

Weather & Oceans



- Breaking Down the TEKS
- Reviewing the Concepts
- Really Cool Resources!



Hook 'em!

- I recommend starting the unit or perhaps each day in the unit with a relevant, exciting video clip. Here are some examples:
- **Train vs. Tornado** (have students describe the sky, clouds, trees, wind as the train crosses a weather front and is lifted off the tracks by a tornado!!! Relate to inertia when the cars at the back stay in motion and crash into the front!)
- <http://www.youtube.com/watch?v=azV5bC2br-Q>
- **Destructive Hail Storm in Arizona -**
- <http://www.youtube.com/watch?v=DuMX9AM9BrE>
- **Lighting in Slow Motion**
- <http://www.youtube.com/watch?v=7kI1d7DMbco>
- **Awesome Cold Front Time Lapse that ends in SNOW!**
- <http://www.youtube.com/watch?v=0NoPXm7d5Tc>
Shows how the cold air mass moves in, clouds form, snow, etc!
- **Bill Nye – Storms video – BEST El Nino explanation (7 min in)**



Consider acting (or having students act) like a meteorologist reporting the weather!!

You can use actual, current local weather forecasts from weather.com

Revisit the predictions for the week to see if they were correct!


<http://www.youtube.com/watch?v=EK-9orptDhA>

OR

<http://www.youtube.com/watch?feature=endscreen&v=Q7sdbPw7ruQ&NR=>



<http://www.wunderground.com/maps/#?type=Fronts>

Right Now	Next 36 Hours		
 FOG	Today 	Tonight 	Tomorrow 
Fog 57°F Feels Like: 57° Get FREE weather on your desktop	Scattered T-Storms 70° High	Isolated T-Storms 63° Low	Scattered T-Storms 74° High
Past 24-hr: Precip: 0 in Snow: 0 in	<u>Chance of Rain:</u> 30%	Chance of Rain: 30%	Chance of Rain: 50%
Wind: Calm	Wind: SE at 14 mph	Wind: SSE at 14 mph	Wind: S at 12 mph
Through 11am: Rain showers developing by mid-morning. Cloudy with temperatures steady in the mid 50s. Winds SE at 5 to 10 mph. Chance of rain 40%.	A few showers this morning. Isolated thunderstorms developing in the afternoon. High around 70F. Winds SE at 10 to 20 mph. Chance of rain 30%.	Partly cloudy with isolated thunderstorms possible. Low 63F. Winds SSE at 10 to 20 mph. Chance of rain 30%.	Variable clouds with scattered showers and thunderstorms, mainly in the afternoon. A few storms may be severe. High 74F. Winds S at 10 to 15 mph. Chance of rain 50%.

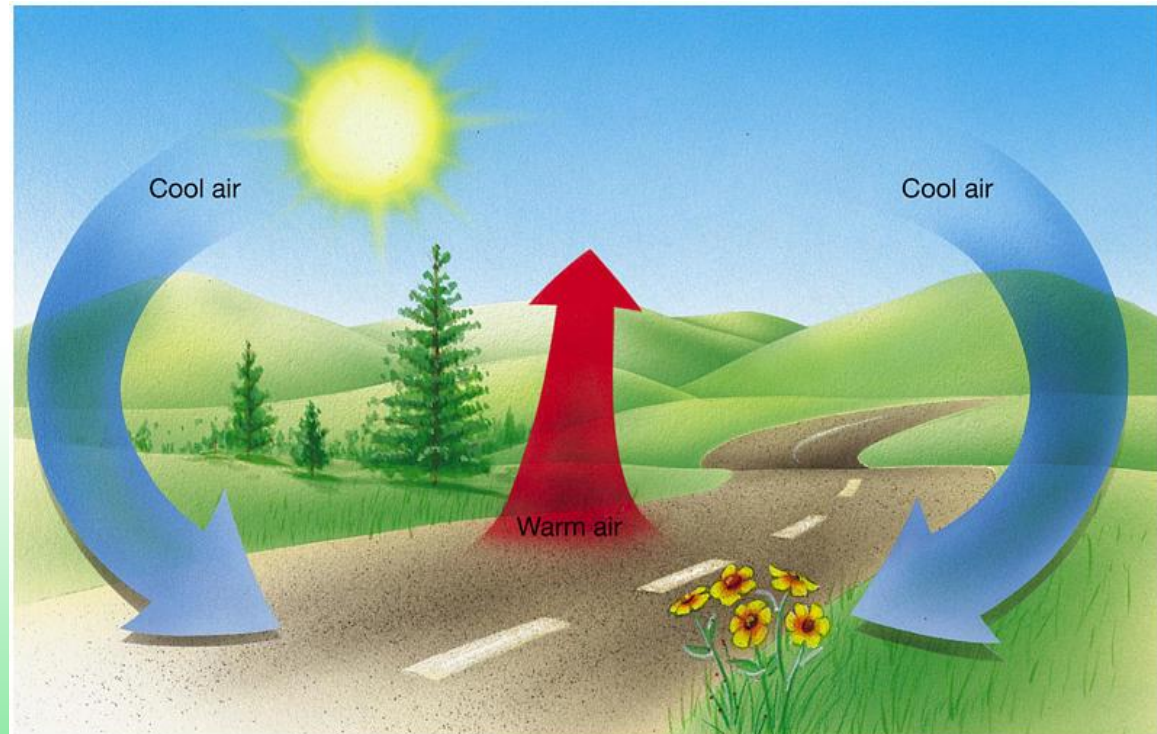
Factors Affecting Our Weather

- Uneven heating of Earth's surface
- Differences in air pressure
- Moisture
- Topography
- Rotation of Earth

The TEKS

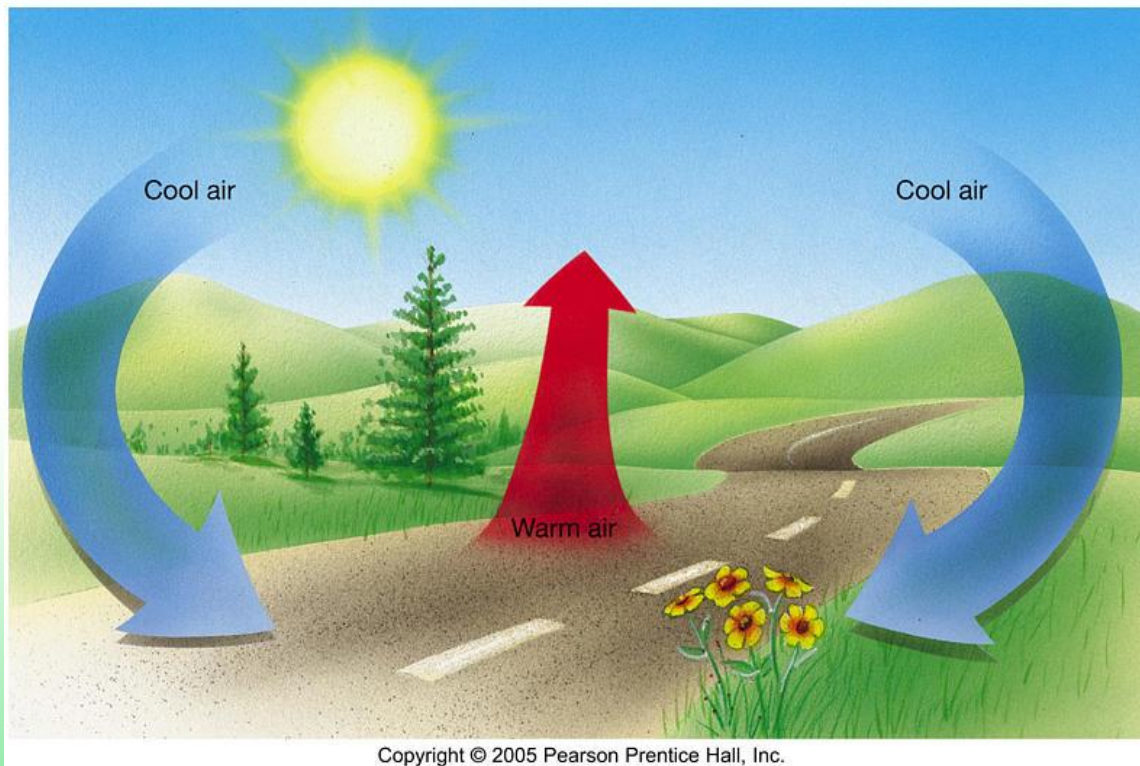
Know that climatic interactions exist among Earth, ocean, and weather systems.

- **8.10 (A)** recognize that the Sun provides the energy that drives **convection** within the atmosphere and oceans, producing winds and ocean currents;

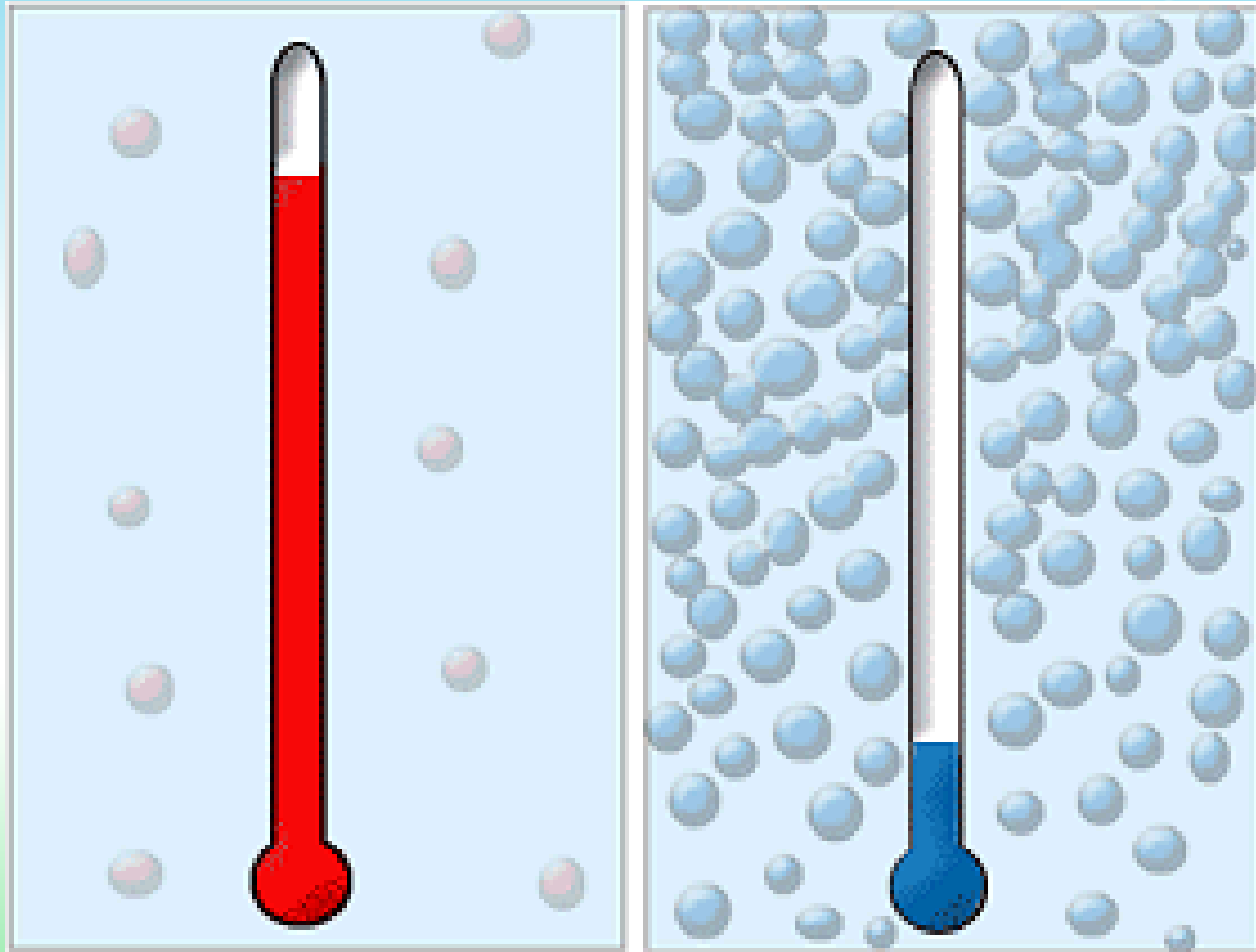


CONVECTION

transfer of heat by the movement of warmed matter



Hot Air is Less Dense!

