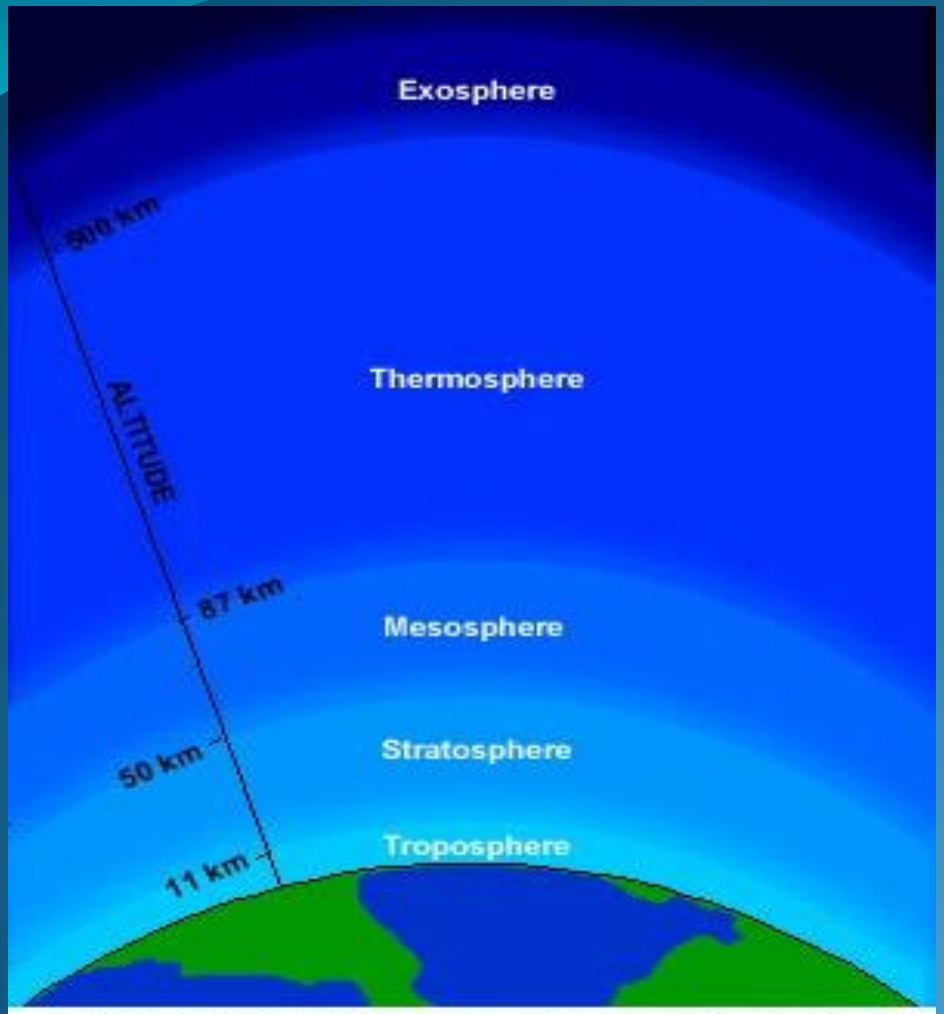
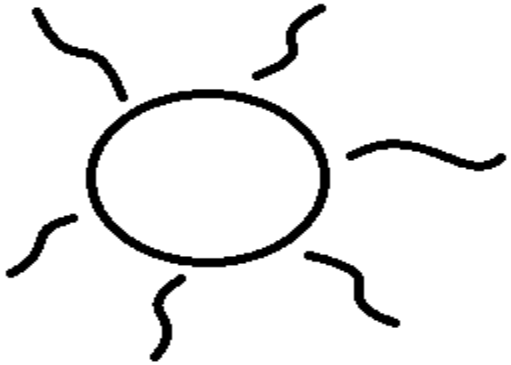
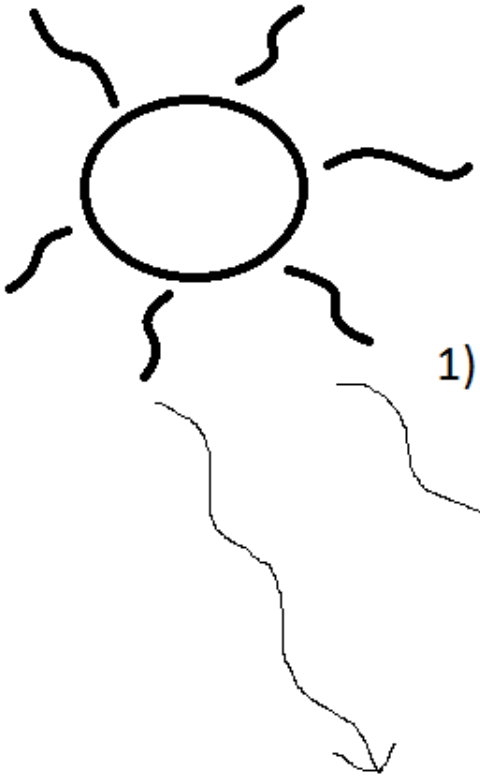
The Atmosphere



This cartoon view of our atmosphere shows the five different layers. Approximate thickness of the layers is listed on theleft but is not the same worldwide. The scale of the atmosphere is exaggerated compared with the Earth to include relevant details.

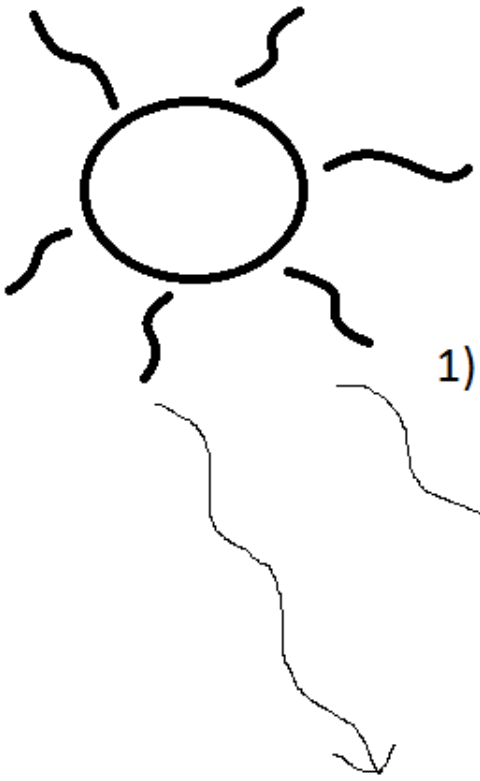
- How our atmosphere is heated.





1) Radiation from the sun

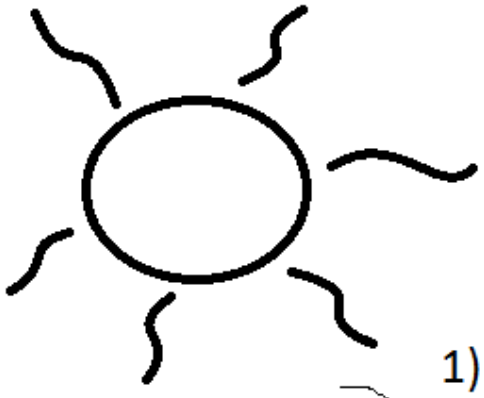
1A) Earth heated from the sun



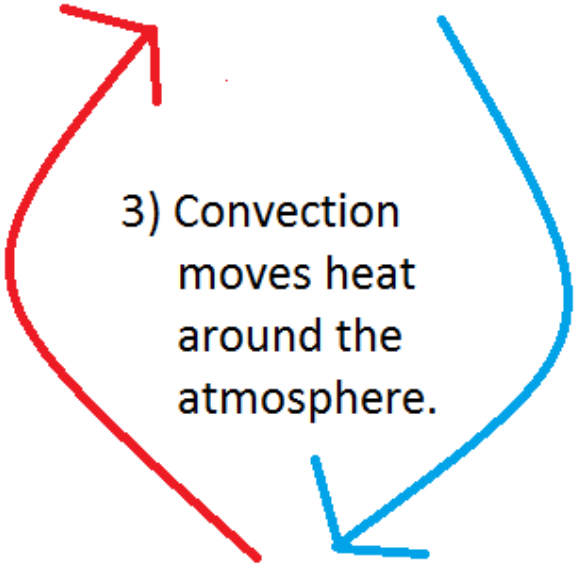
1) Radiation from the sun

2) Conduction - heat is passed to air

1A) Earth heated from the sun



1) Radiation from the sun



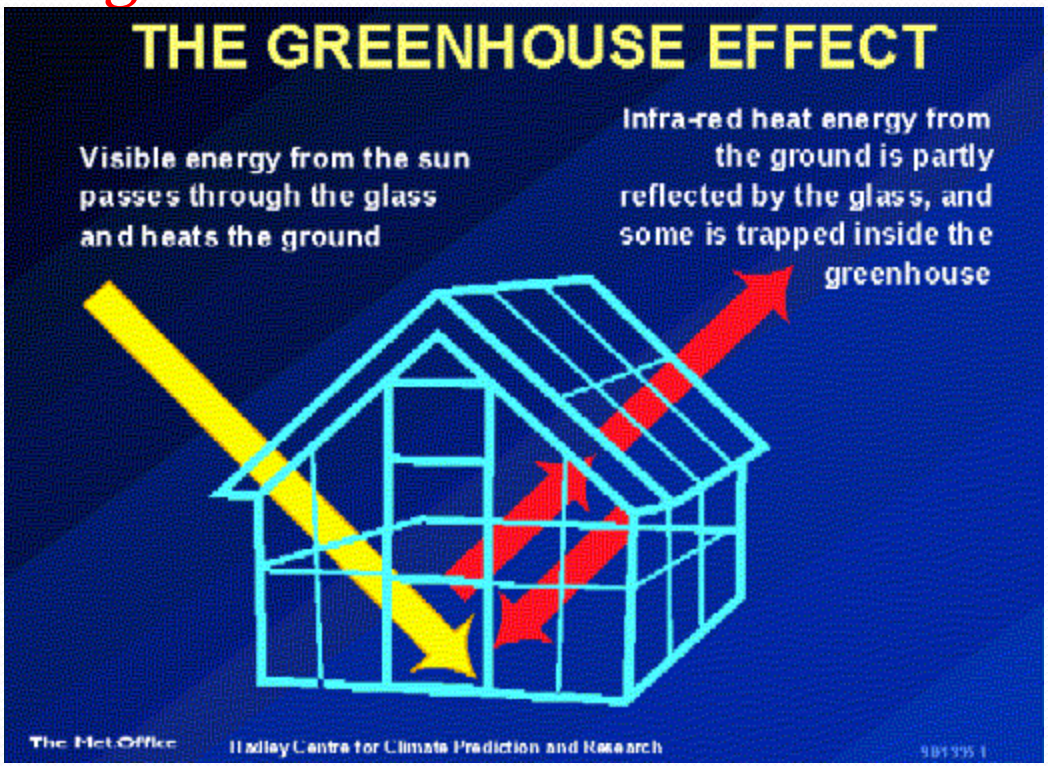
3) Convection moves heat around the atmosphere.

2) Conduction - heat is passed to air

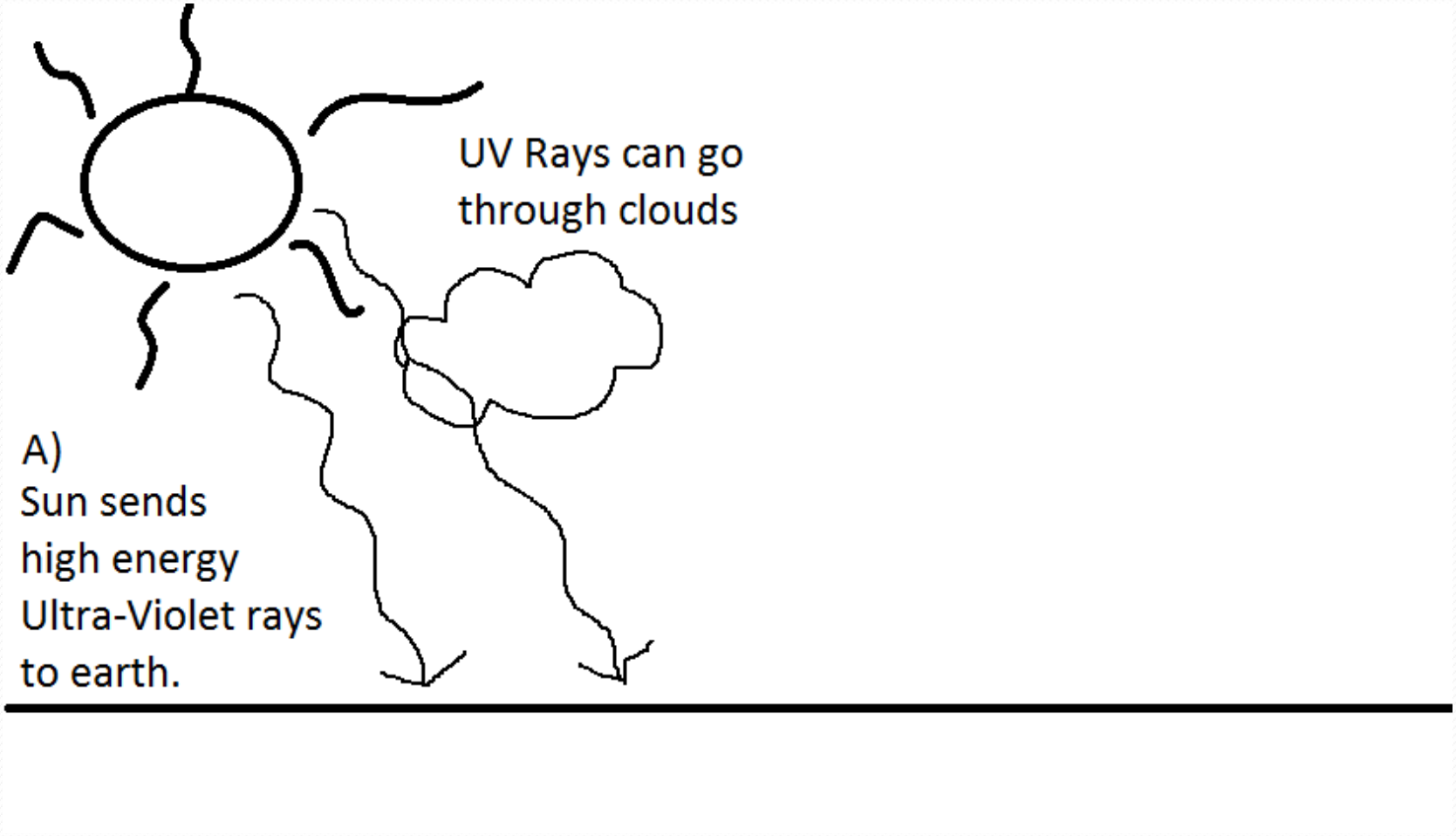
1A) Earth heated from the sun

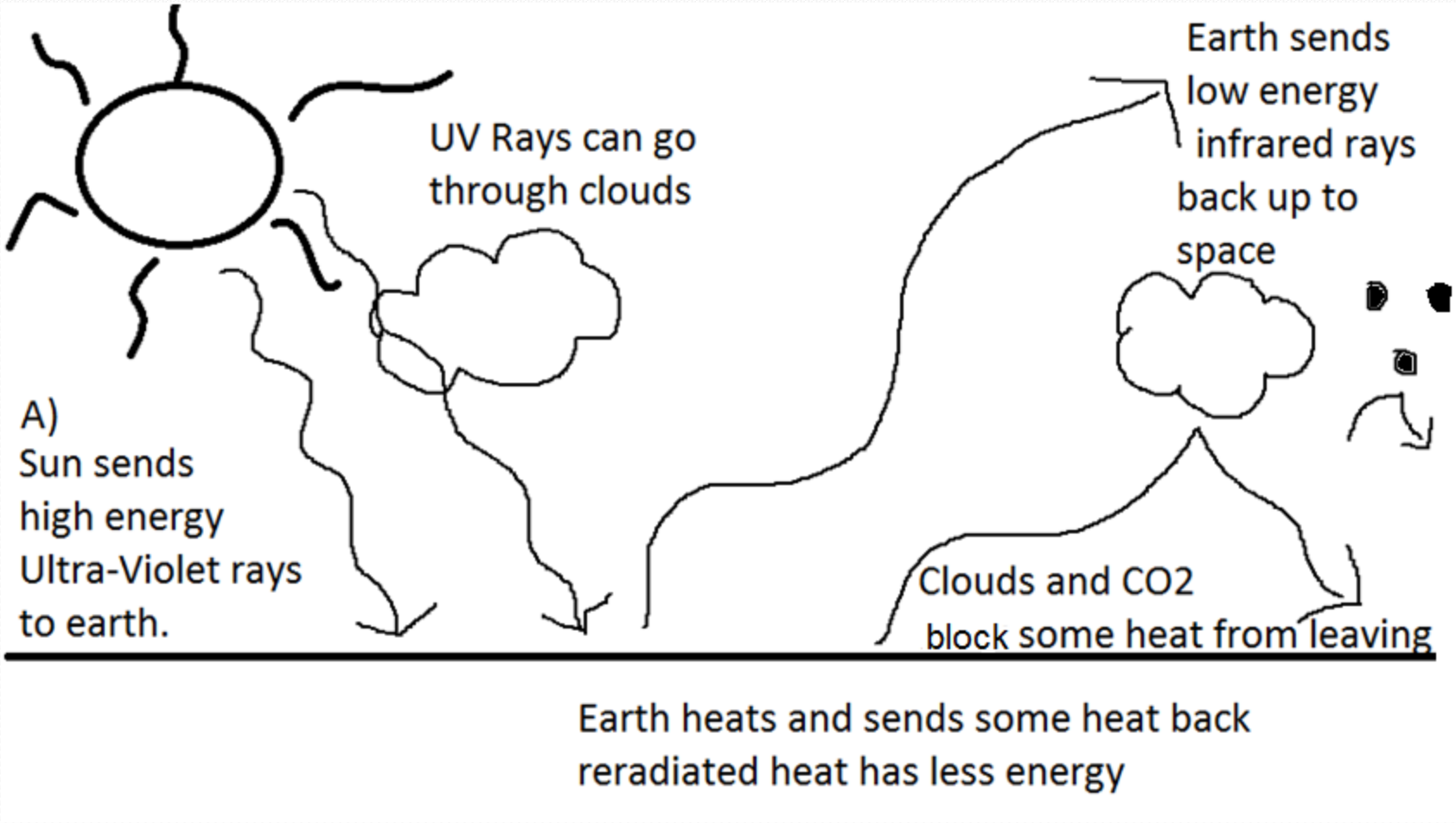
- How is heat transferred around our atmosphere?
- 1) Radiation from the sun to the Earth.
- 2) Conduction passes heat from the Earth to the atmosphere.
- 3) Convection moves heat around our atmosphere
- Earth is heated by Radiation, Conduction and Convection.

- What is the green house effect?



Green House Effect




Earth sends
low energy
infrared rays
back up to
space
UV Rays can go
through clouds
A)
Sun sends
high energy
Ultra-Violet rays
to earth.
Clouds and CO2
block some heat from leaving
Earth heats and sends some heat back
reradiated heat has less energy

Greenhouse effect

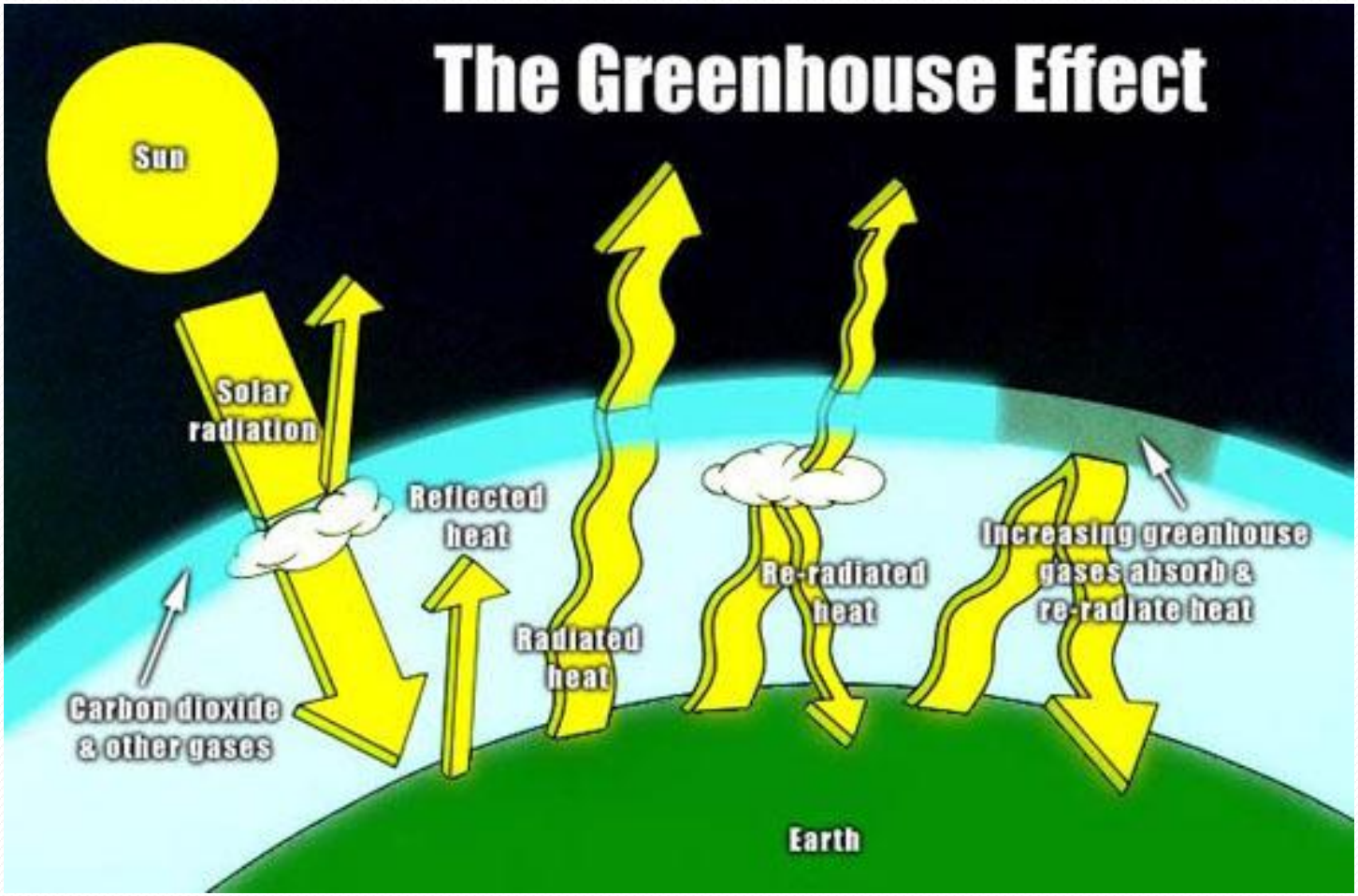
- What is the Greenhouse effect?
- The suns UV rays (think sunglasses) make their way to the earth (through clouds and C02)
- The Earth sends Infrared rays (night vision) back to space.
- Clouds (H20 Vapor), C02 and other gasses block the infrared rays from returning.
- This heats up the earth like a blanket.

What are the Major Greenhouse gases

Major Greenhouse gasses

* 1)Carbon Dioxide
* 2)Water Vapor
  3)Methane
  4)Nitrous Oxide

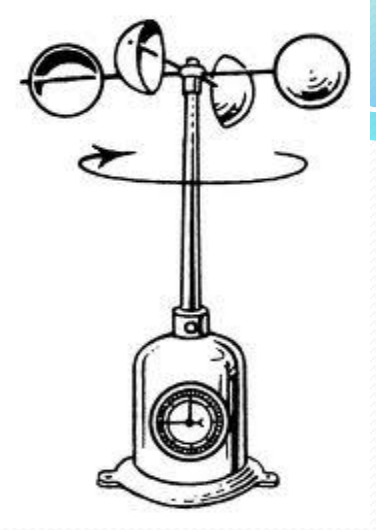
- What nights will keep in more heat, a clear night or a cloudy night.
- Cloudy nights act as blankets and hold in more heat.


The Greenhouse Effect
Sun
Solar radiation
Reflected heat
Radiated heat
Re-radiated heat
Increasing greenhouse gases absorb & re-radiate heat
Carbon dioxide & other gases
Earth

winds

- Wind-
- Wind is moving air.
- Is a North Wind, going North or coming from the North?
- Winds are named from the direction they are coming from.
- Why do we name winds based on where they are coming from?
- Where the wind comes from tells us what type of air it brings. Ex. North winds = Cold winds

Wind

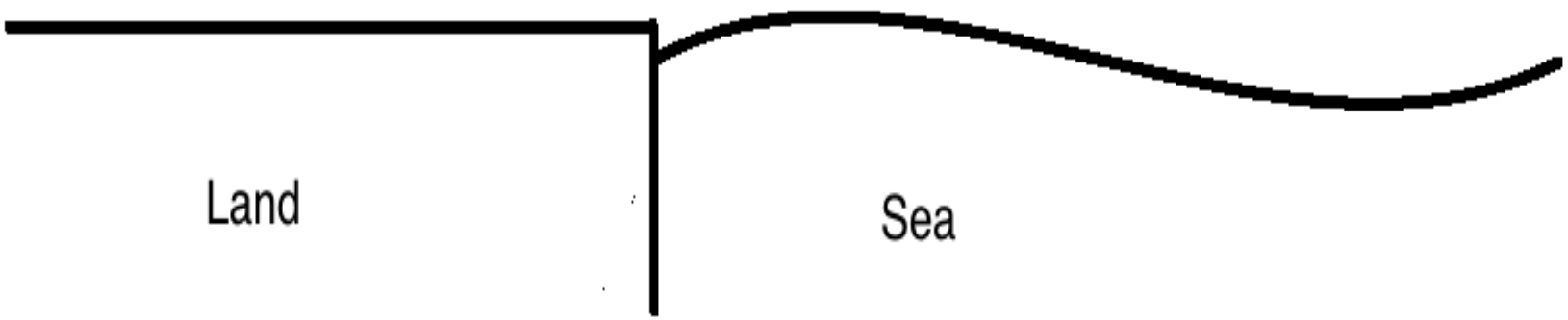


- How is wind direction found?
- Weathervane – Shows wind direction (rooster/arrow)

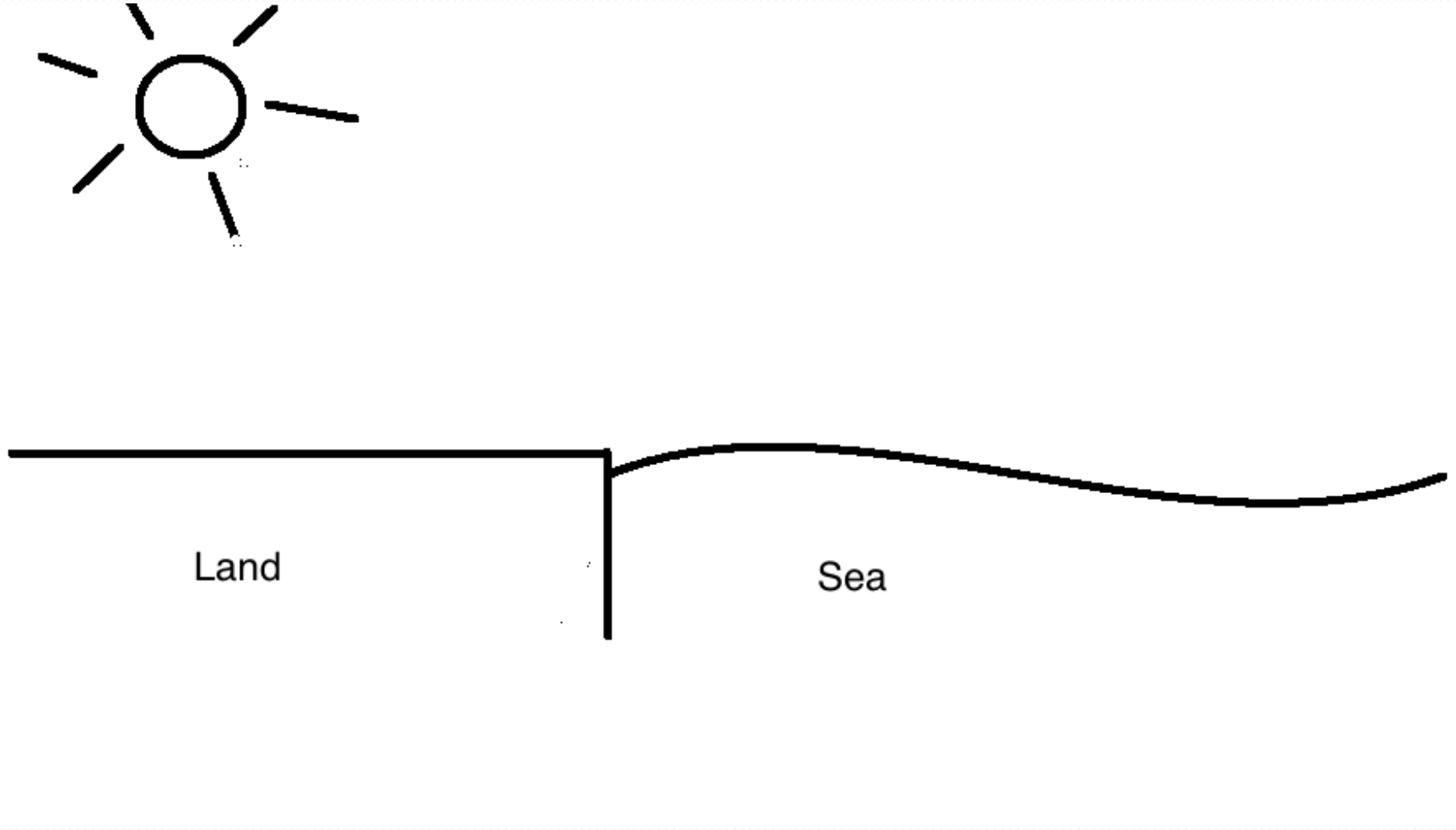
- How is wind speed found?
- Anemometers – record wind speed (spinning cups)

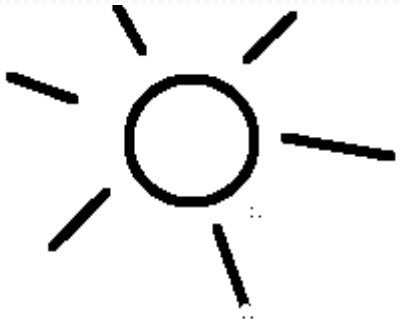
- Where do we record all our weather?
- Weather stations – record all weather findings

