLOGICAL STUDIES

B. Clouds—form when air rises, cools to its dew point, and becomes saturated

1. Low clouds—form at 2000 m or less
   - **a.** Cumulus—puffy clouds formed when air currents rise and carry moisture
   - **b.** Stratus—layered dull, gray sheets that can cover the entire sky
   - **c.** Nimbostratus—low, dark, thick layers that hide the Sun

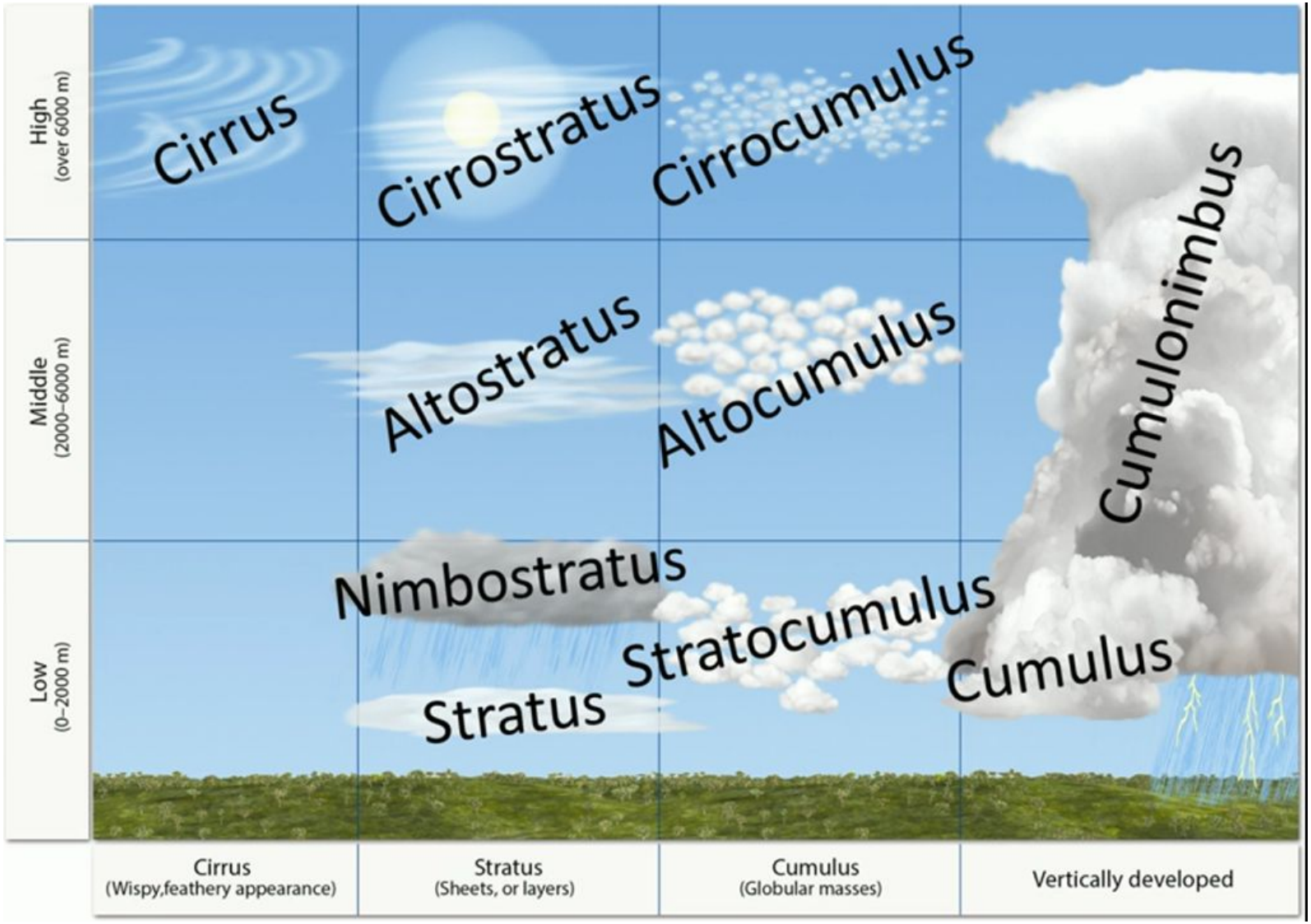
2. Middle clouds—form between 2,000 m and 8,000 m