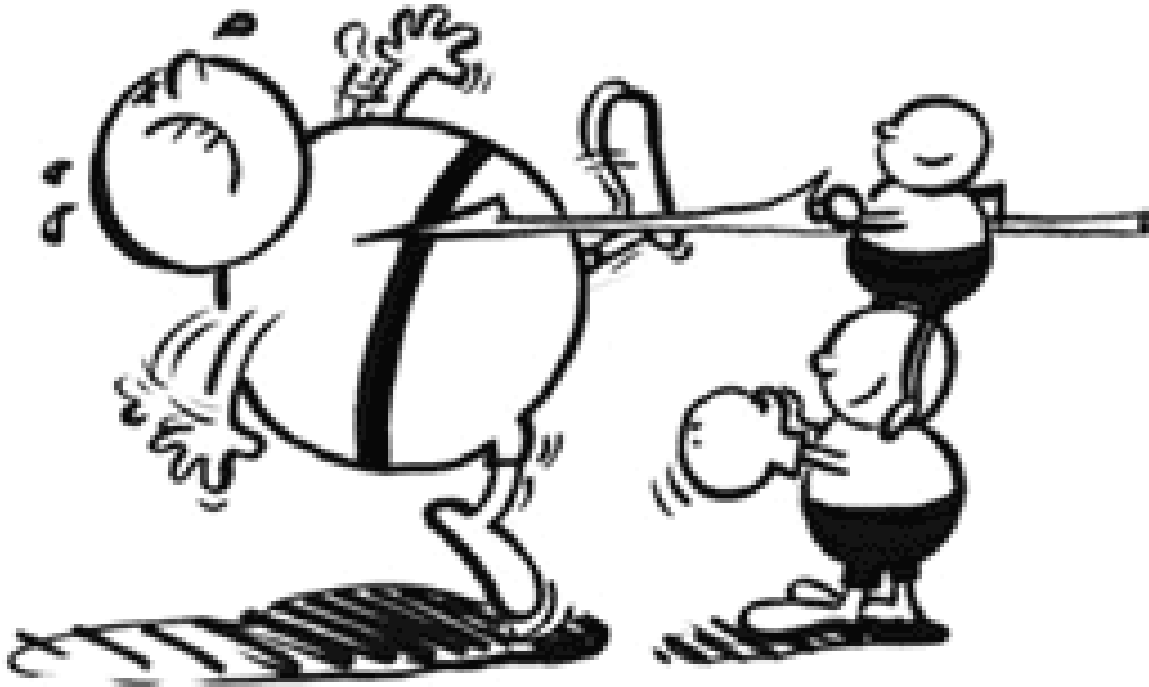


Force = Mass X Acceleration

↑
increase

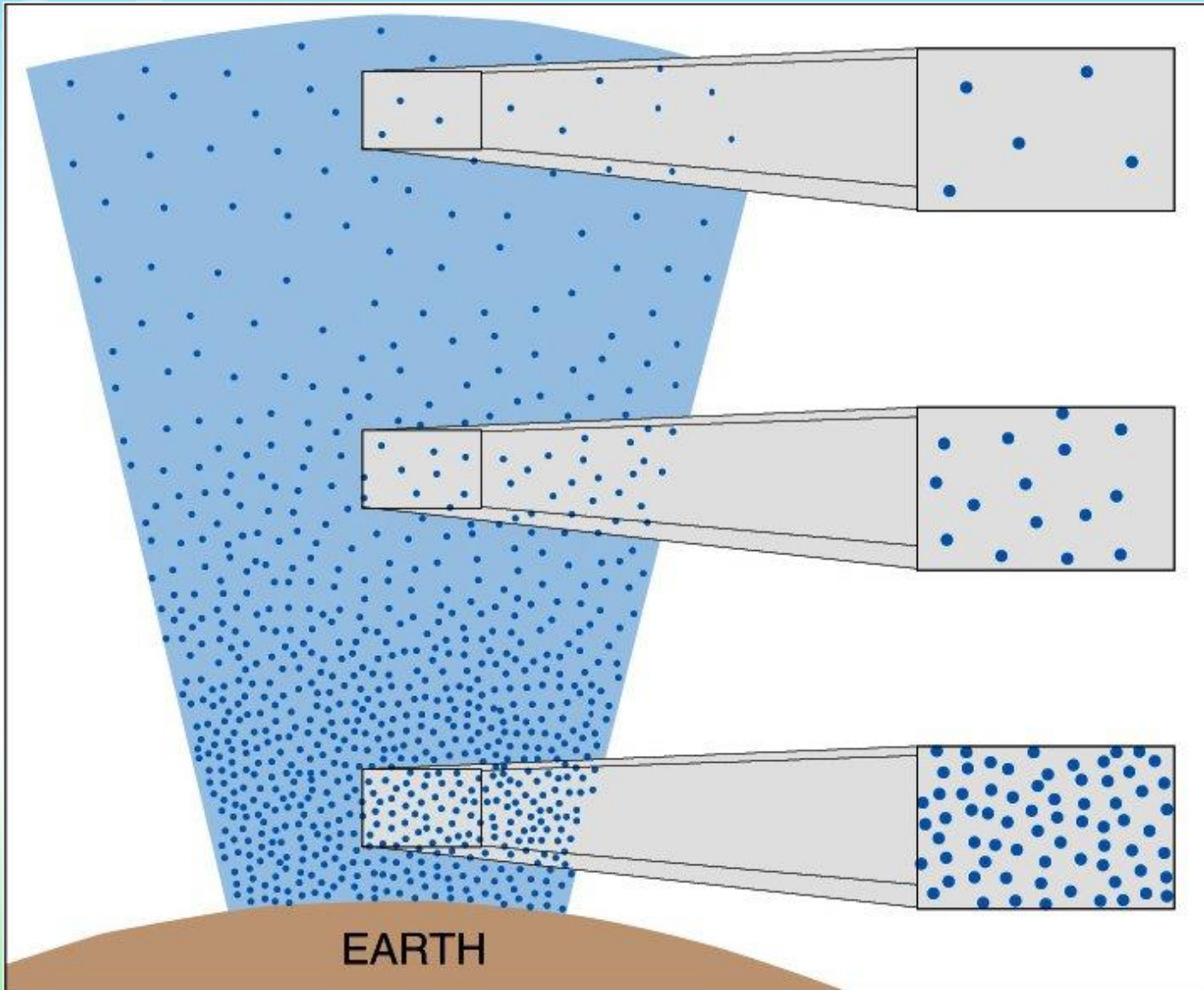
↑
increase

Gravity pulls with more force on
heavier objects!



*The Bigger They Are,
The Harder They
Fall!*

Atmospheric Density



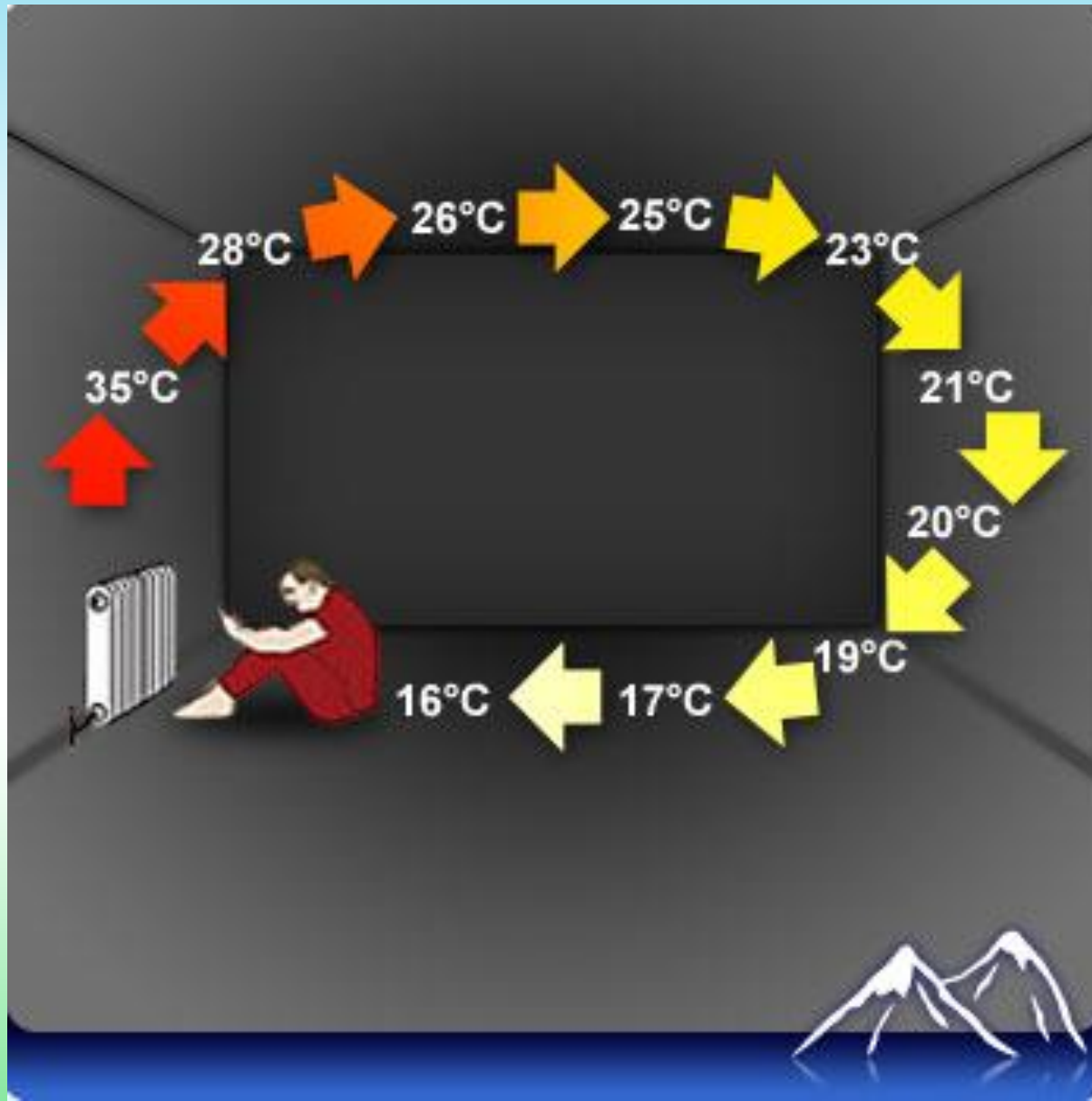
What is **most**
dense
SINKS!

CONVECTION

Soup is heated in the pan by convection. The hot soup rises. Cool soup falls to take the hot soup's place.