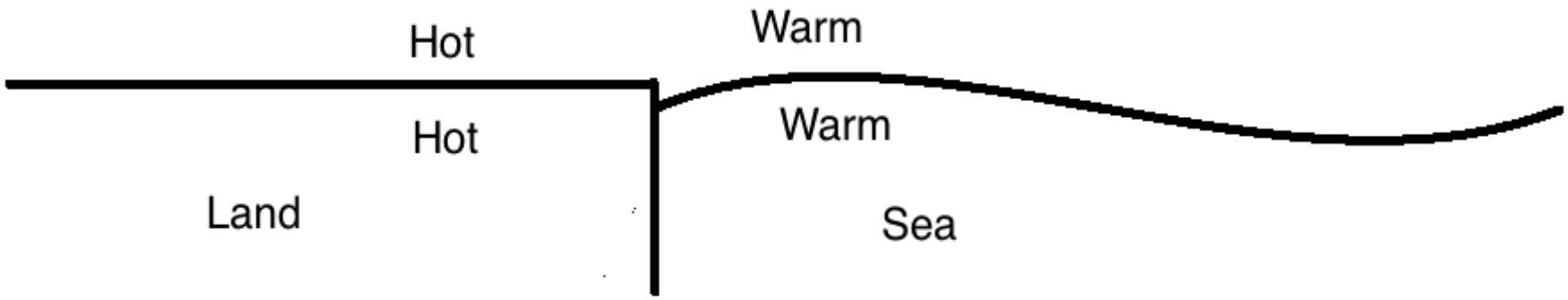
Local winds

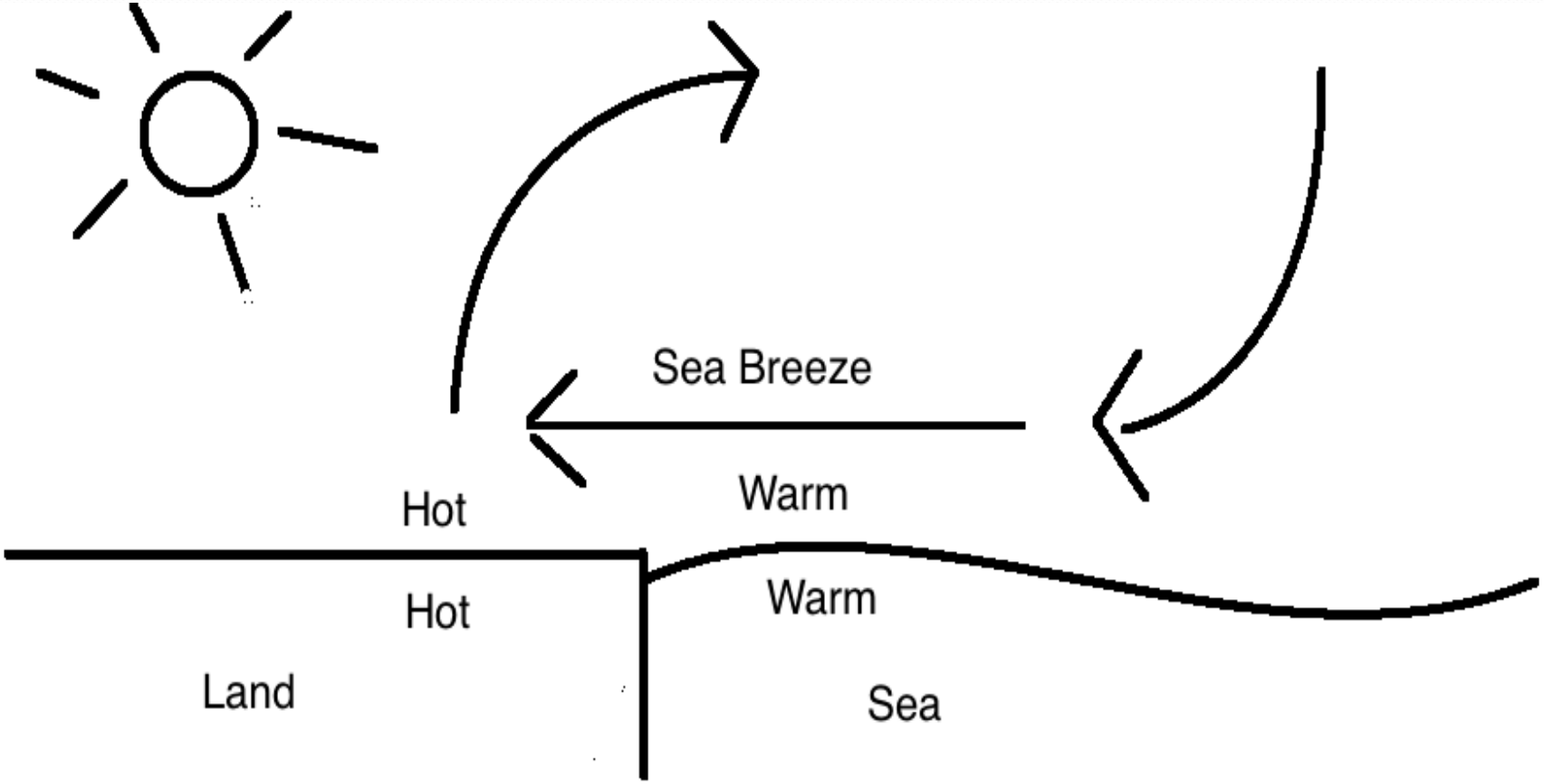


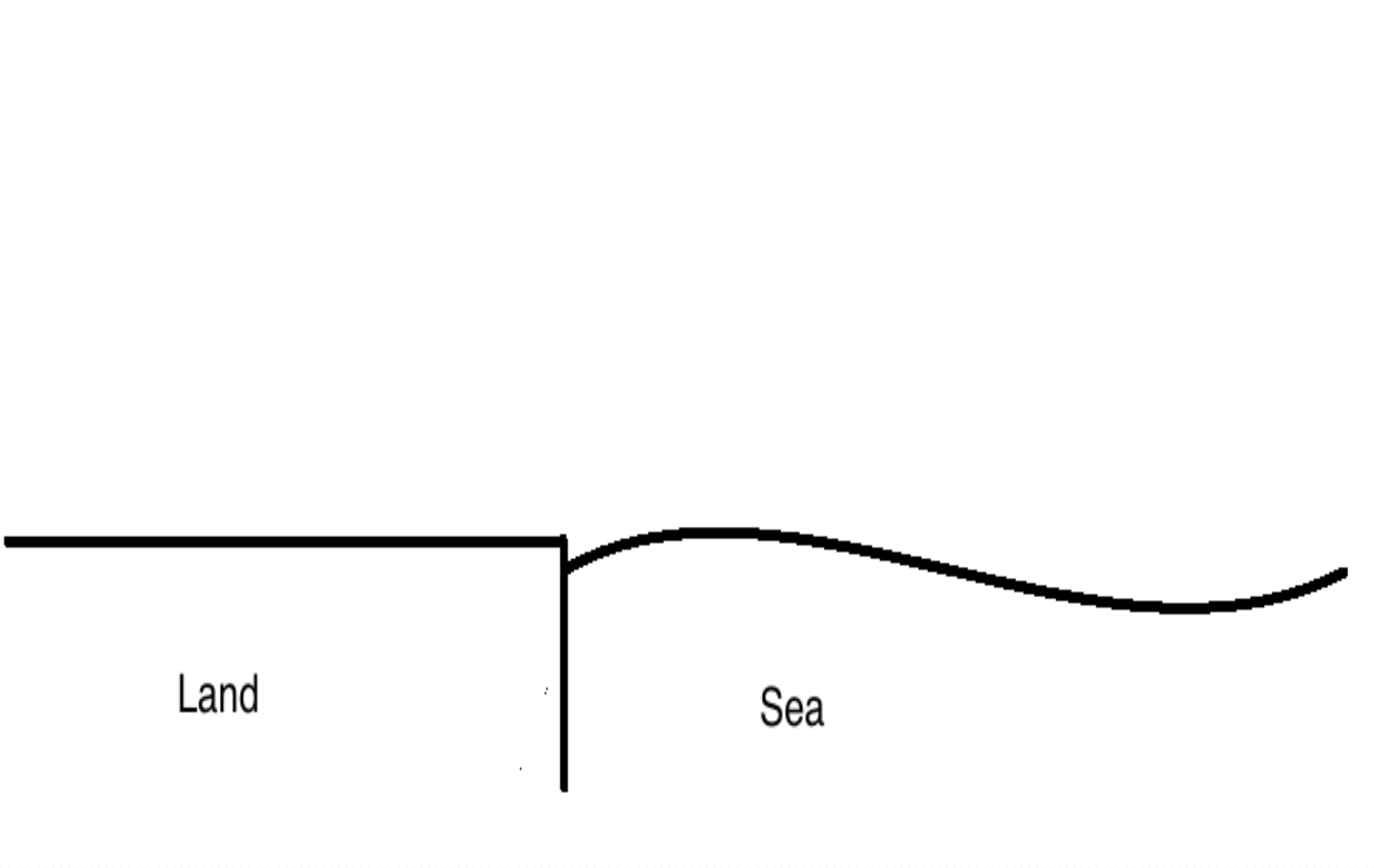
Local winds

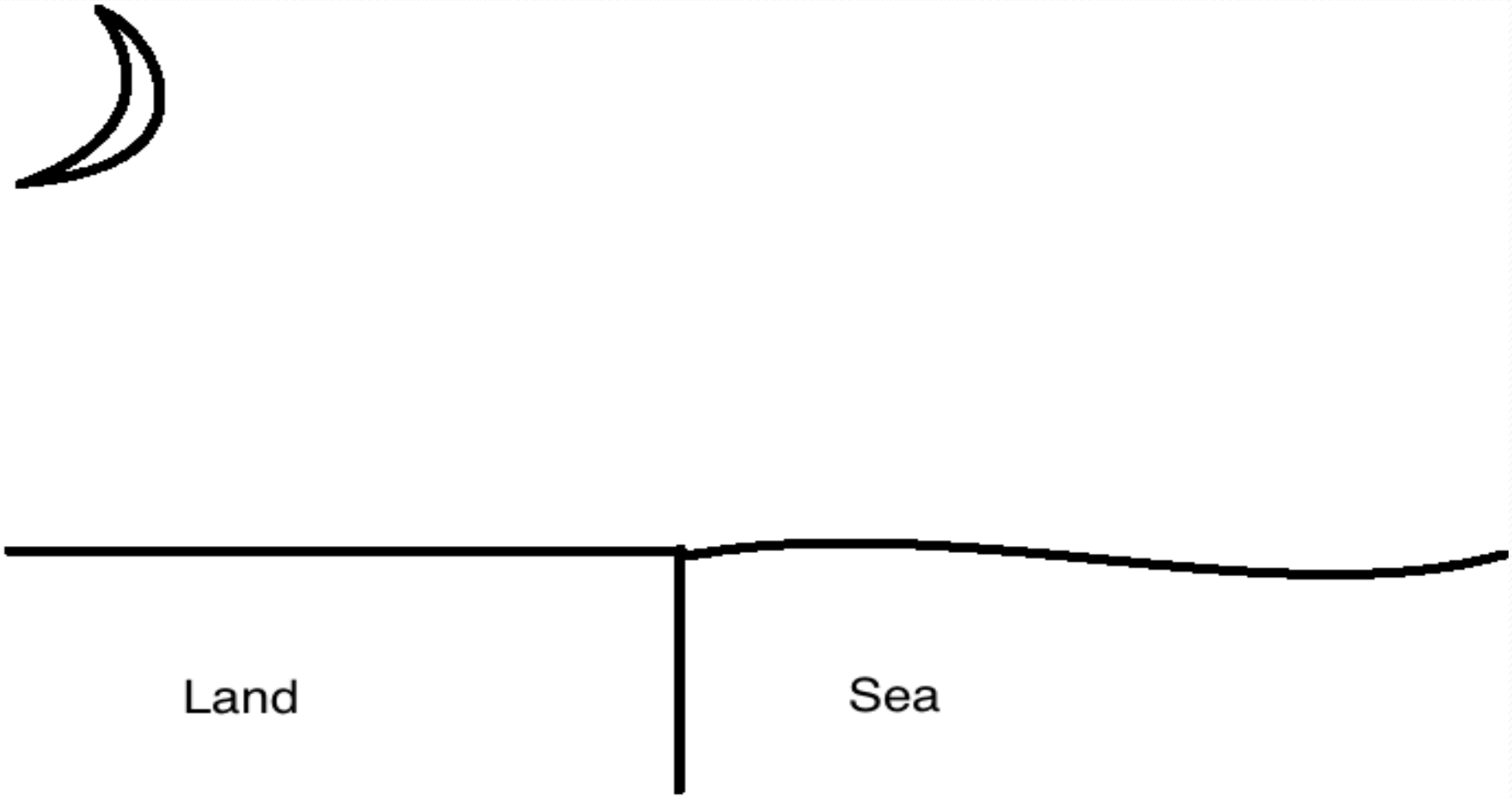


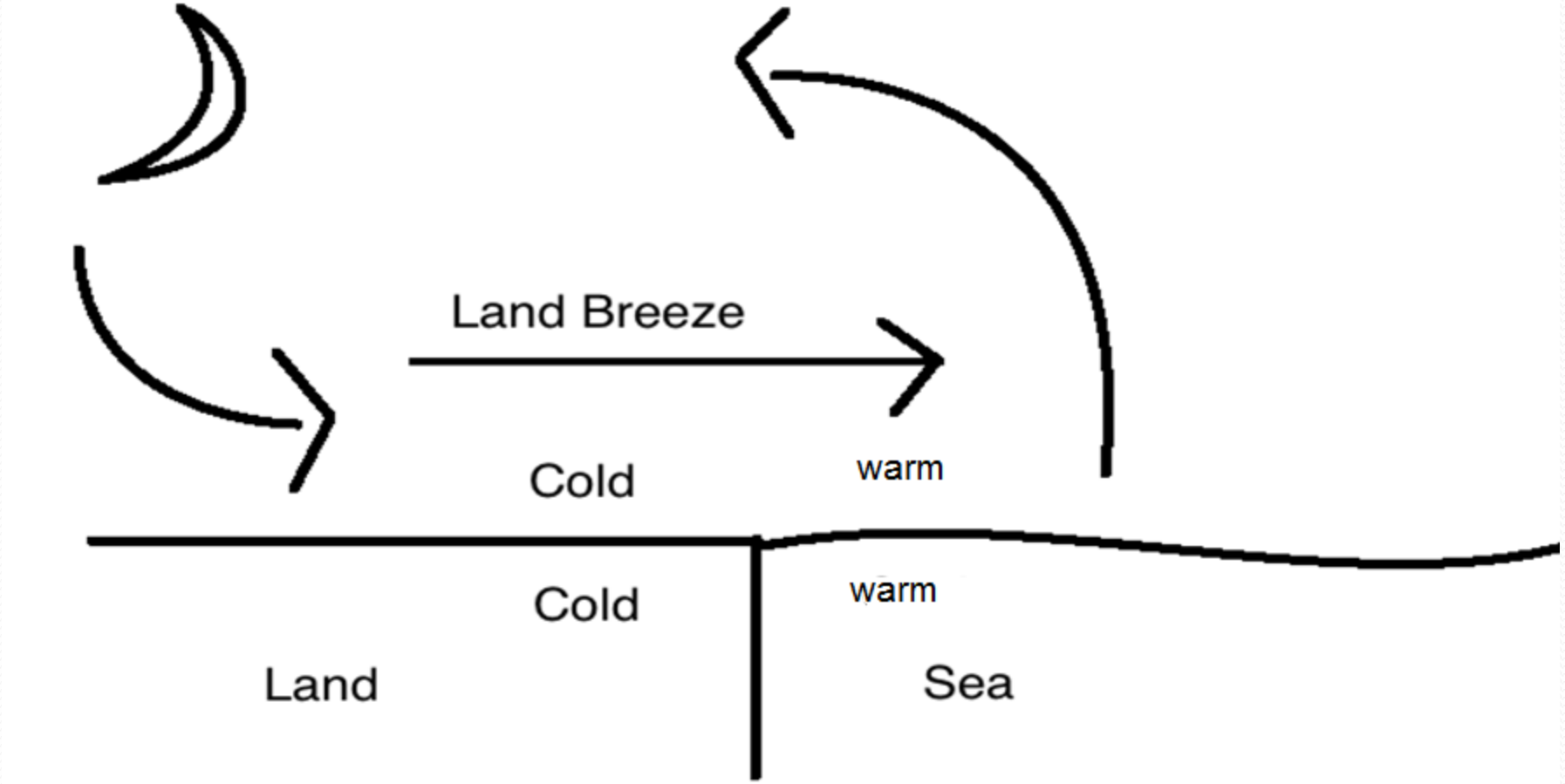



Hot
Warm
Hot
Warm
Land
Sea

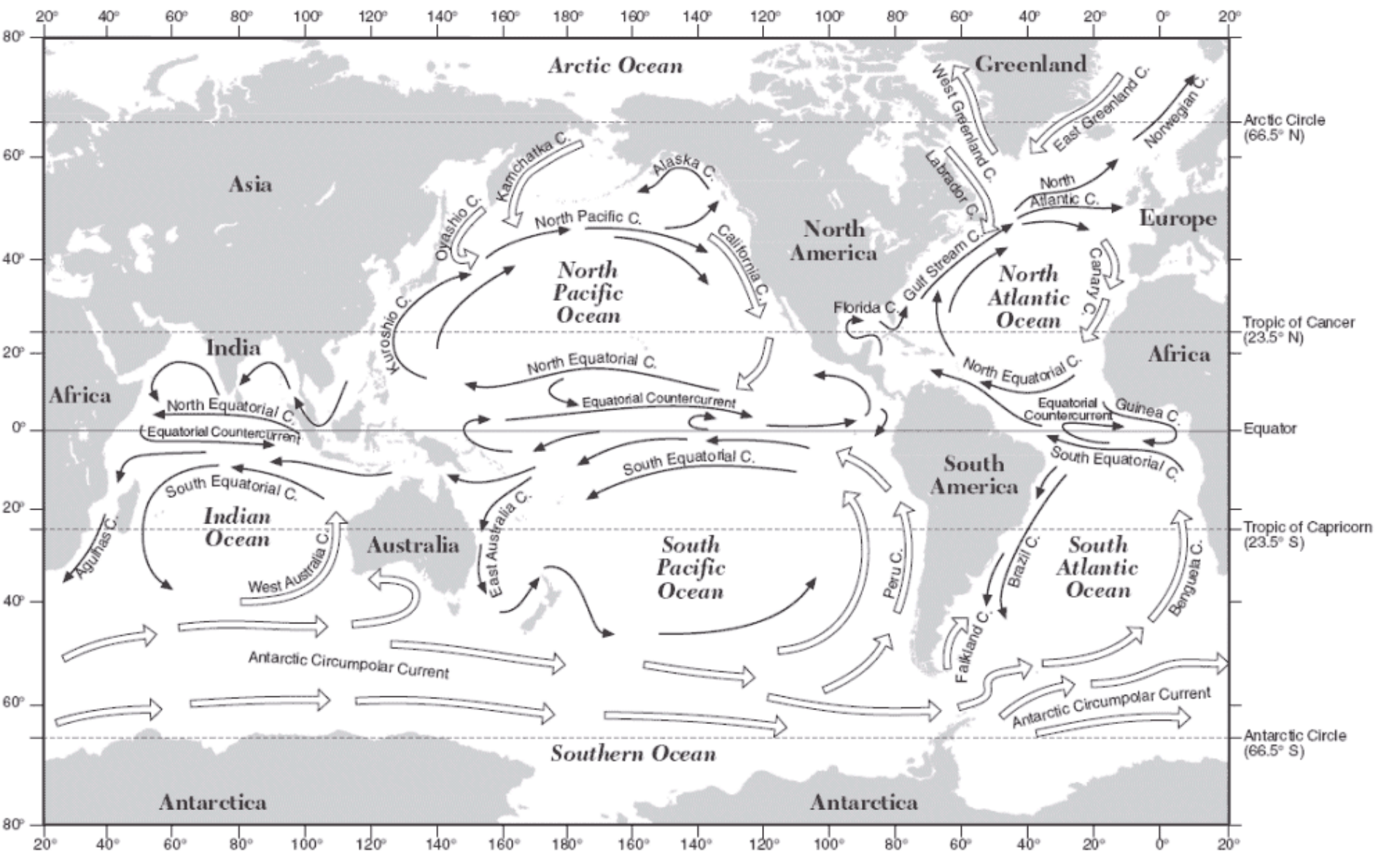

Sea Breeze
Hot
Warm
Hot
Warm
Land
Sea


Land
Sea


Land
Sea


Land Breeze
Cold
warm
Cold
warm
Land
Sea

- Land / Sea Breezes happen when an area is by a large body of water. It is controlled by convection.
- They help regulate the temperature.
- Summers are cooler (by cool water)
- Winters are warmer (by warm water)
- Smaller yearly temperature range
- Lagrange 25 – 85 deg F (range = 60)
- Long Island 30 – 80 deg F (range = 50)



NOTE: Not all surface ocean currents are shown.

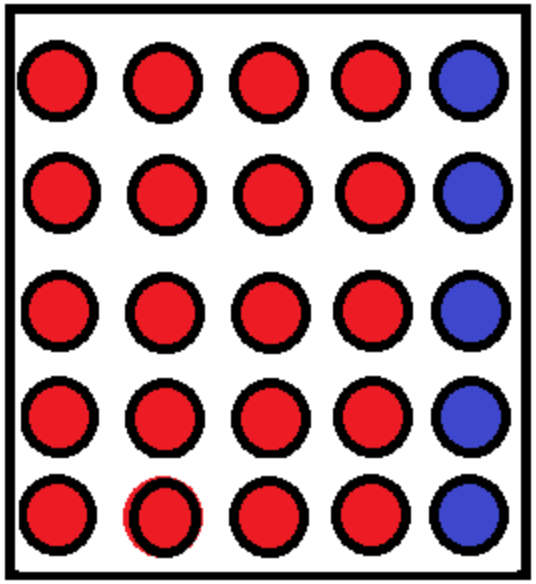
Wet & dry air (R)

- Which air is lighter, dry or wet air?
- Wet air is lighter then dry air.

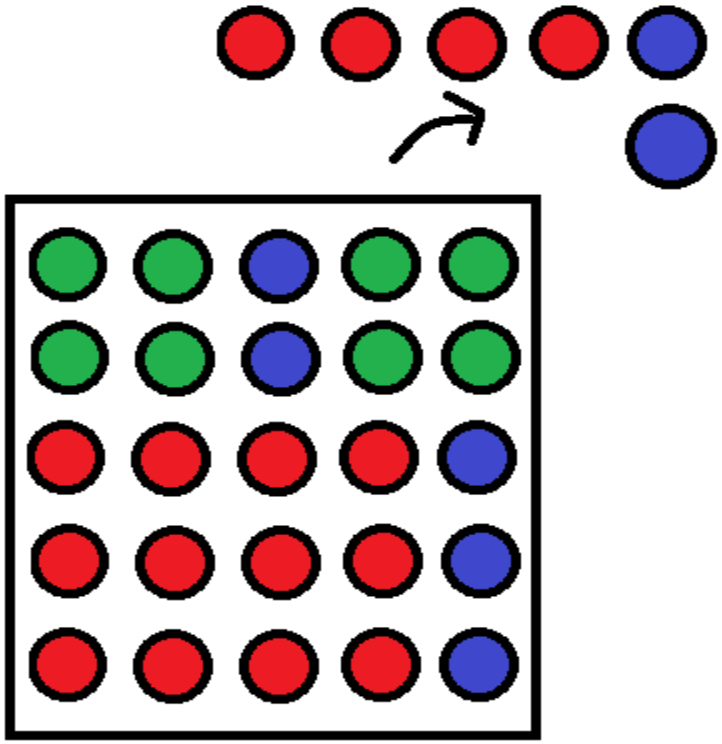
ELEMENT (symbol)	CRUST		HYDROSPHERE	TROPOSPHERE
	Percent by mass	Percent by volume	Percent by volume	Percent by volume
Oxygen (O)	46.10	94.04	33.0	21.0
Silicon (Si)	28.20	0.88		
Aluminum (Al)	8.23	0.48		
Iron (Fe)	5.63	0.49		
Calcium (Ca)	4.15	1.18		
Sodium (Na)	2.36	1.11		
Magnesium (Mg)	2.33	0.33		
Potassium (K)	2.09	1.42		
Nitrogen (N)				78.0
Hydrogen (H)			66.0	
Other	0.91	0.07	1.0	1.0

Dry air is mostly Nitrogen, water vapor is mainly hydrogen

Wet air (R)



Dry air = 4 N (7) , 1 Oxy (8)



Water = 2 H (1) , 1 Oxy (8)

Total weight = 180

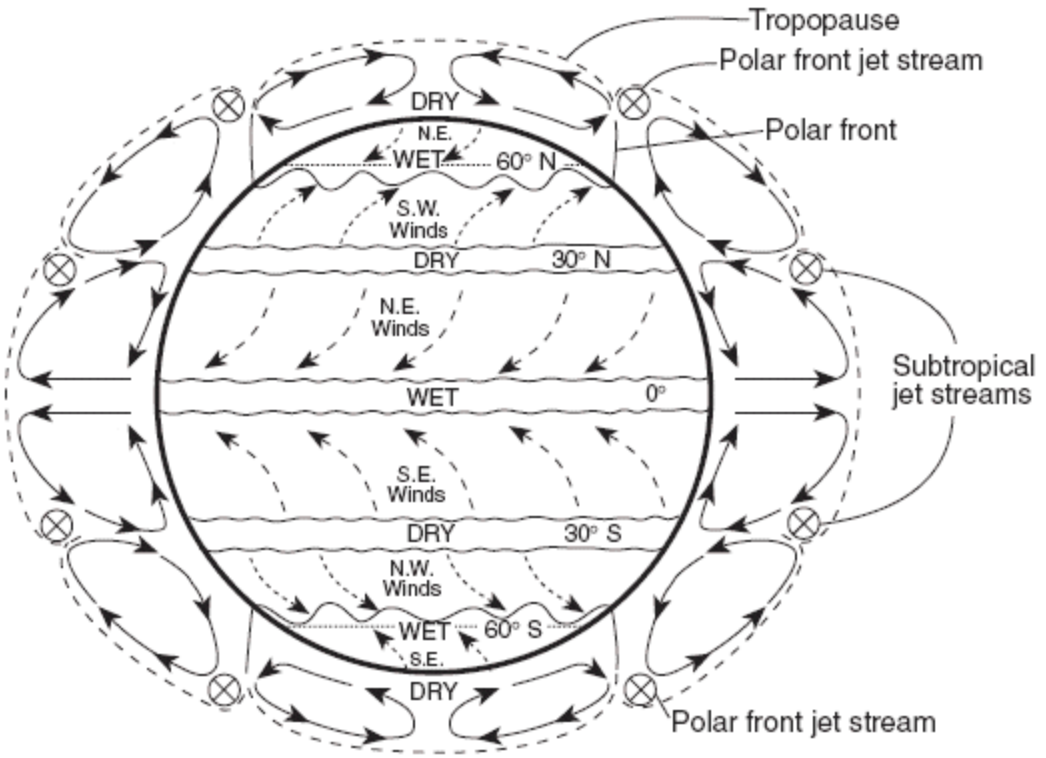
Total weight = 132

To add lighter Hydrogen of wet air into dry air, you must remove heavier dry Nitrogen. This makes wet air lighter.

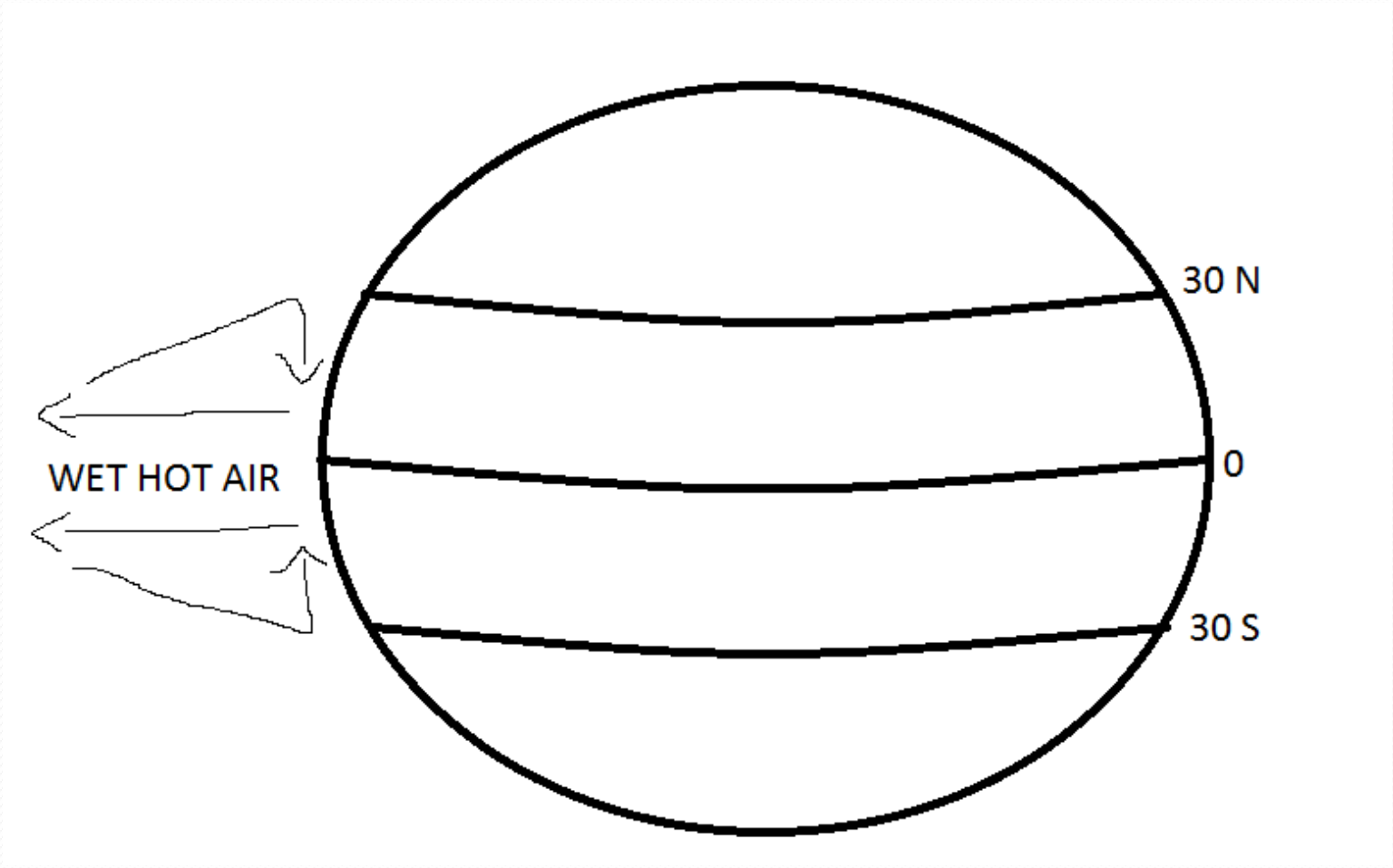
Global winds (R)

The drawing on the right shows the locations of the belts near the time of an equinox. The locations shift somewhat with the changing latitude of the Sun's vertical ray. In the Northern Hemisphere, the belts shift northward in the summer and southward in the winter.

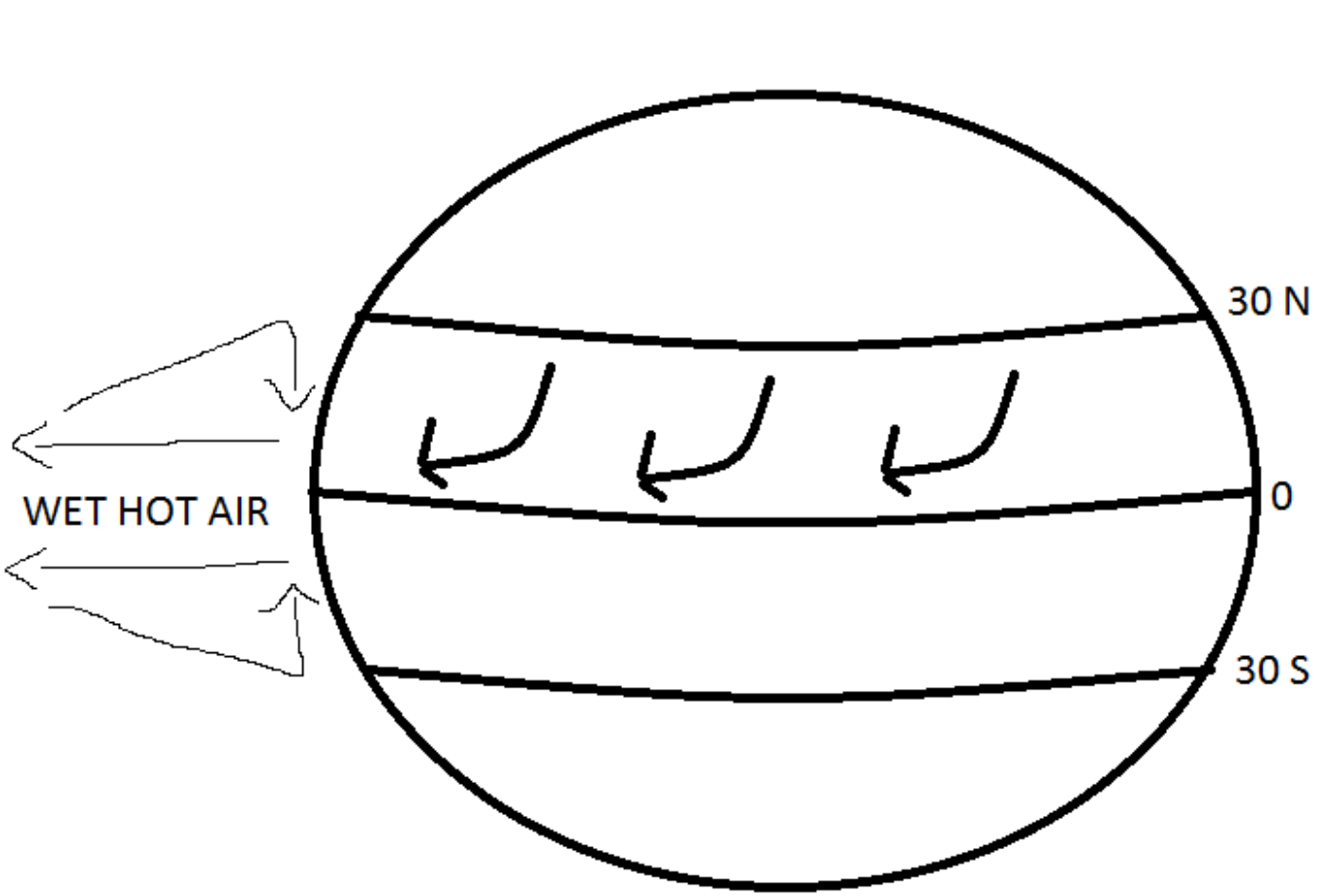
(Not drawn to scale)



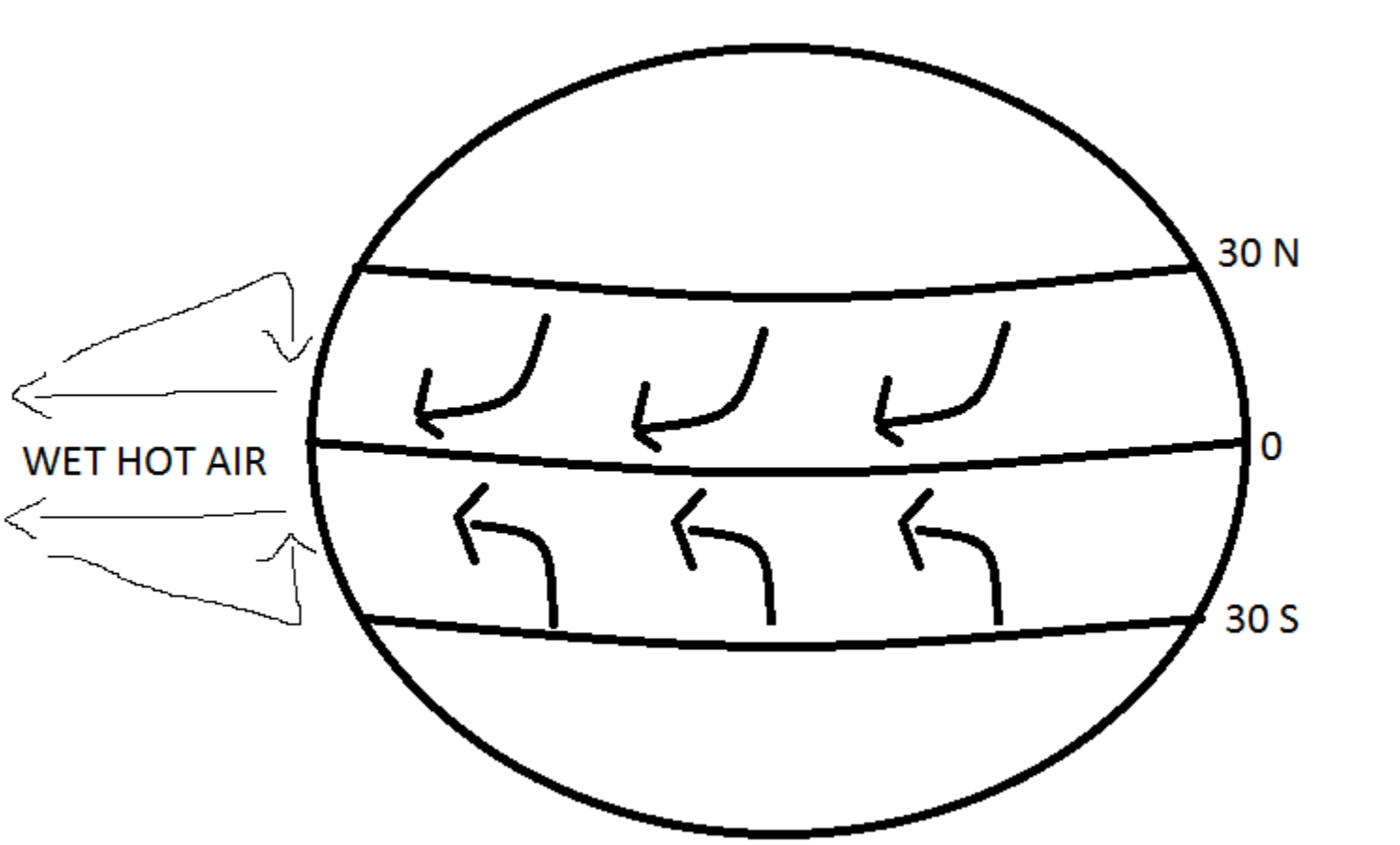
Global (Planetary) Winds (R)