   a. Most are layered

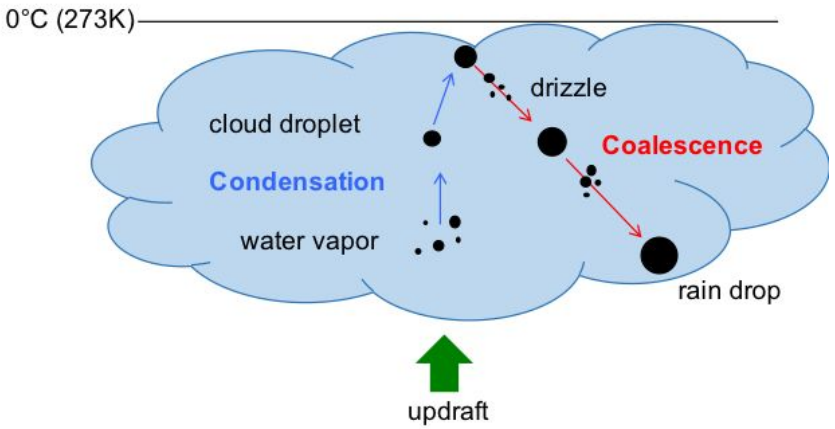
   b. Names have *alto-* prefix

   c. Can produce light precipitation

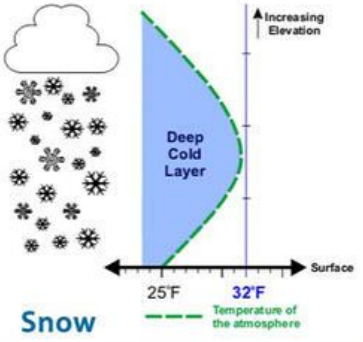
3. High and vertical clouds
    a. Cirrus—wispy, high-level clouds
    b. Cirrostratus—high, layered clouds that can cover the sky
    c. Cumulonimbus—known as thunderstorm clouds; produce heavy precipitation


High
(over 6000 m)
Middle
(2000–6000 m)
Low
(0–2000 m)
Cirrus
Cirrostratus
Cirrocumulus
Altostratus
Altocumulus
Cumulonimbus
Nimbostratus
Stratocumulus
Cumulus
Stratus
Cirrus
(Wispy,feathery appearance)
Stratus
(Sheets, or layers)
Cumulus
(Globular masses)
Vertically developed

C. Precipitation—falling water in the form of rain, freezing rain, sleet, snow, or hail

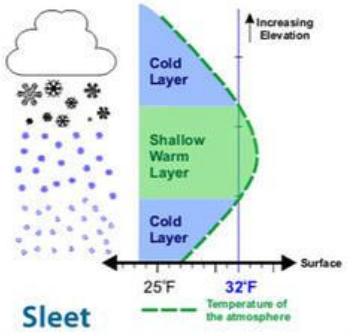


Types of Frozen Precipitation



Snow

Snow falls when water vapor condenses as ice crystals. The air temperature is below freezing all the way to the ground, so the ice crystals remain frozen. They fall as flakes.

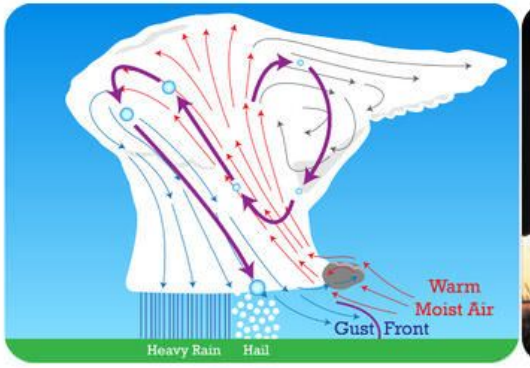


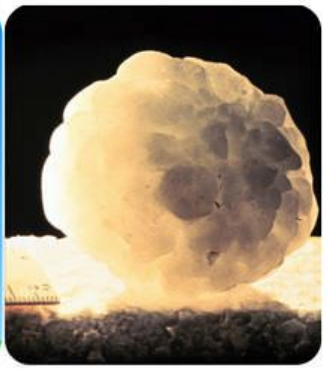
Sleet

Sleet forms when snow melts as it falls through a layer of warm air and then refreezes. It turns into small, clear ice pellets as it passes through a cold layer near the ground.