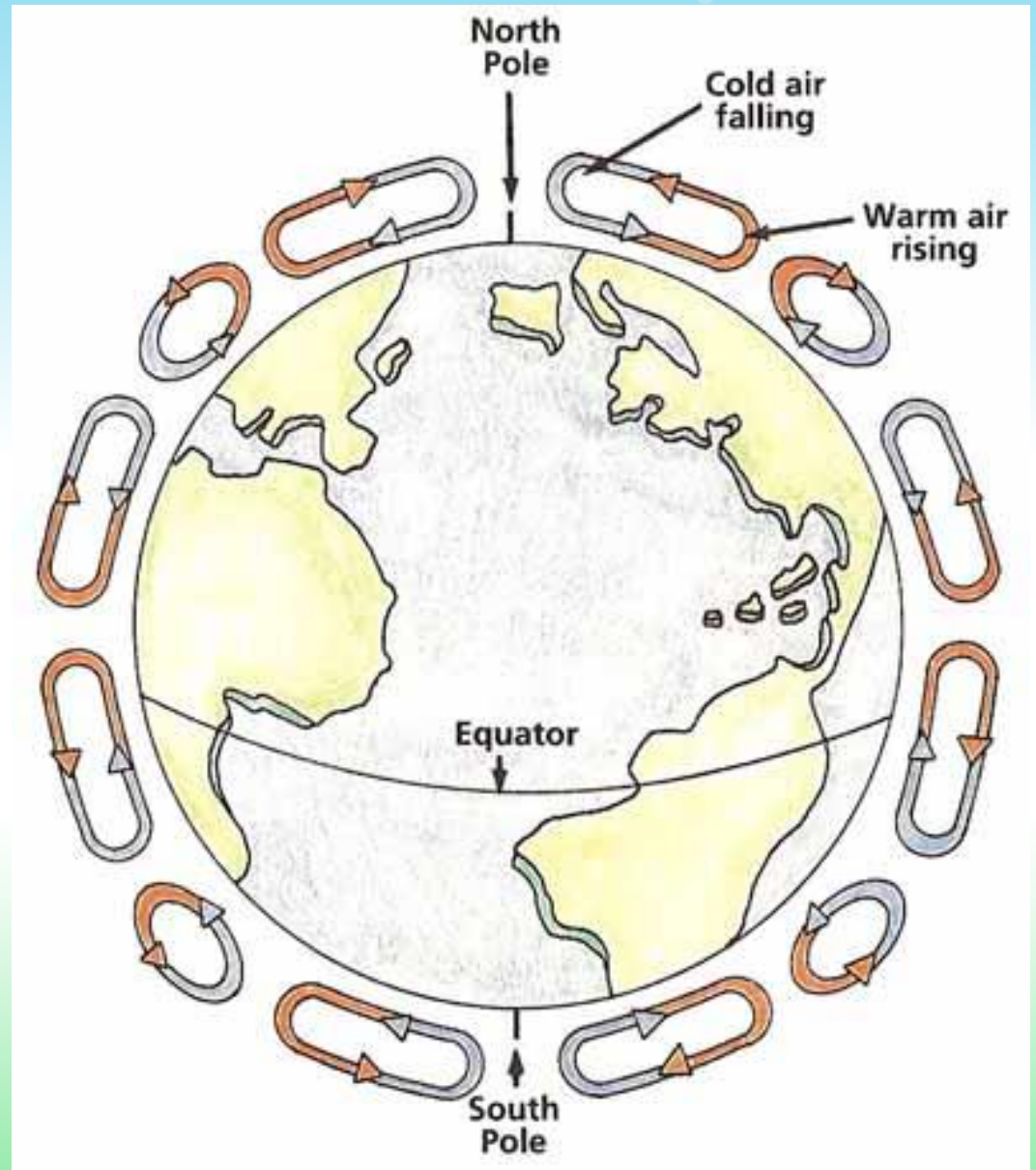


CONVECTION



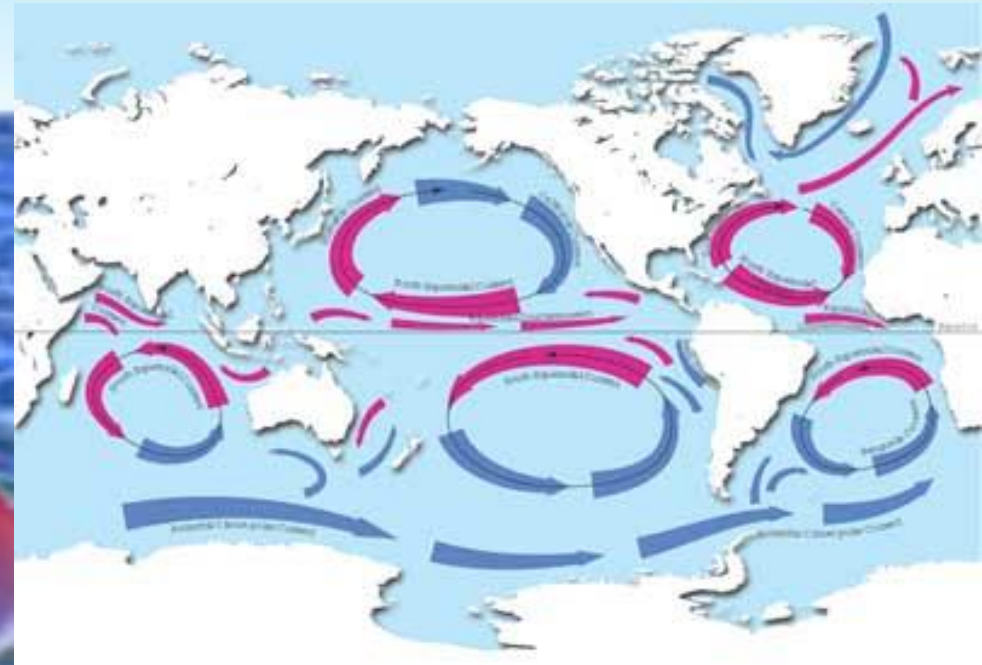
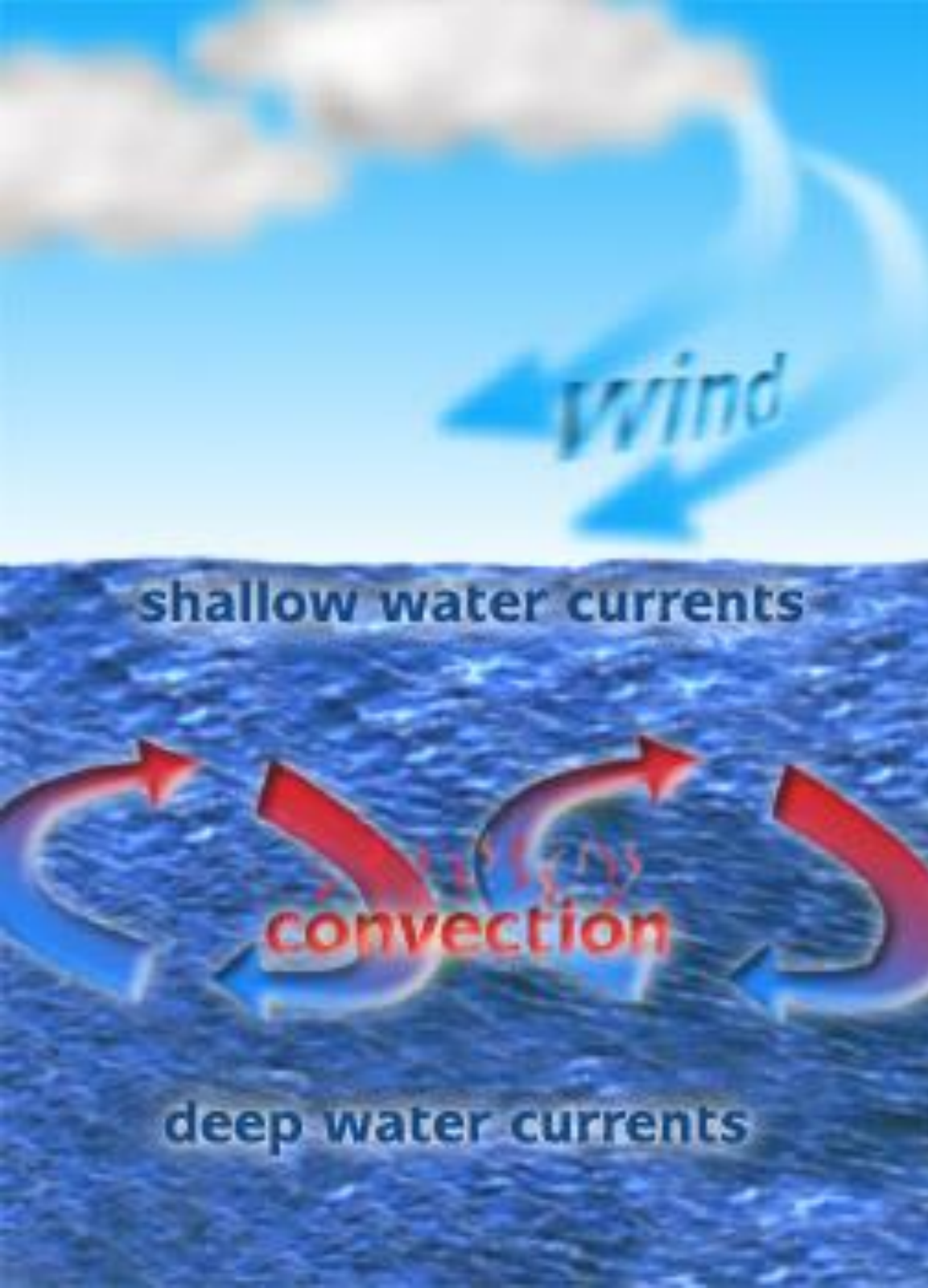
CONVECTION

Moves air in the atmosphere!



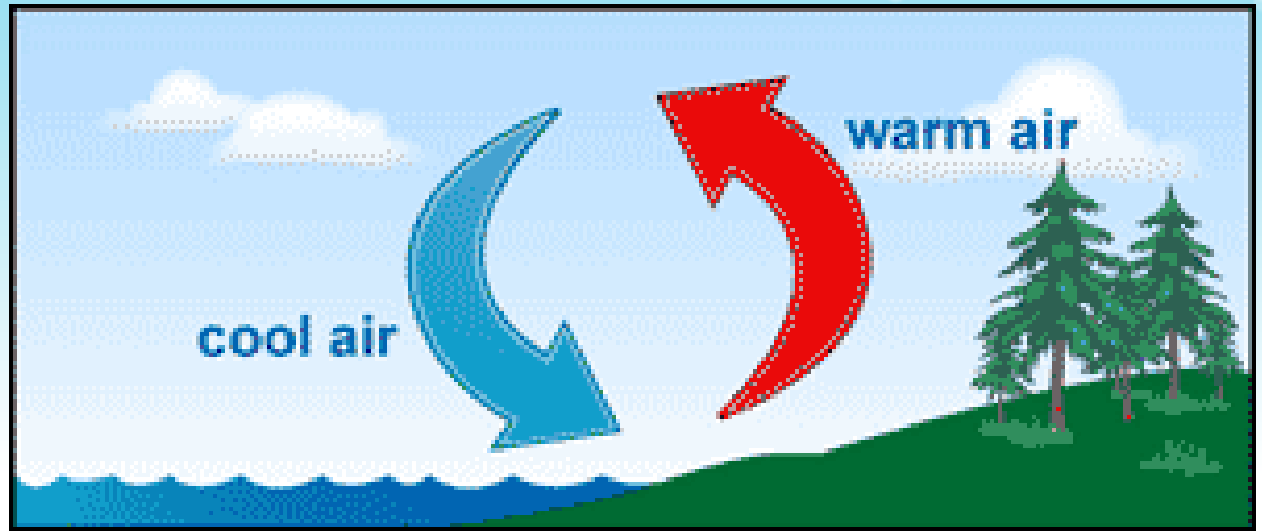
CONVECTION

causes deep ocean currents!



CONVECTION

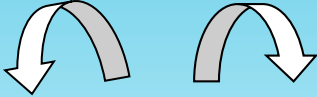
Wind over the
shore changes
direction
because of
EARTH'S
UNEVEN
WARMING &
COOLING!



DAY TIME



NIGHT TIME



CONVECTION DEMOS!

- Tea bag

<http://www.youtube.com/watch?v=UUYV-h1gCJc>

- Colored Water

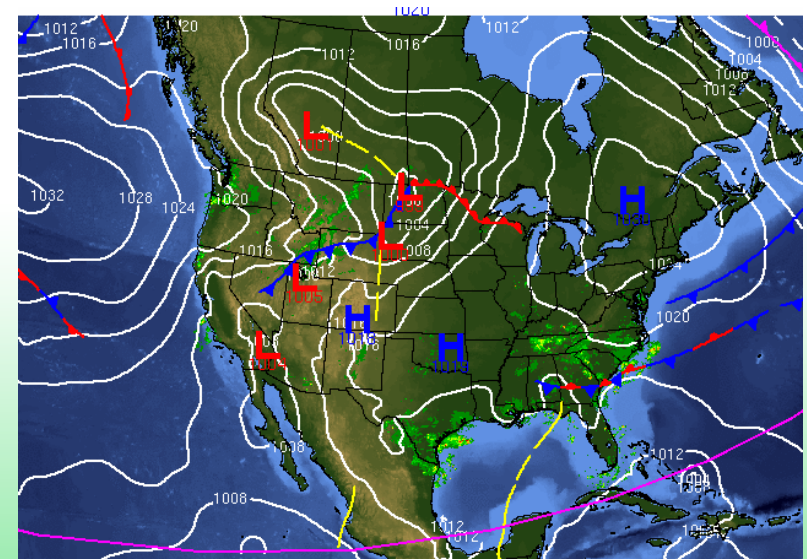
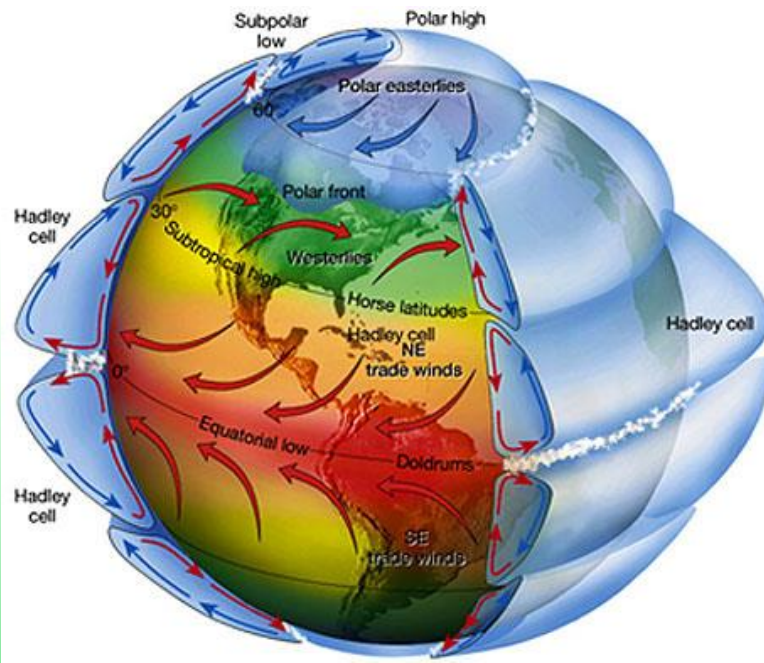
<http://www.youtube.com/watch?v=G9QJ1vv2WyM>

<http://www.youtube.com/watch?v=7xWWowXtuvA>

The TEKS

Know that climatic interactions exist among Earth, ocean, and weather systems.