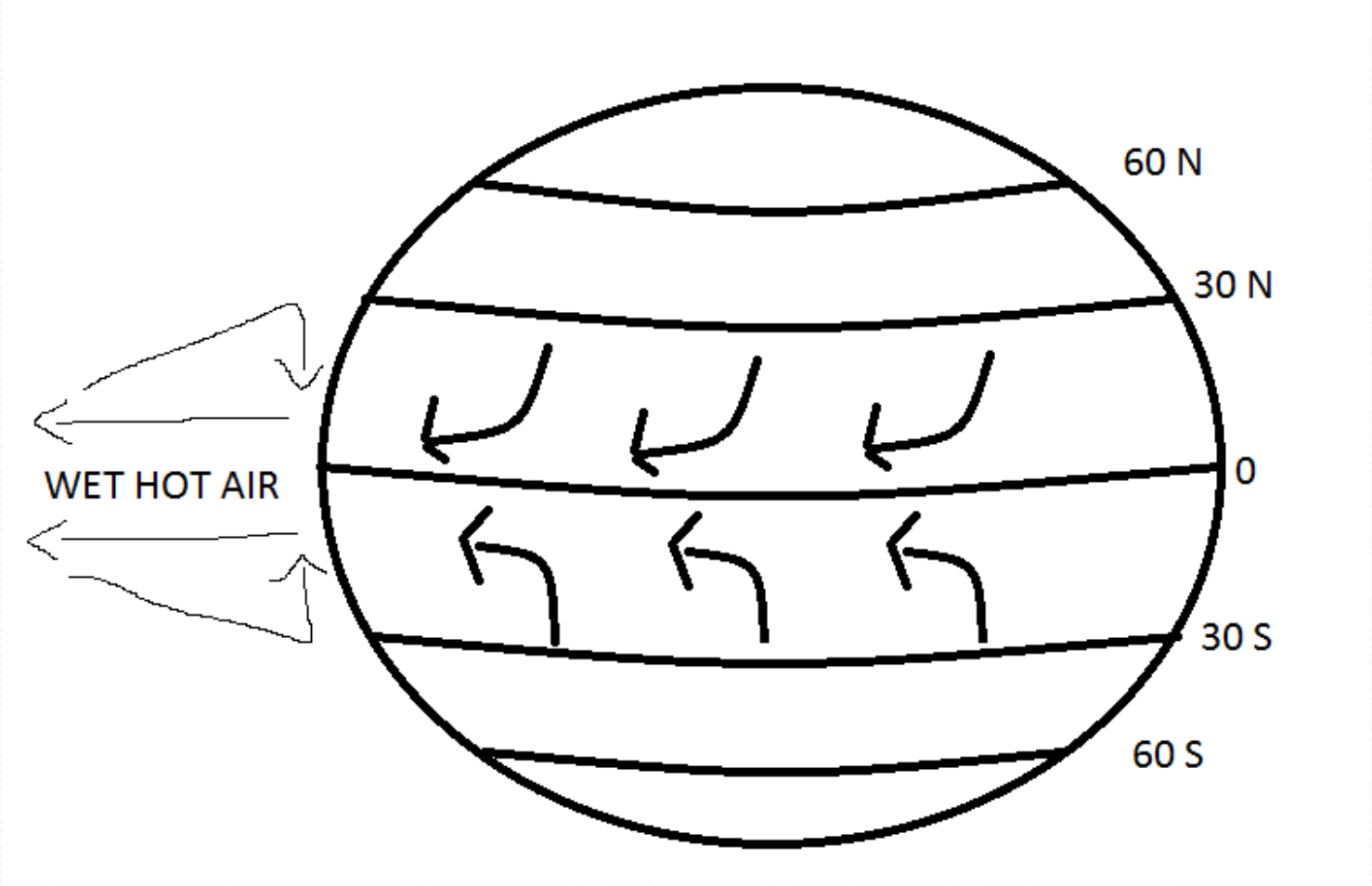
(R)



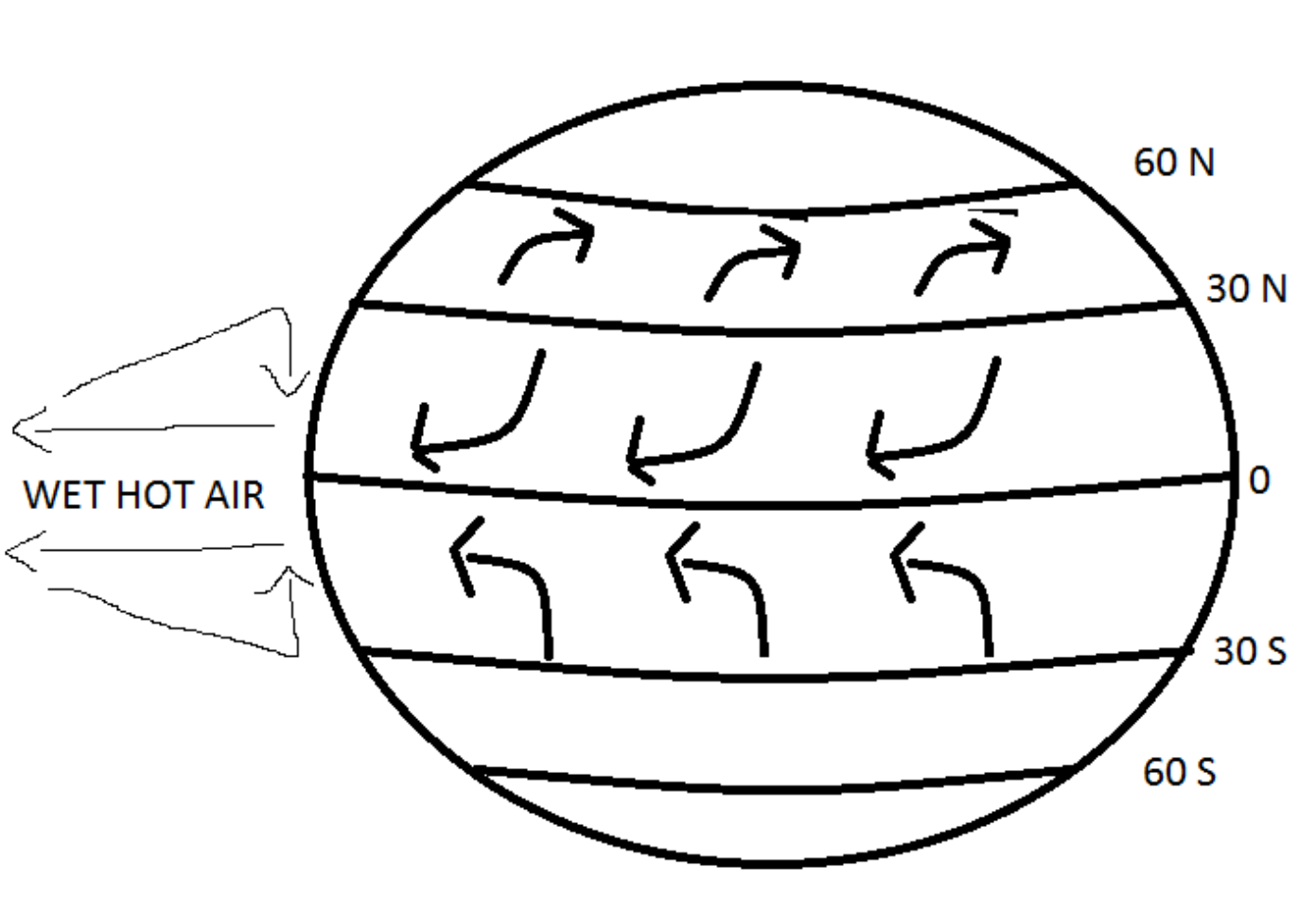
(R)



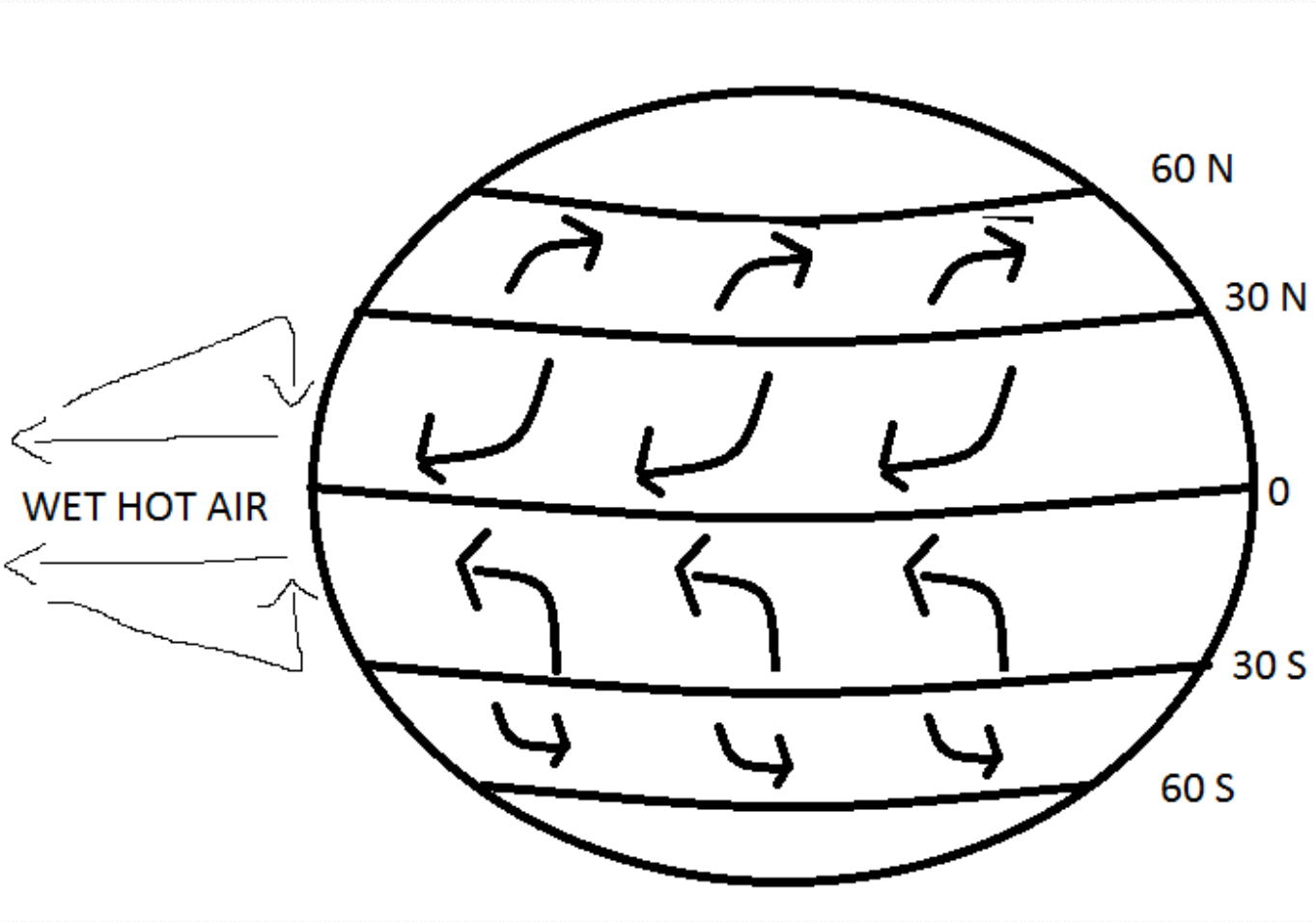
Global winds (R)



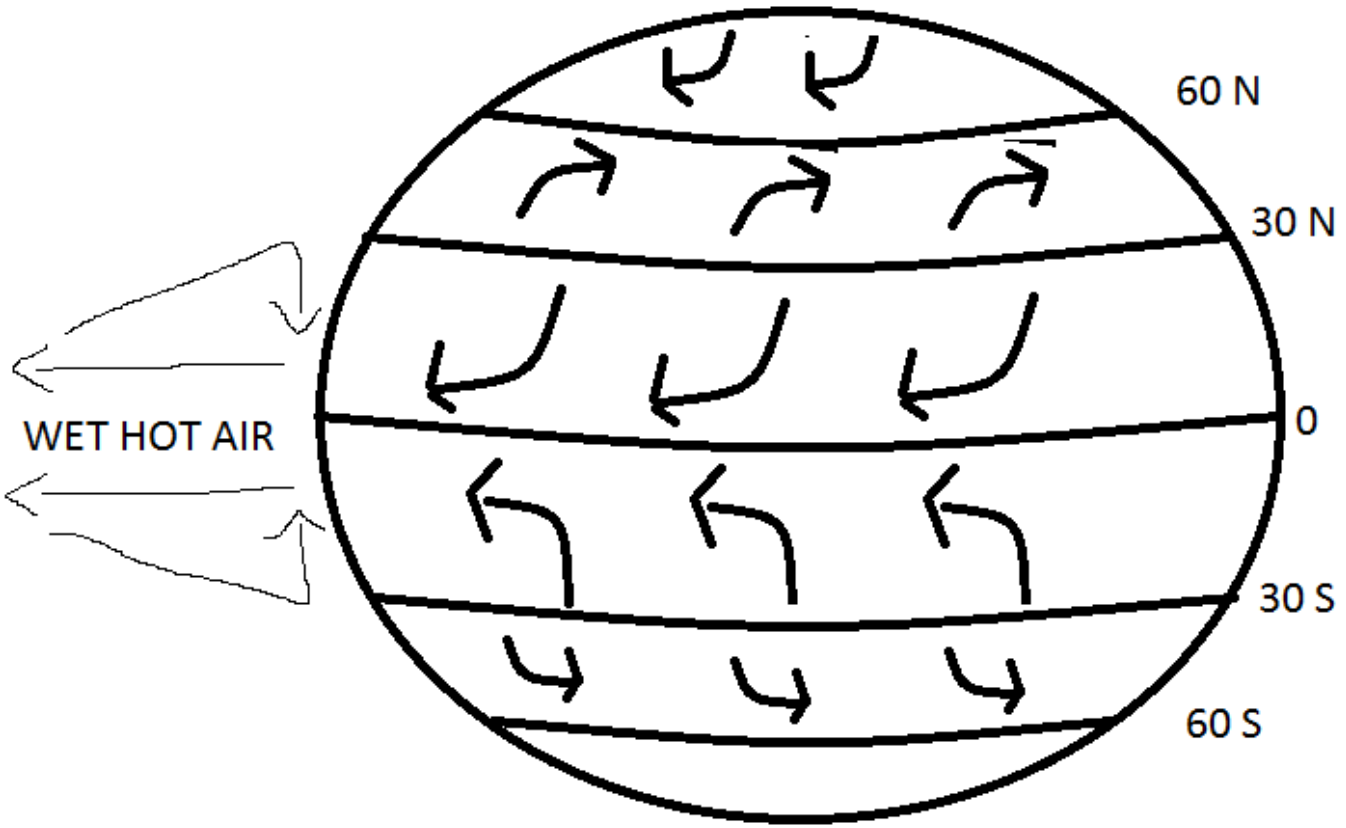
(R)



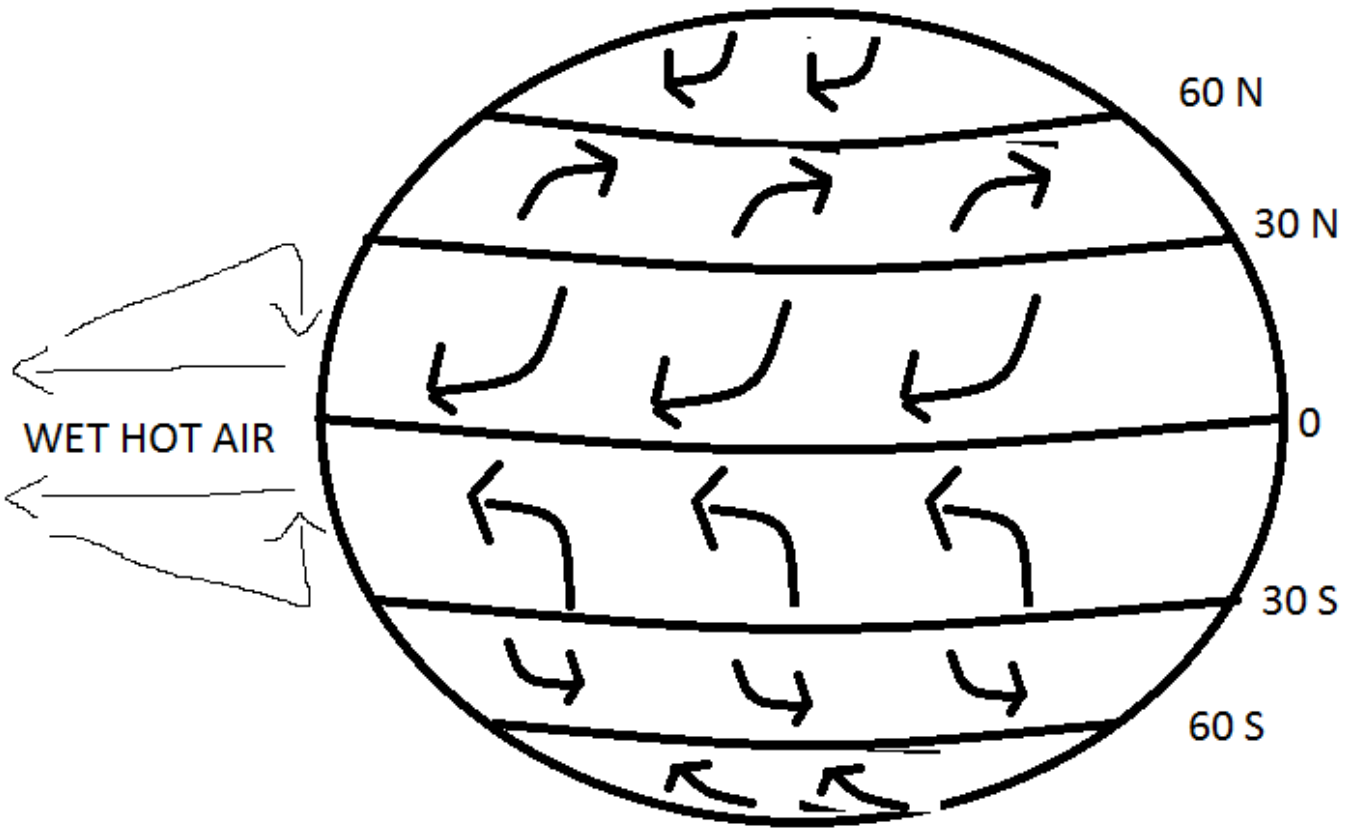
(R)



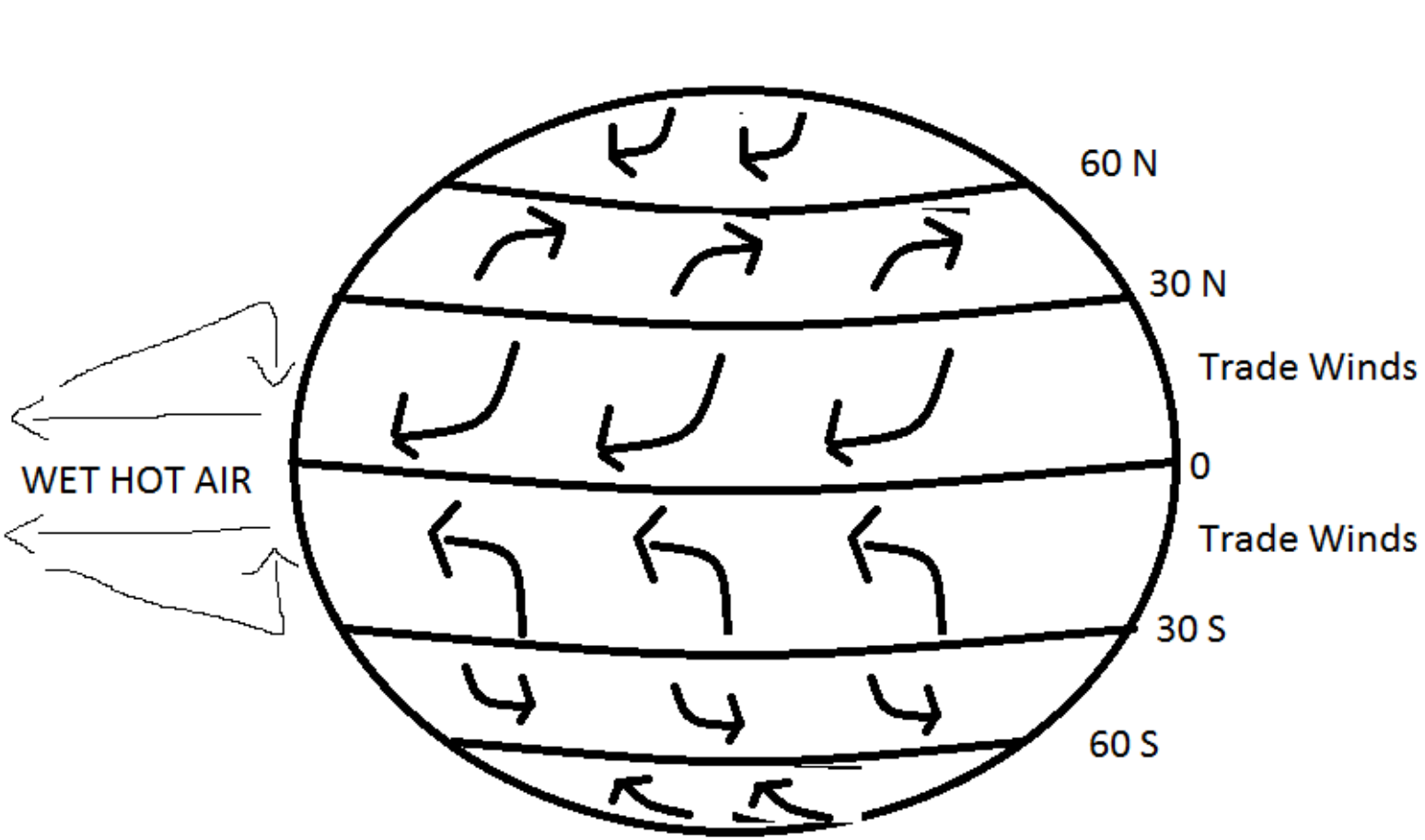
(R)



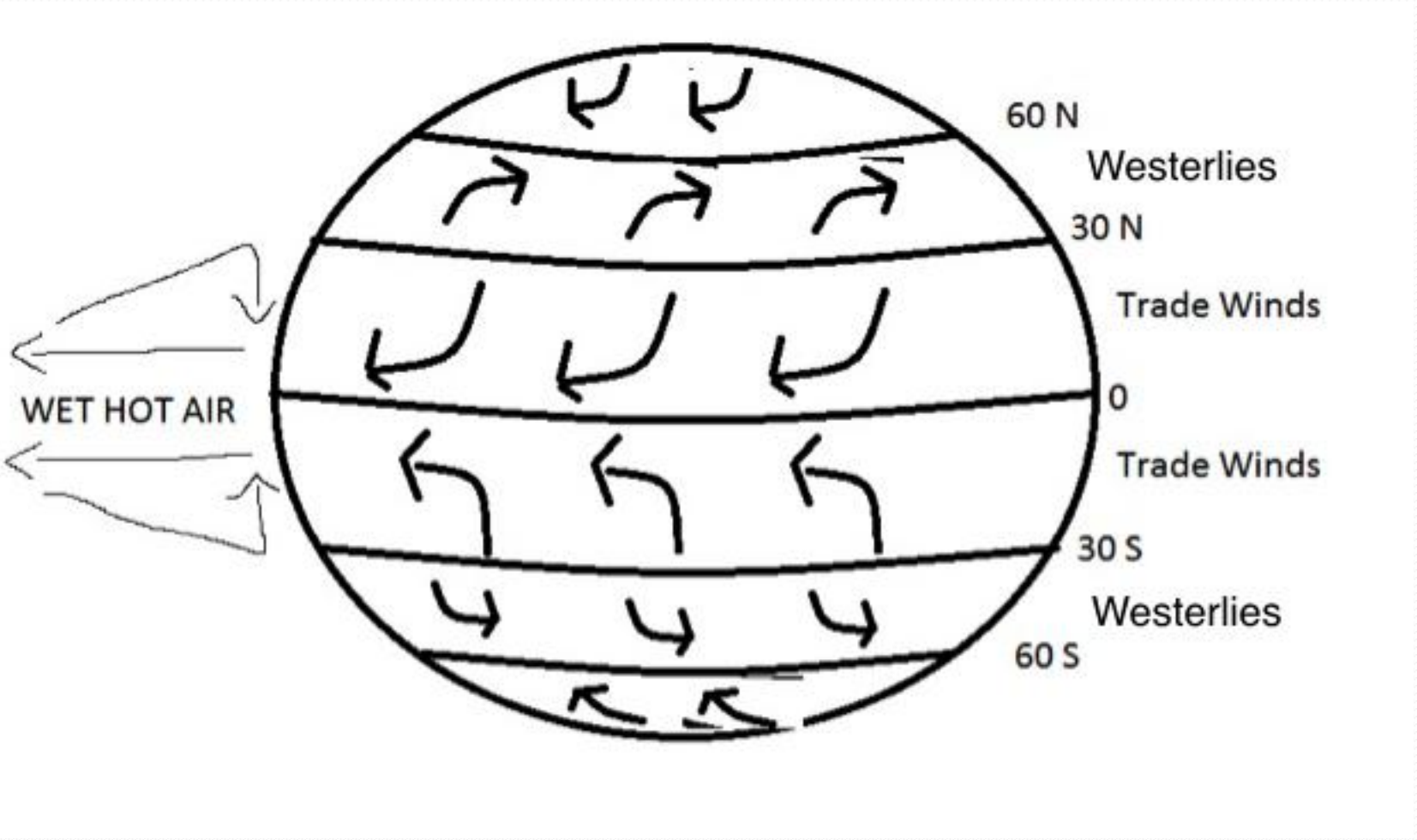
(R)



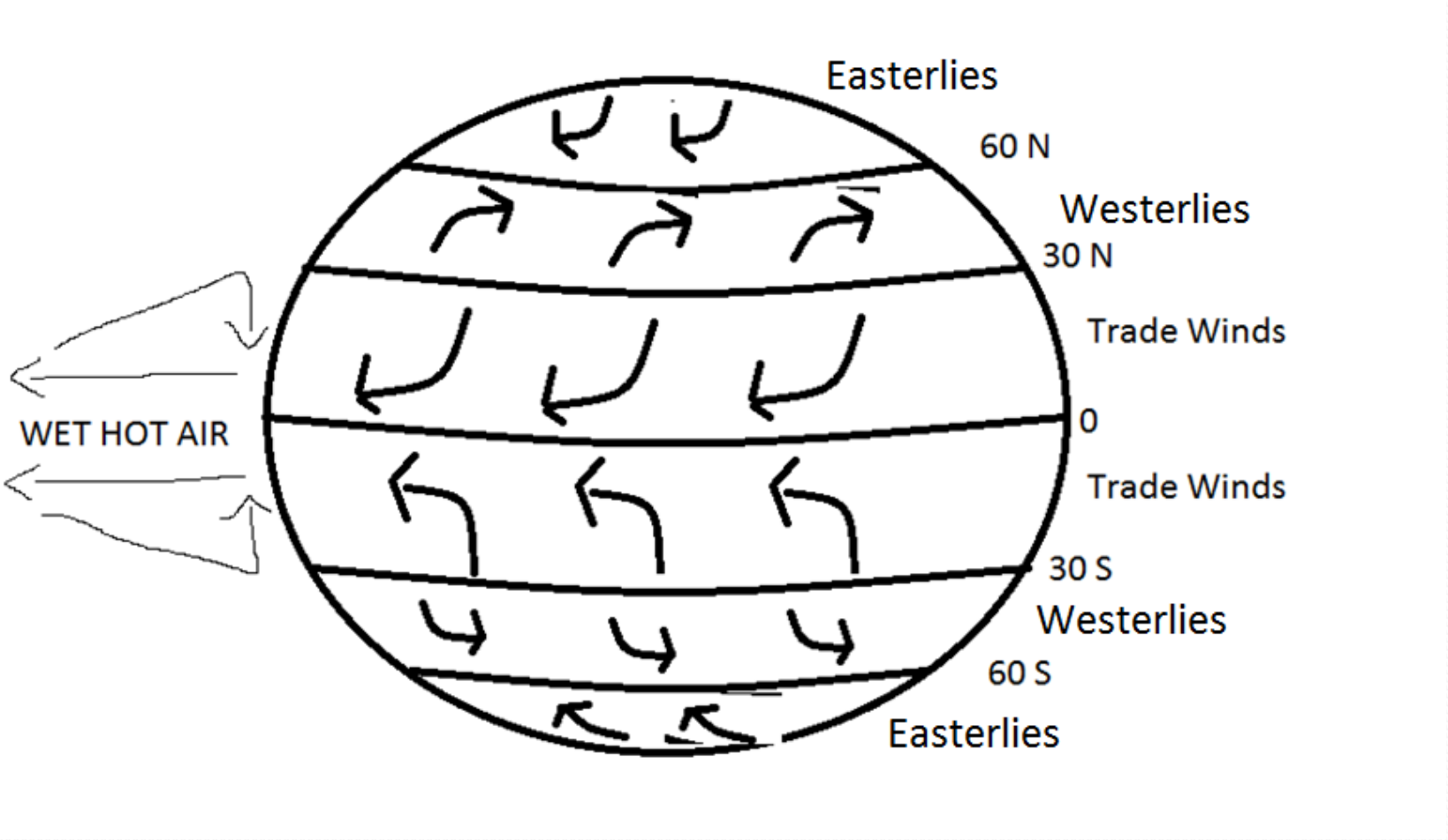
(R)



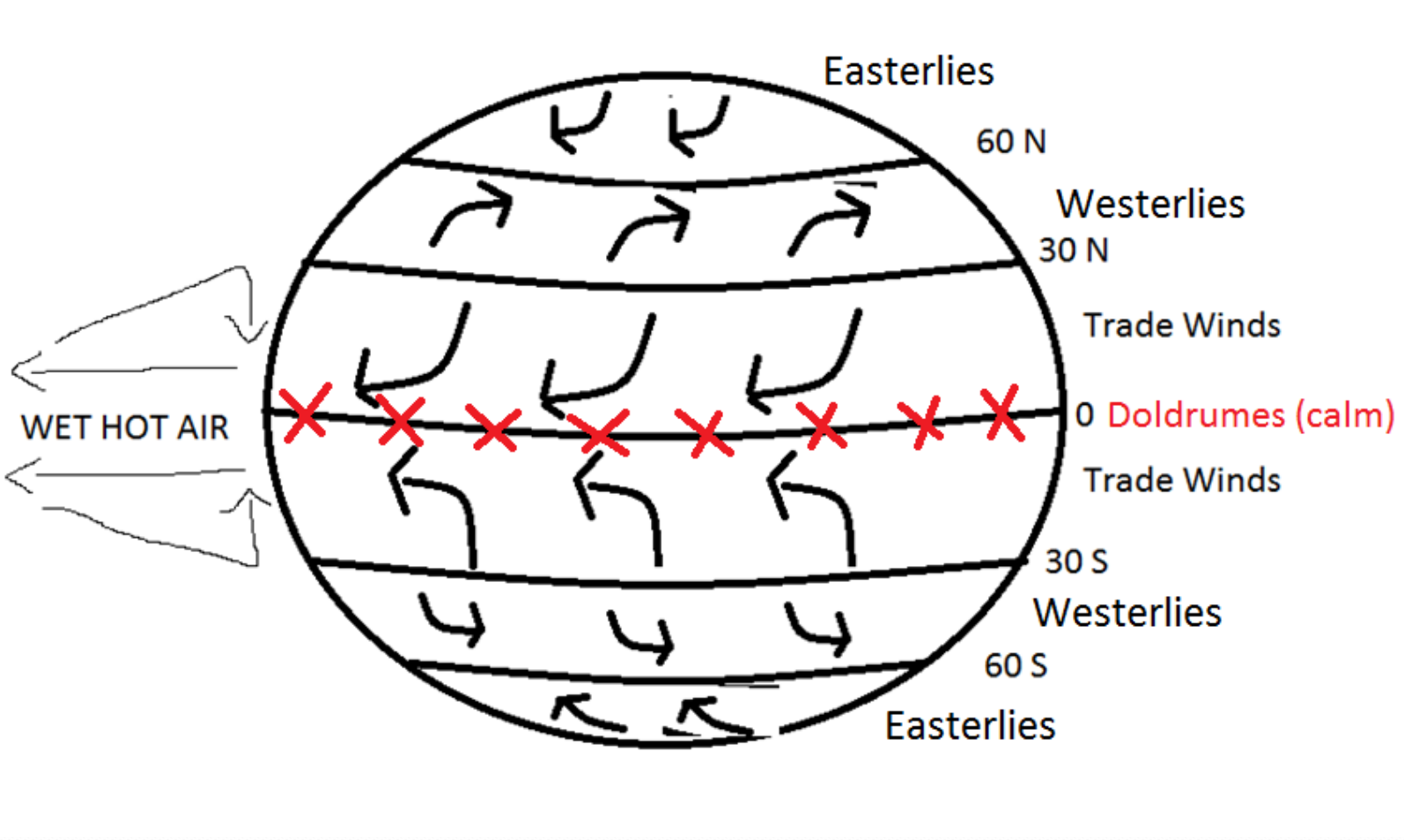
(R)


60 N
Westerlies
30 N
Trade Winds
0
Trade Winds
30 S
Westerlies
60 S
WET HOT AIR

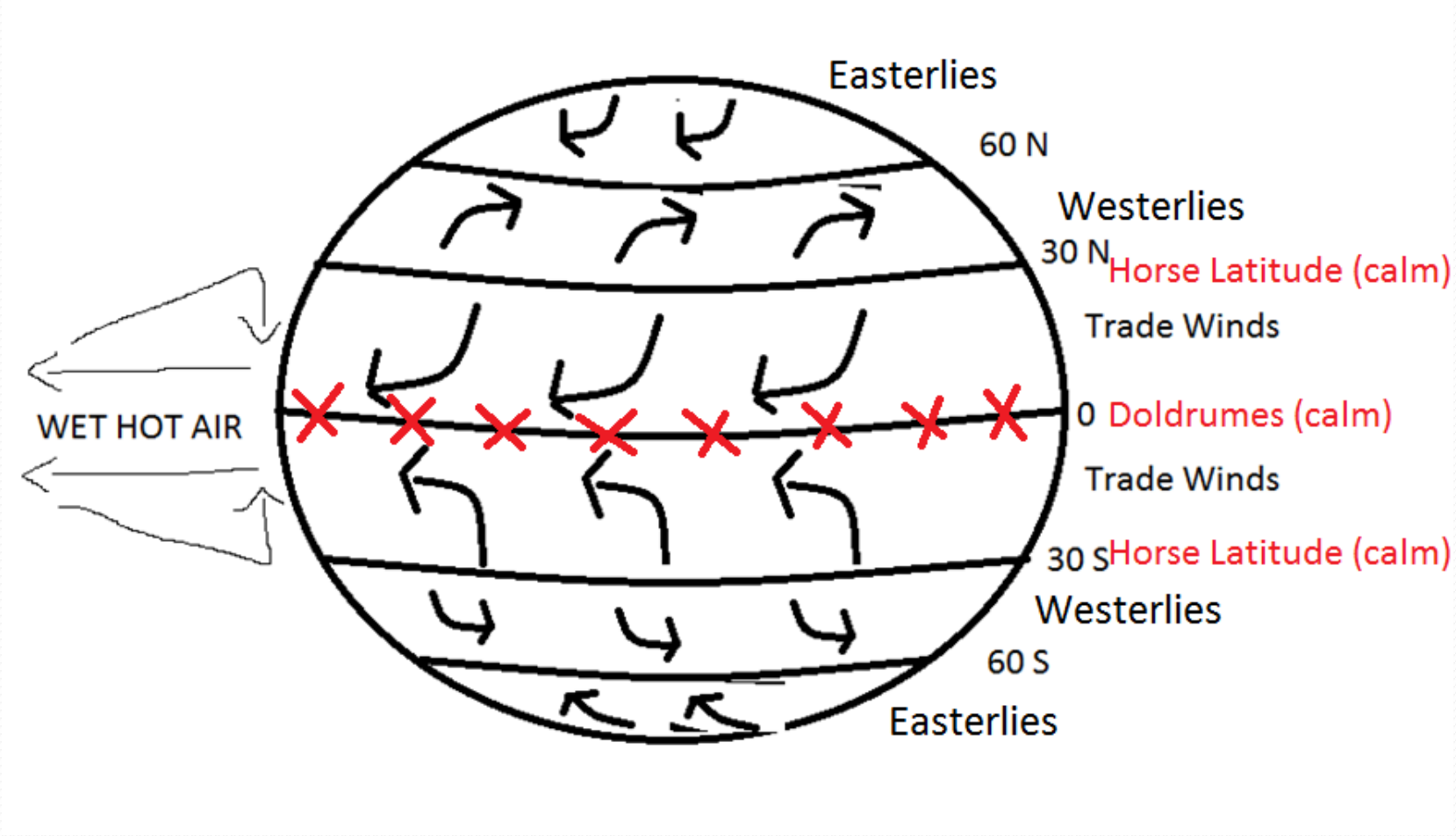
(R)