Freezing Rain

Freezing rain falls as liquid water. It freezes on contact with cold surfaces near the ground. It may cover everything with a glaze of ice. If the ice is thick, its weight may break tree branches and pull down power lines.





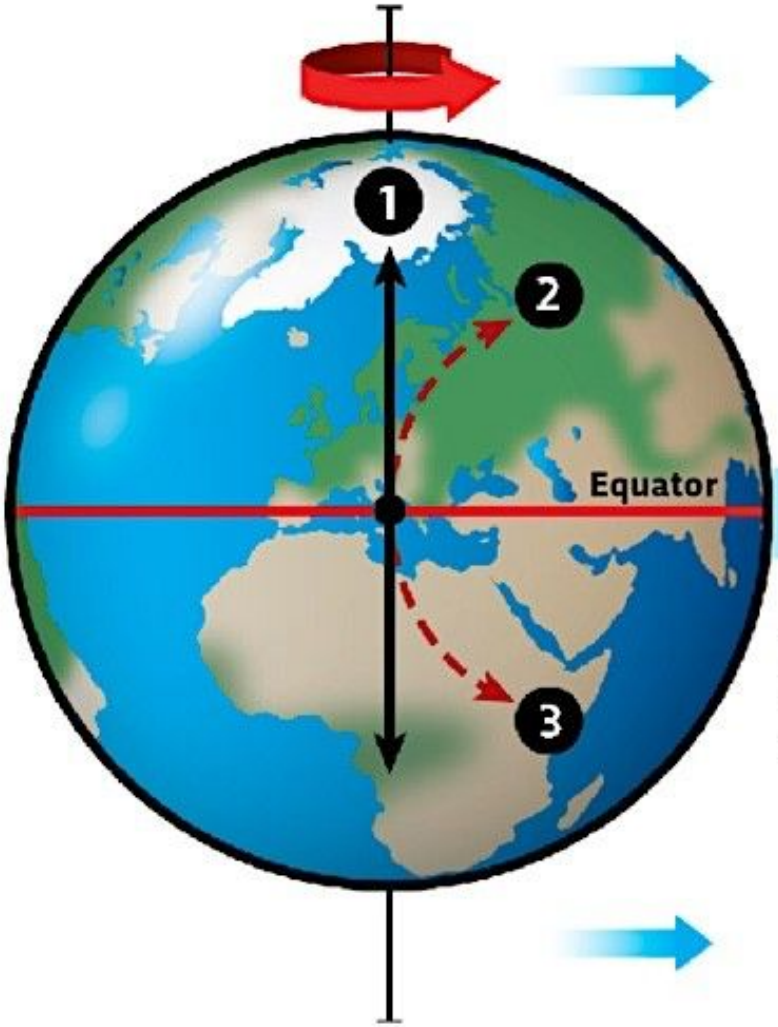
Hail

Hail forms when strong updrafts carry rain high into the troposphere. The rain freezes into balls of ice called hailstones. This may happen over and over again until the hailstones are as big as baseballs. Hail forms only in cumulonimbus clouds.

D. Wind—air moving from one temperature or pressure area to another

1. Coriolis effect—deflected air moves to the right in the northern hemisphere and to the left in the southern hemisphere.
2. Surface winds include the trade winds near the equator, the prevailing westerlies from about 30 degrees to 60 degrees latitude north and south of the equator, and the polar easterlies near the poles
3. Jet streams—bands of strong winds near the top of the troposphere at the northern and southern boundaries of the prevailing westerlies