- **8.10 (B)** identify how **global patterns** of **atmospheric movement** influence local weather using weather maps that show **high and low pressures** and **fronts**;



12Z 02 Sep 2004

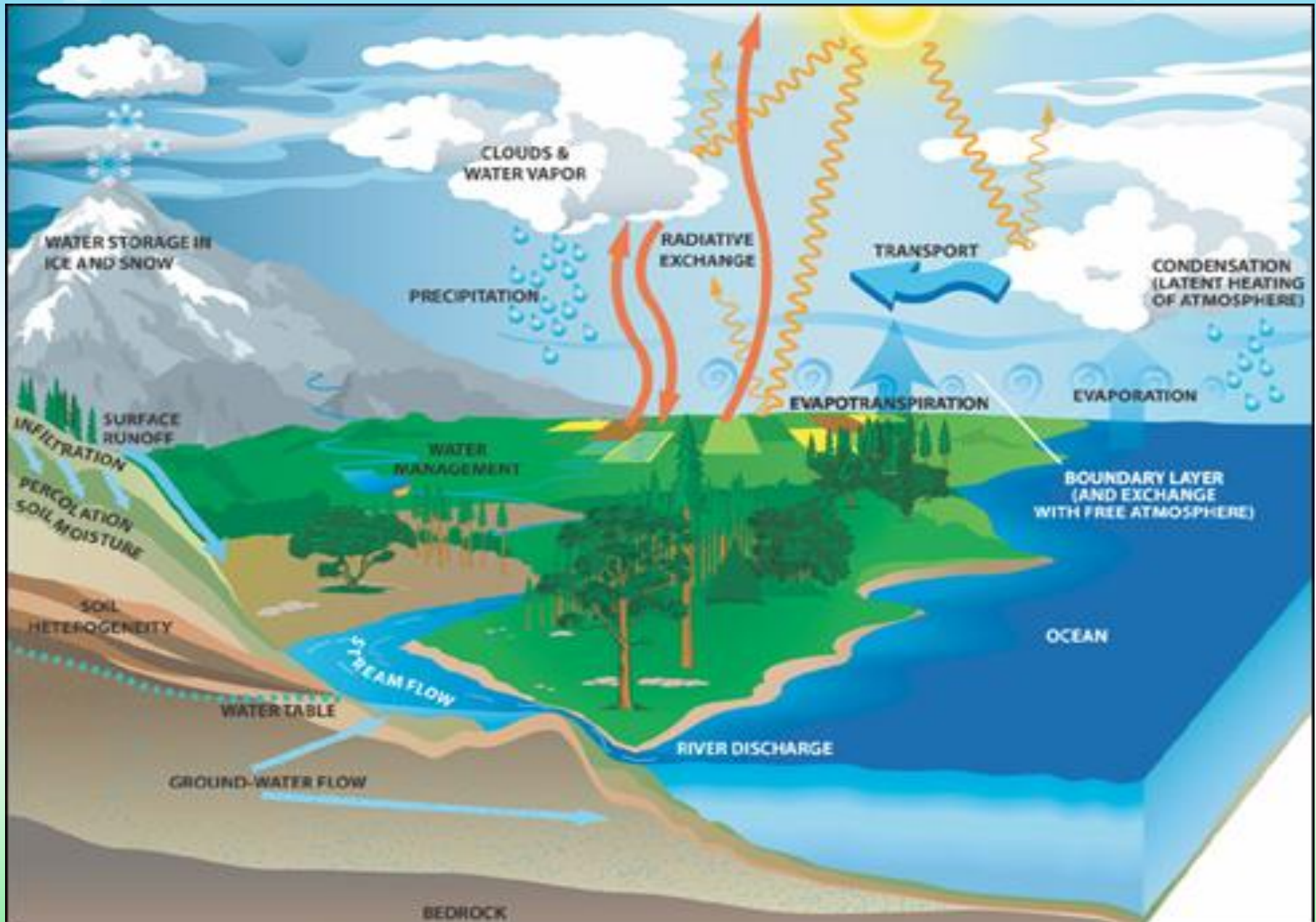
University of Wyoming

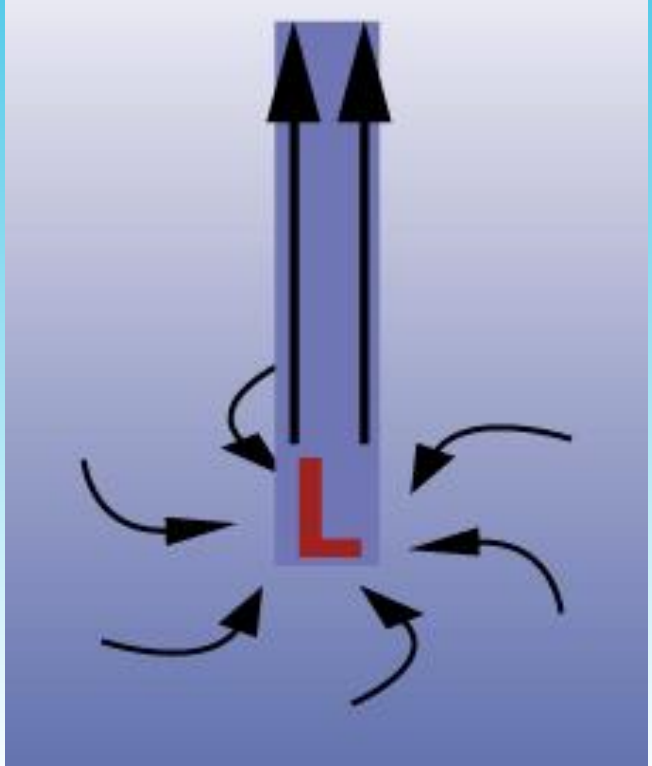
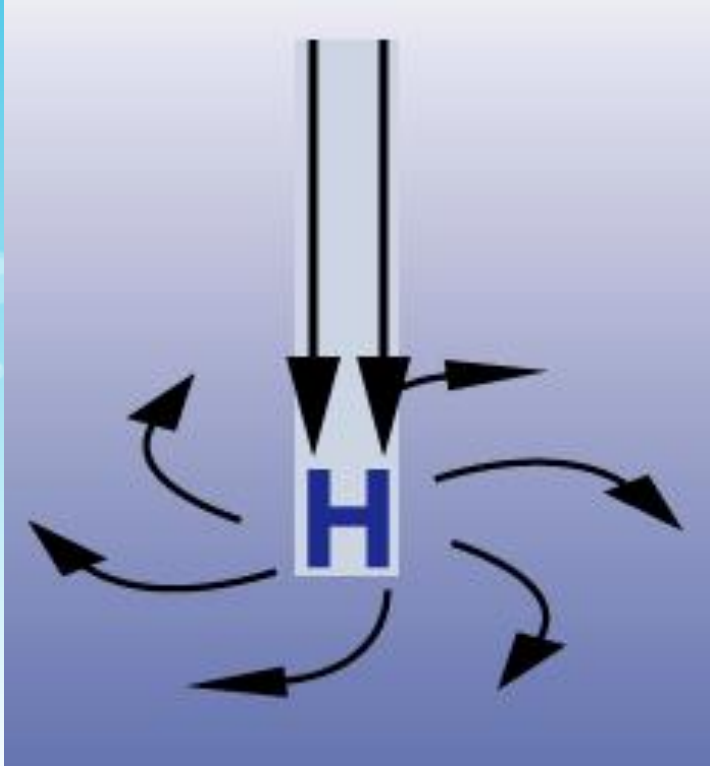
Atmospheric Movement

MOSTLY CAUSED BY:

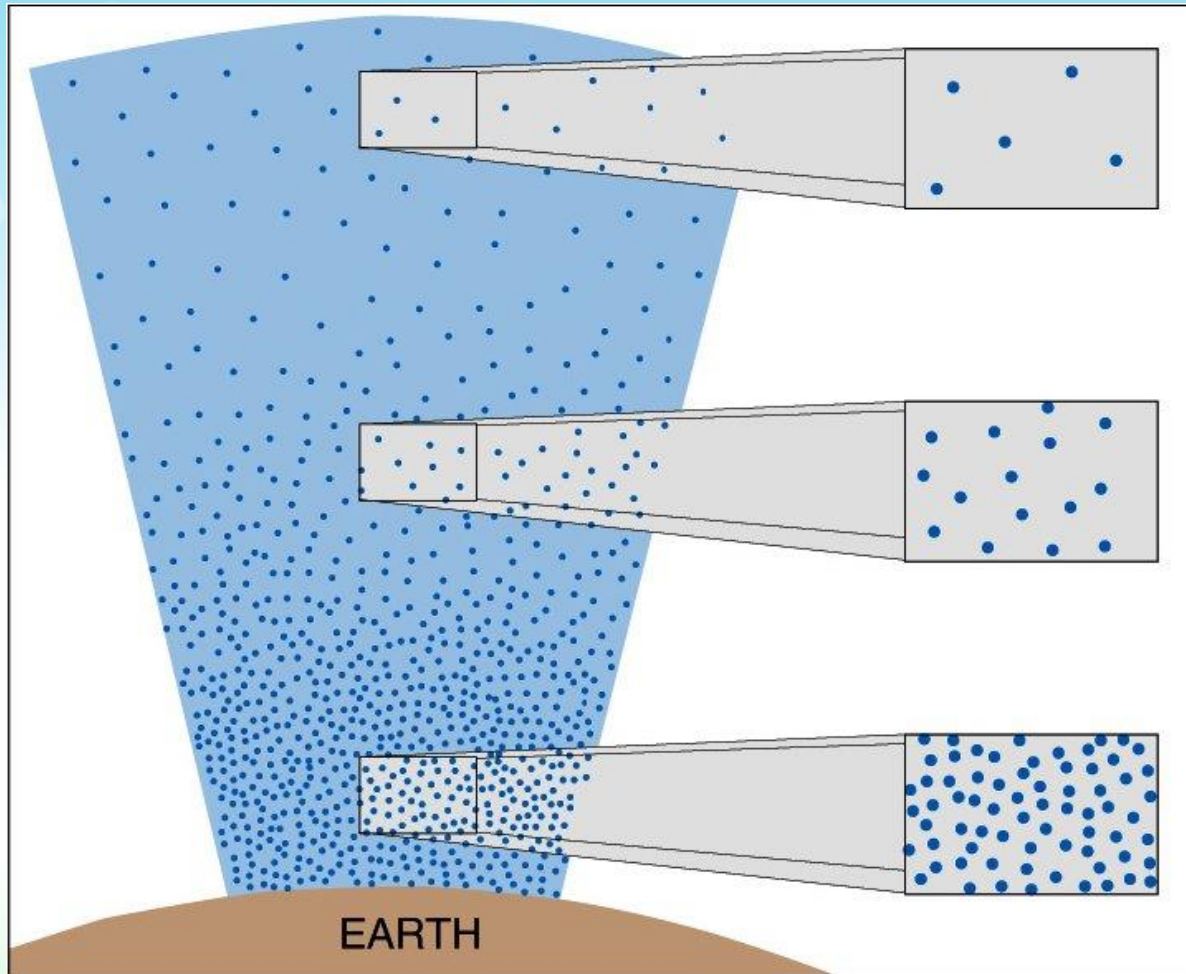
- Temperature differences
- Pressure differences
- Coriolis Effect (due to Earth's rotation)

The Water Cycle





Air Pressure Demos!