Easterlies
60 N
Westerlies
30 N
Trade Winds
0
Trade Winds
30 S
Westerlies
60 S
Easterlies
WET HOT AIR

(R)


Easterlies
60 N
Westerlies
30 N
Trade Winds
WET HOT AIR
0 Doldrumes (calm)
Trade Winds
30 S
Westerlies
60 S
Easterlies

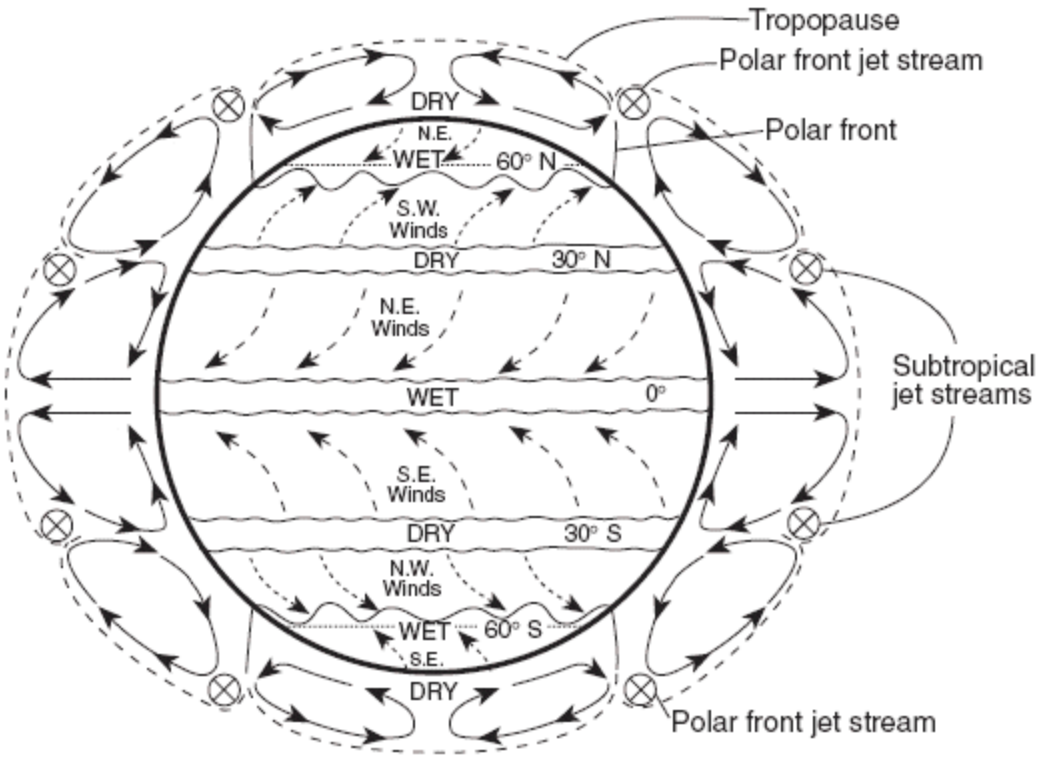
(R)


Easterlies
60 N
Westerlies
30 N
Horse Latitude (calm)
Trade Winds
WET HOT AIR
0
Doldrumes (calm)
Trade Winds
30 S
Horse Latitude (calm)
Westerlies
60 S
Easterlies

Global winds (R)

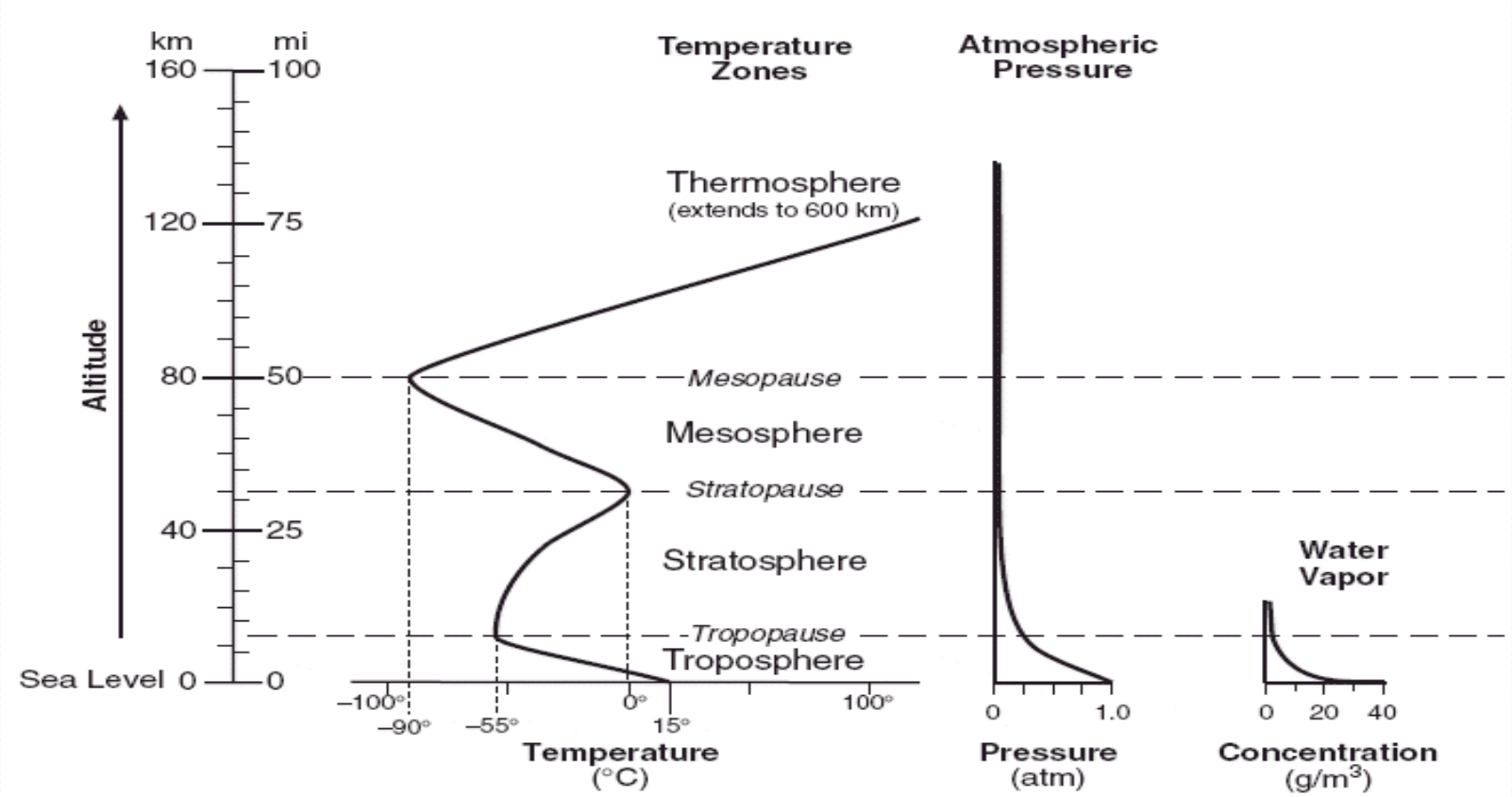
The drawing on the right shows the locations of the belts near the time of an equinox. The locations shift somewhat with the changing latitude of the Sun's vertical ray. In the Northern Hemisphere, the belts shift northward in the summer and southward in the winter.

(Not drawn to scale)



- What are global winds?
- Global wind patterns are caused by convection and the rotation of the Earth.
- The Corriolis effect makes the winds move right or left.
- Right / Clockwise in N. Hemisphere (we are right)
- Left / Counterclockwise in S. Hemisphere (Australians wrong aka Left)
- What wind belt do we live in?
- We live in the Westerlies (our winds come from the West)
- What wind belt in the tropics did traders from Europe Use?
- Traders from Europe came to the New World using the Trade Winds.
- What are Jet Streams?
- Jet streams are fast moving currents of air in between the convection currents of our atmosphere.
- (Think Finding Nemo Turtle currents)

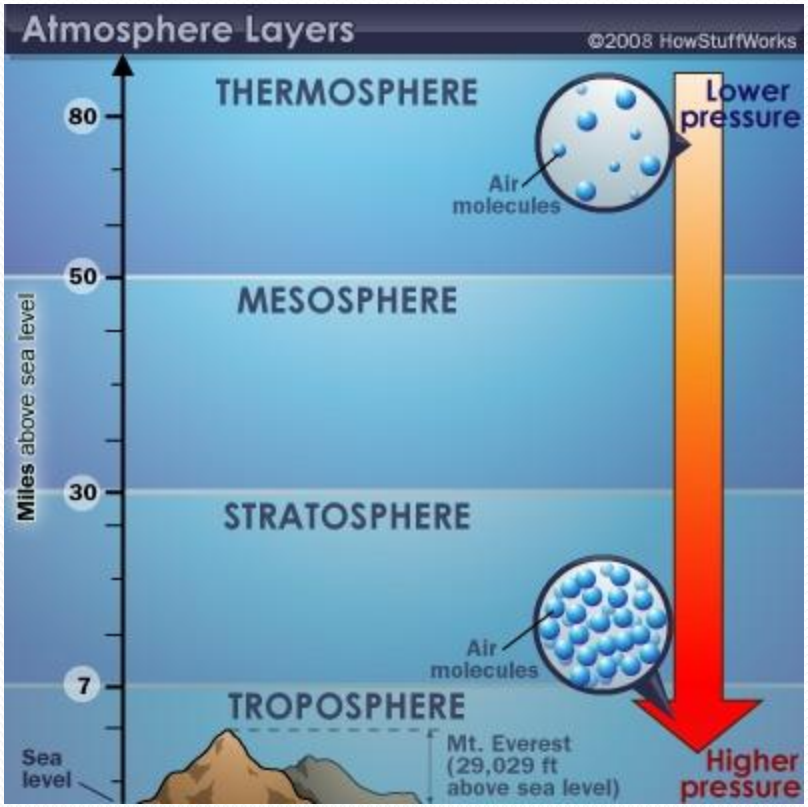
Atmosphere layers (R)



Notice: 40 mi, pauses, pressure (1atm), water concentration, life

(R)

- Why does it get colder as you get higher?



Temperature drops as you increase in the Troposphere because air thins.

Atmosphere (R)

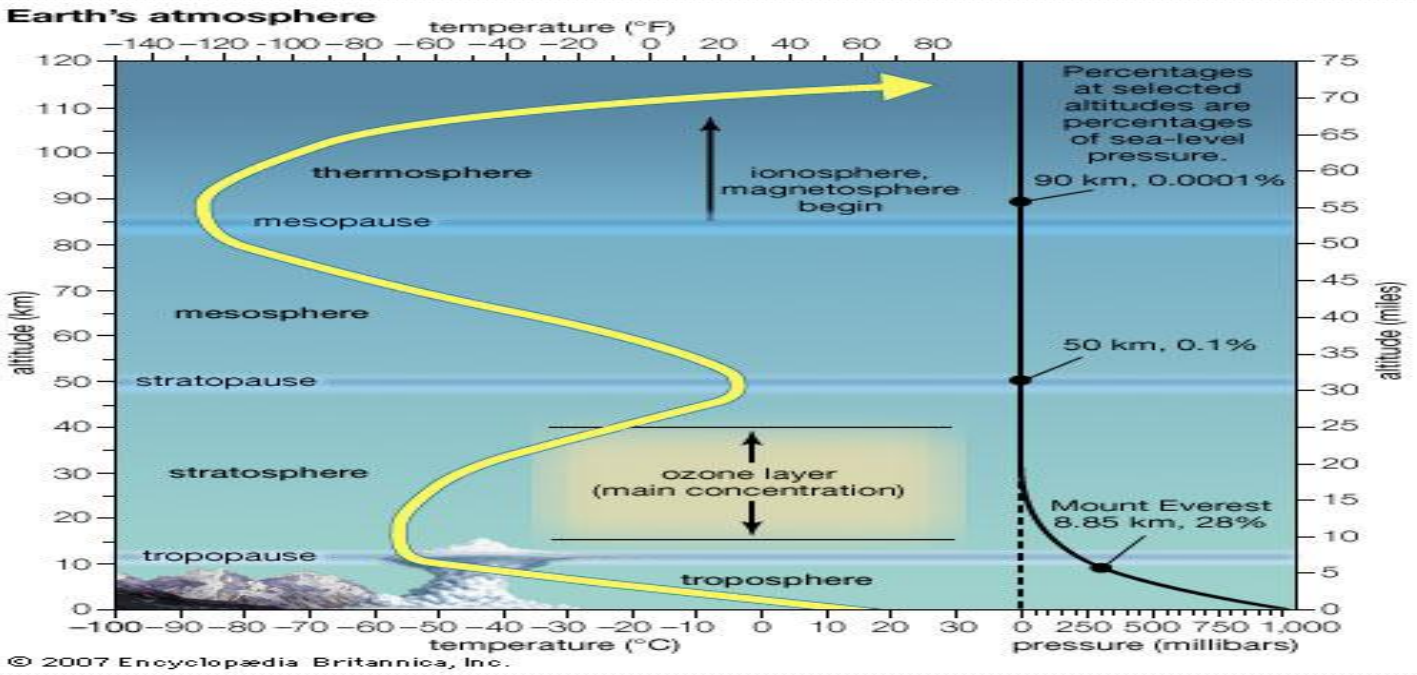
We live in the bottom layer of the Atmosphere called the Troposphere

Troposphere contains almost all water, weather and life.

- The higher you go, the less weight is above you so pressure drops.
- Sea level = 1 Atmosphere of pressure (1 atm)
- Pauses are where atmosphere layers change and the temperature reverses.

(R)

- Why does temperature increase as you get higher up in the Stratosphere?



The Stratosphere contains the Ozone Layer.

This adds more molecules into the air and increases the temperature.

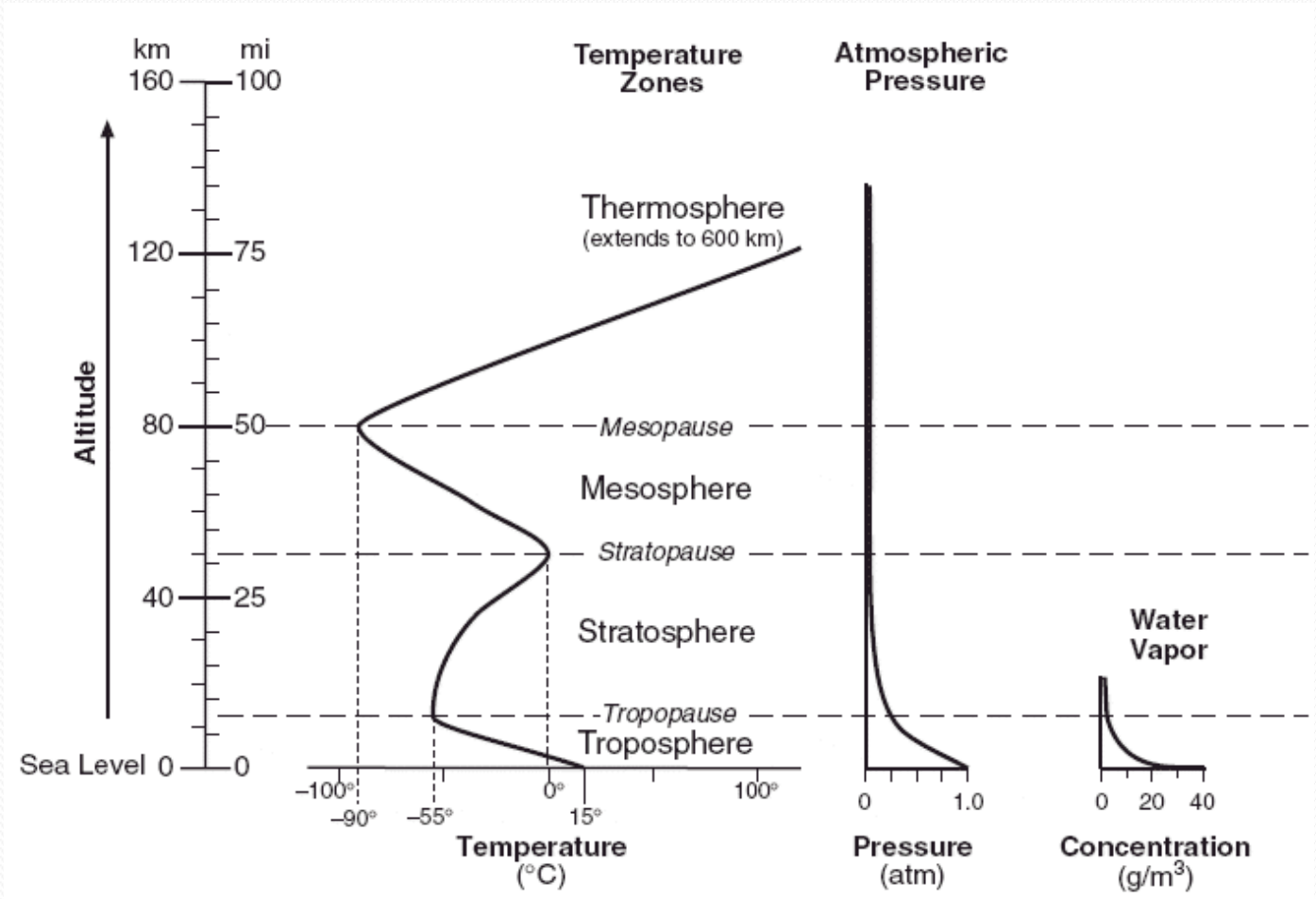
Atmosphere (G)

- The Atmosphere is made of many layers.
- We live in the bottom layer called the Troposphere.
  which contains almost all water, weather and life.
- The higher you go, the less weight is above you so pressure drops and air thins.
- Sea level = 1 Atmosphere of pressure

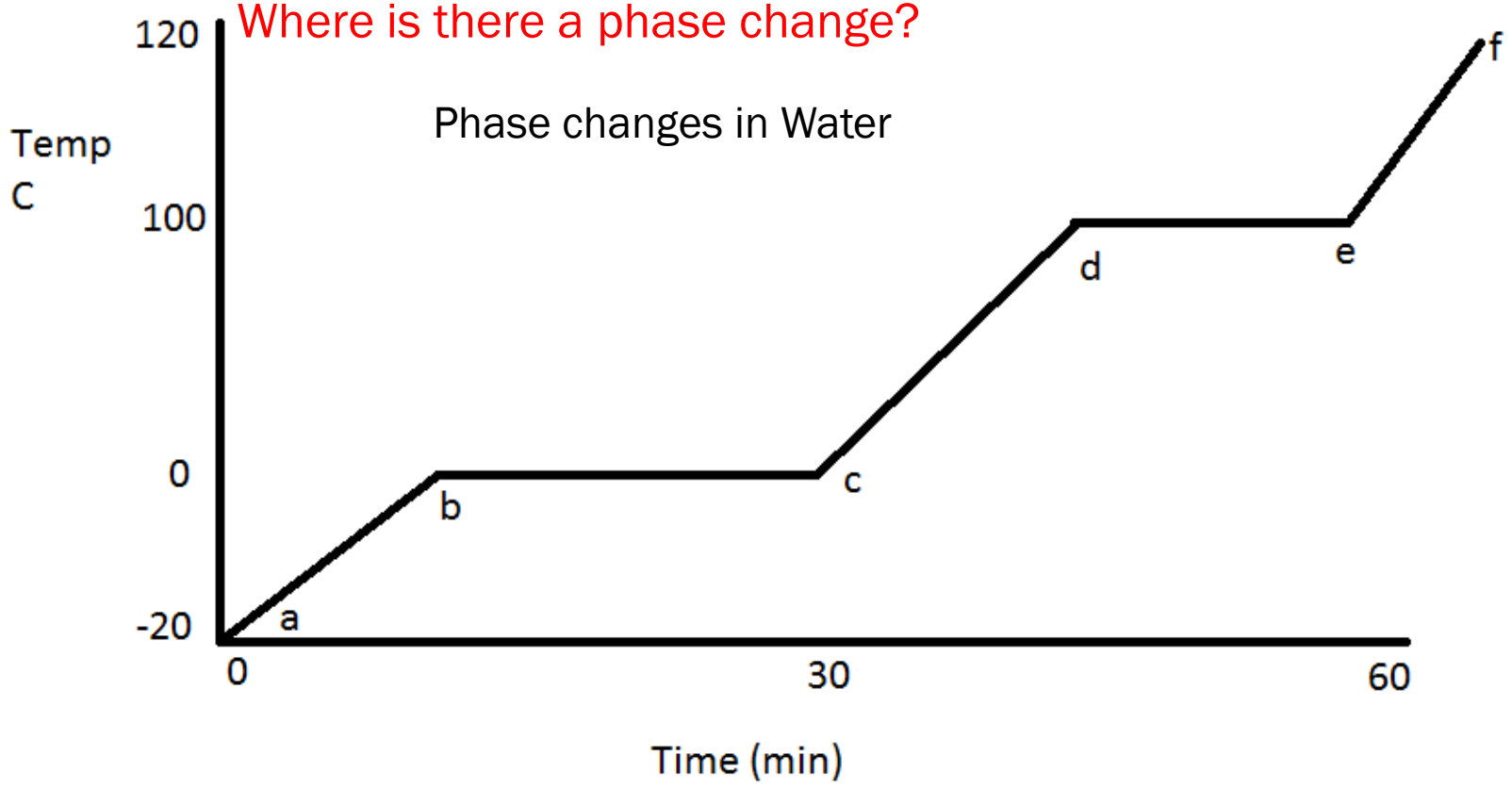
- Above that is the Stratosphere: contains the Ozone Layer (which protects us from a lot of the suns harmful rays)

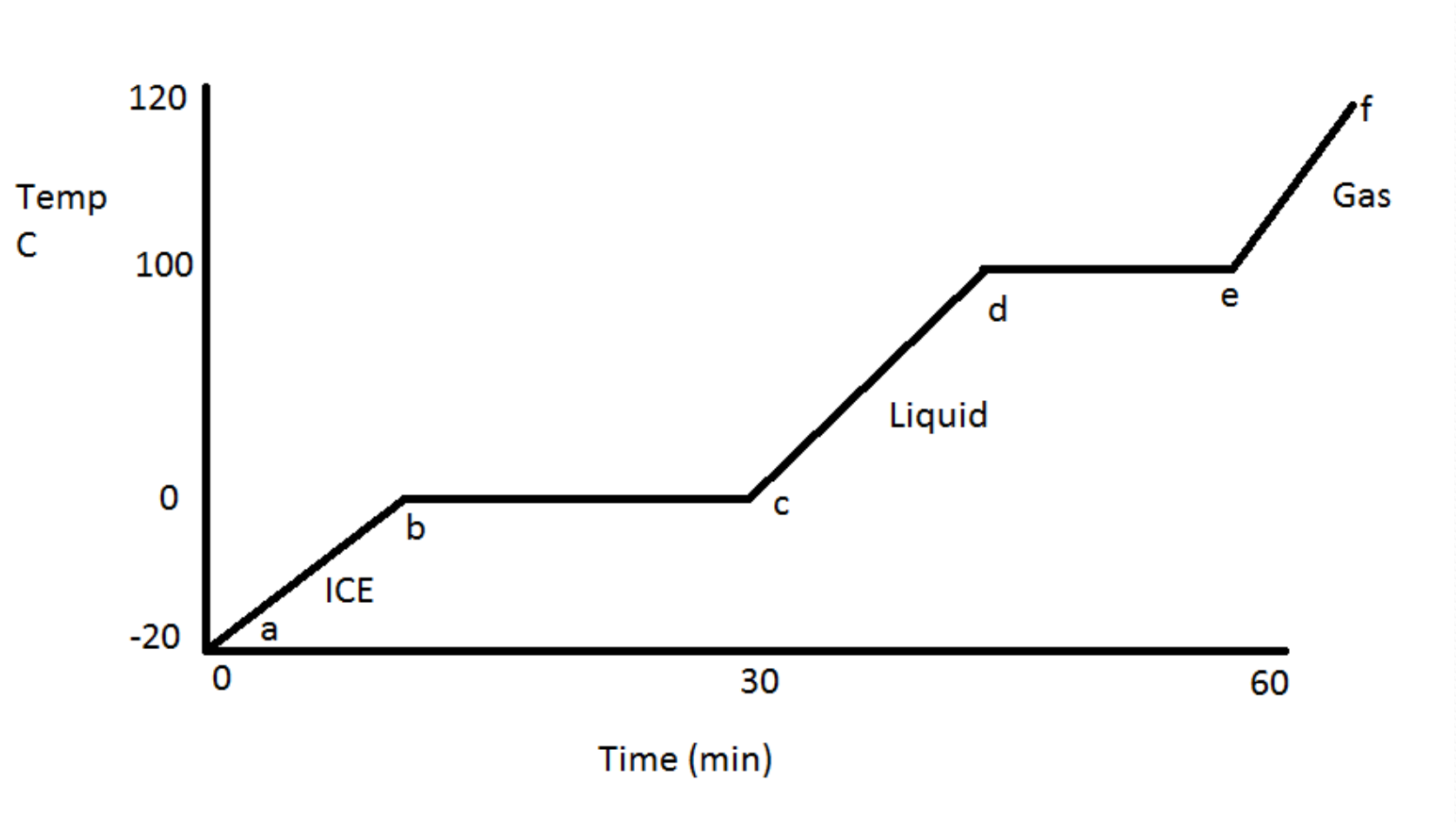
- Additional layers are above them which burn up meteors and create the Northern Lights.

(R)

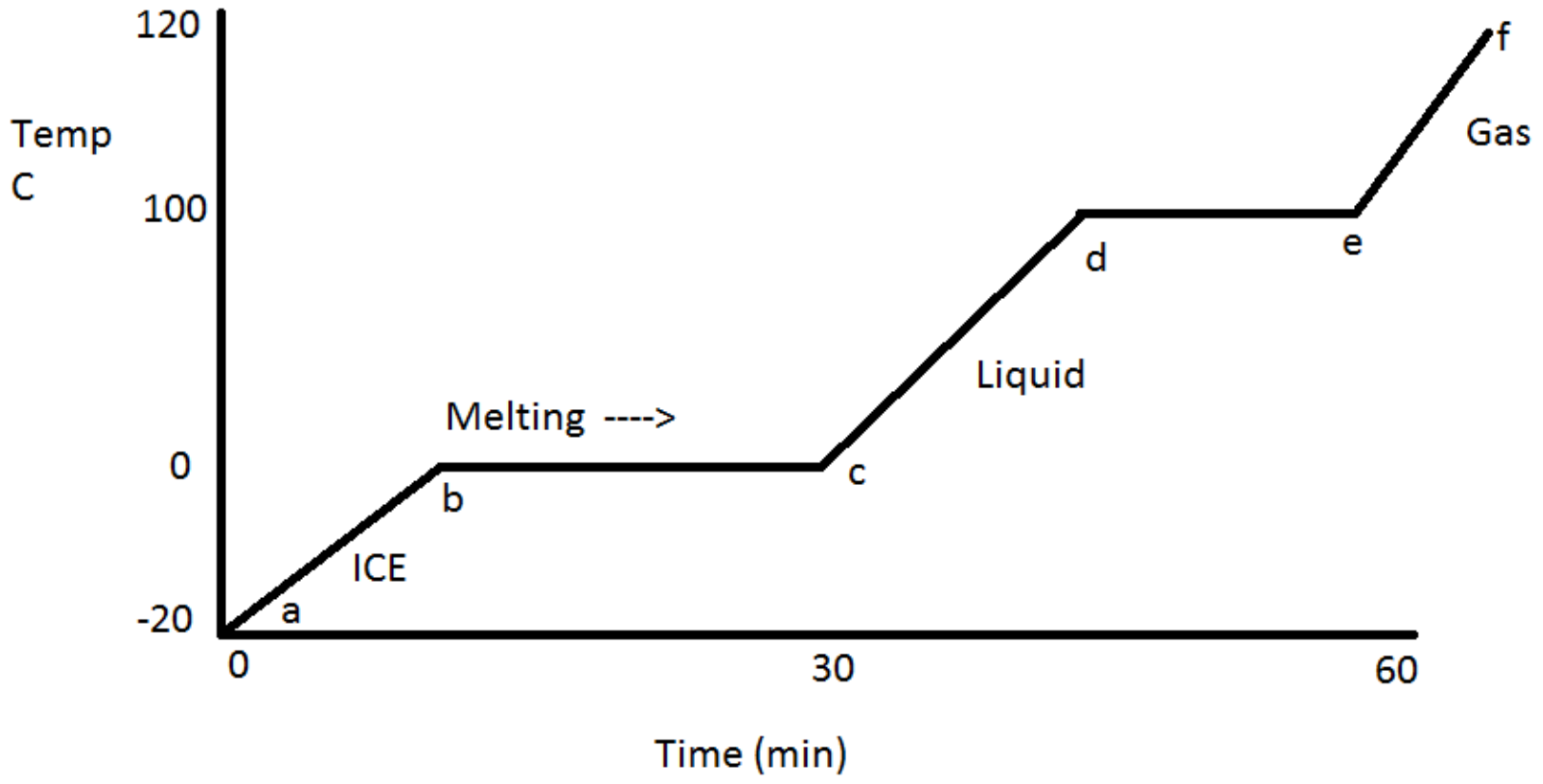

km
mi
160
100
120
75
80
50
40
25
0
0
Altitude
Sea Level
Temperature Zones
Atmospheric Pressure
Thermosphere
(extends to 600 km)
Mesopause
Mesosphere
Stratopause
Stratosphere
Tropopause
Troposphere
–100°
–90°
–55°
0°
15°
100°
Temperature
(°C)
0
1.0
Pressure
(atm)
Water Vapor
0
20
40
Concentration
(g/m3)

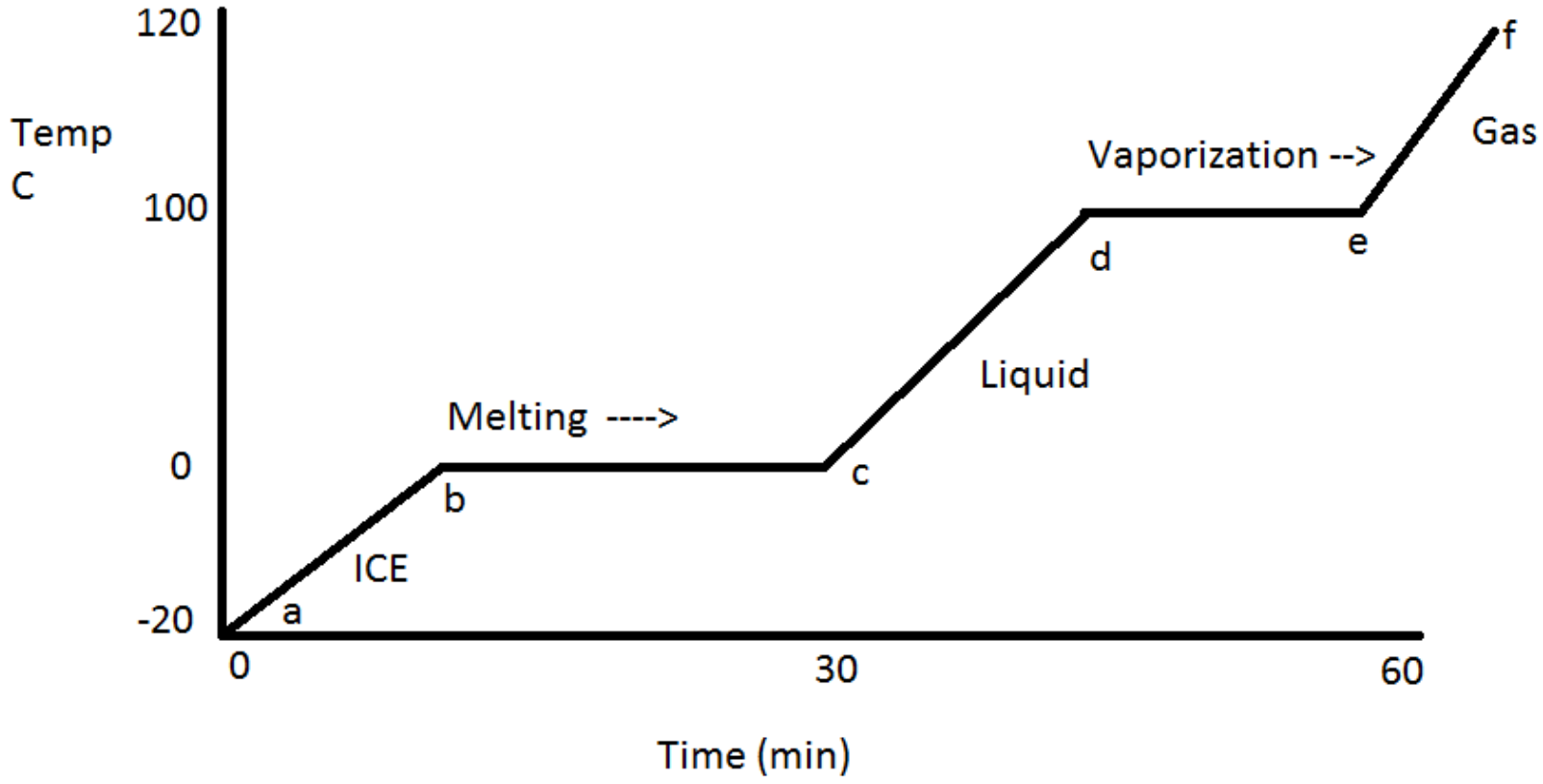
Where is there a phase change?