THE CORIOLIS EFFECT

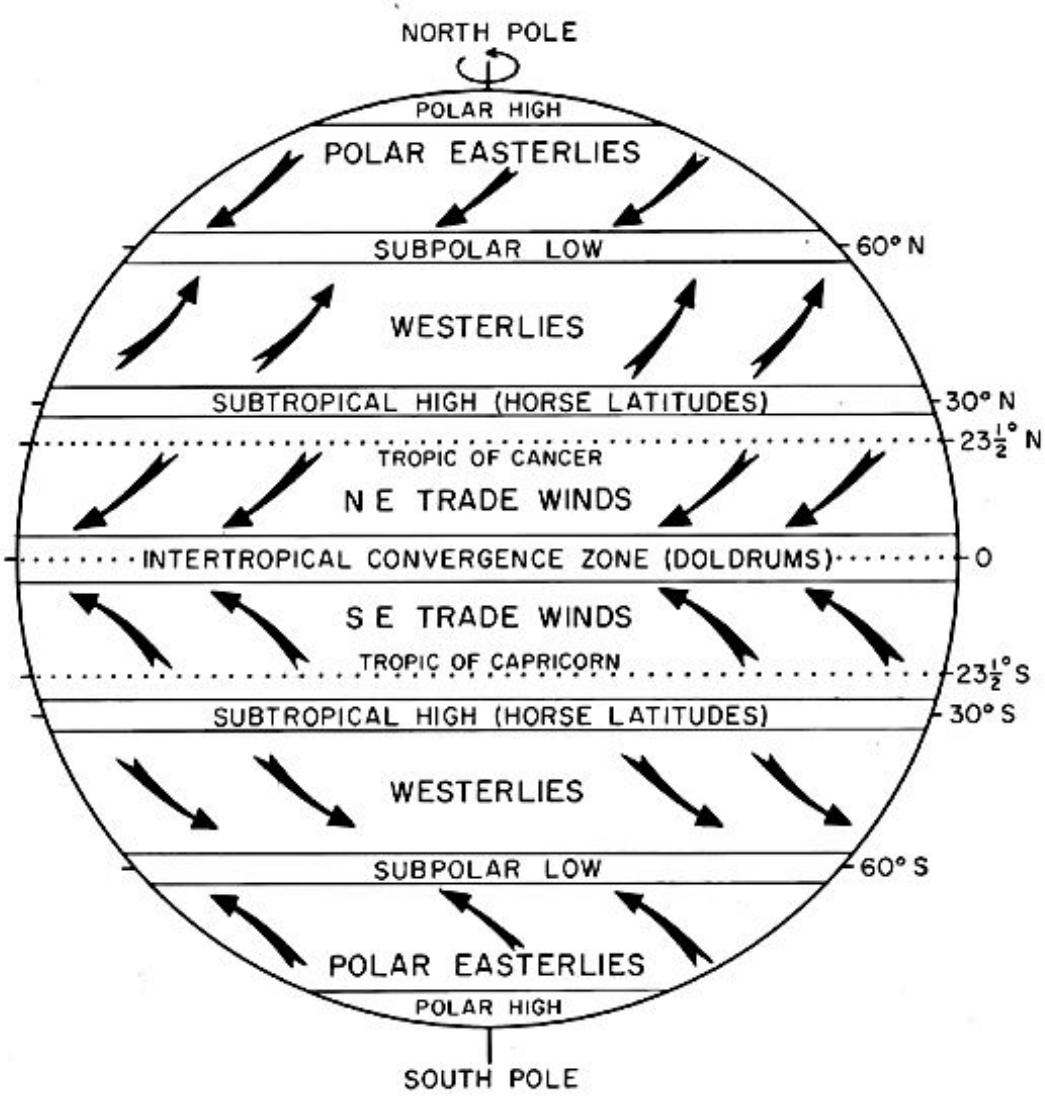


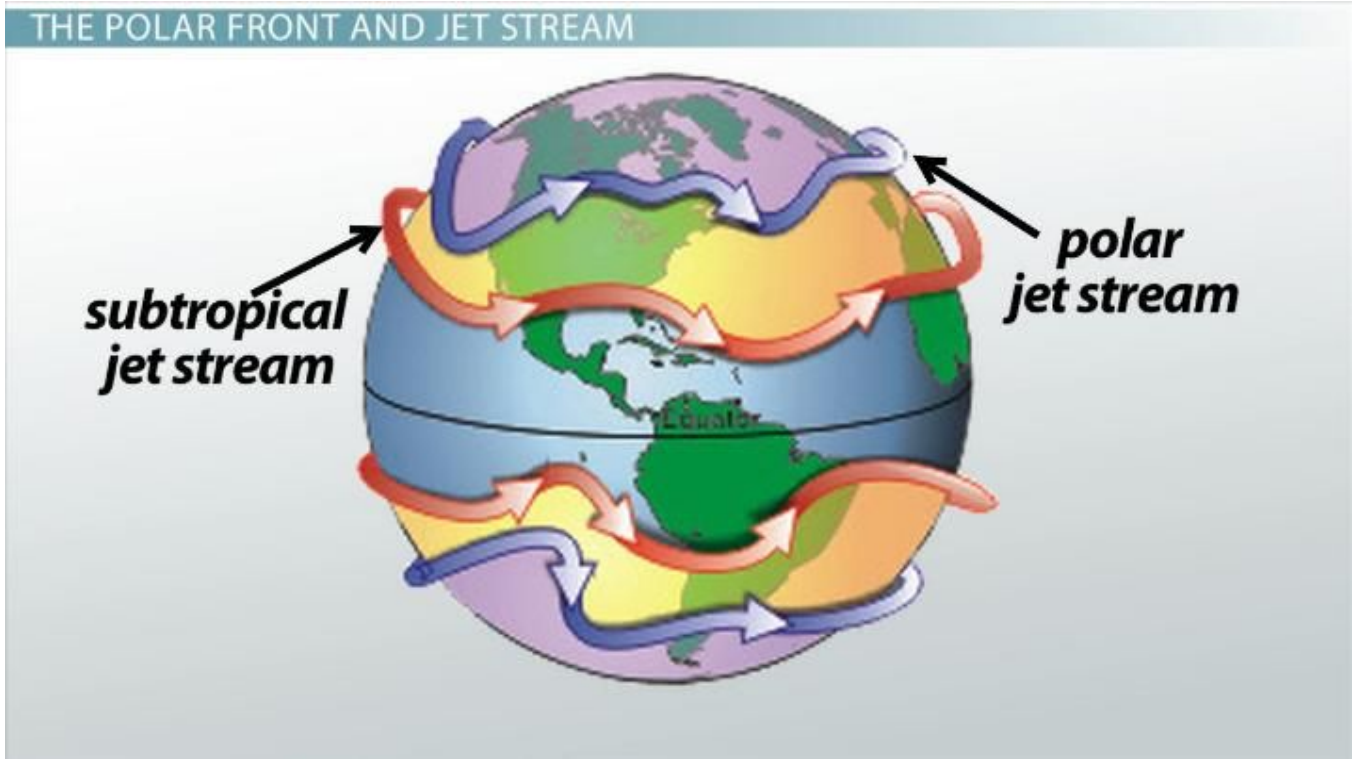
The Earth's surface travels faster at the equator than at the poles

1 Intended path
Imagine a current of air moving from the equator.

2 Actual path (northern hemisphere)
Even though it's moving in a straight line, it appears to an observer to bend towards the right. This is because as it moves northwards, the ground beneath is moving progressively slower and hasn't 'caught up' with the air current.

3 Actual path (southern hemisphere)
In the southern hemisphere, this effect causes currents to bend towards the left.


NORTH POLE
POLAR HIGH
POLAR EASTERLIES
SUBPOLAR LOW
60° N
WESTERLIES
SUBTROPICAL HIGH (HORSE LATITUDES)
30° N
23½° N
TROPIC OF CANCER
N E TRADE WINDS
INTERTROPICAL CONVERGENCE ZONE (DOLDRUMS)
0
S E TRADE WINDS
TROPIC OF CAPRICORN
23½° S
SUBTROPICAL HIGH (HORSE LATITUDES)
30° S
WESTERLIES
SUBPOLAR LOW
60° S
POLAR EASTERLIES
POLAR HIGH
SOUTH POLE



Jet streams form **when warm air masses meet cold air masses in the atmosphere**. ... On average, jet streams move at about 110 miles per hour. But dramatic temperature differences between the warm and cool air masses can cause jet streams to move at much higher speeds — 250 miles per hour or faster.