-Acting out movement from high to low pressure

(or video of a crowd or elevator

<http://www.youtube.com/watch?v=ZcK3Avl4KgU>)

-Balloon in a bottle

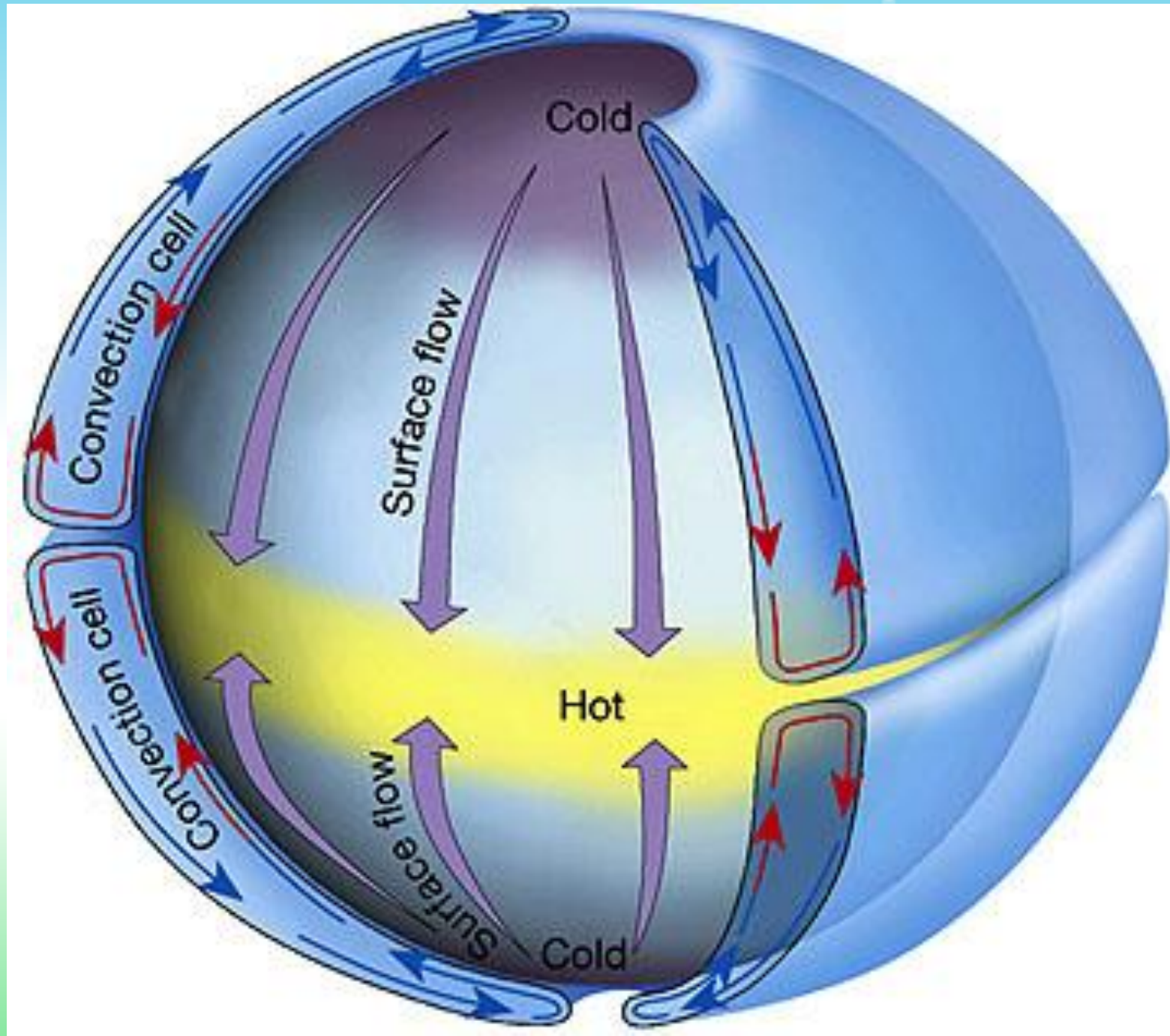
<http://www.youtube.com/watch?v=Q3owA2hGMzE>

- Cloud in a Bottle

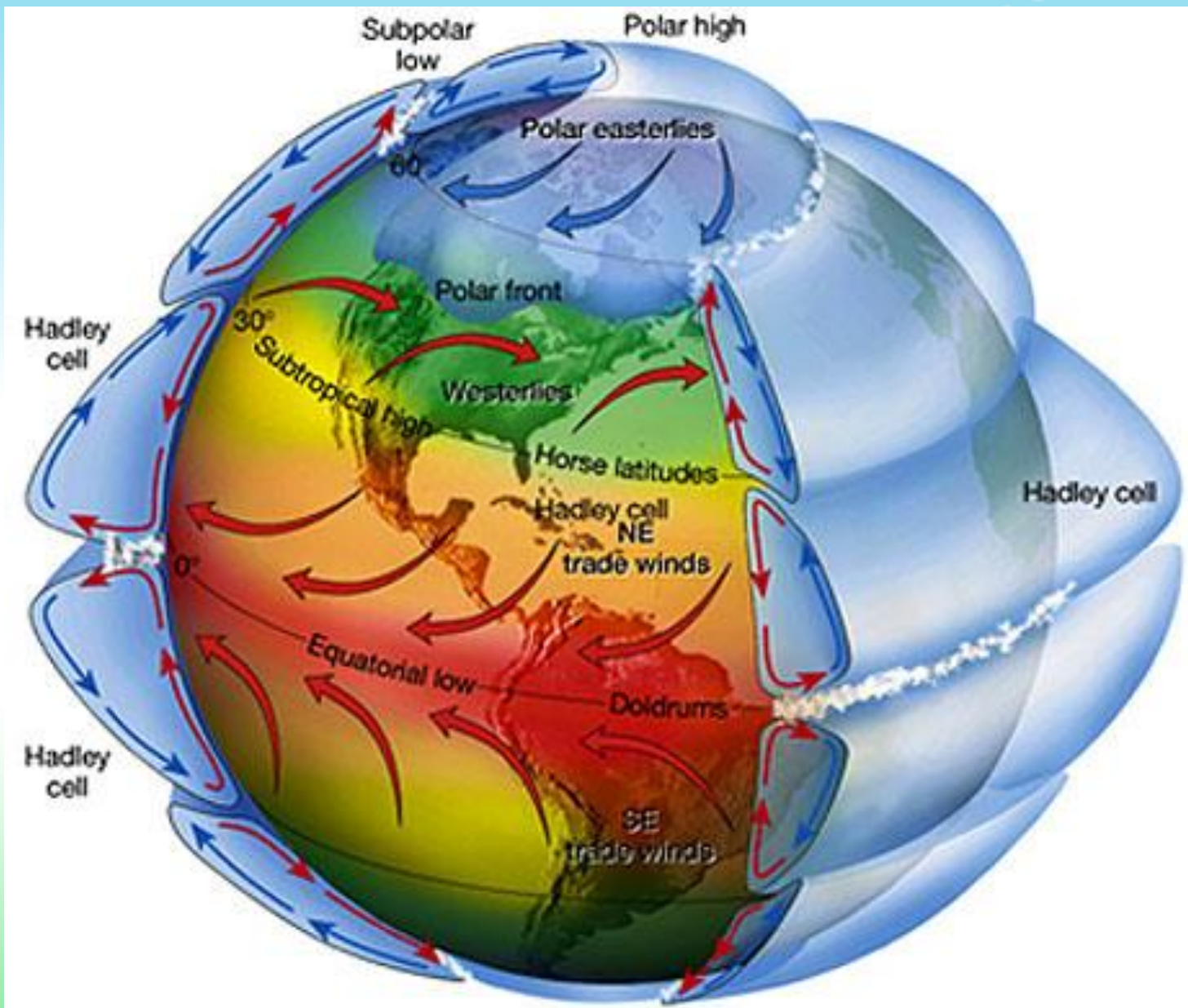
<http://www.youtube.com/watch?v=YUdR9xESD64>

**Air Flow
from High to Low!**

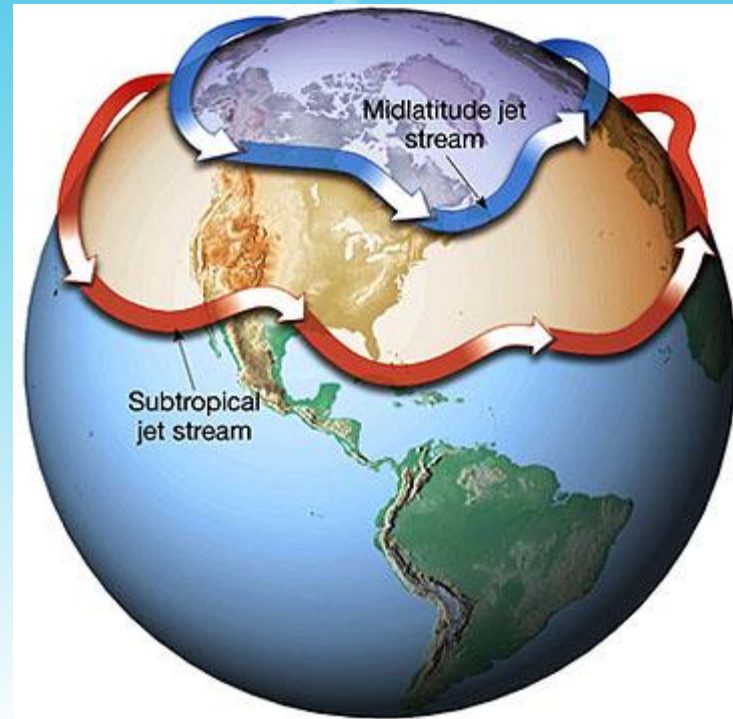
We would expect...



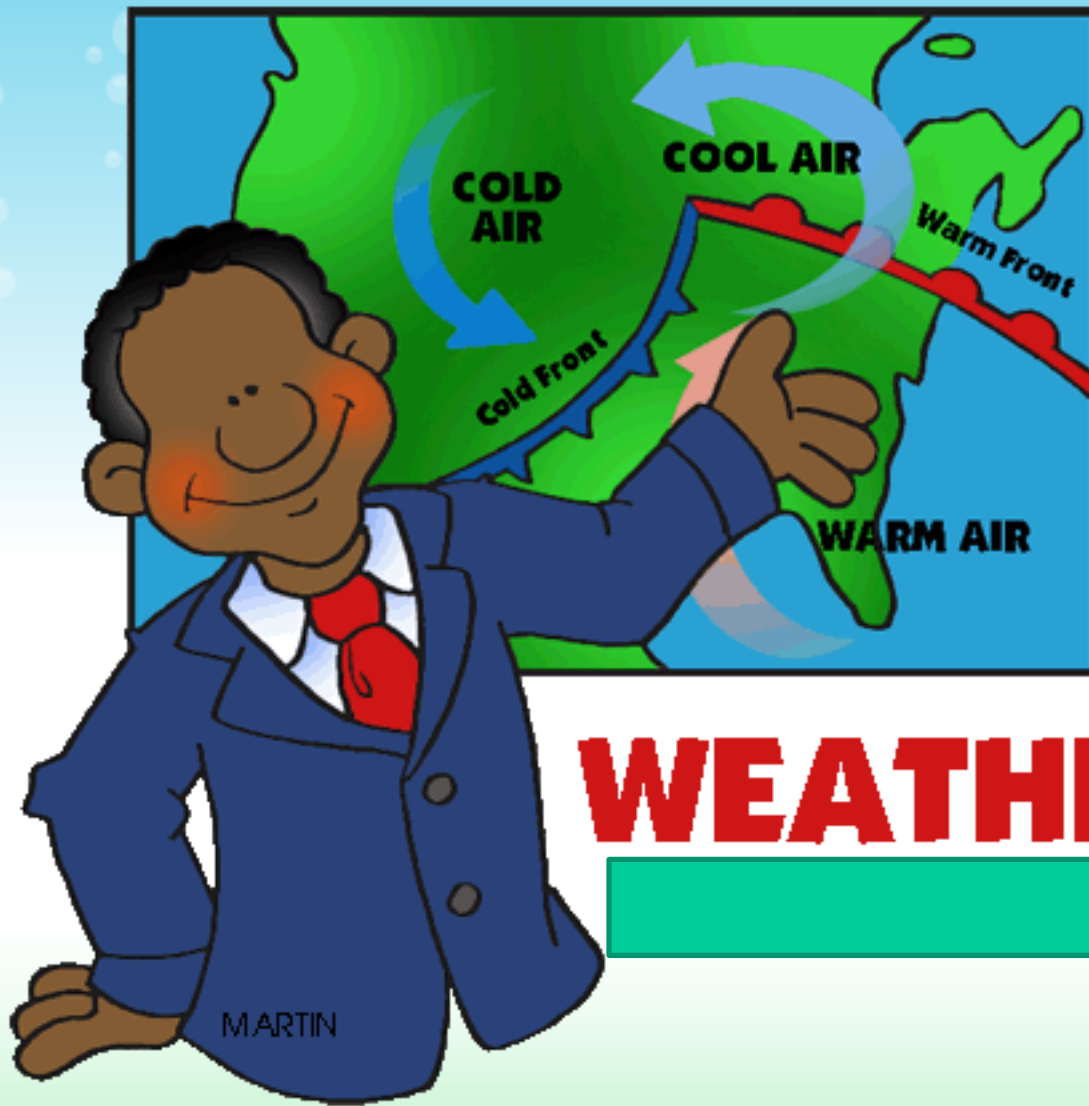
Global Winds



Jet Streams



- **Jet Streams** function as steering currents for air masses and as zonal boundaries for sharp differences in temperature. Jets are something like "rivers of air" found at high altitudes and noted for their high speeds. Typical positions of two jet streams are shown in this diagram