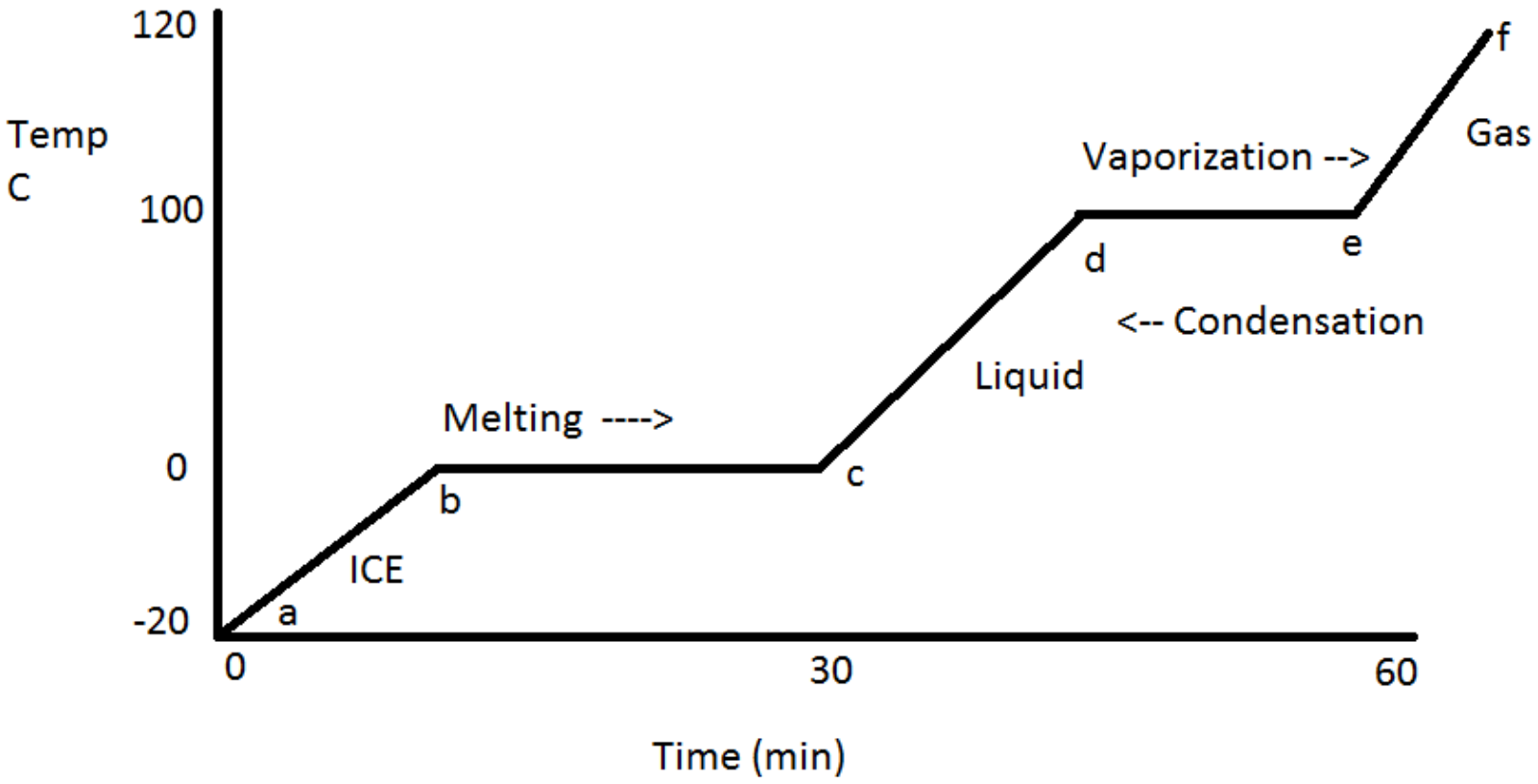


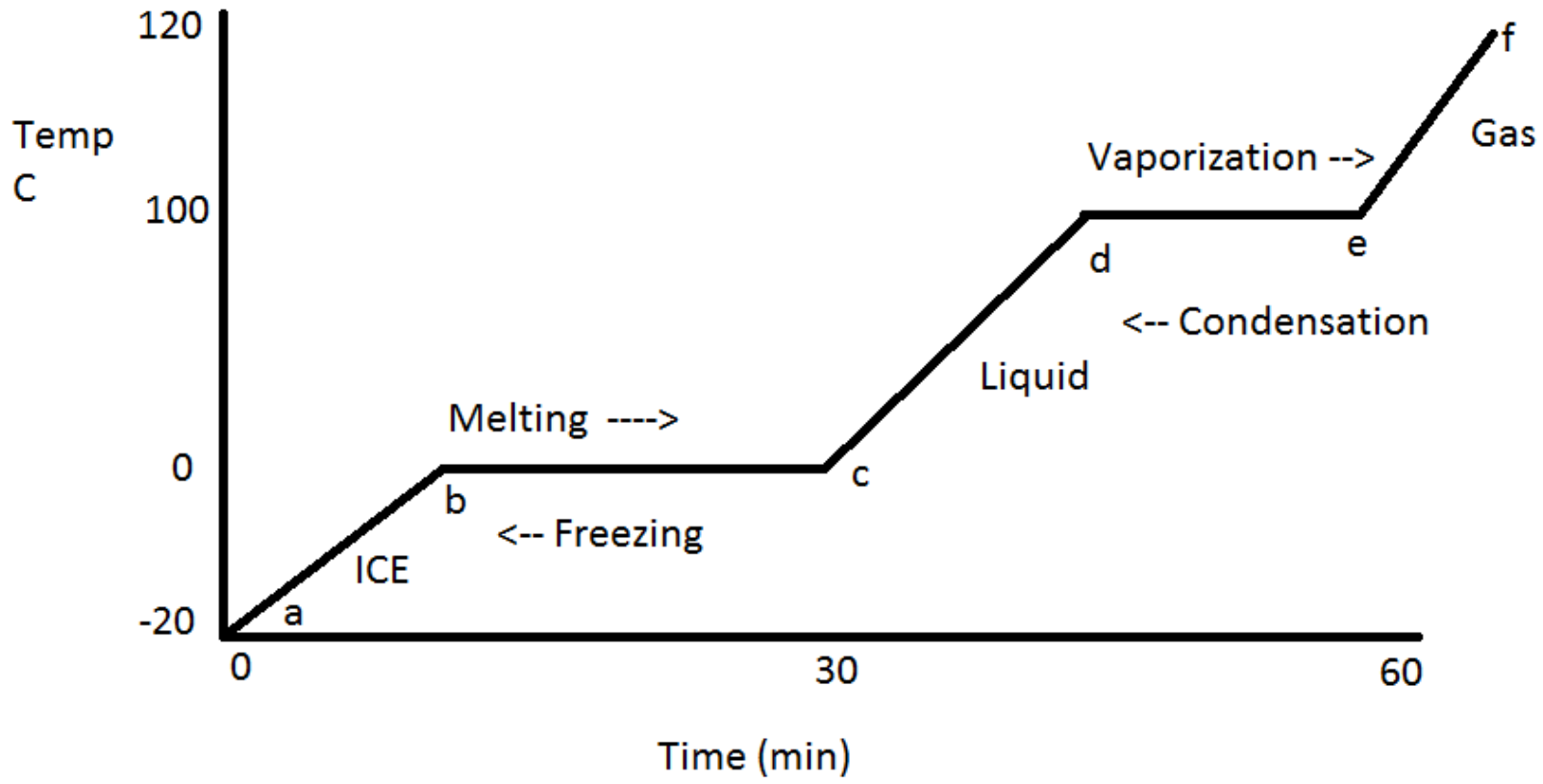


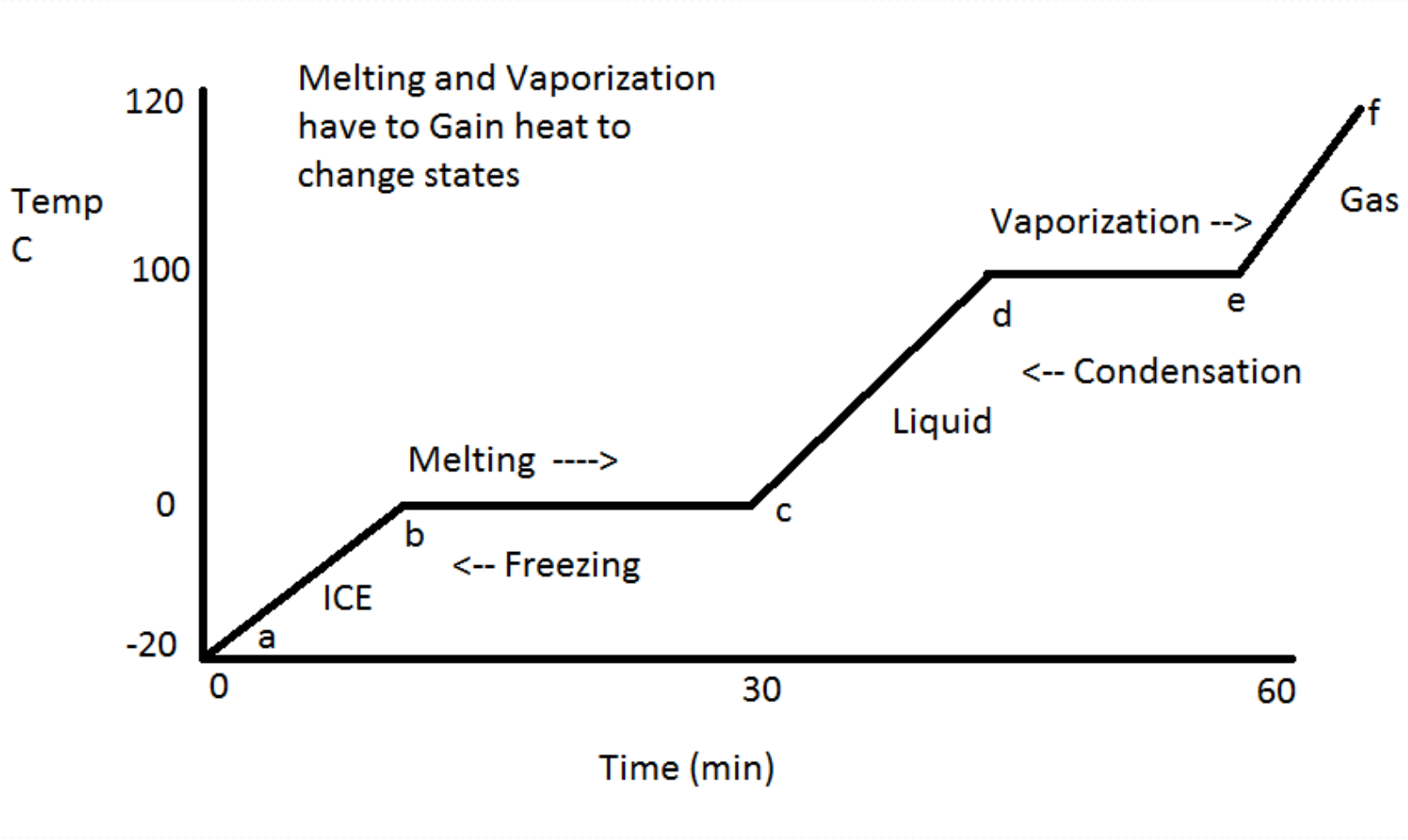
There is a phase change between B – C, D - E

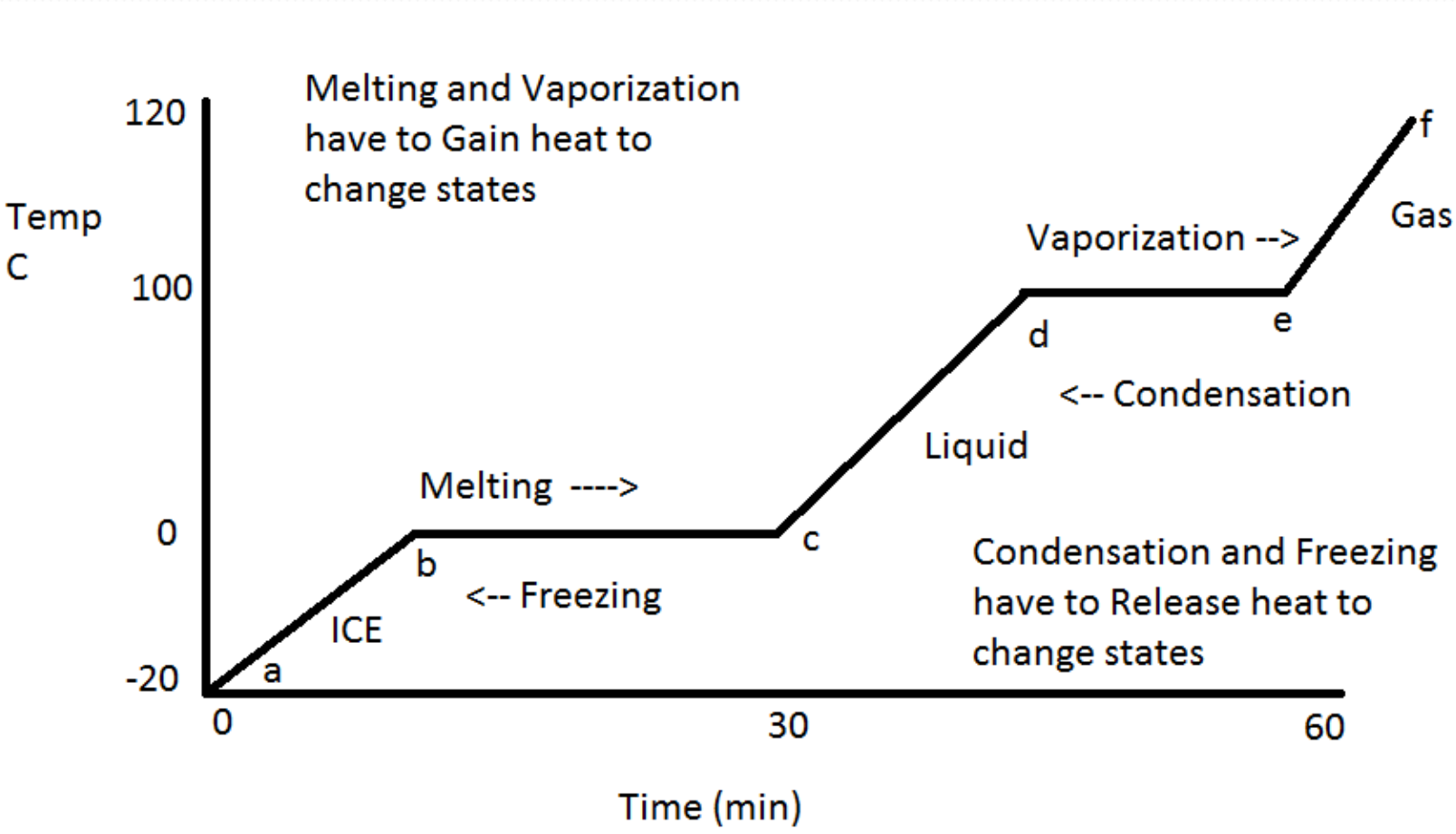

120
Temp
C
100
0
-20
0
30
60
Time (min)
a
ICE
b
Melting ---->
c
Liquid
d
e
f
Gas


120
Temp
C
100
0
-20
0
30
60
Time (min)
ICE
a
b
Melting ---->
c
Liquid
d
e
Vaporization -->
f
Gas


120
Temp
C
100
0
-20
0
30
60
Time (min)
a
ICE
b
Melting ---->
c
Liquid
d
<-- Condensation
e
Vaporization -->
f
Gas


120
Temp
C
100
0
-20
0
30
60
Time (min)
a
ICE
b
<-- Freezing
Melting ---->
c
Liquid
d
<-- Condensation
e
Vaporization -->
f
Gas


Melting and Vaporization have to Gain heat to change states
Temp C
120
100
0
-20
0
30
60
Time (min)
a
ICE
b
<-- Freezing
Melting ---->
c
Liquid
d
<-- Condensation
e
Vaporization -->
f
Gas


Melting and Vaporization have to Gain heat to change states
Temp C
120
100
0
-20
0
30
60
Time (min)
a
ICE
b
Melting ---->
<-- Freezing
c
Liquid
d
Vaporization -->
e
f
Gas
<-- Condensation
Condensation and Freezing have to Release heat to change states

(R)

Heat energy gained during melting	334 J/g
Heat energy released during freezing	334 J/g
Heat energy gained during vaporization	2260 J/g
Heat energy released during condensation	2260 J/g
Density at 3.98°C	1.0 g/mL

FACTORS OF WEATHER – AIR PRESSURE

- 1) What is air pressure?
- Air pressure is weight of air being pulled down on an area.
- 2) What two factors affect air pressure?
- Temperature and altitude effect air pressure.
- 3) Why would air pressure be greater at sea level than on the top of a mountain?
- At sea level there is more air above you so you have more pressure

- 4) Would air pressure be greater at S. Pole or equator? Why?
- South Pole
- Colder air is denser and has more pressure
- 5) How does the force of air pressure move air particles?
- Air moves from High Pressure to Low Pressure
- What makes air move faster?
- The bigger the difference in pressure
- The faster the air moves.

6) How is air pressure measured?

Barometers Measure air pressure

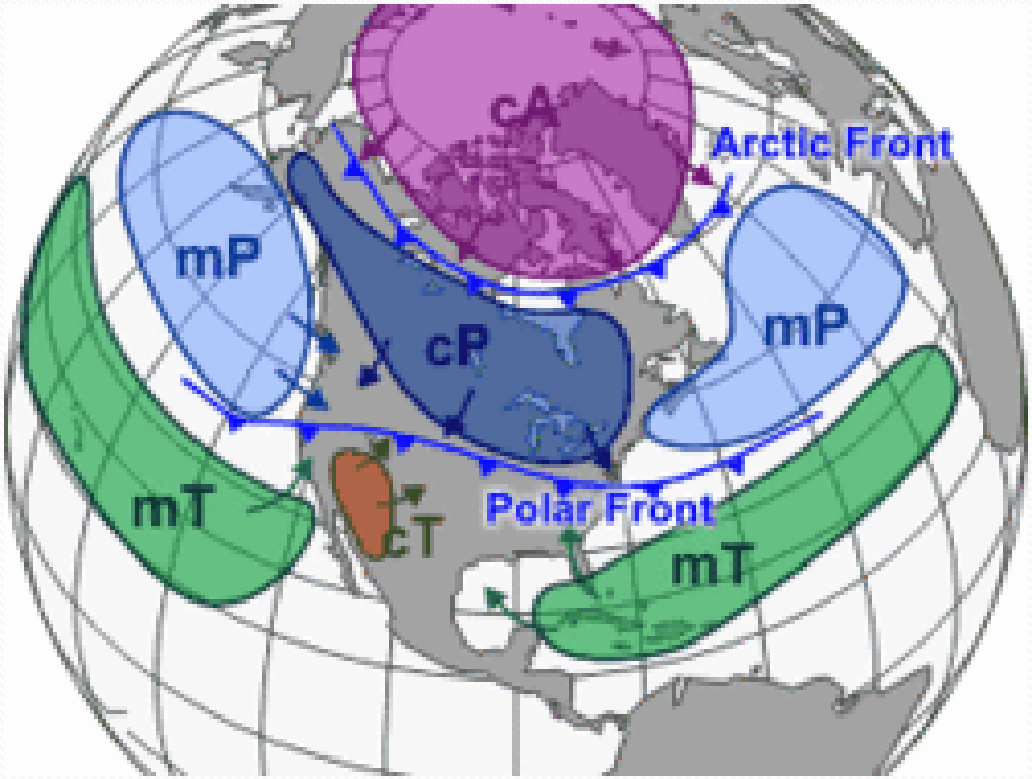
- Weather?
- Weather - Current conditions outside.

- Climate?
- Climate – The average weather of an area

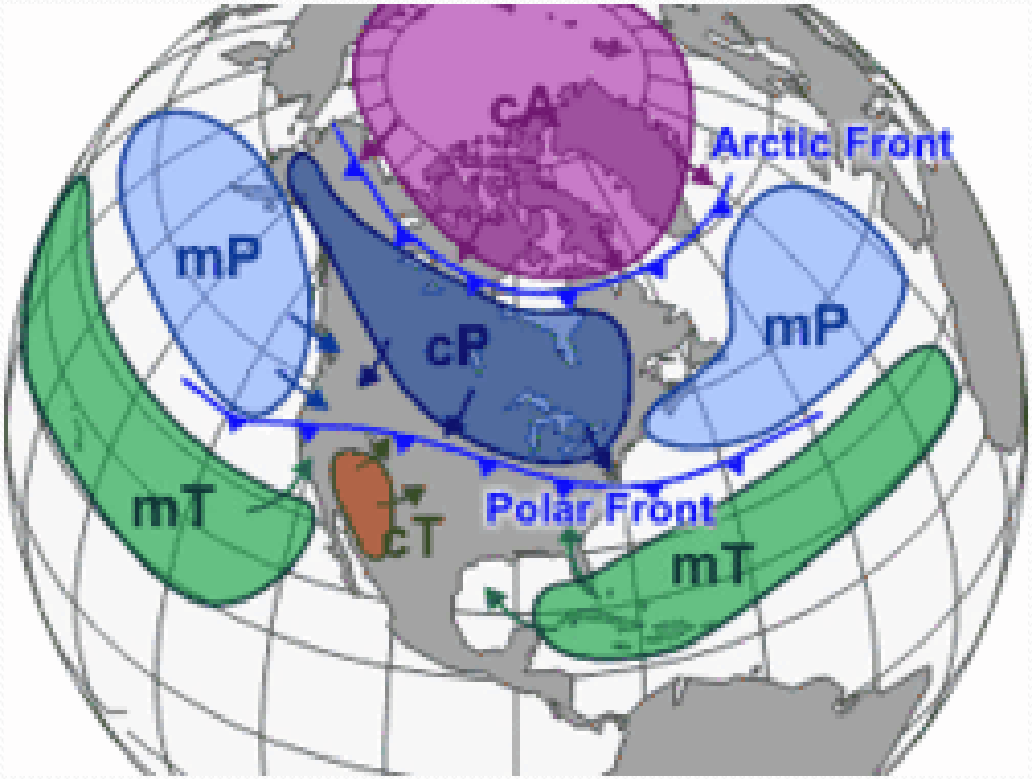
- Desert weather vs climate?
- A Desert may have cold & rainy weather one day,
- But its climate is still hot and dry

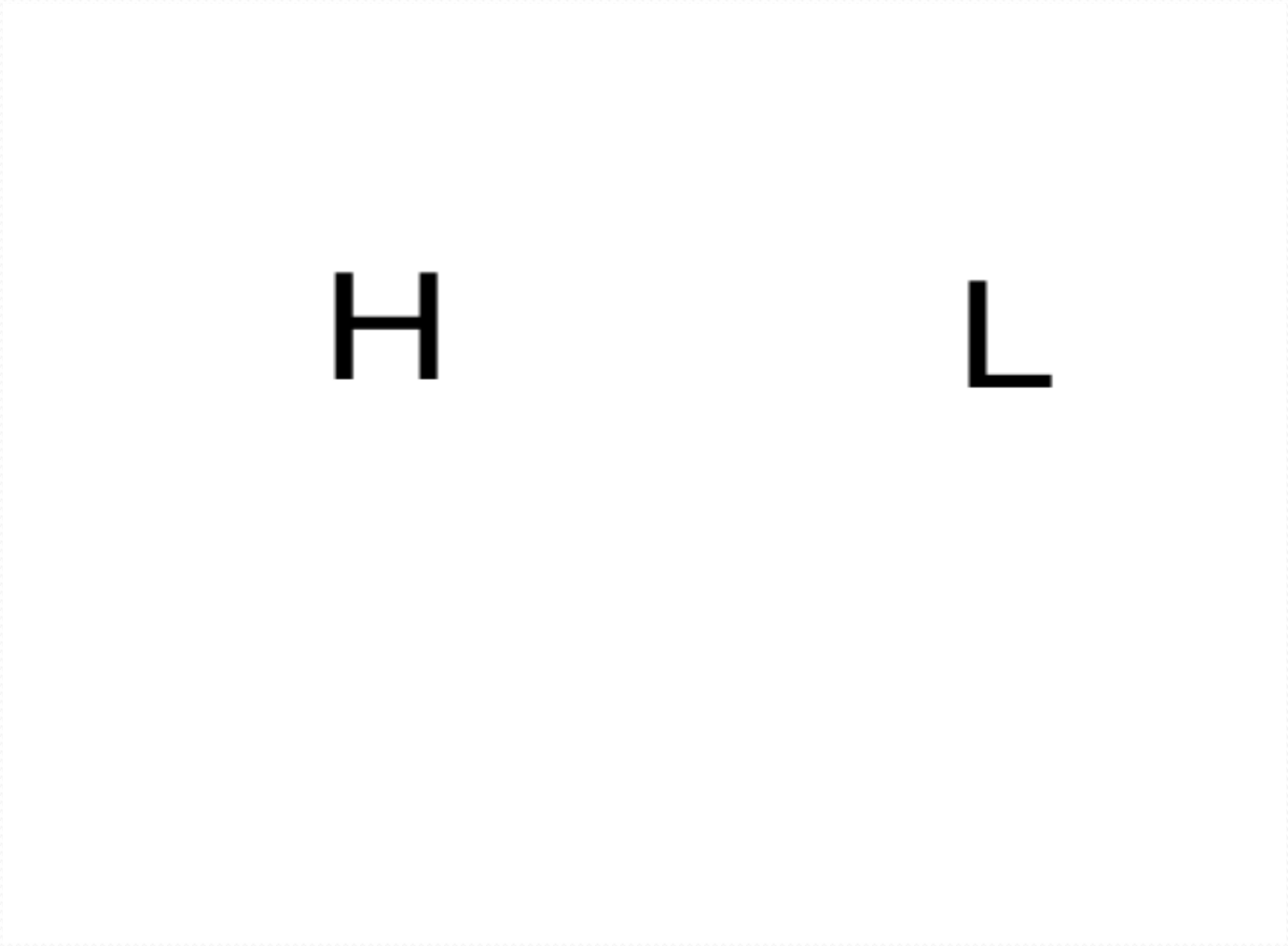
Changes in weather

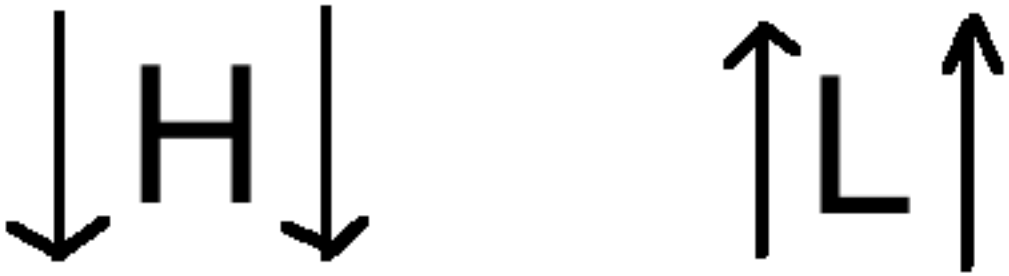
- Four Changeable factors of weather?
- Four changeable factors of weather.
- 1) Air pressure
- 2) Temperature
- 3) Winds (direction, speed)
- 4) Humidity (AMOUNT OF H2O IN AIR)

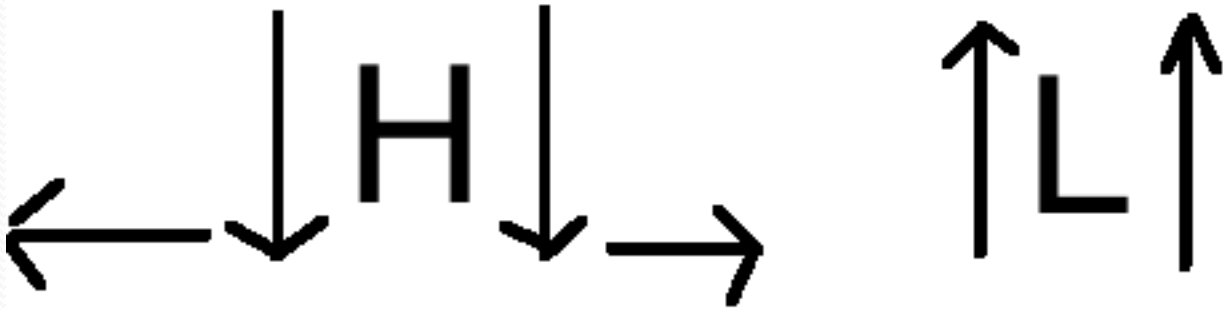

cA
Arctic Front
mP
cP
mP
mT
cT
Polar Front
mT

- What is an air mass?
- Air masses are large bodies of air with similar characteristics (temperature, humidity). They cover land or water.
- Types?
- continental
- Continental – Forms over Land – Dry
- Maritime
- Maritime – Forms over water – Wet
- Tropical
- Tropical – Low Latitude – Warm
- Polar
- Polar – High Latitude – Cold
- Arctic
- Arctic – Very High Latitudes - Freezing

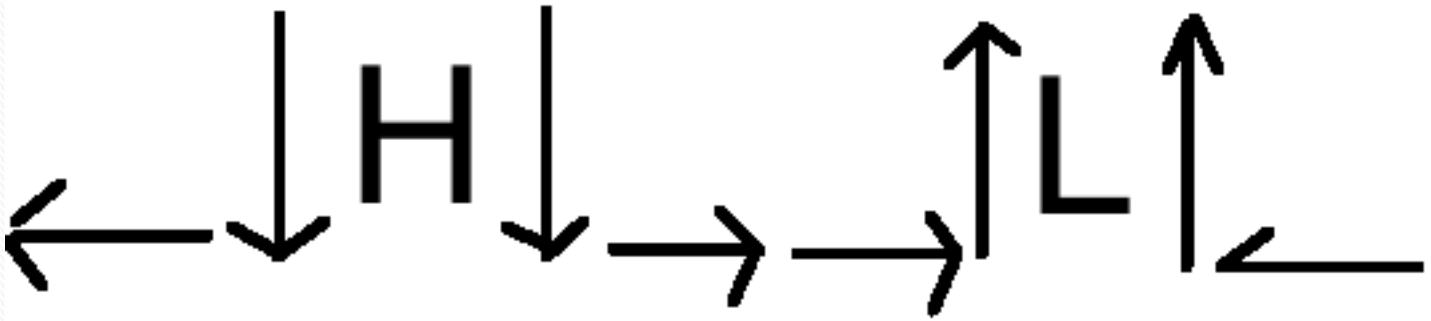

cA
Arctic Front
mP
cP
mP
mT
cT
Polar Front
mT


H
L


H
L

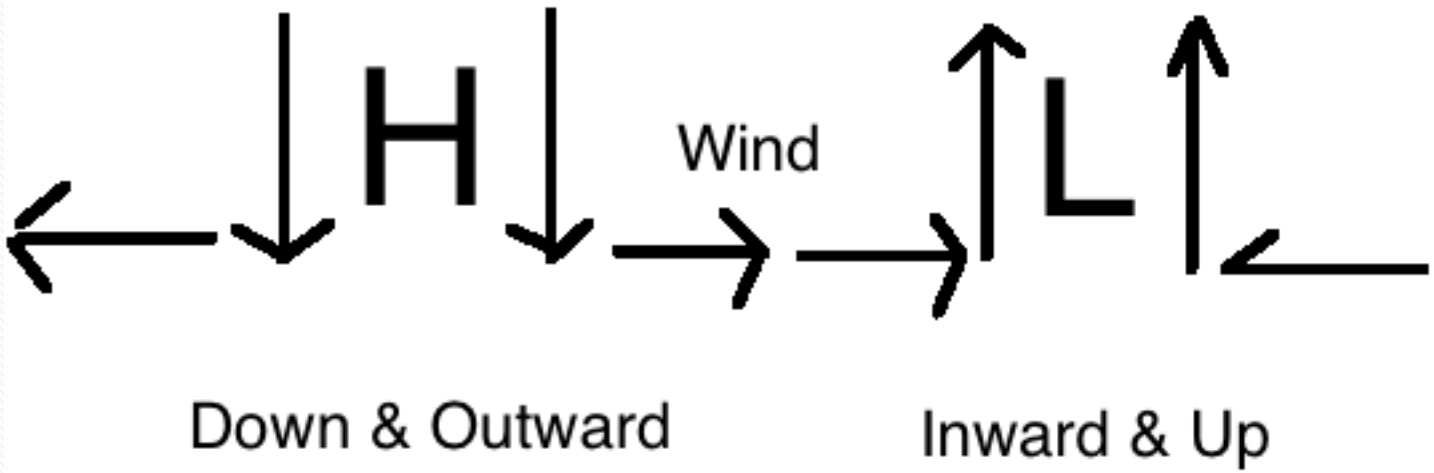


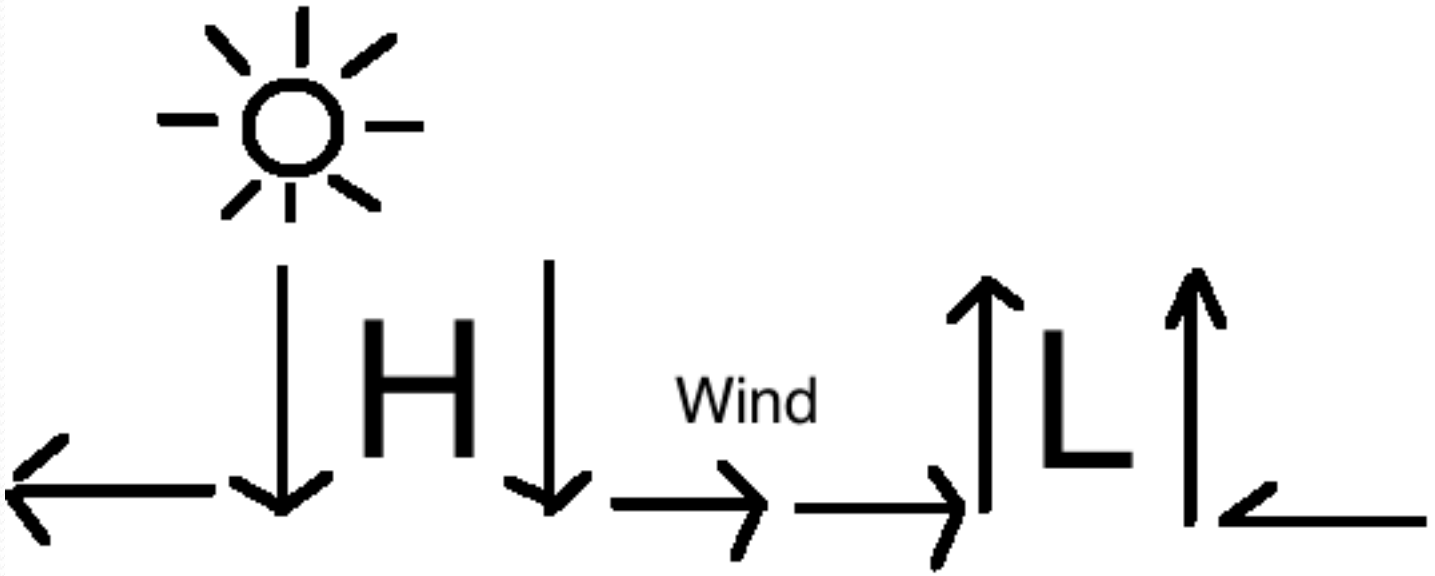
Down & Outward



Down & Outward

Inward & Up

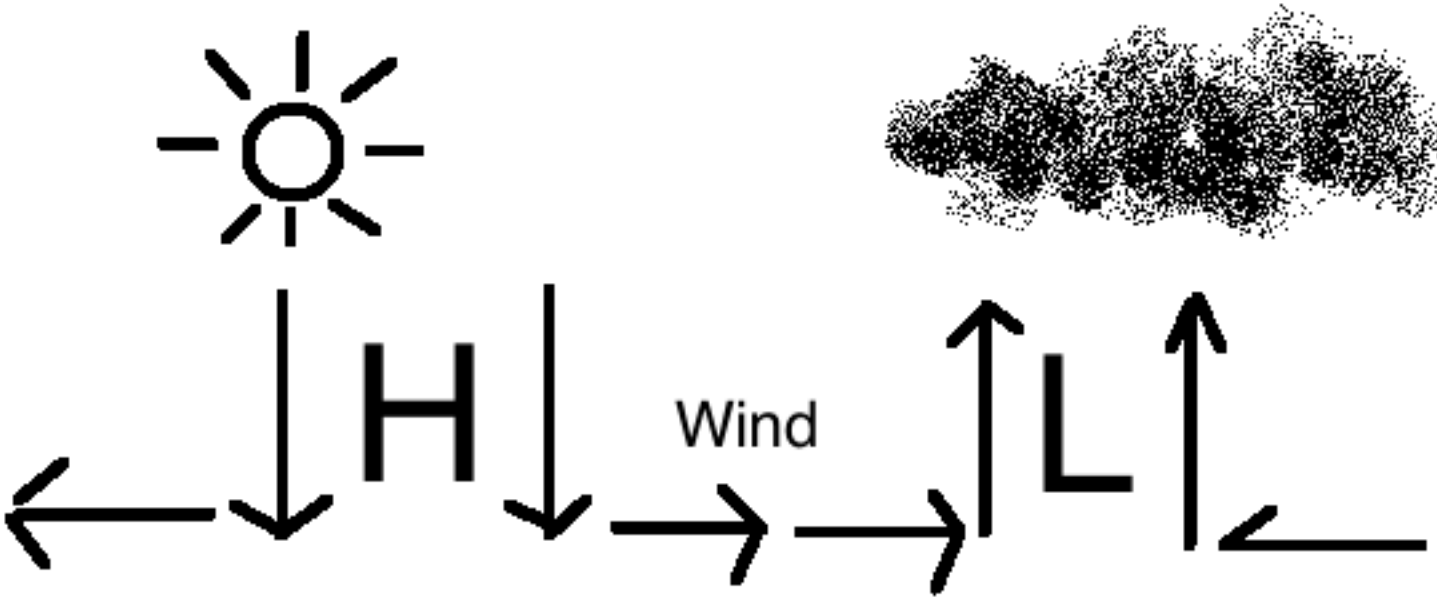

H
Wind
L
Down & Outward
Inward & Up



Down & Outward

Clear Skies

Inward & Up

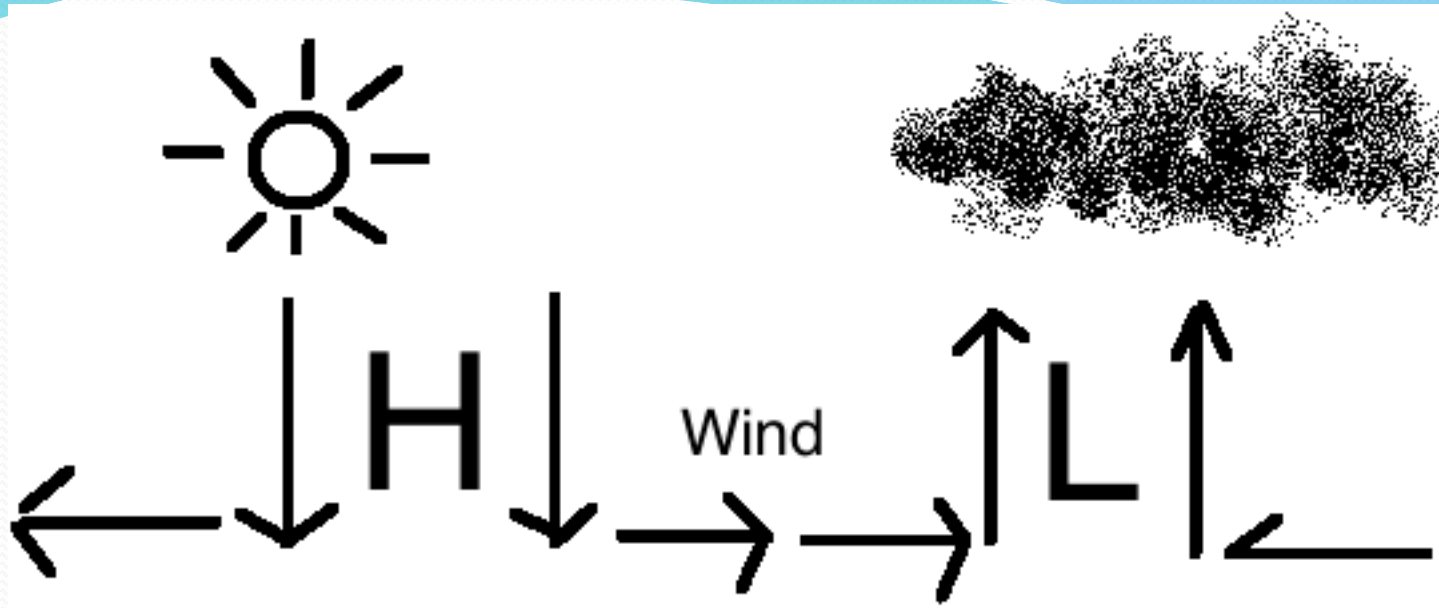


Down & Outward

Clear Skies

Inward & Up

Stormy Skies



Down & Outward

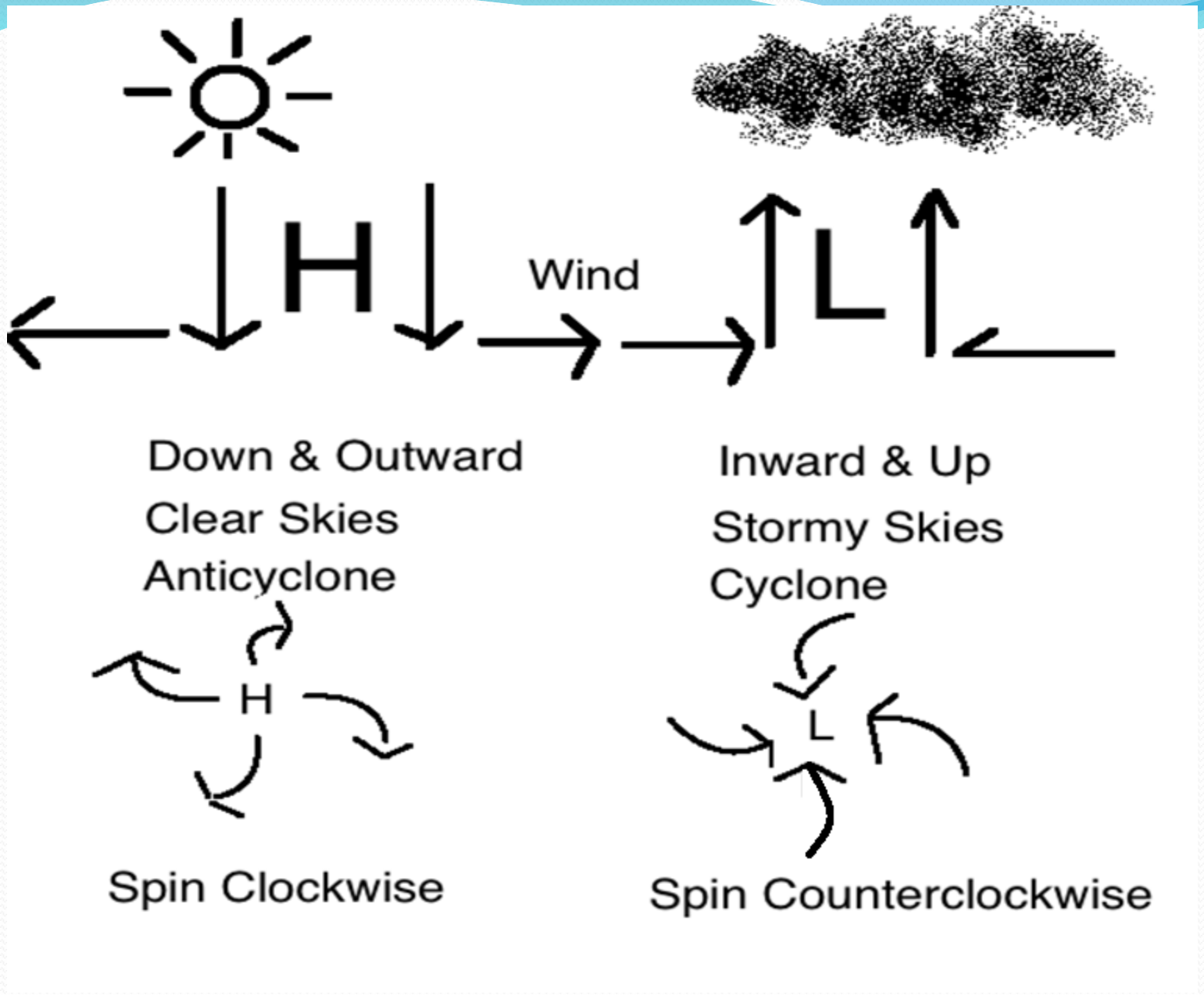
Clear Skies

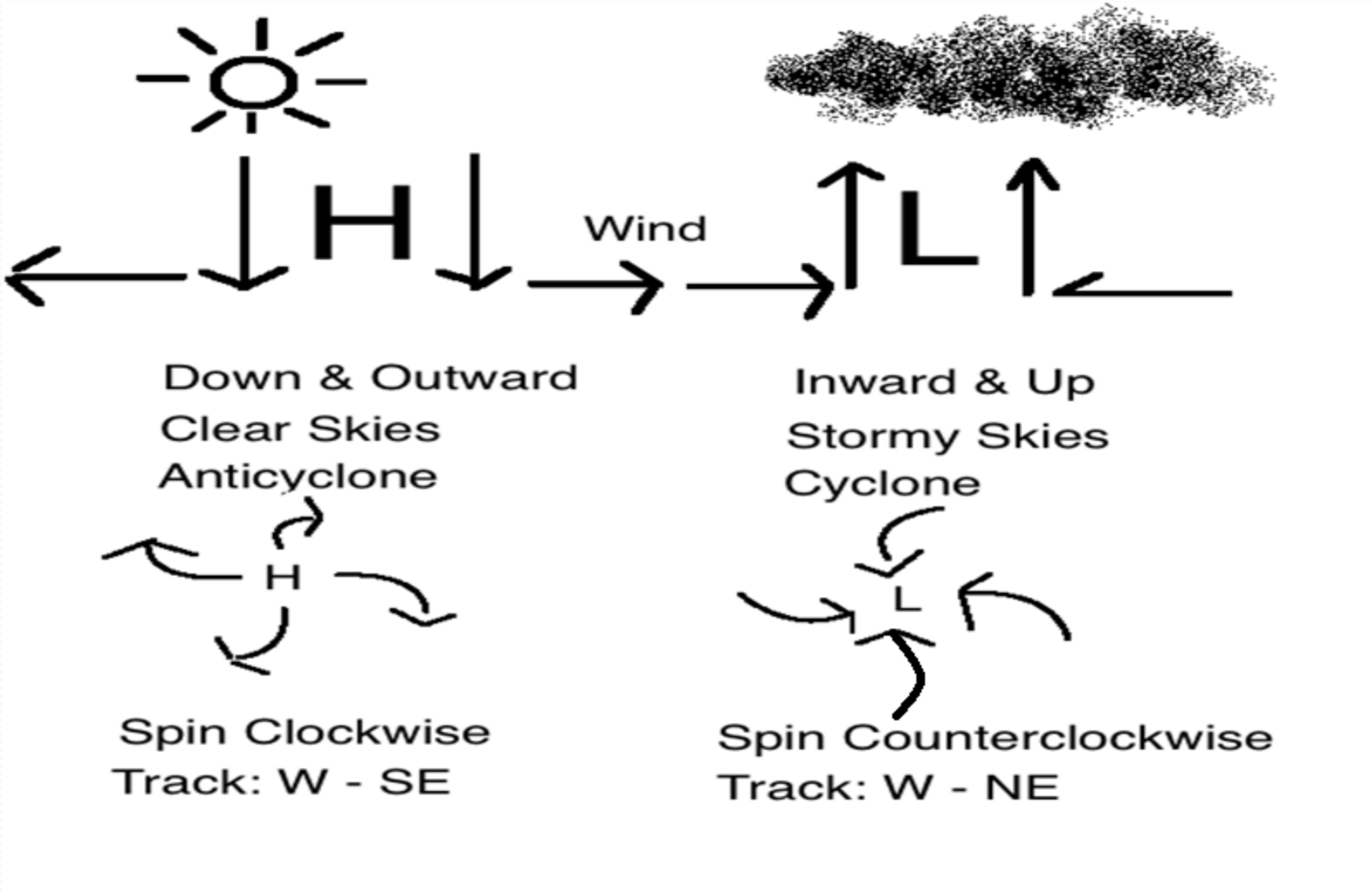
Anticyclone

Inward & Up

Stormy Skies

Cyclone


H
Wind
L
Down & Outward
Clear Skies
Anticyclone
Inward & Up
Stormy Skies
Cyclone
H
L
Spin Clockwise
Spin Counterclockwise


H
Wind
L
Down & Outward
Clear Skies
Anticyclone
Inward & Up
Stormy Skies
Cyclone
H
L
Spin Clockwise
Track: W - SE
Spin Counterclockwise
Track: W - NE

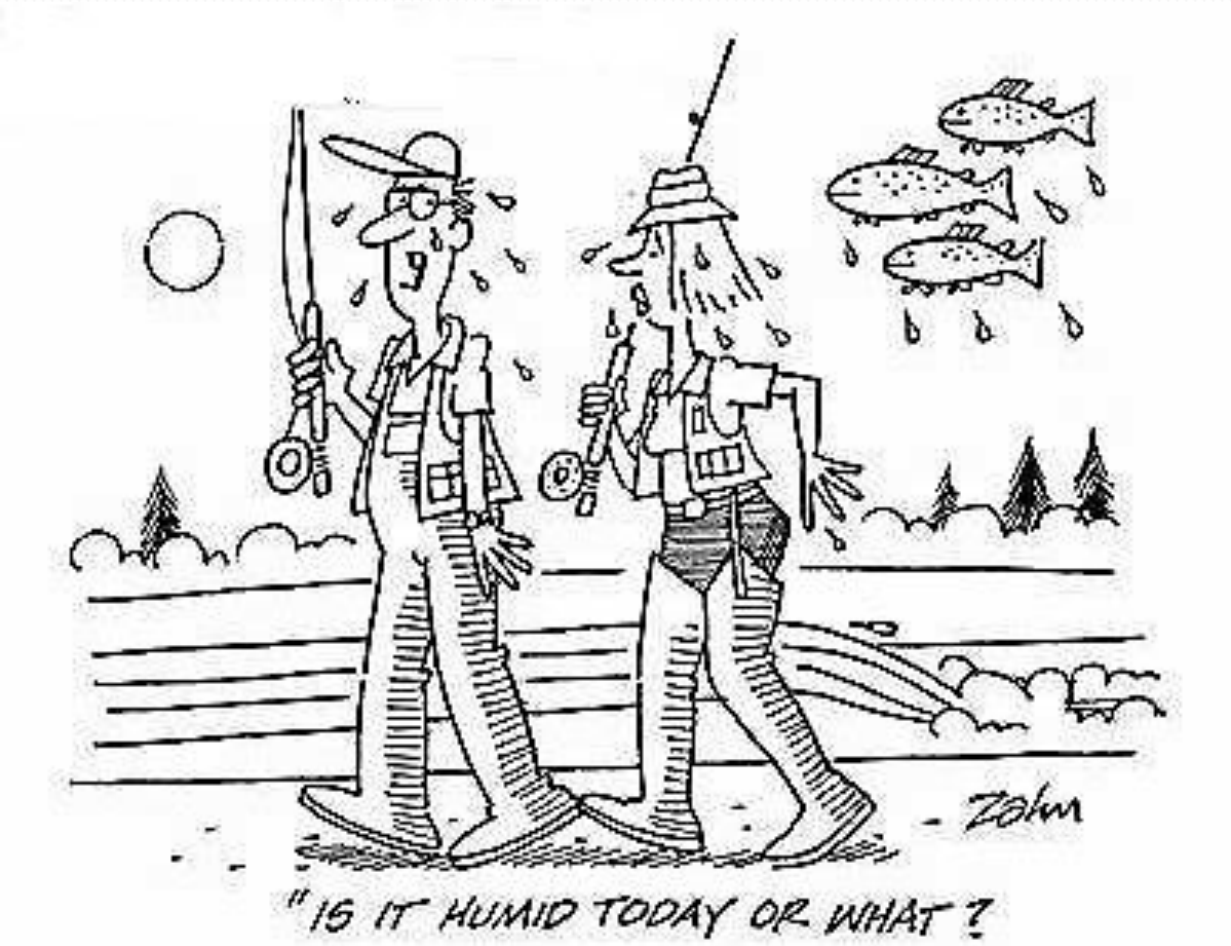

WINTER
STORM
SUN-MON
WINTER'S
COLD
SNOW/ICE STORM
L
SPRINGLIKE
WARMTH
AccuWeather.com
15:54Z 02/27/2014

Humidity

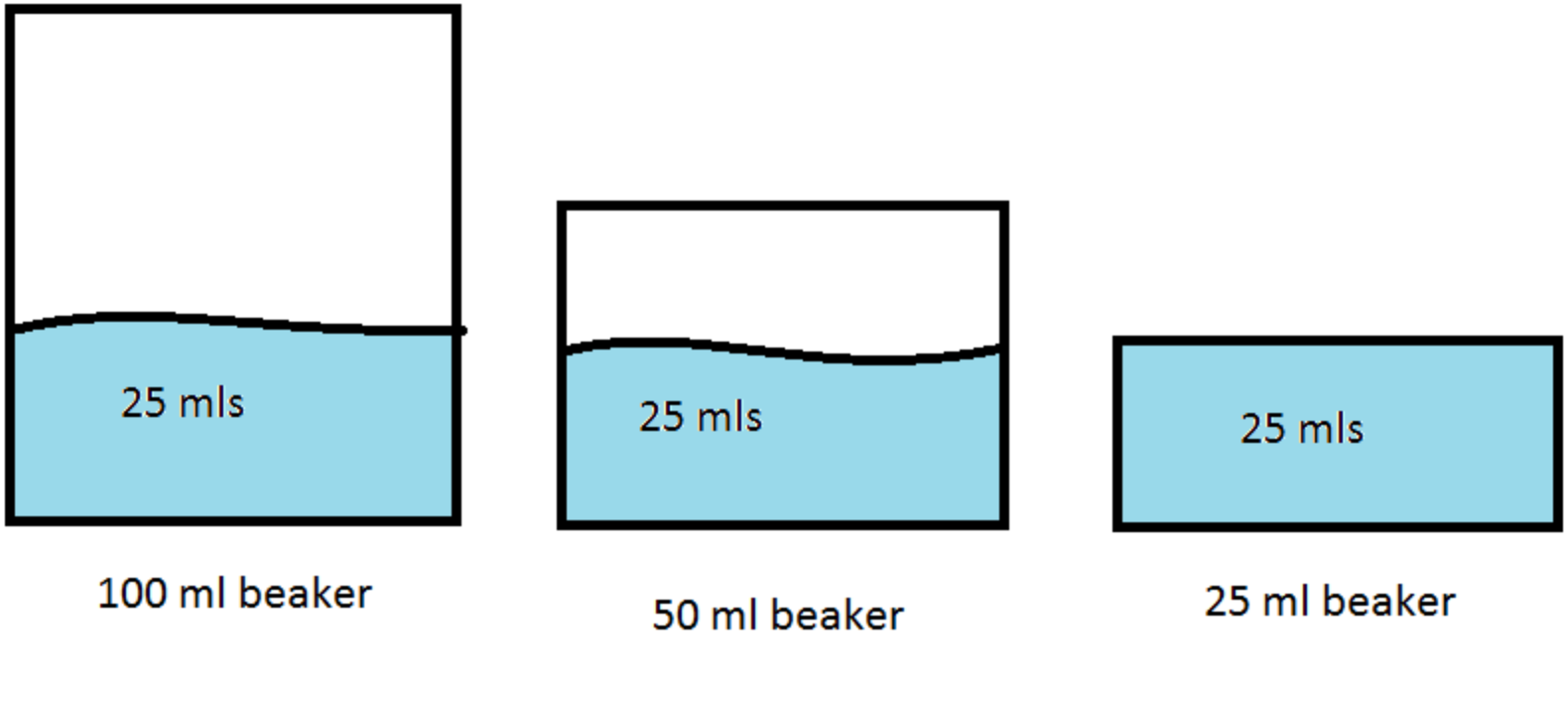
- What is Humidity?
- Humidity is the amount of water vapor in the air.
- (absolute humidity)

High Humidity

Low Humidity

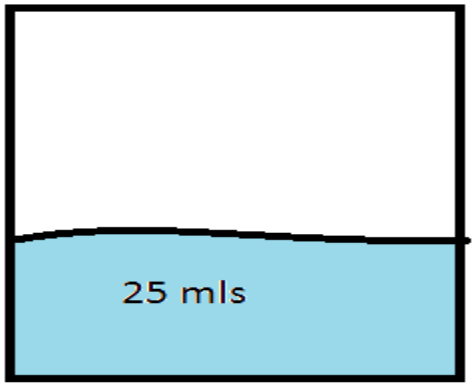

Zohn
"IS IT HUMID TODAY OR WHAT?

Even though all 3 beakers have the same ‘humidity’ are they the same?



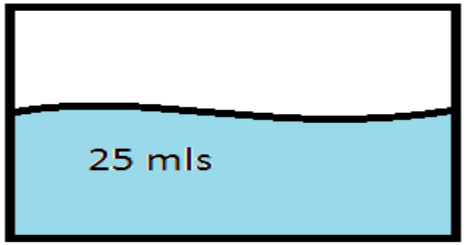
Relative Humidity

- What is Relative Humidity?
- Relative Humidity is how much water vapor is in the air, compared to (relative to) how much water the air can hold. (How full the air is, % full)



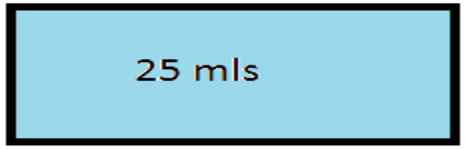
100 ml beaker

25 % RH



50 ml beaker

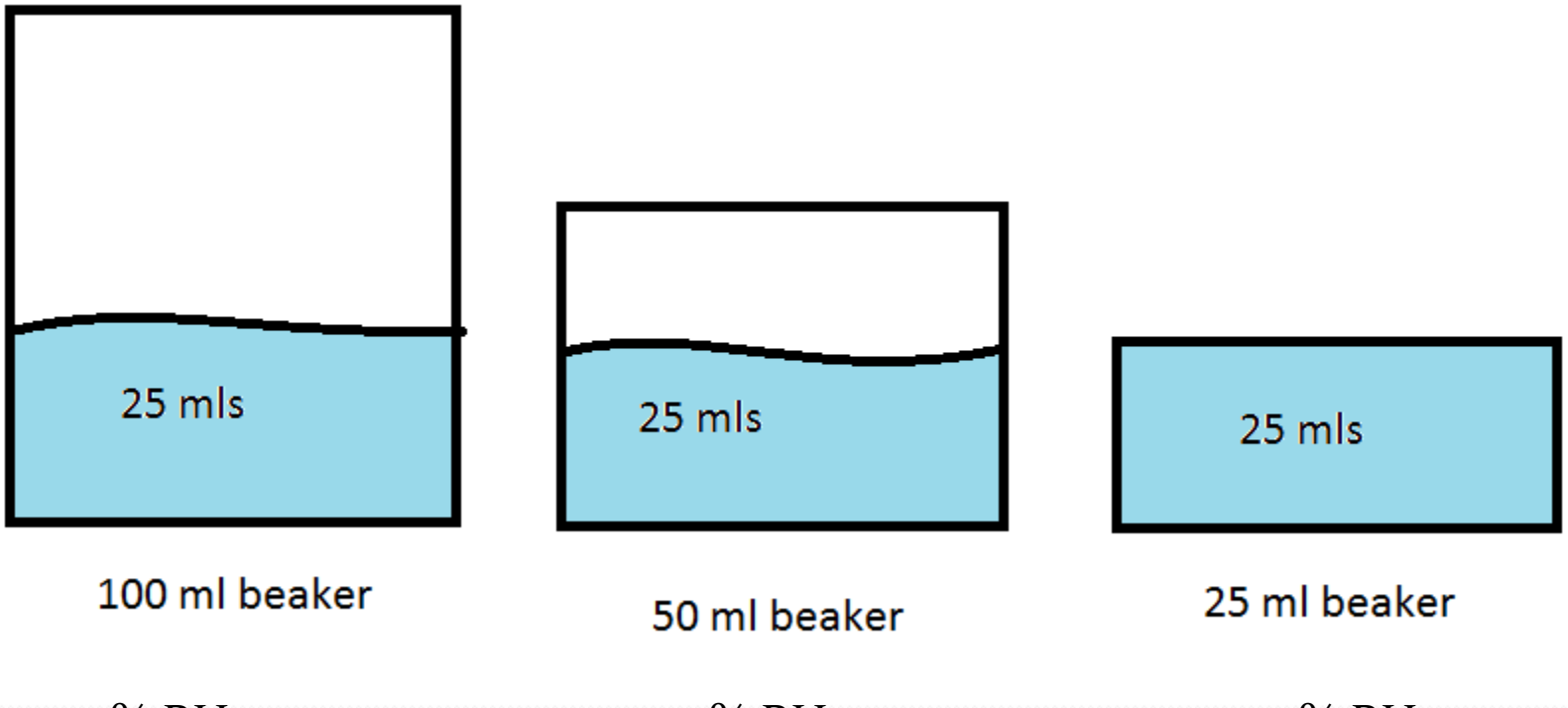
50 % RH



25 ml beaker

100 % RH

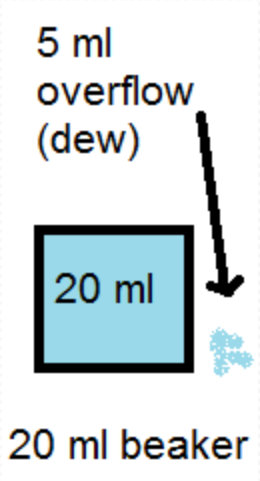
- What changes how much water the air can hold?
- Temperature affects how much water the air can hold.
- Can hotter air hold more or less water?
- Hot air expands so it holds more H2O(Bigger beaker)
- Temp goes up → RH goes down. (Desert, dry heat)
- Cold air contracts so it is smaller (smaller beaker)
- Temp goes down → RH goes up (Dew in the AM)



25 % RH	50 % RH	100 % RH
80 deg	60 deg	40 deg

- How else can you change RH?
- You can also add (evaporation) or remove water (precipitation) to change RH.

- What would happen if the RH was 100% and then it got colder?
- When the air gets cold enough or too much water is added, it cannot hold any more water vapor and it comes out of the air as a liquid
- (ex. Dew forms at night when its cold then goes back into the air as the morning heats up)



100 % RH
30 deg

- What do we call the point when it gets too cold to hold any more water vapor in the air?
- Dew point (DP) is the temperature when the air cannot hold anymore H_2O (RH=100%)
- Dew point = Full air

- Is DP a set temperature?
- DP changes based on adding or removing water (evaporation / precipitation) or by changing the temperature.

- Can the temperature ever get below the dew point?
- When the temperature drops to the DP water is released. This lowers the DP.
- DP falls WITH temperature
- Temperature can NEVER be lower then DP.
- What does it mean when you have a high RH.
- High RH means you are close to your DP.
- (DP = 100% RH)
- Low RH means you are far from your DP.

Relative Humidity lab (general)

- Purpose – To learn about relative humidity and dew point.

Data – temp / humidity data sheet
- graph on temp / humidity

Con –Humidity?
Relative Humidity?
How temp changes R.H.?
What air hold more H_2O… hot or cold, why?
How else can you change R.H.?
What is Dew point (its R.H)?
Can temp drop below your D.P?
Why does dew typically form over night?
Why do clouds FORM high in the sky and not on the ground?

(R)

- How do you find DP and RH.
- To find DP & RH you need a Sling Psychrometer.
- They are made of two thermometers.
- Dry Bulb is a normal thermometer which shows temperature.
- Wet Bulb is a normal thermometer with a wet cloth on the end. This shows how much moisture the air can hold by how much evaporates and cools the thermometer.
- By comparing the two thermometers you can find the DP and RH

(R)

- How does the wet bulb work?
- As you spin the psychrometer the water evaporates.
- When water evaporates it cools (why we sweat)
- The dryer the air, the more room for evaporation, the cooler the wet bulb will get.

(R)

Dewpoint (°C)

Dry-Bulb Temperature (°C)	Difference Between Wet-Bulb and Dry-Bulb Temperatures (C°)														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
−20	−20	−33													
−18	−18	−28													
−16	−16	−24													
−14	−14	−21	−36												
−12	−12	−18	−28												
−10	−10	−14	−22												
−8	−8	−12	−18	−29											
−6	−6	−10	−14	−22											
−4	−4	−7	−12	−17	−29										
−2	−2	−5	−8	−13	−20										
0	0	−3	−6	−9	−15	−24									
2	2	−1	−3	−6	−11	−17									
4	4	1	−1	−4	−7	−11	−19								
6	6	4	1	−1	−4	−7	−13	−21							
8	8	6	3	1	−2	−5	−9	−14							
10	10	8	6	4	1	−2	−5	−9	−14	−28					
12	12	10	8	6	4	1	−2	−5	−9	−16					
14	14	12	11	9	6	4	1	−2	−5	−10	−17				
16	16	14	13	11	9	7	4	1	−1	−6	−10	−17			
18	18	16	15	13	11	9	7	4	2	−2	−5	−10	−19		
20	20	19	17	15	14	12	10	7	4	2	−2	−5	−10	−19	
22	22	21	19	17	16	14	12	10	8	5	3	−1	−5	−10	−19
24	24	23	21	20	18	16	14	12	10	8	6	2	−1	−5	−10
26	26	25	23	22	20	18	17	15	13	11	9	6	3	0	−4
28	28	27	25	24	22	21	19	17	16	14	11	9	7	4	1
30	30	29	27	26	24	23	21	19	18	16	14	12	10	8	5

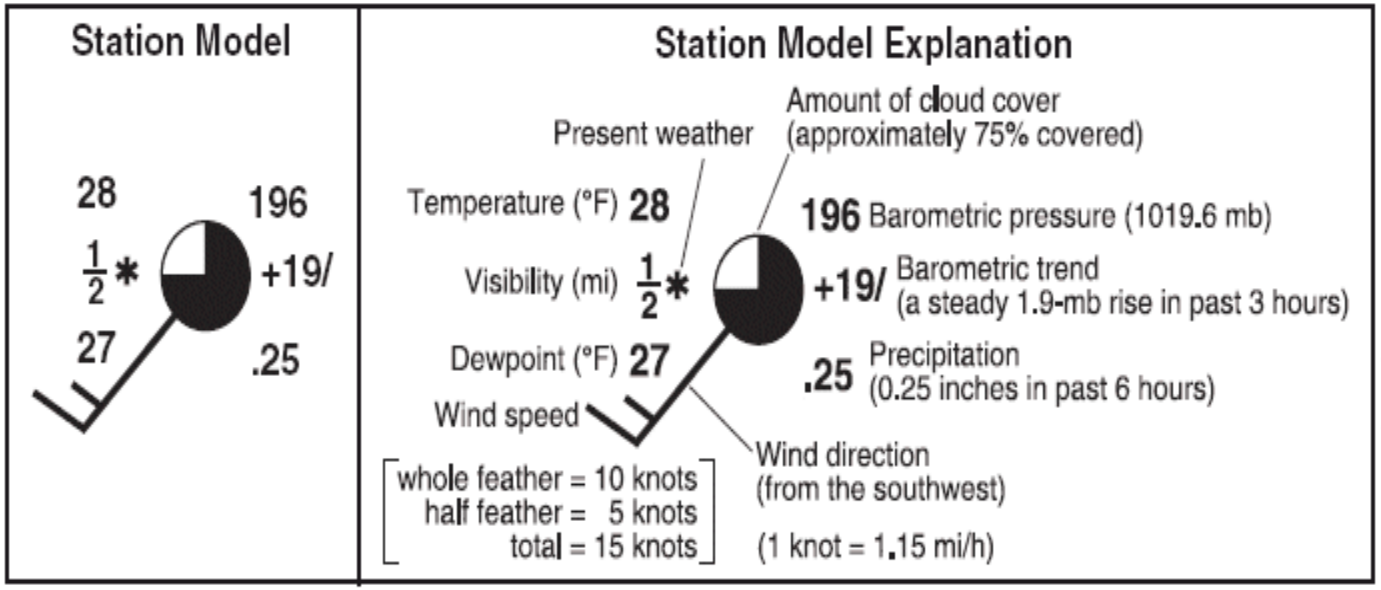
(R)

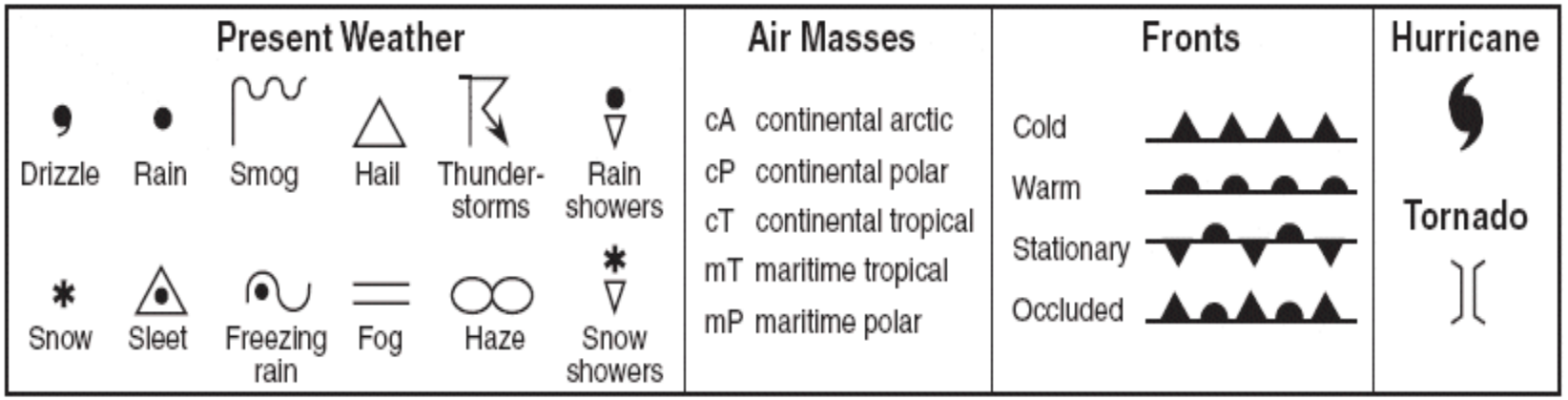
Dry-Bulb Temperature (°C)	Difference Between Wet-Bulb and Dry-Bulb Temperatures (C°)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
−20	100	28														
−18	100	40														
−16	100	48														
−14	100	55	11													
−12	100	61	23													
−10	100	66	33													
−8	100	71	41	13												
−6	100	73	48	20												
−4	100	77	54	32	11											
−2	100	79	58	37	20	1										
0	100	81	63	45	28	11										
2	100	83	67	51	36	20	6									
4	100	85	70	56	42	27	14									
6	100	86	72	59	46	35	22	10								
8	100	87	74	62	51	39	28	17	6							
10	100	88	76	65	54	43	33	24	13	4						
12	100	88	78	67	57	48	38	28	19	10	2					
14	100	89	79	69	60	50	41	33	25	16	8	1				
16	100	90	80	71	62	54	45	37	29	21	14	7	1			
18	100	91	81	72	64	56	48	40	33	26	19	12	6			
20	100	91	82	74	66	58	51	44	36	30	23	17	11	5		
22	100	92	83	75	68	60	53	46	40	33	27	21	15	10	4	
24	100	92	84	76	69	62	55	49	42	36	30	25	20	14	9	4
26	100	92	85	77	70	64	57	51	45	39	34	28	23	18	13	9
28	100	93	86	78	71	65	59	53	47	42	36	31	26	21	17	12
30	100	93	86	79	72	66	61	55	49	44	39	34	29	25	20	16

Relative Humidity (R)

- Absolute Humidity?
- Relative Humidity?
- What changes Relative Humidity?
- Dew Point? (and its (RH).
- Why does dew form over night?
- How to use a Sling Psychrometer?
- Wet Bulb?
- Dry Bulb?
- How to use the charts?
- Can Temp ever drop below the DP? (Why)?