WEATHER FRONTS

MARTIN

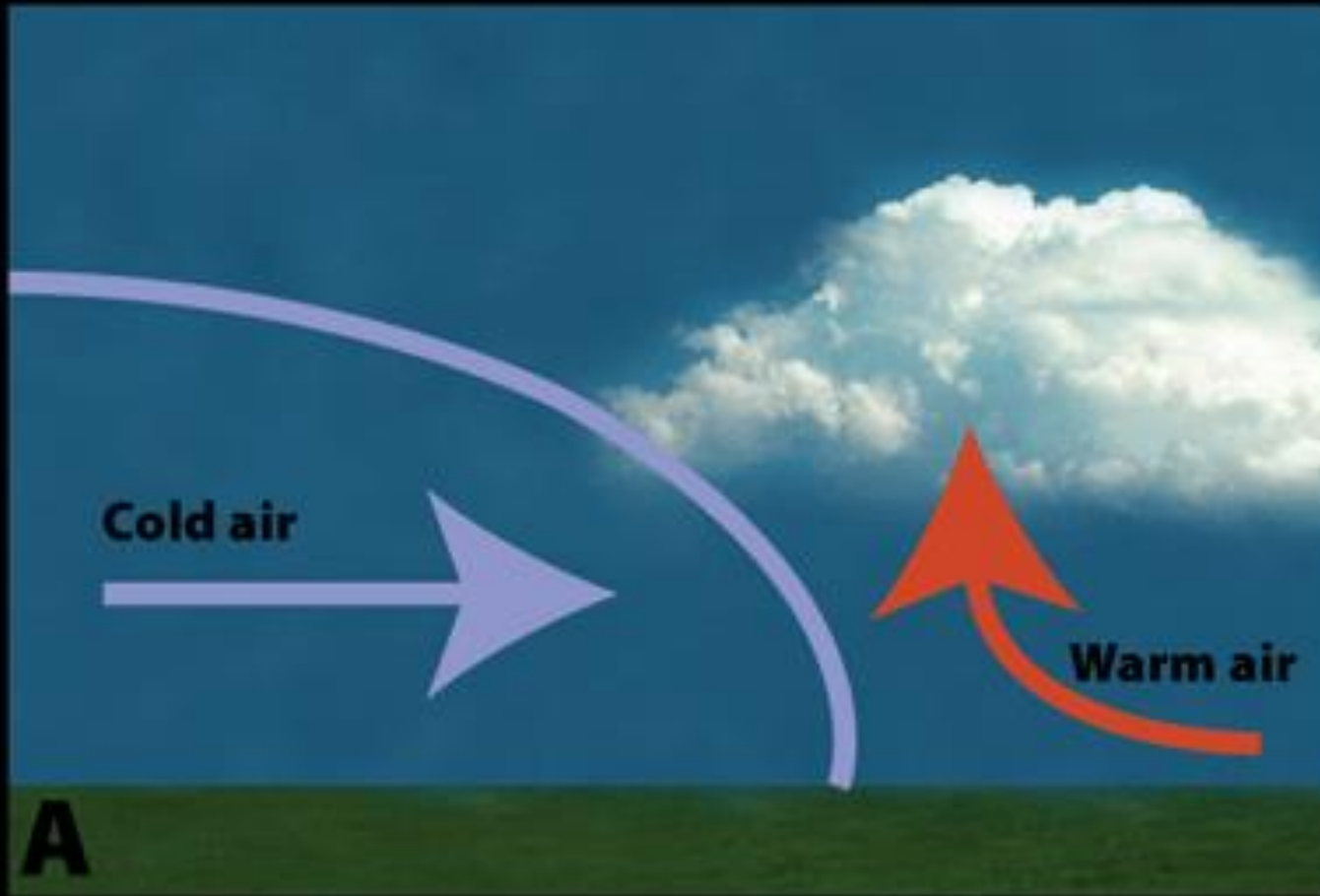
Four Types of Fronts

Cold Fronts

A cold front forms when cold air moves underneath warm air, forcing the warm air to rise.

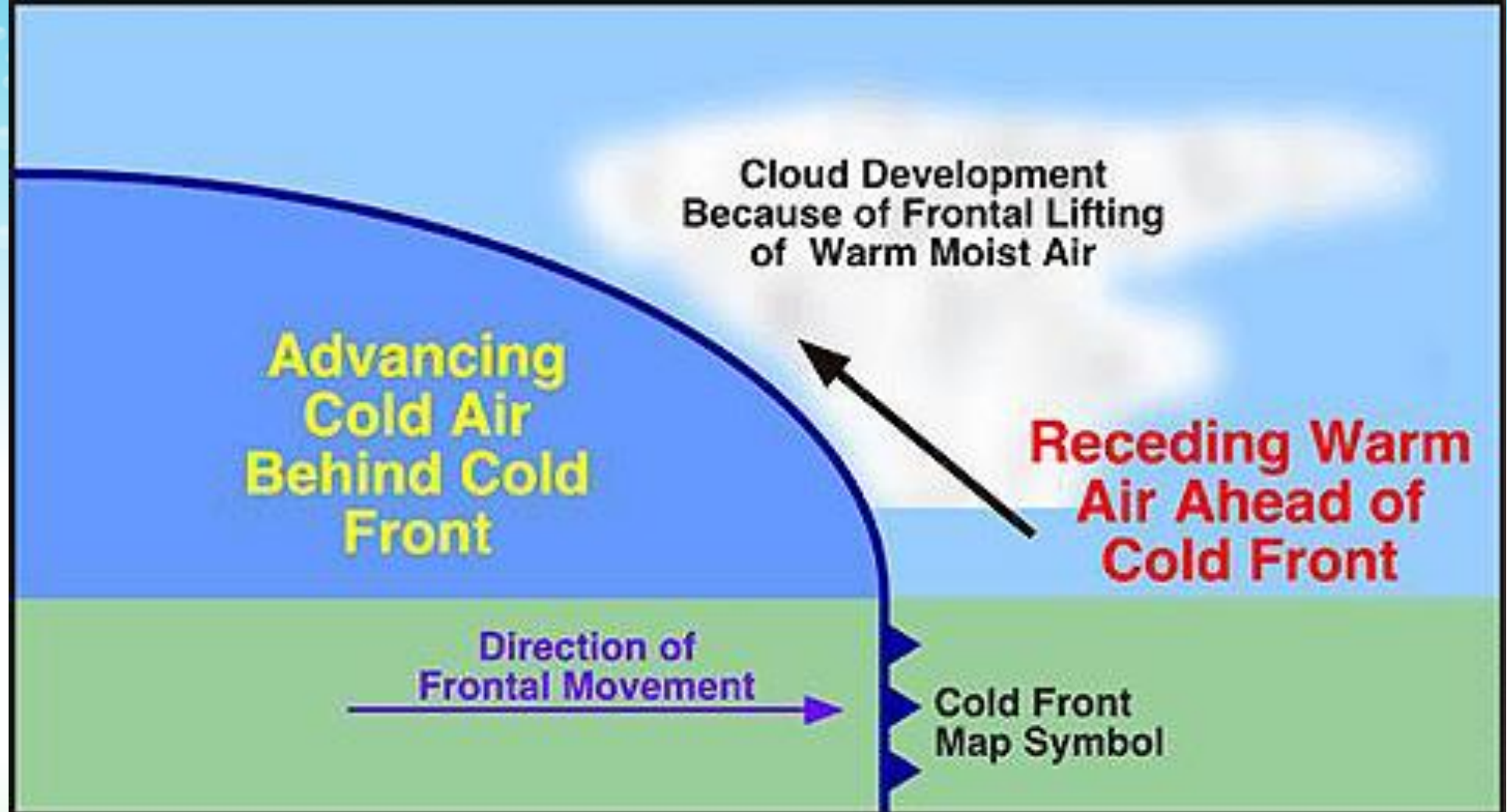


Cold Front



On Weather Map

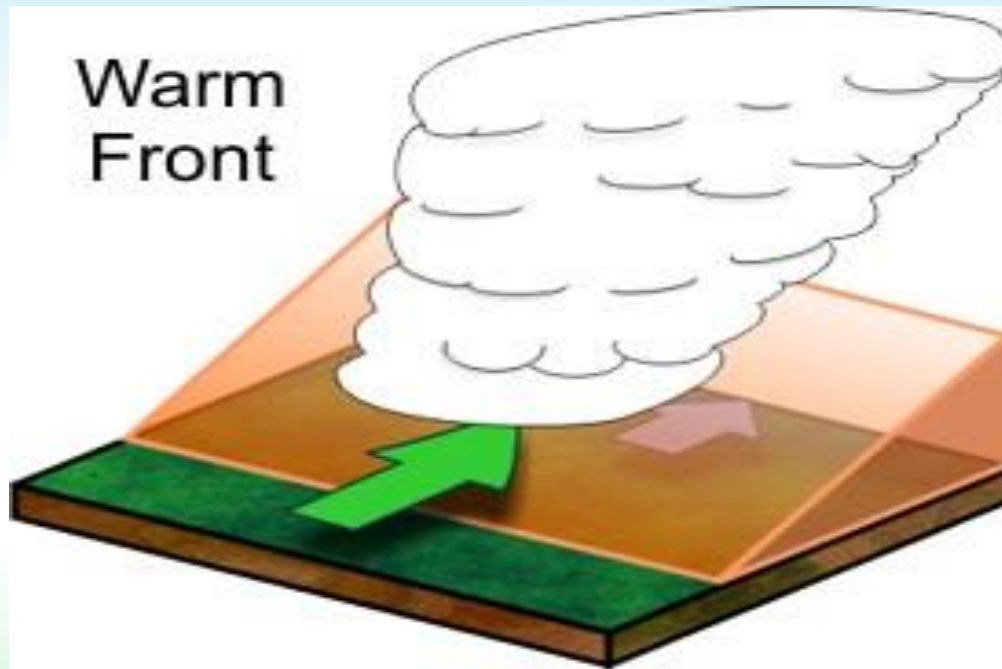
How can you tell which direction the front is moving from the map?



Four Types of Fronts

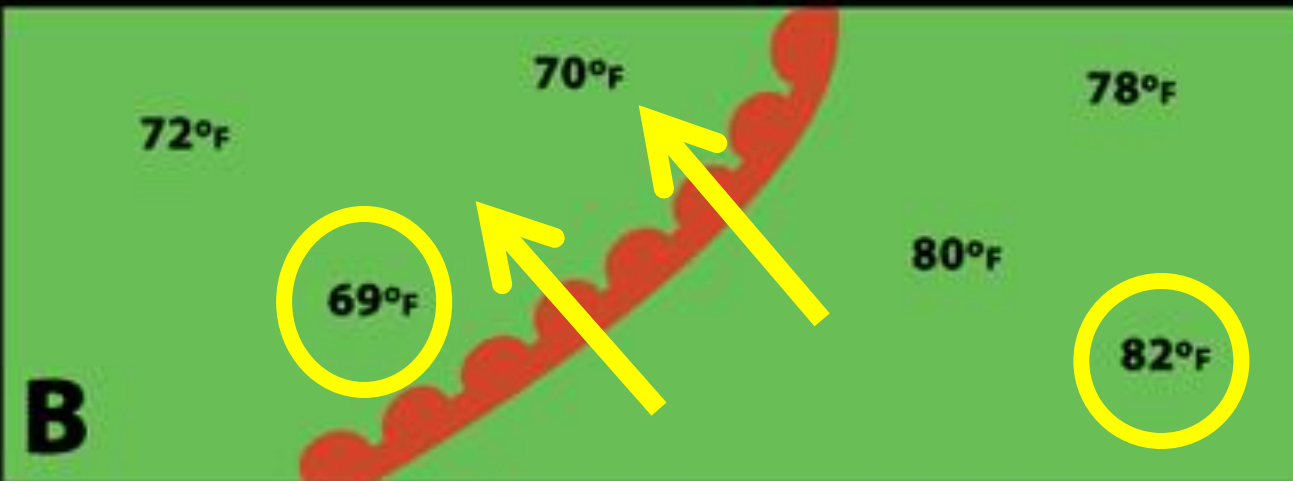
Warm Fronts

- A warm front forms when warm air moves over cold air.



What kind of weather forms at a warm front?