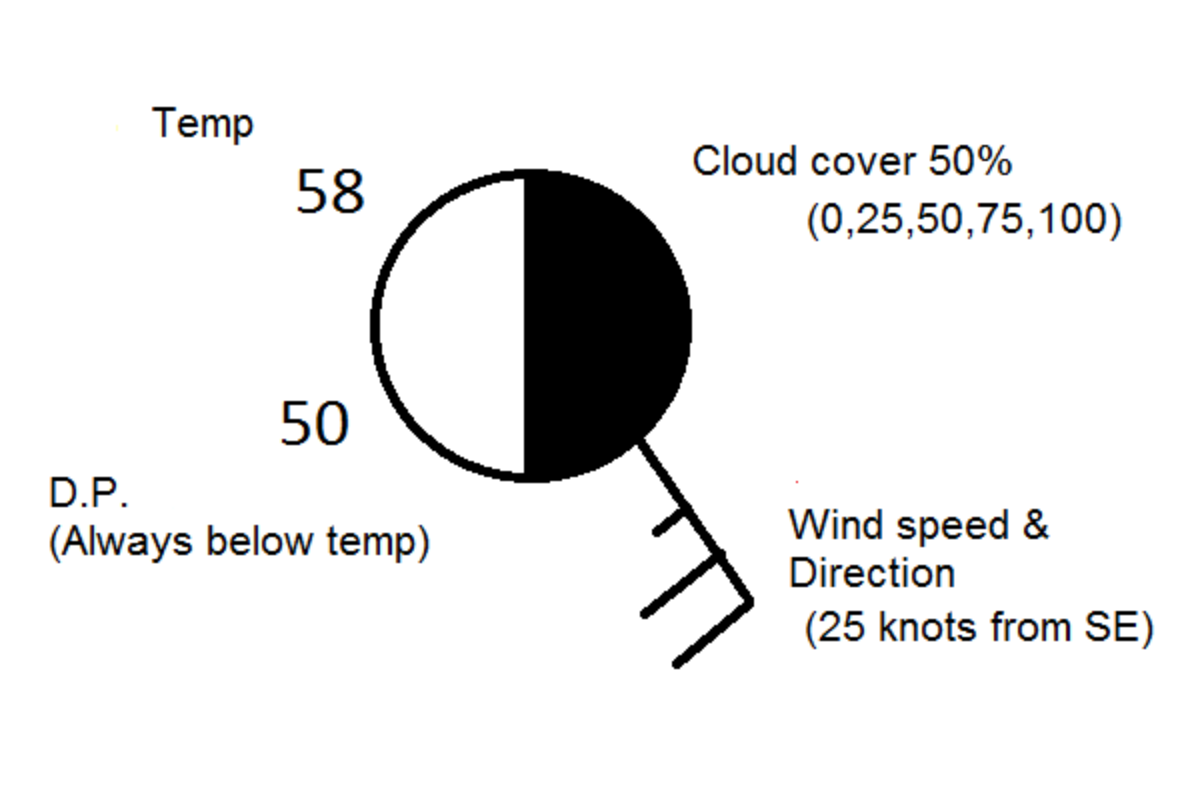
STATION MODEL (R)





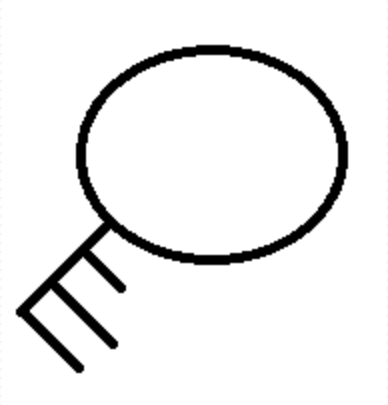
Station models

- A station model is a key showing weather conditions.

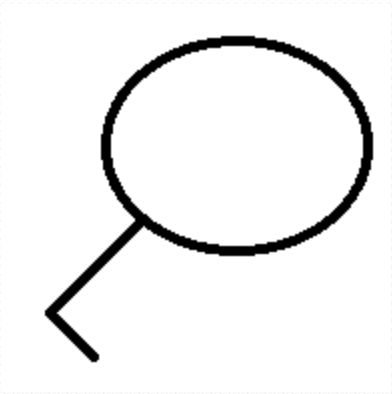


Station model

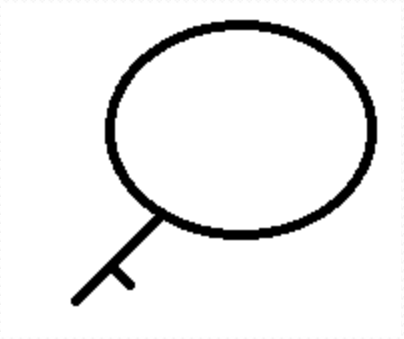
- Wind direction is shown where it is coming from
- Feathers show wind speed.
- Full feather = 10 knots (~10 mph)
- Half feather = 5 knots (~5 mph)



25 Knots



10 Knots



5 Knots

5 knots will always be set in

Pressure on a station model (R)

- How do you write pressure on a station model?
- 1019.6 = 196
- 988.4 = 884
- To put pressure on a station model drop the 9 or 10 and remove the decimal. (use last 3 numbers)
- How do you convert station model pressure to real pressure?
- Station model pressures
- under 500 (5) “needs help” add a 10
- Over 500 (5) “doesn’t need help” add a 9
- Lastly add back the decimal

(R)

- Practice station models.
- 884 = ?
- 988.4

- 240 = ?
- 1024.0

- After converting, check ESRT to see if it works.
- Ex 1088.4 and 924.0 are not on the chart

Clouds

- What is a cloud?
- A cloud is a visible mass of liquid droplets or frozen crystals.
- How does a cloud form?
- Clouds form when water vapor cools to the Dew Point. Then it finds a substance to attach to (cloud nuclei) (dust, air particles, pollution, etc.)
- How are clouds named?
- Clouds are named by:
- Shape
- Altitude
- Precipitation levels (Density)

Clouds shapes

Types of clouds?

Cumulus (Clumpy)(Accumulate)

Rounded individual clouds.

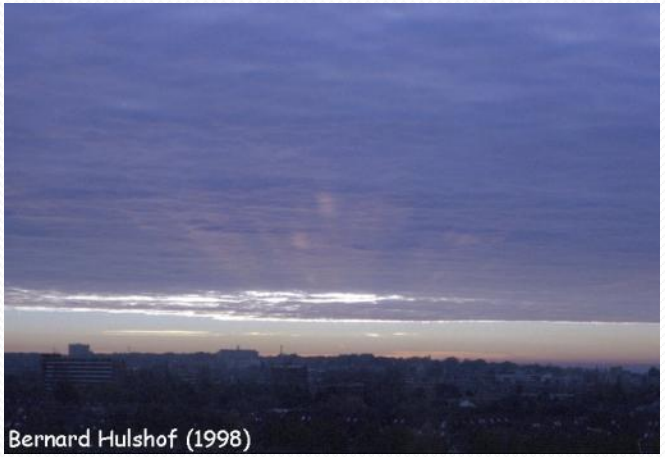
Flat base and rising dome.

Stratus (Stretched out)(Straddle)

Layered clouds

Covering much or all of the sky.

No distinct individual clouds.



Cloud Altitudes

- Low level clouds
- no prefix.
- (ex. Cumulus & Stratus)
- Altitude is less than 2000m high
- Large amounts of water
- Dense &White

Rain Makers

- Low level clouds that bring precipitation
- NIMB (~numb cause its cold)

  prefix – Nimbo (Nimbostratus)

  suffix – Nimbus (cumulonimbus)

Typically darker due to large amounts of H2O

Cloud Altitudes

- Mid level clouds
- Prefix Alto
- (Ex. Altocumulus, Altostratus)
- Altitude between 2000m – 6000m
- Contain less water
- Infrequent rain or drizzle

Cloud Altitudes

- High level clouds
- Prefix Cirro (Syracuse high Up)
- (Cirrostratus, cirrocumulus)
- Low temps, small amounts of H_2O
- Thin and white, made of ice crystals
- Not rainmakers.

Cloud Altitudes

- Highest Clouds
- Cirrus Clouds (curl of hair)
- (both cirros become Cirr(us))
- Very high, cold, thin, white, wispy
- If followed by more clouds, rain may be coming

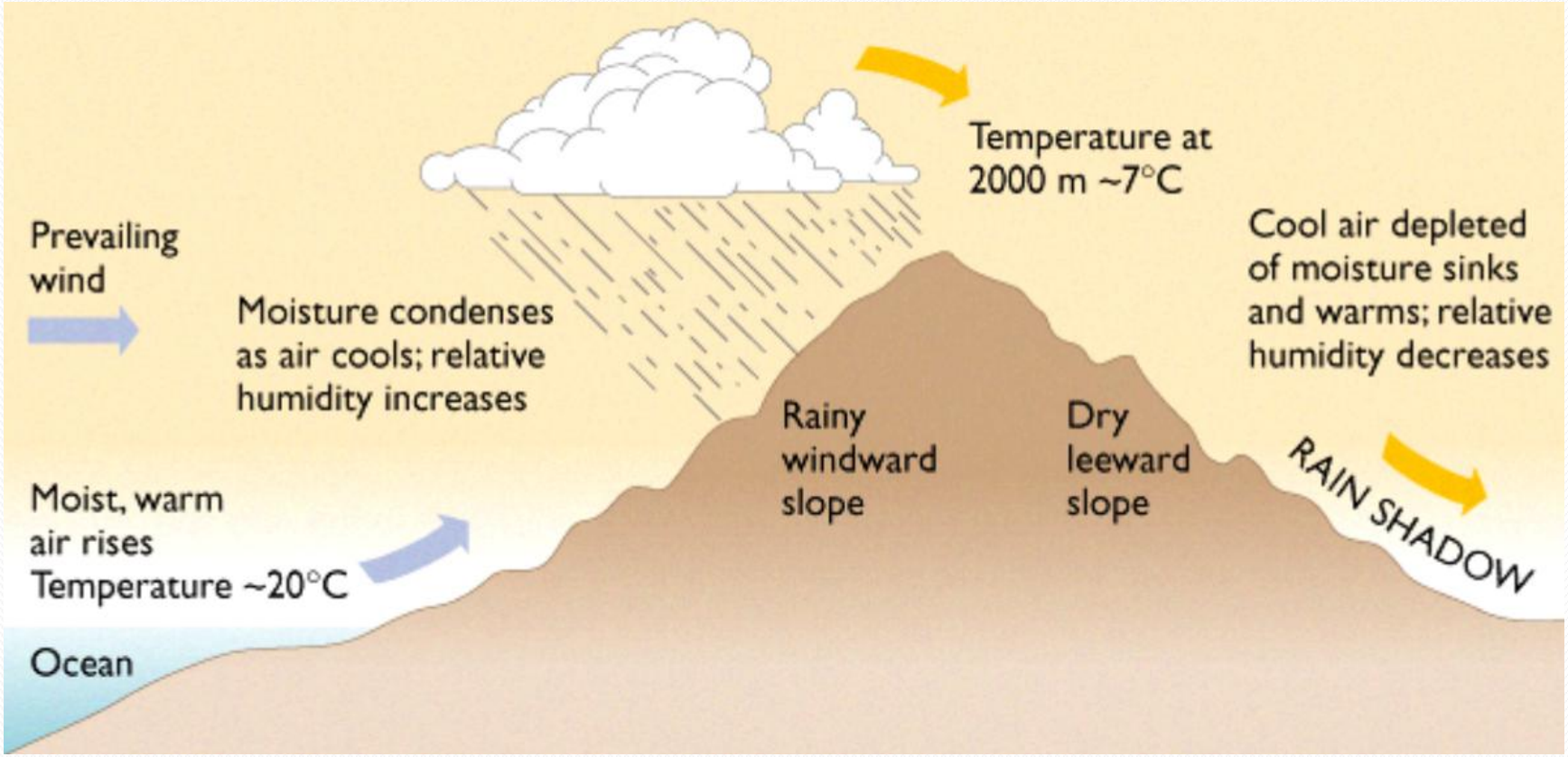
Clouds

- Names can also be combined to form new clouds
- (ex – stratocumulus)

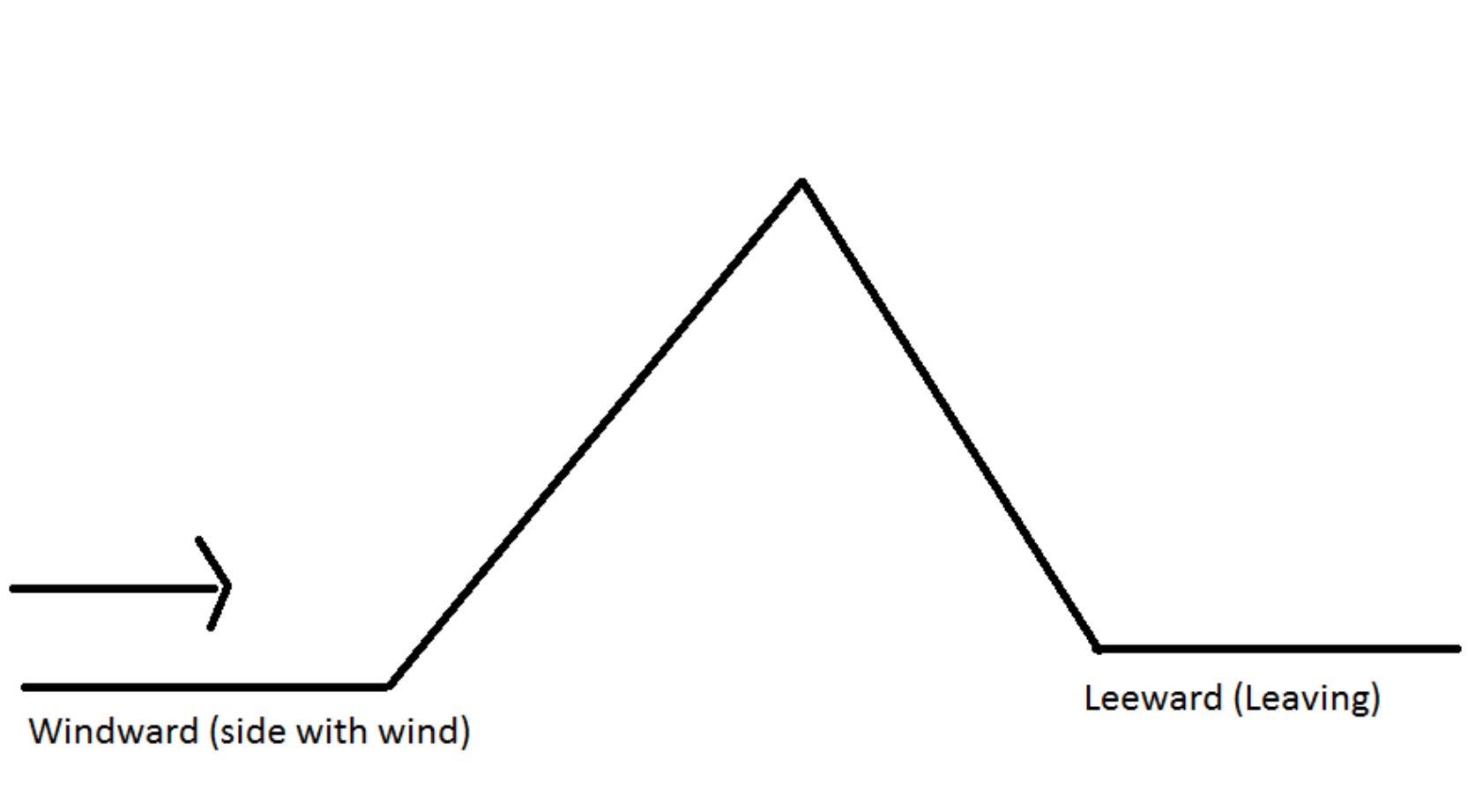
- What is Fog?
- Fog is a cloud on the ground.

- What is Smog?
- Smog = smoke & Fog

(R)


Temperature at
2000 m ~7°C
Prevailing
wind
Moisture condenses
as air cools; relative
humidity increases
Cool air depleted
of moisture sinks
and warms; relative
humidity decreases
Rainy
windward
slope
Dry
leeward
slope
RAIN SHADOW
Moist, warm
air rises
Temperature ~20°C
Ocean

(R)



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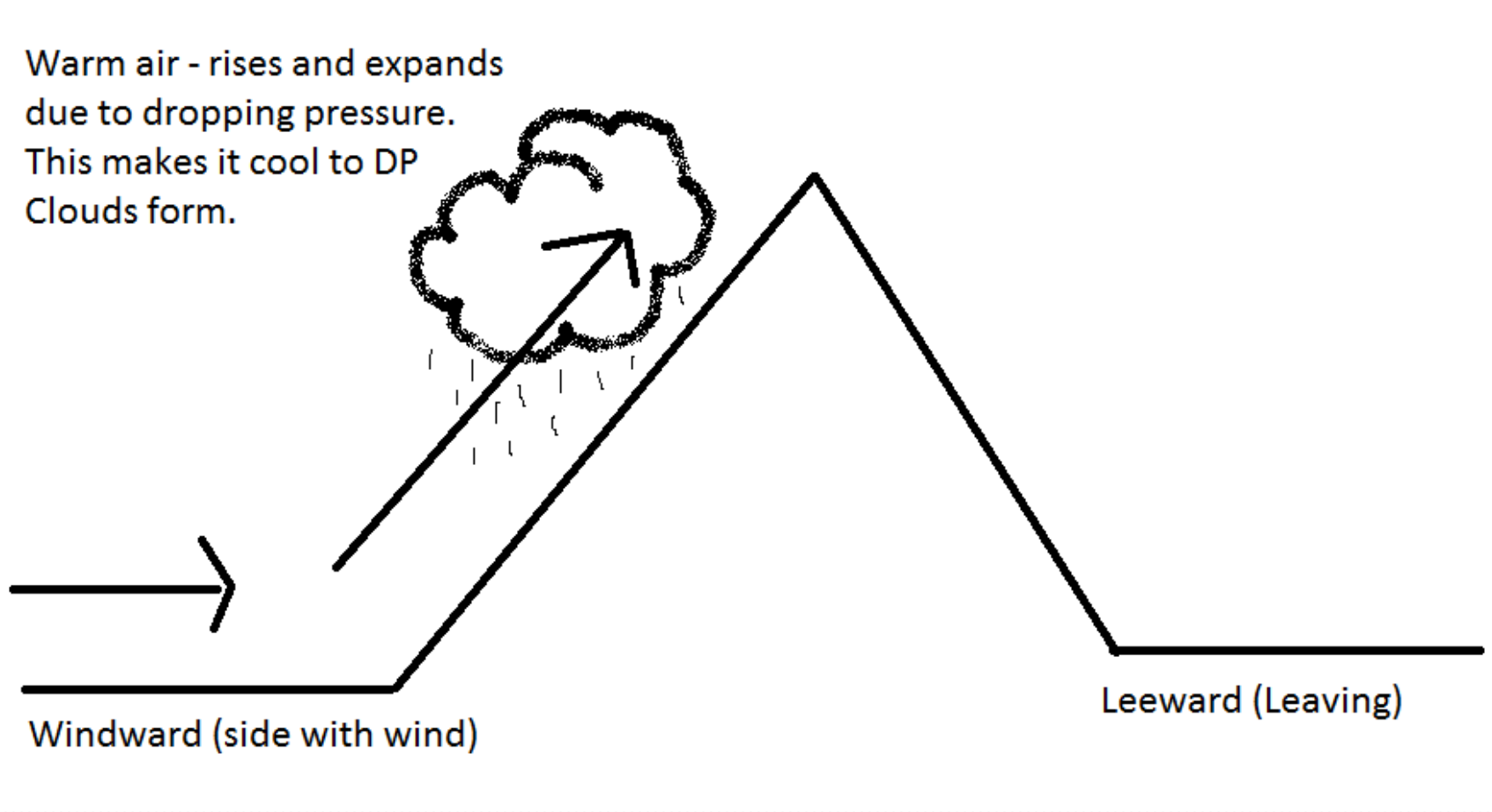
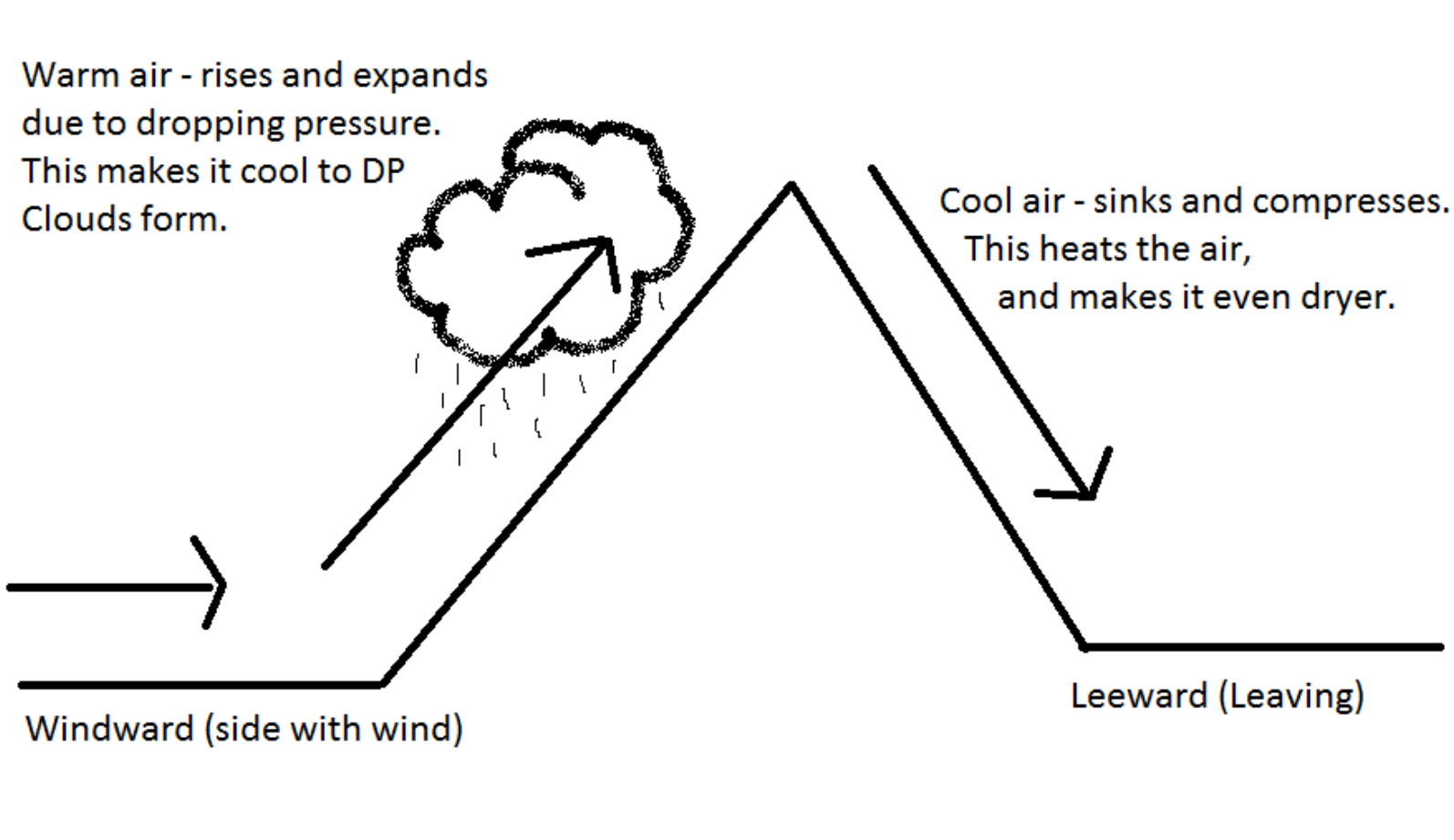
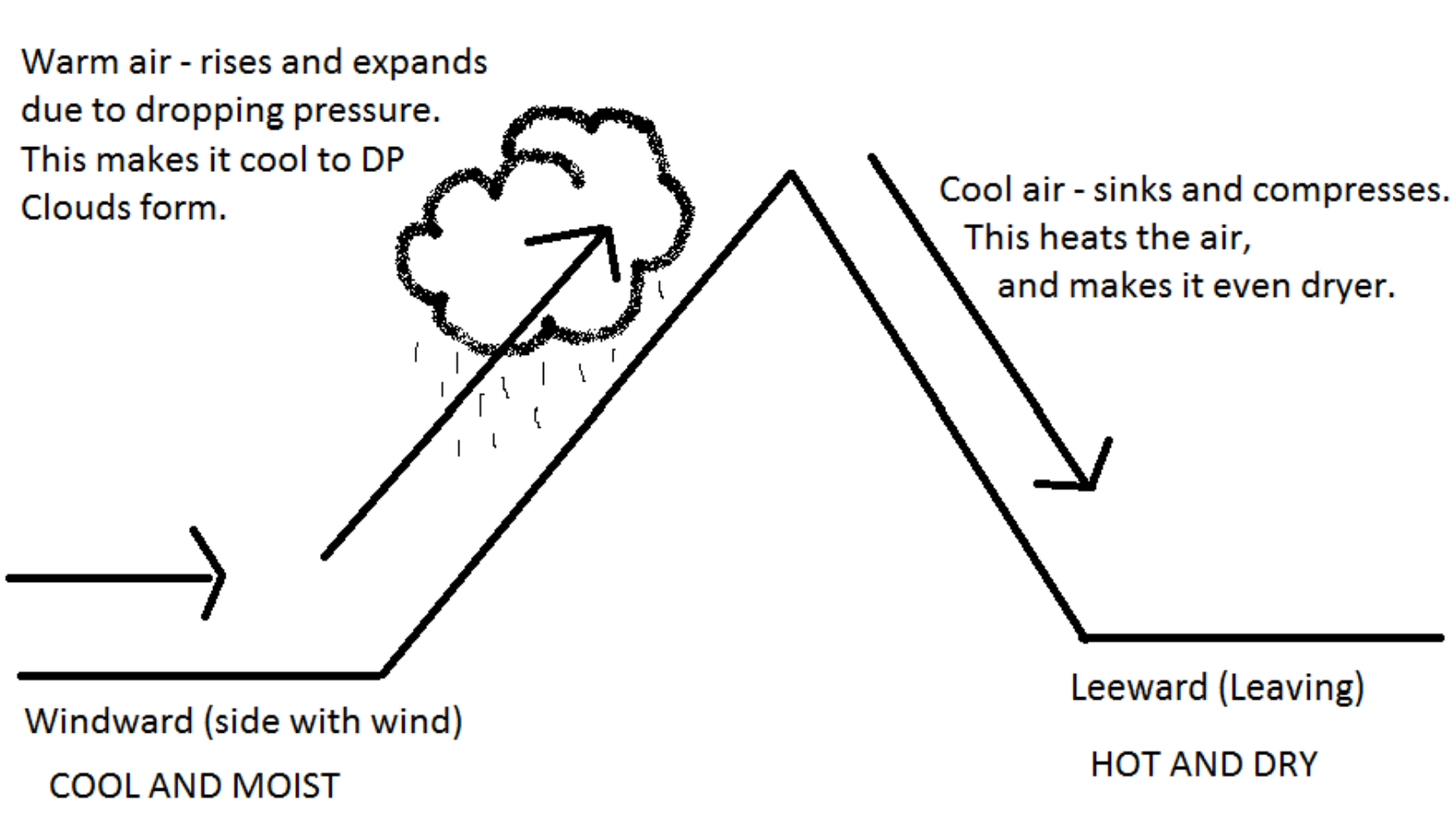

Warm air - rises and expands due to dropping pressure. This makes it cool to DP Clouds form.
Windward (side with wind)
Leeward (Leaving)

(R)


Warm air - rises and expands
due to dropping pressure.
This makes it cool to DP
Clouds form.
Cool air - sinks and compresses.
This heats the air,
and makes it even dryer.
Windward (side with wind)
Leeward (Leaving)

(R)

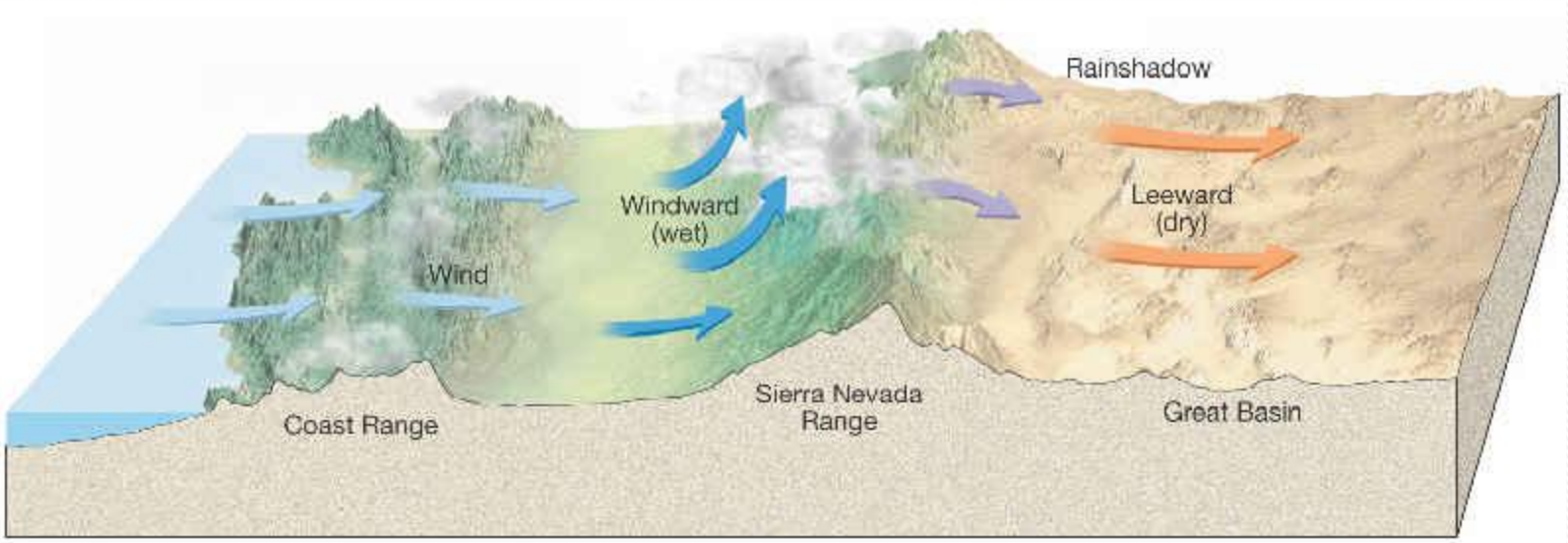

Warm air - rises and expands
due to dropping pressure.
This makes it cool to DP
Clouds form.
Cool air - sinks and compresses.
This heats the air,
and makes it even dryer.
Windward (side with wind)
COOL AND MOIST
Leeward (Leaving)
HOT AND DRY

(R) Mountains

- Orographic Uplift (mountain uplift).
- Is caused when mountains force air up.
- This makes the air expand and cool creating a cloud.
- When the dry air goes back down
- It compresses and heats.

- Cool wet air on the windward side (california)
- Hot dry air on the leeward side (deserts)

(R)



Rainshadow effect is the result of the mountains blocking the rain
And causes deserts.


WINDWARD
LEEWARD

Precipitation

- What is precipitation?
- Precipitation is moisture falling from the sky.
- What types of precipitation are there?
- Rain
- Snow
- Hail
- Sleet
- Freezing rain

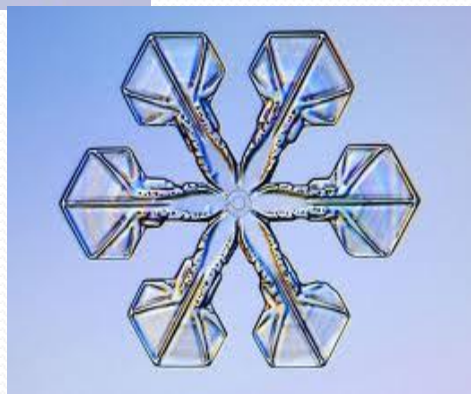
- Rain.
- Rain: most common form of precipitation (liquid)
- Starts as H_2O droplets

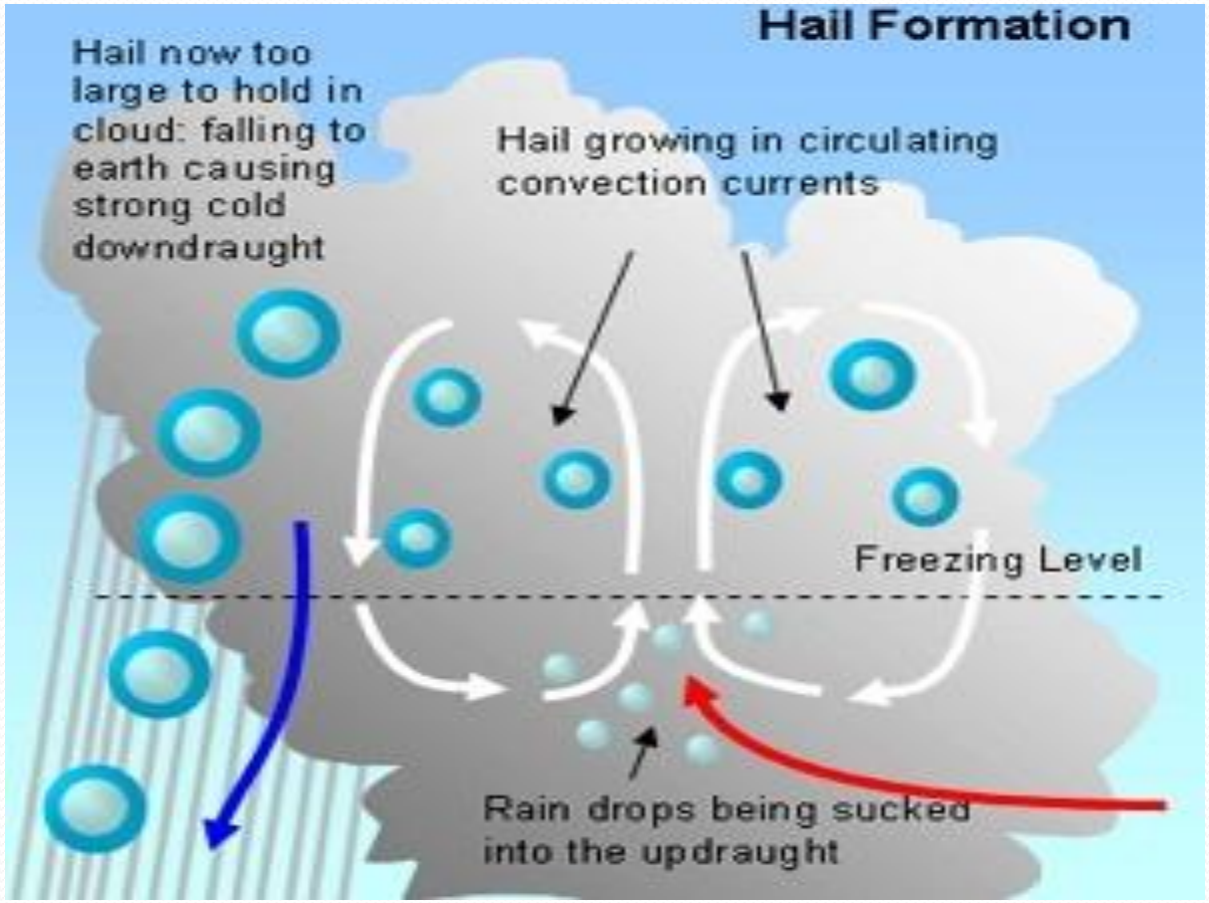
  or ice crystals in the cloud (that melt on way down)

What do raindrops look like?