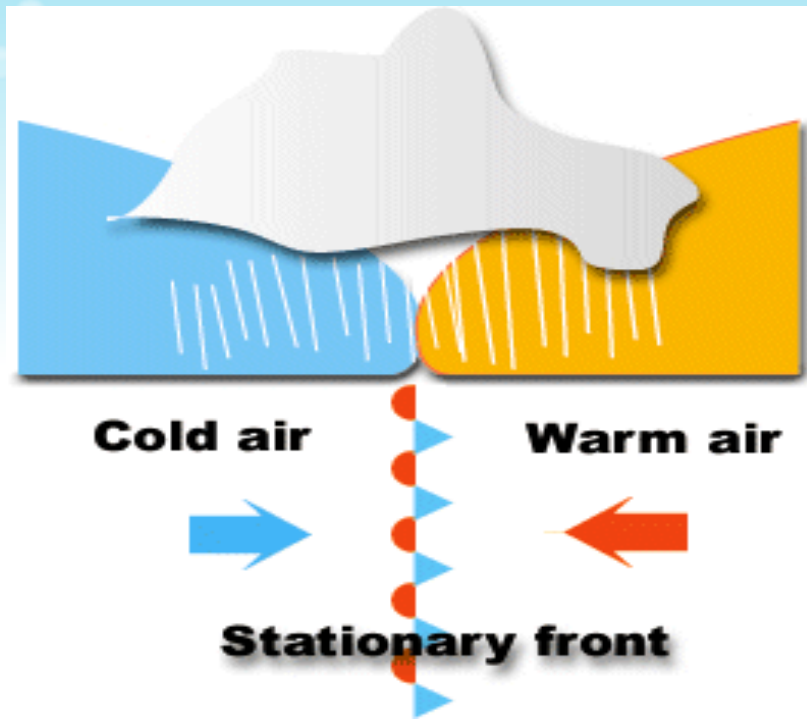
Warm Front



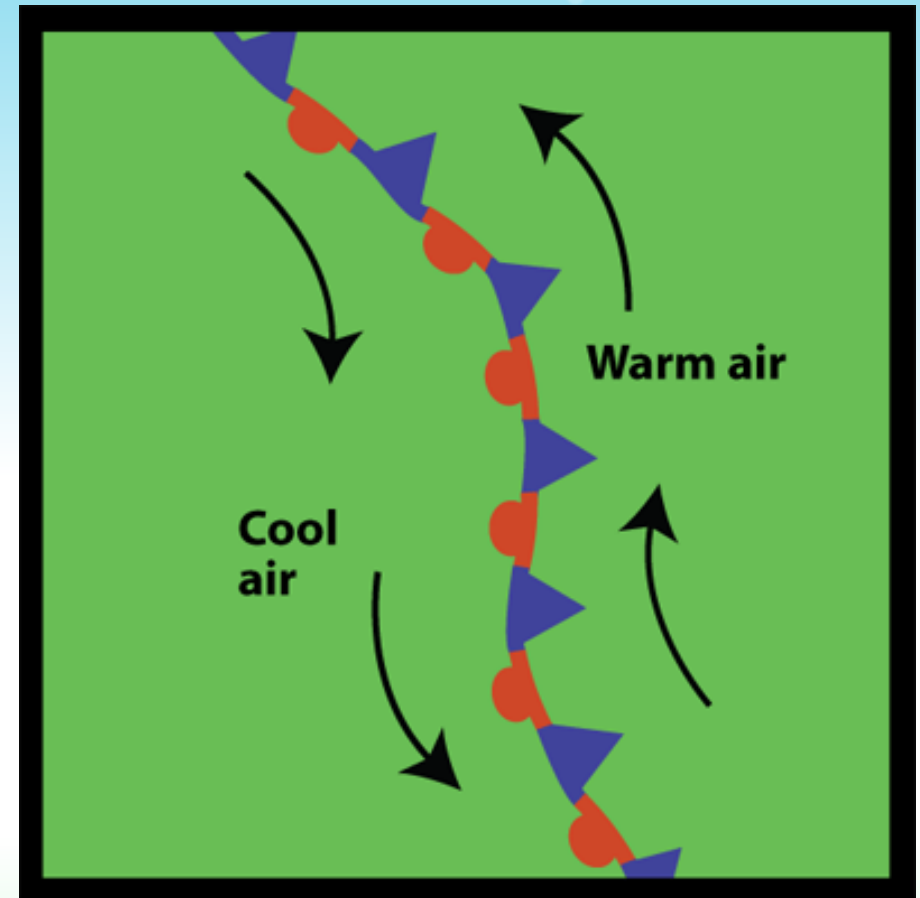
On Weather Map

How can you tell which direction the front is moving from the map?

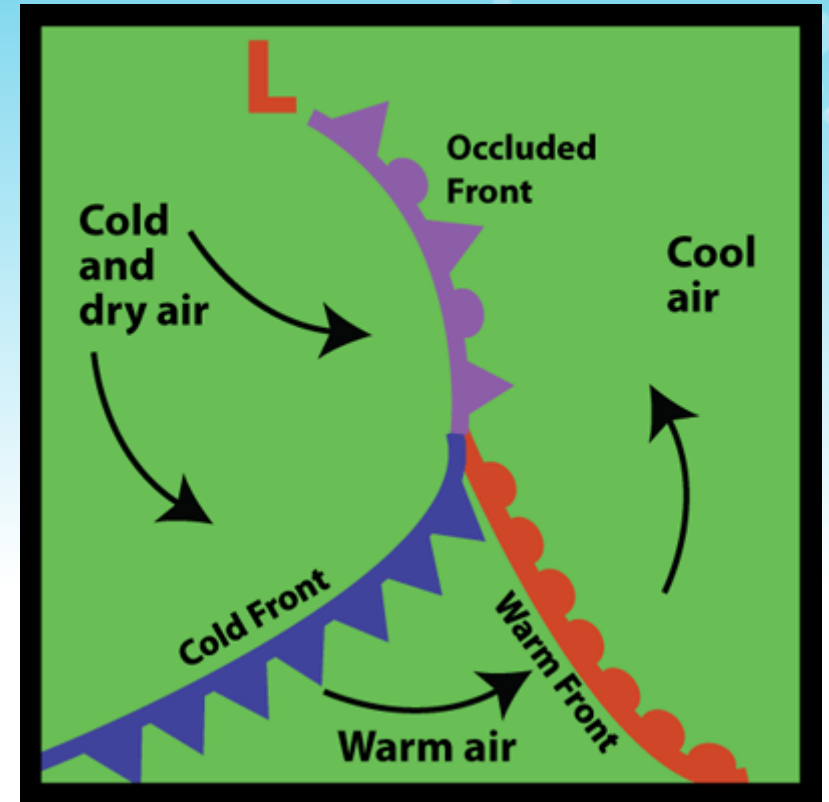
Stationary Fronts



Where the warm and cool air meet, water vapor in the warm air condenses into rain, snow, fog, or clouds.

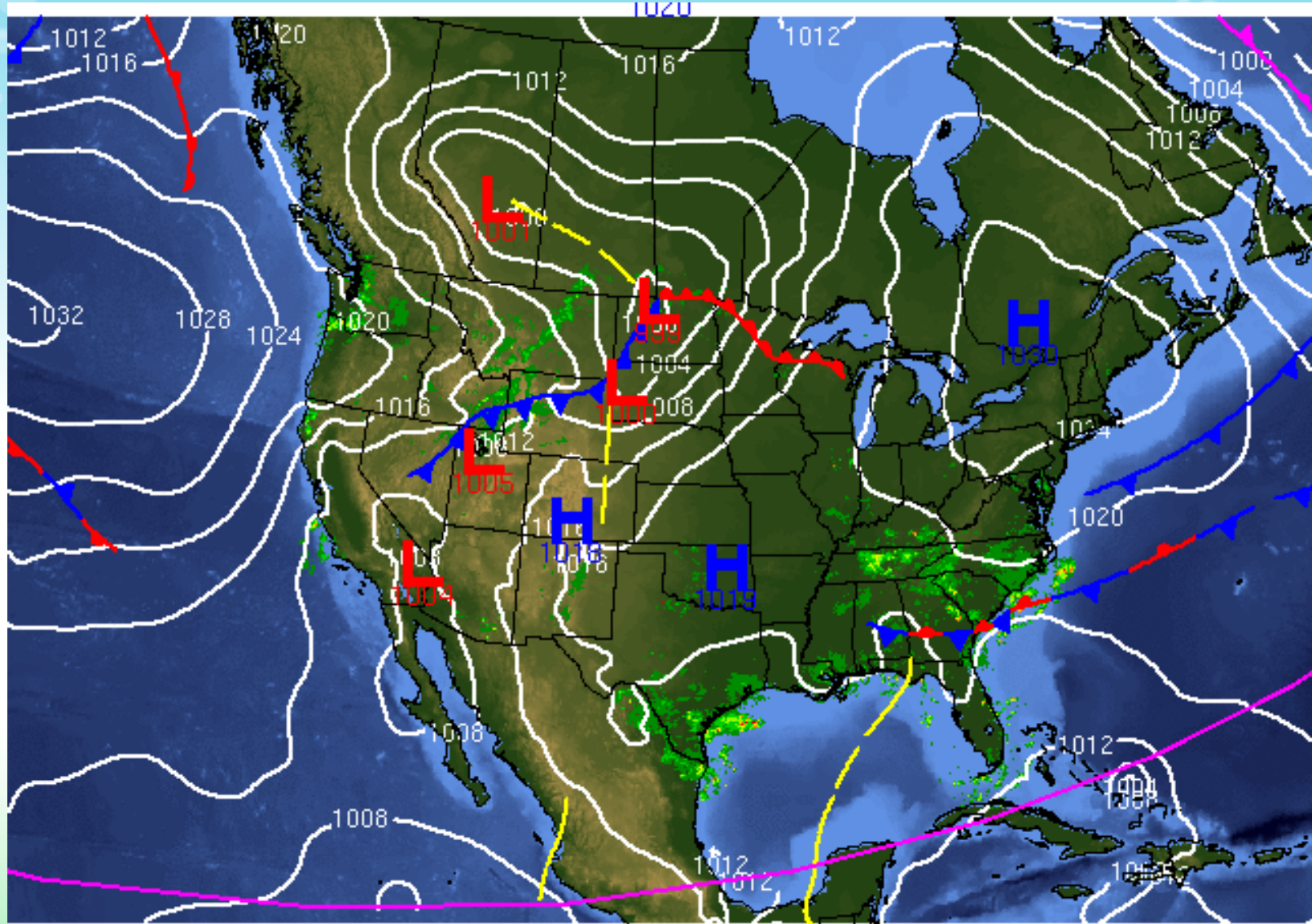


Occluded Fronts



When a cold air mass and a cool air mass come together, the warm air caught between them is forced upward.

Reading Weather Maps



Read the Legend!!!

L Low Pressure Center in Millibars...typically brings clouds and precipitation

H High Pressure Center in Millibars...typically brings fair skies

•• Rain

••• Moderate Rain

•••• Heavy Rain

•• Rain and Drizzle

••• Drizzle

•* Rain and Snow

* Flurries

** Snow

**• Moderate Snow

**•• Heavy Snow

☃ Smoke

R Thunderstorms

≡ Fog

≡≡ Dense Fog

≡• Rain and Fog

≡•• Drizzle and Fog

≡•* Rain, Drizzle, & Fog

≡** Snow and Fog

≡**• Rain, Snow, & Fog

☃ Freezing Rain

☃ Freezing Drizzle

☃ Blowing Snow

R Thunderstorms w/ Hail

Unshaded areas indicate cloud-free or fair skies

Black lines are lines of constant pressure or isobars

Grey shaded areas indicate cloudy areas

Green shaded areas indicate areas that have the best chance for precipitation



Cold Front...boundary between approaching cold air and warmer air

Warm Front...boundary between approaching warm air and cooler air

Occluded Front...cold air over takes warm air or vice versa

Stationary Front...boundary between warm and cold air has little or no movement

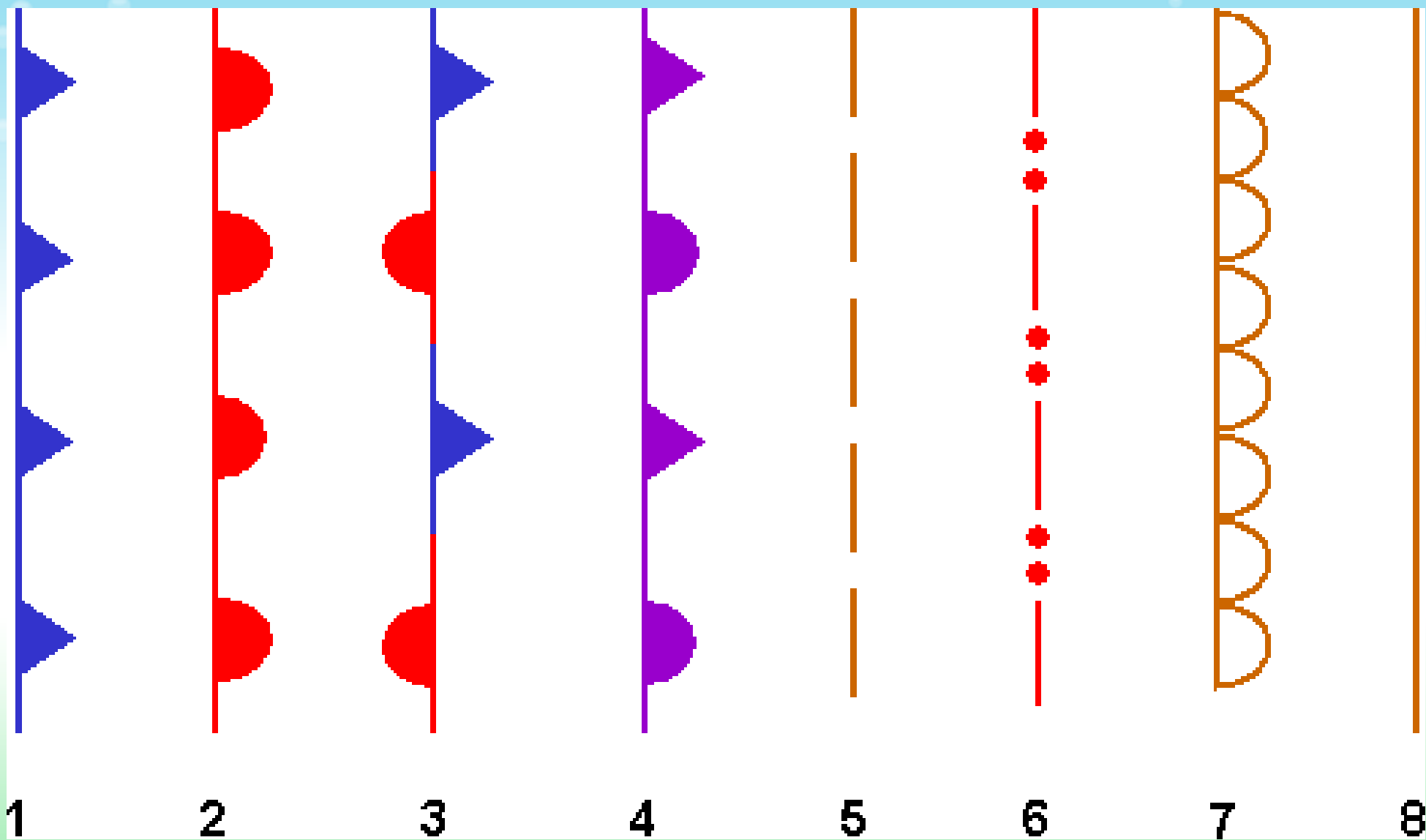
Rain Showers

Snow Showers

Rain & Snow Showers

Snow or Ice Pellets













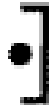











Trough...boundary of low pressure



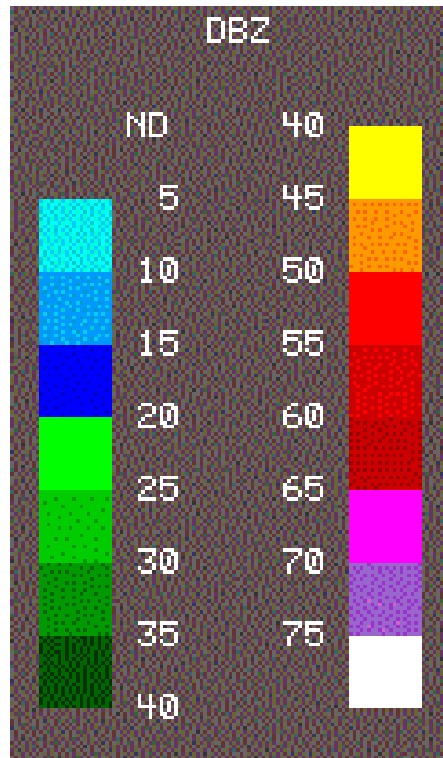
Total Sky Cover

-  **No clouds**
-  **Less than one-tenth or one-tenth**
-  **Two-tenths or three-tenths**
-  **Four-tenths**
-  **Five-tenths**
-  **Six-tenths**
-  **Seven-tenths or eight-tenths**
-  **Nine-tenths**
-  **Completely overcast**
-  **Sky obscured**

Symbols for Precipitation

- | | | | |
|--|--|--|---|
| 
SQUALL | 
HAZE | 
LIGHT FOG | 
HEAVY FOG,
ICE FOG |
| 
SLIGHT RAIN,
INTERMITTENT | 
SLIGHT RAIN,
CONTINUOUS | 
DRIZZLE | 
SLIGHT FREEZING
DRIZZLE |
| 
MODERATE RAIN,
INTERMITTENT | 
MODERATE RAIN,
CONTINUOUS | 
HEAVY RAIN,
INTERMITTENT, | 
HEAVY RAIN,
CONTINUOUS |
| 
PRECIPITATION
during Past Hour | 
ICE PELLETS
(Sleet) | 
SNOW | 
PRECIPITATION NOT
REACHING GROUND |
| 
PRECIPITATION
landing far from station | 
PRECIPITATION
landing near station | 
SHOWERS | 
HAIL |
| 
RAIN SHOWERS,
moderate or heavy | 
RAIN SHOWERS,
violent | 
SLIGHT SHOWERS
of SNOW PELLETS | 
SLIGHT SHOWERS
of HAIL |

Radar



Very Light

Light

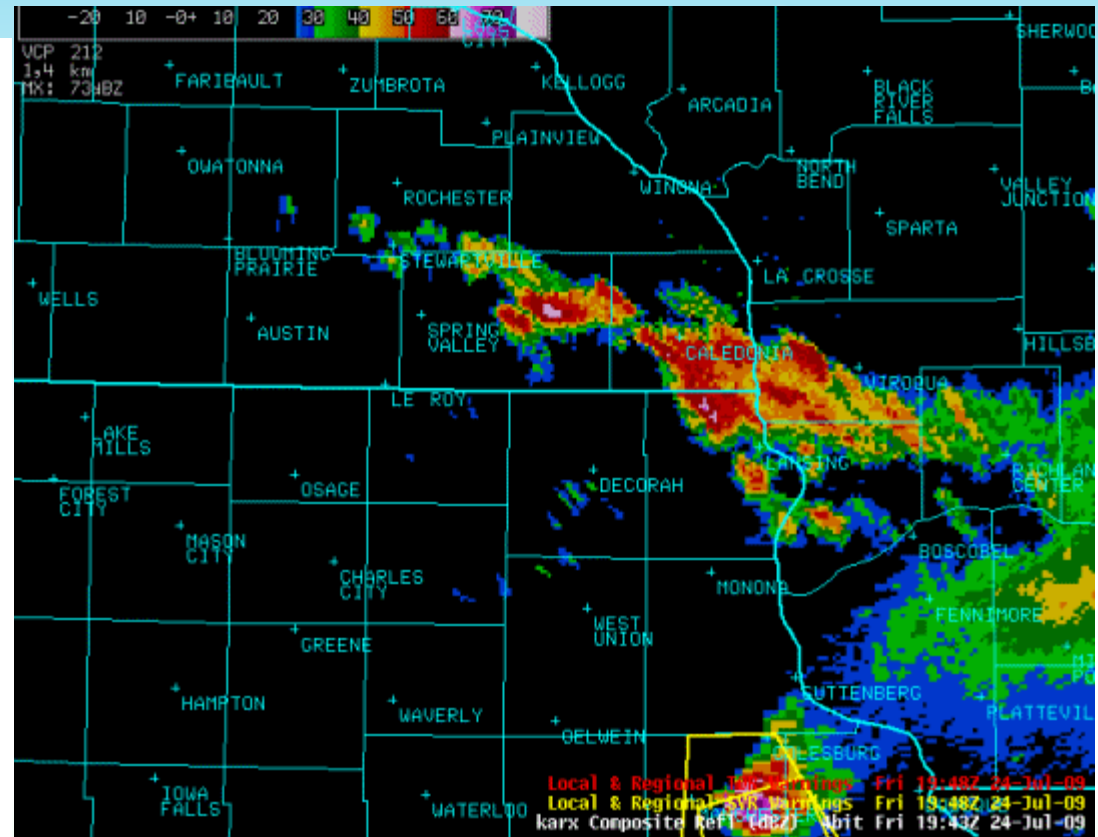
Moderate

Heavy

Severe

Intense

Extreme



<http://www.crh.noaa.gov/arx/?n=jul2409>

Local Weather....

<http://www.wunderground.com/maps/#?type=Fronts>

The TEKS

Know that climatic interactions exist among Earth, ocean, and weather systems.

- **8.10 (C)** identify the role of the oceans in the **formation of weather systems** such as hurricanes.

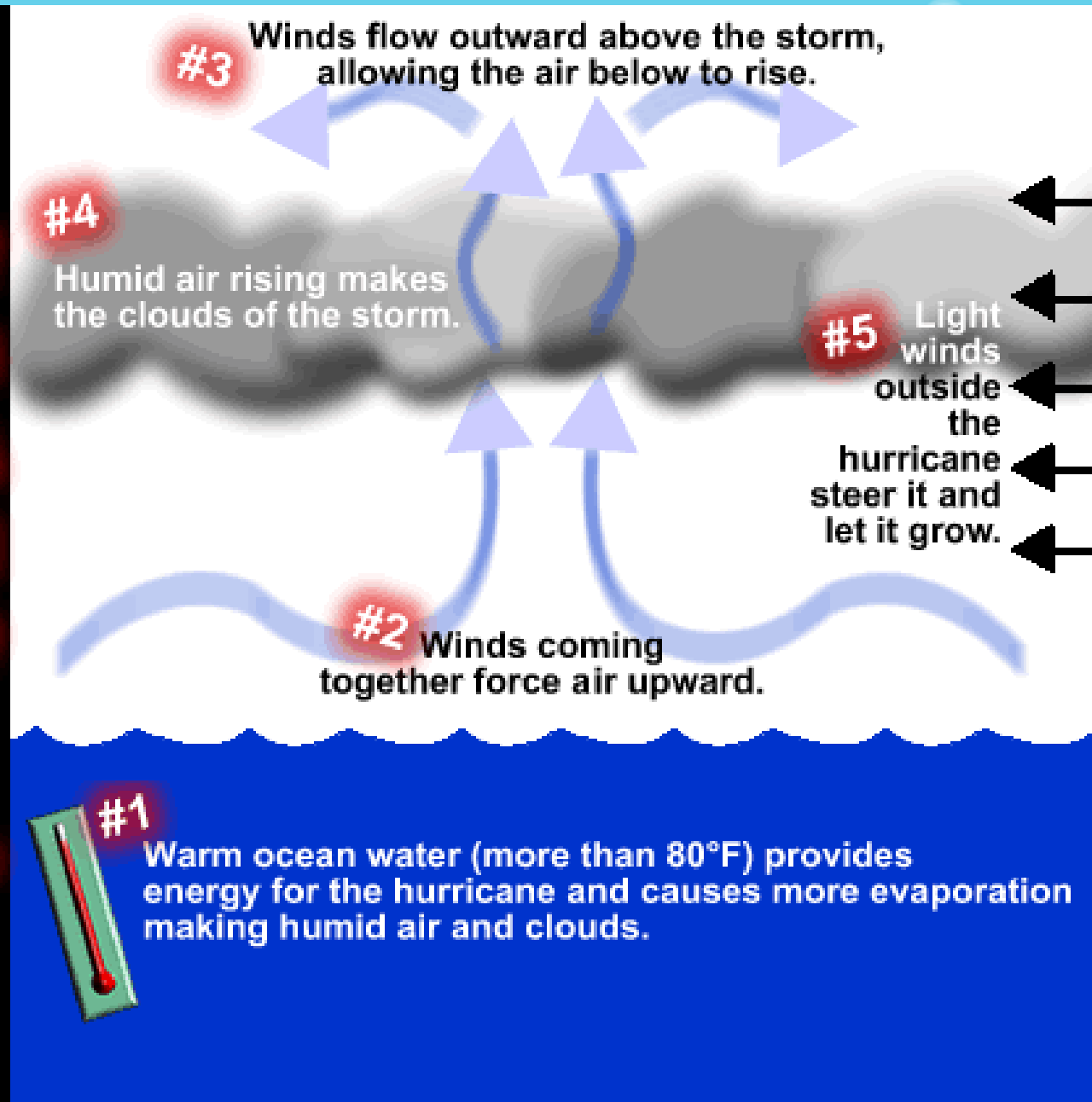
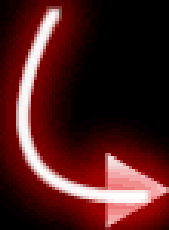


Role of the Ocean

- Slowly absorbs and slowly releases heat energy helping keep Earth's temperatures relatively stable
- Oceans heat or cool the air above them and transport heat around the globe in currents.
- Hurricanes form over warm ocean water, drawing their energy from the water's heat.



**WHAT
DOES
A
HURRICANE
NEED?**



What Happens On Land?

- **Landfall**

After a few hours over land, a hurricane will weaken rapidly. WHY?

- Without the moisture and heat sources provided by the ocean, the storm can no longer produce thunderstorms near the eye. Without this convection, the storm's energy dissipates.

Recommended Resources...

- Edheads – Reading a Weather Map Tutorial & Interactive Game
- <http://edheads.org/activities/weather/index.shtml>
- Current Weather Maps – (different maps for temp, pressure, moisture, etc)
- <http://weather.rap.ucar.edu/surface/>
- Weather - Easy Interactive Barometer
- http://kids.earth.nasa.gov/archive/air_pressure/barometer.html
- Air Force Association that Flies Into Hurricanes to Collect Data!
- <http://www.hurricanehunters.com/>
- Short video clip about their mission
<http://oceantoday.noaa.gov/hurricanehunters/welcome.html>
- NOAA – Education Resources
- <http://www.education.noaa.gov/>
- Bill Nye – Storms
- <http://www.gamequarium.org/cgi-bin/search/linfo.cgi?id=7827>

Other Files You Might Like...

- Edusmart
- BrainPop – Weather
- Unit Organizer
- Bill Nye – Storms – check out the clearest, most fun explanation of El Nino ever!! (also has Winds, Atmosphere,etc)
- Evaporation & Condensation Lab
- STEMscopes
- Texas STAAR Coach