- Due to falling most drops look like hamburger buns.

- Snow
- When ice crystals fall from the sky, but it is too cold for them to melt.

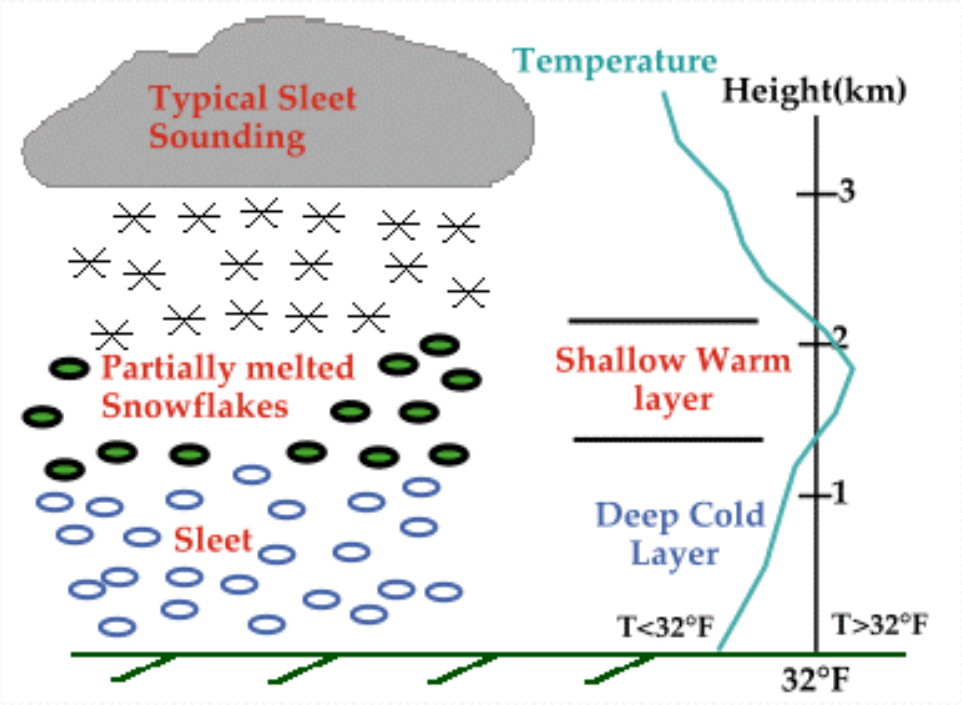



Hail Formation
Hail now too large to hold in cloud: falling to earth causing strong cold downdraught
Hail growing in circulating convection currents
Freezing Level
Rain drops being sucked into the updraught

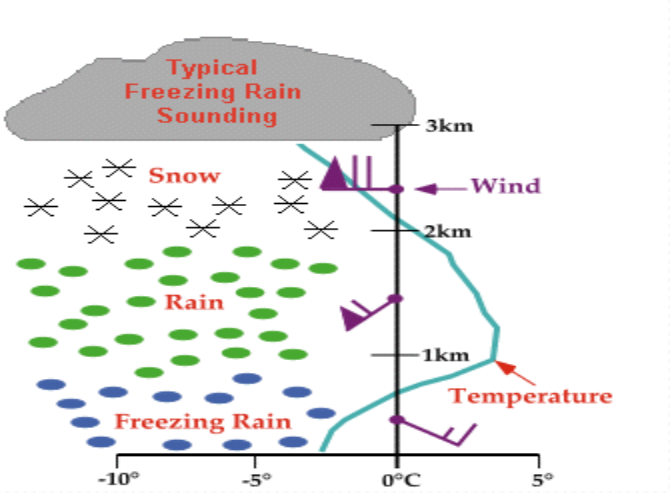

©2002 Scott Blair

- Hail.
- Hail forms when rain gets pushed back upwards in an updraft. On the way up it refreezes and adds a layer of ice.
- Then it falls back down, melts, gets pushed back up and the cycle continues until it is too heavy and falls to earth.
- As hail stones crash in the clouds, static gets built up and can create a charge for lightning.

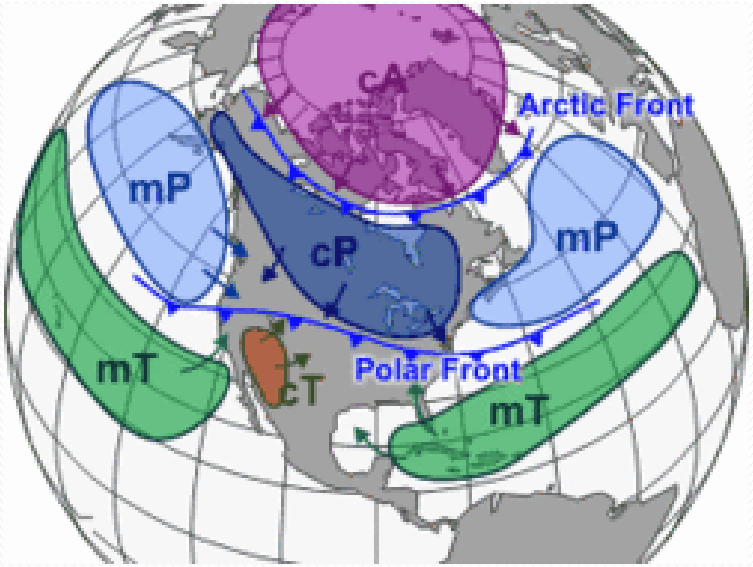
- Sleet.
- Sleet forms when snow partially melts and refreezes before it hits the ground. (sleet bounces)
- Very slushy.



- Freezing rain.
- Freezing rain is when rain hits a very cold layer just as it hits the surface and covers it with ice.
- Most dangerous form of precipitation.
- (horrible roads, downed trees and power lines)



Fronts



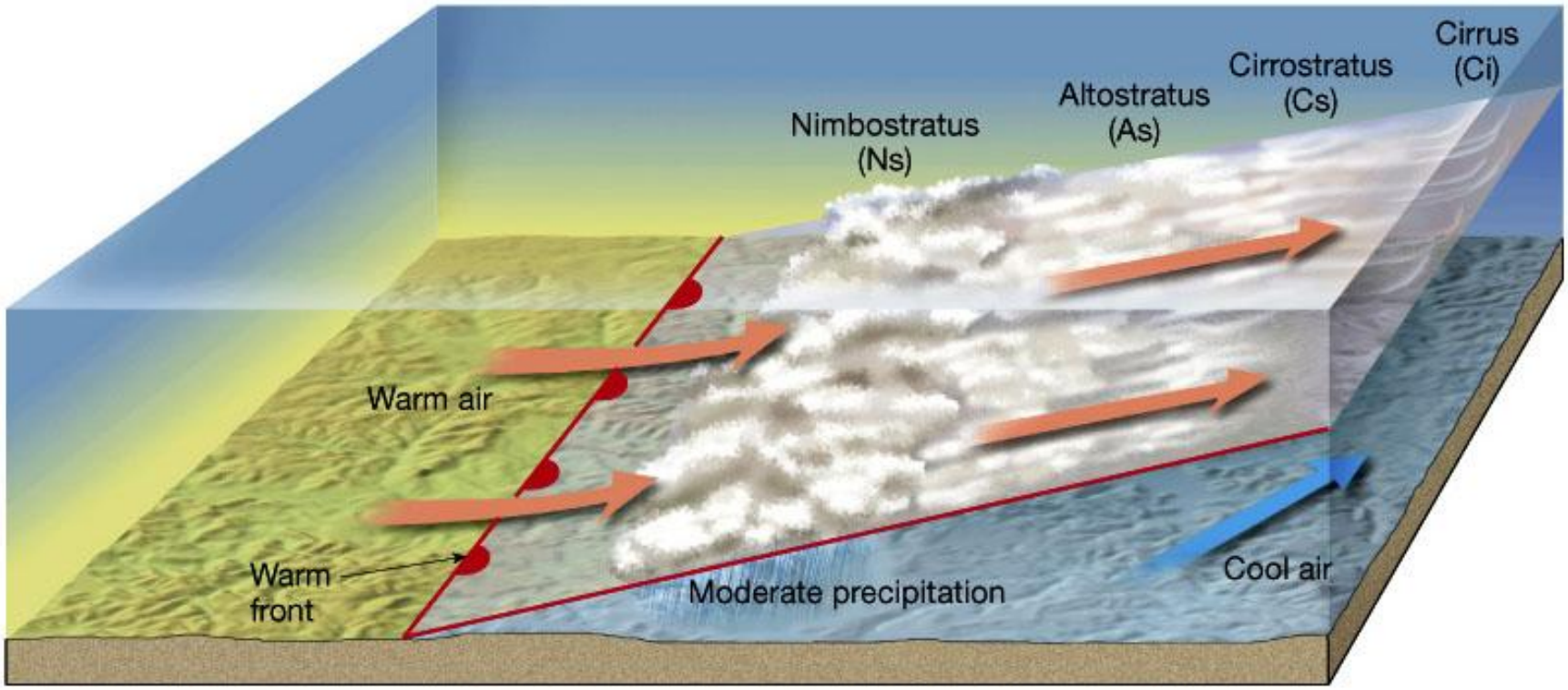
What is a front?

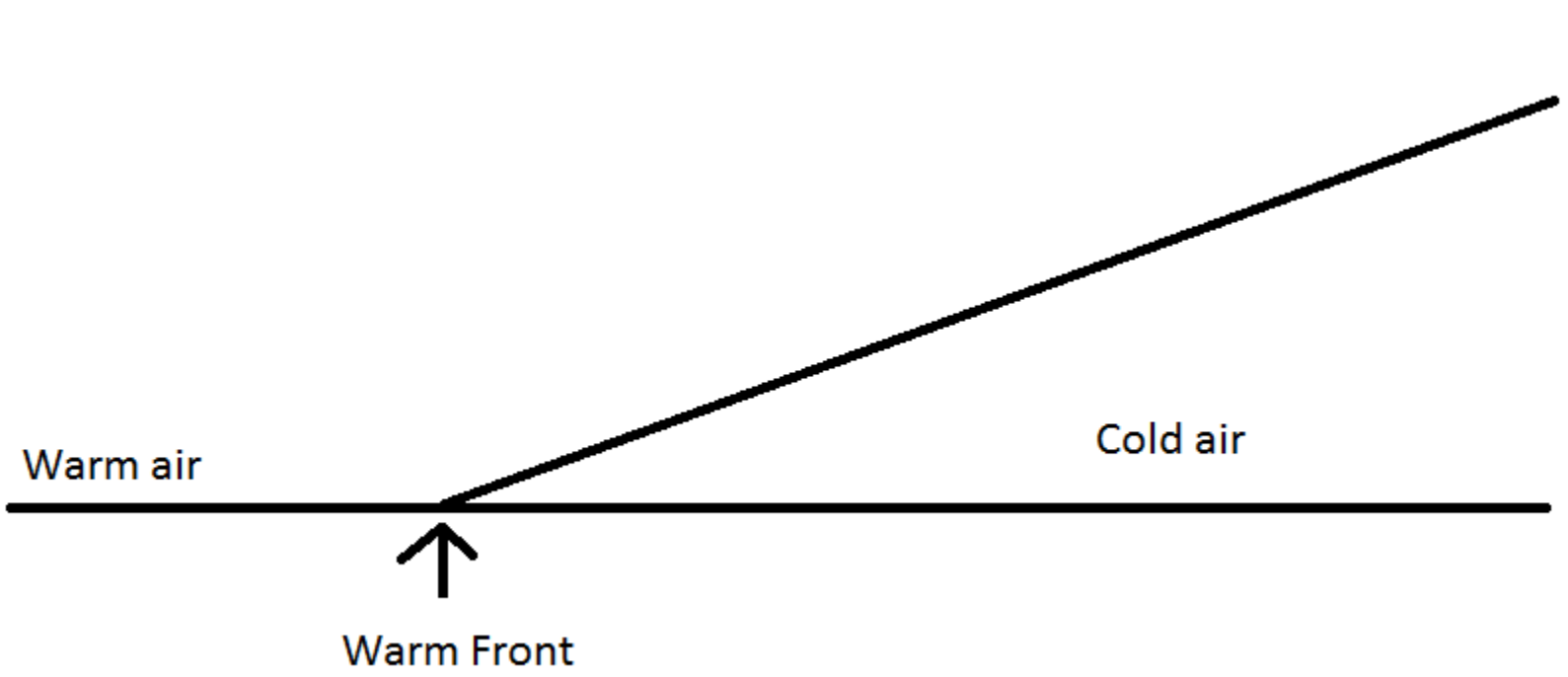
A front is the leading edge of a new air mass.

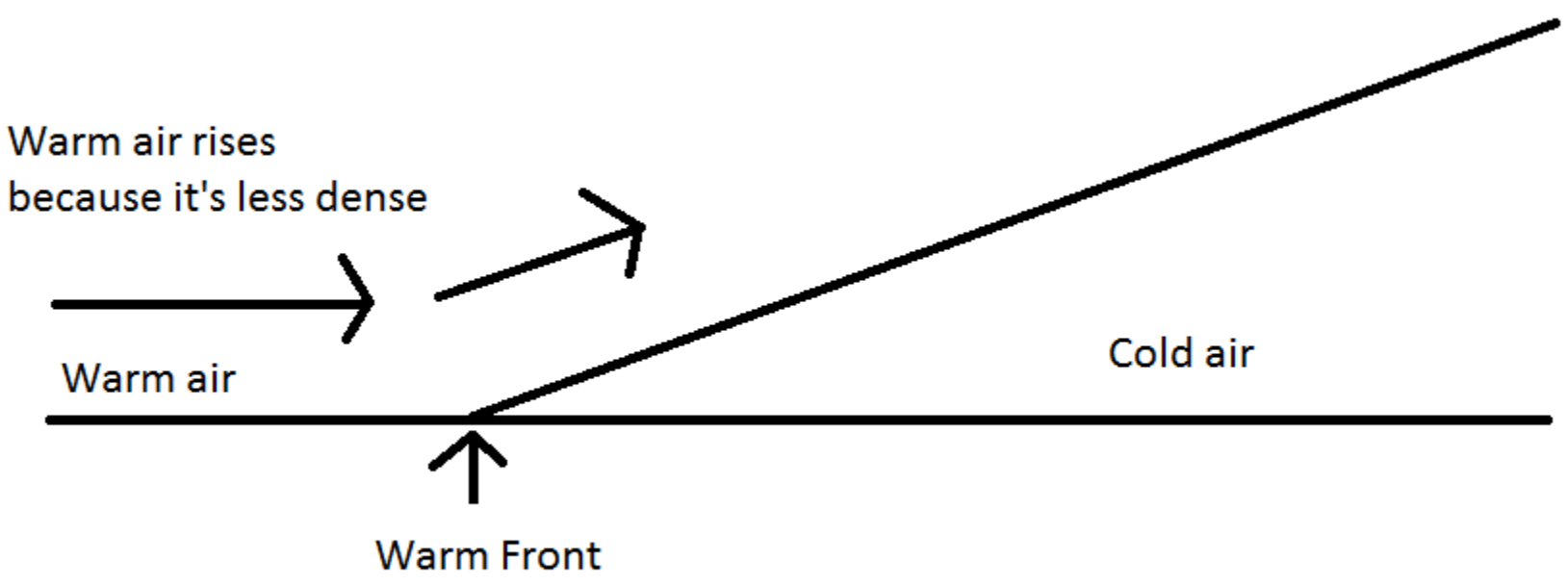
Warm fronts bring warmer air (temp rises 10 degs +)

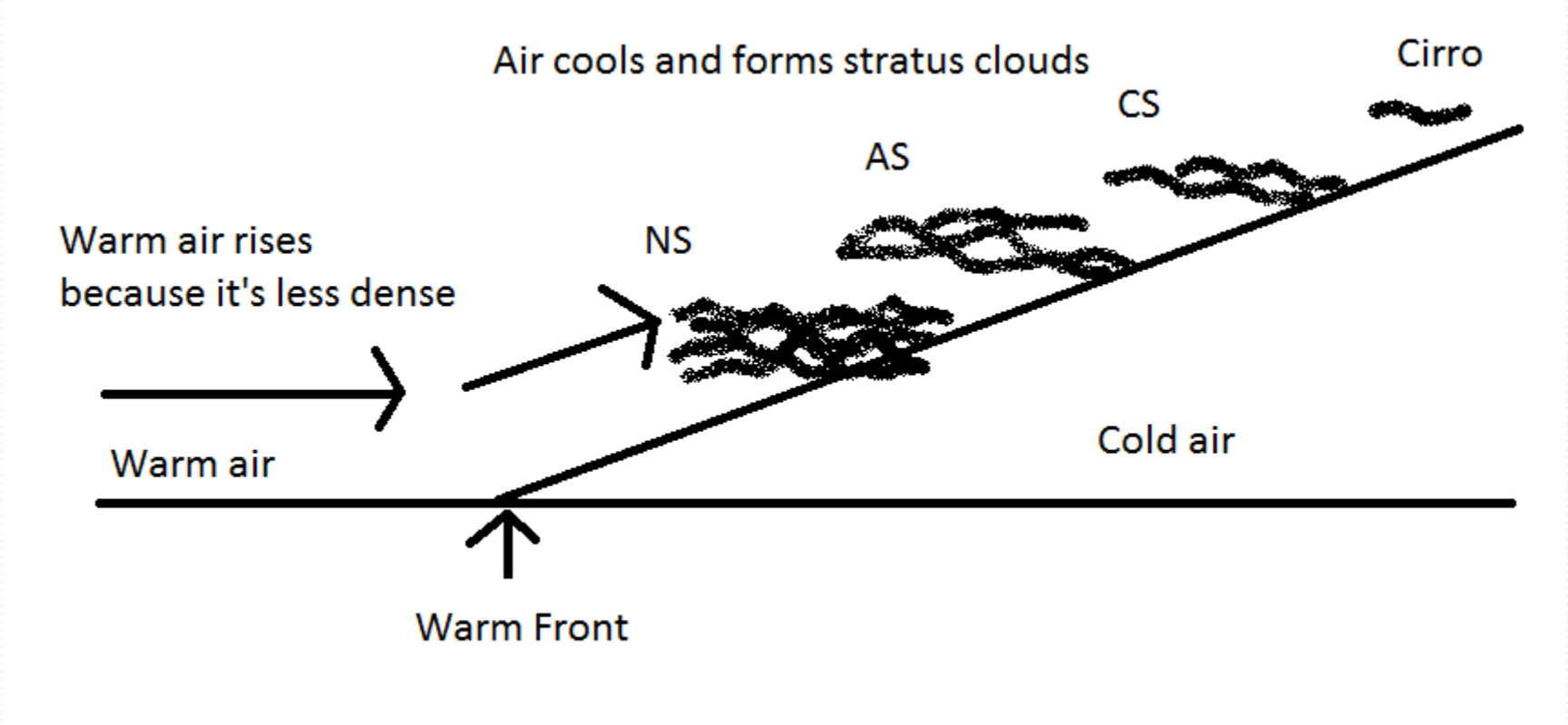
Cold fronts bring colder air (temp drops 10 degs +)

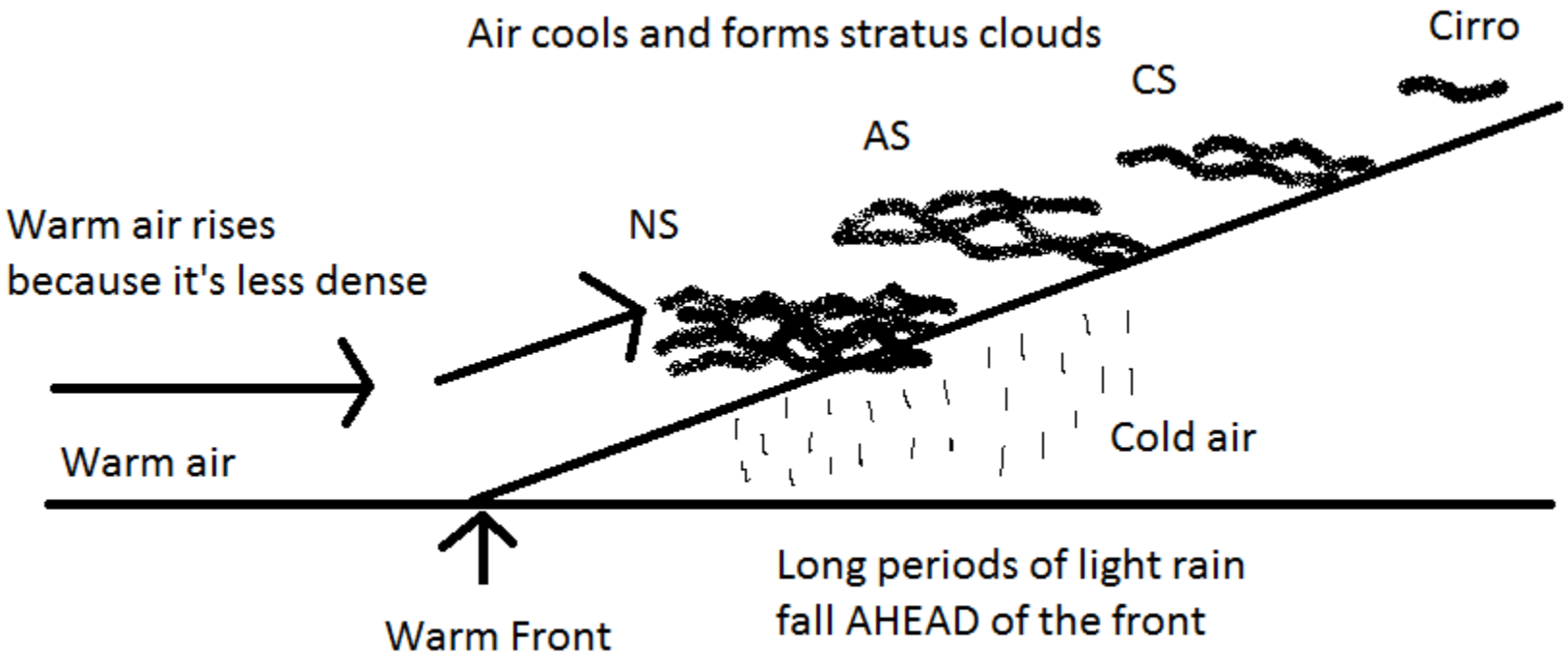
Warm Front


Cirrus
(Ci)
Cirrostratus
(Cs)
Altostratus
(As)
Nimbostratus
(Ns)
Warm air
Warm
front
Moderate precipitation
Cool air

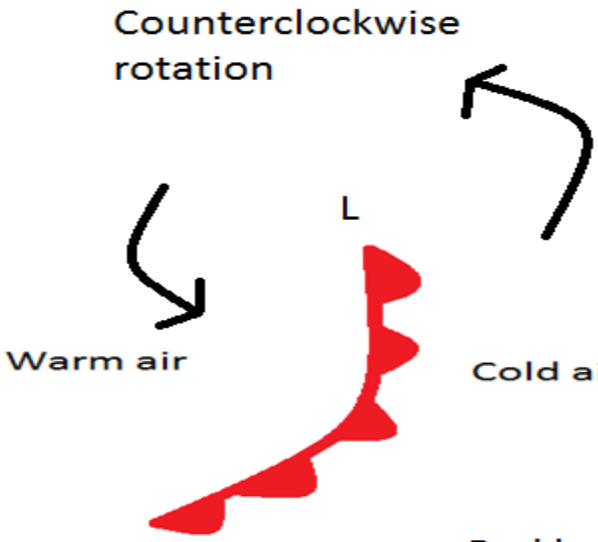

Warm air
Cold air
Warm Front


Warm air rises
because it's less dense
Warm air
Cold air
Warm Front


Air cools and forms stratus clouds
Cirro
CS
AS
NS
Warm air rises
because it's less dense
Warm air
Cold air
Warm Front

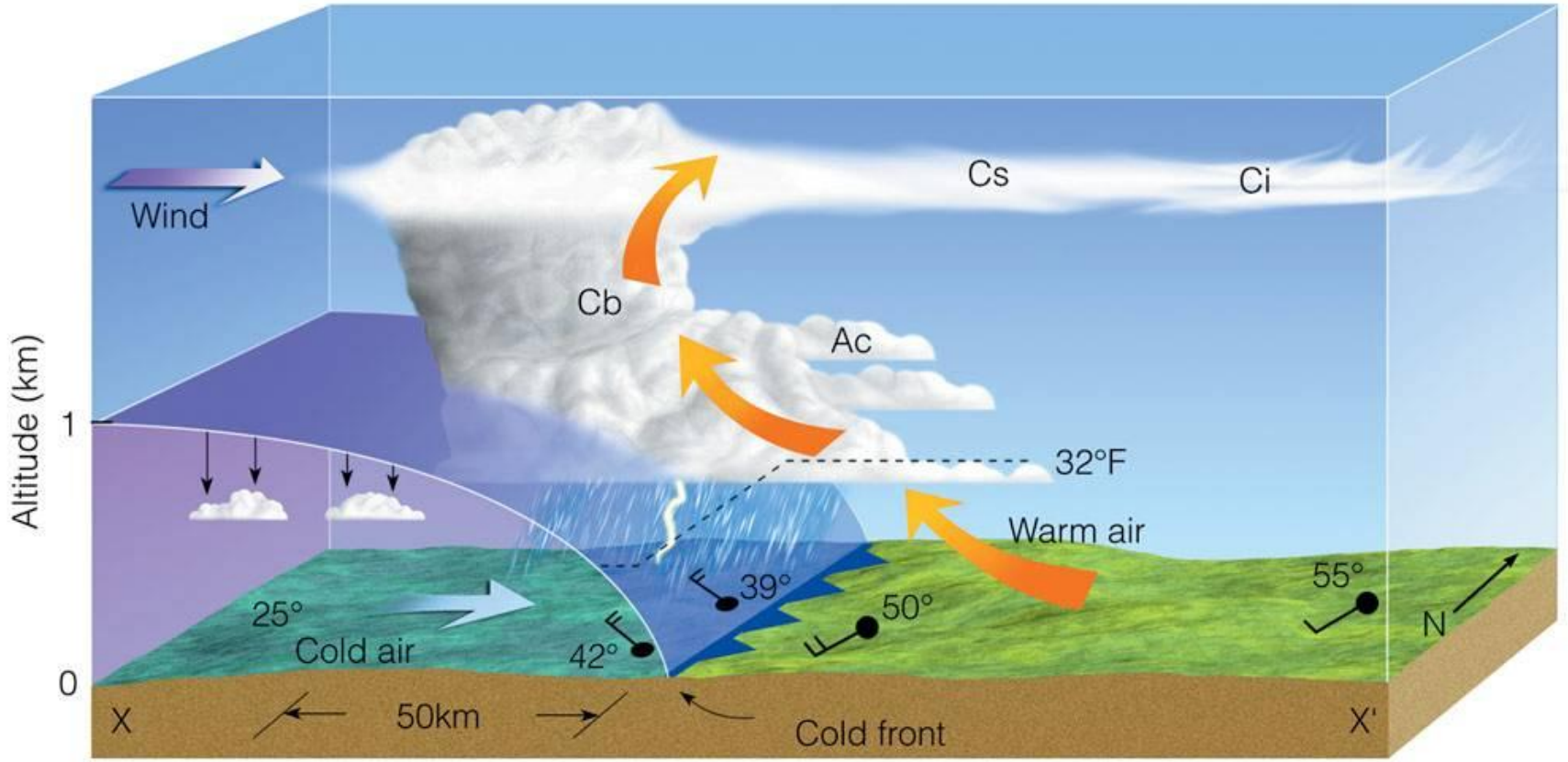

Air cools and forms stratus clouds
Cirro
CS
AS
NS
Warm air rises
because it's less dense
Warm air
Cold air
Warm Front
Long periods of light rain
fall AHEAD of the front

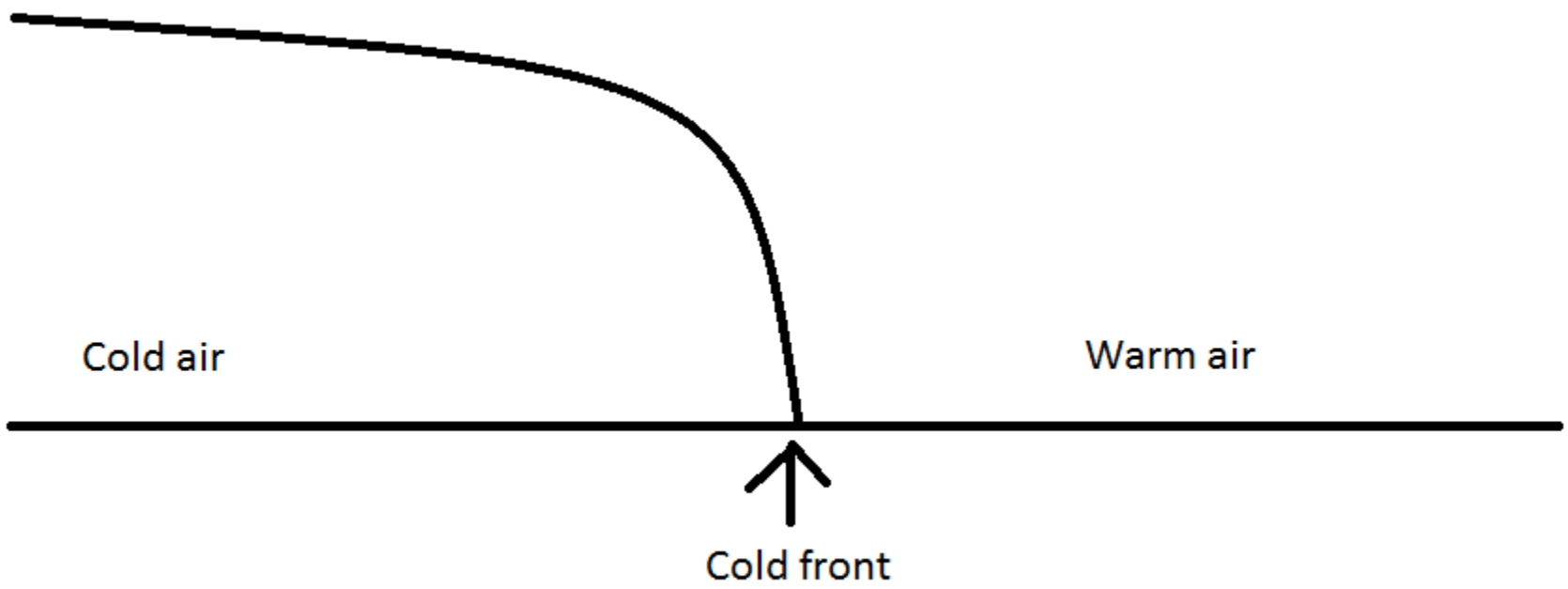
- Warm Fronts.
- Warm fronts: Warm air (less dense) rises above cold air.
- As it rises it cools and creates stratus clouds.
- Long periods of light rain fall AHEAD of the front. (Warming Warning)

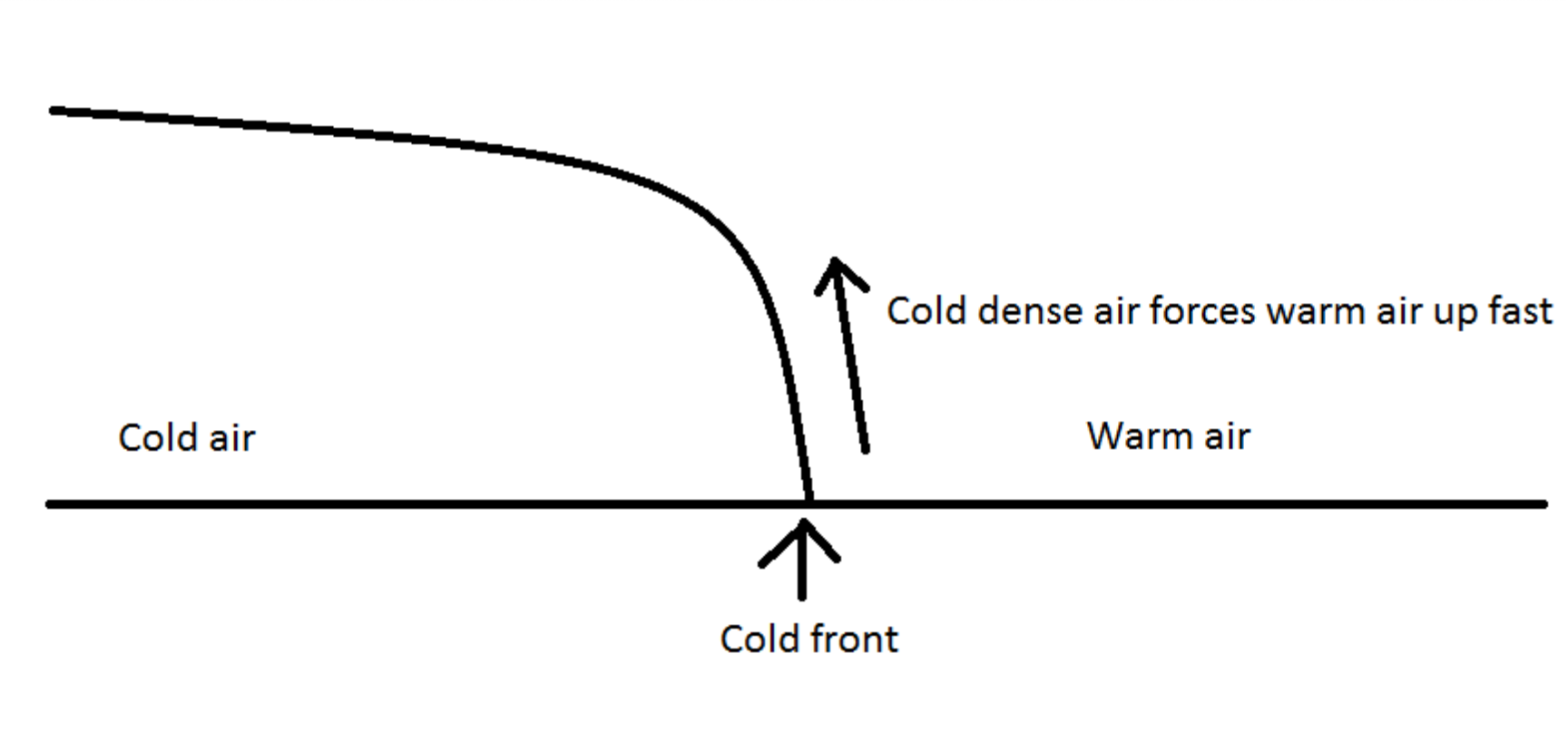


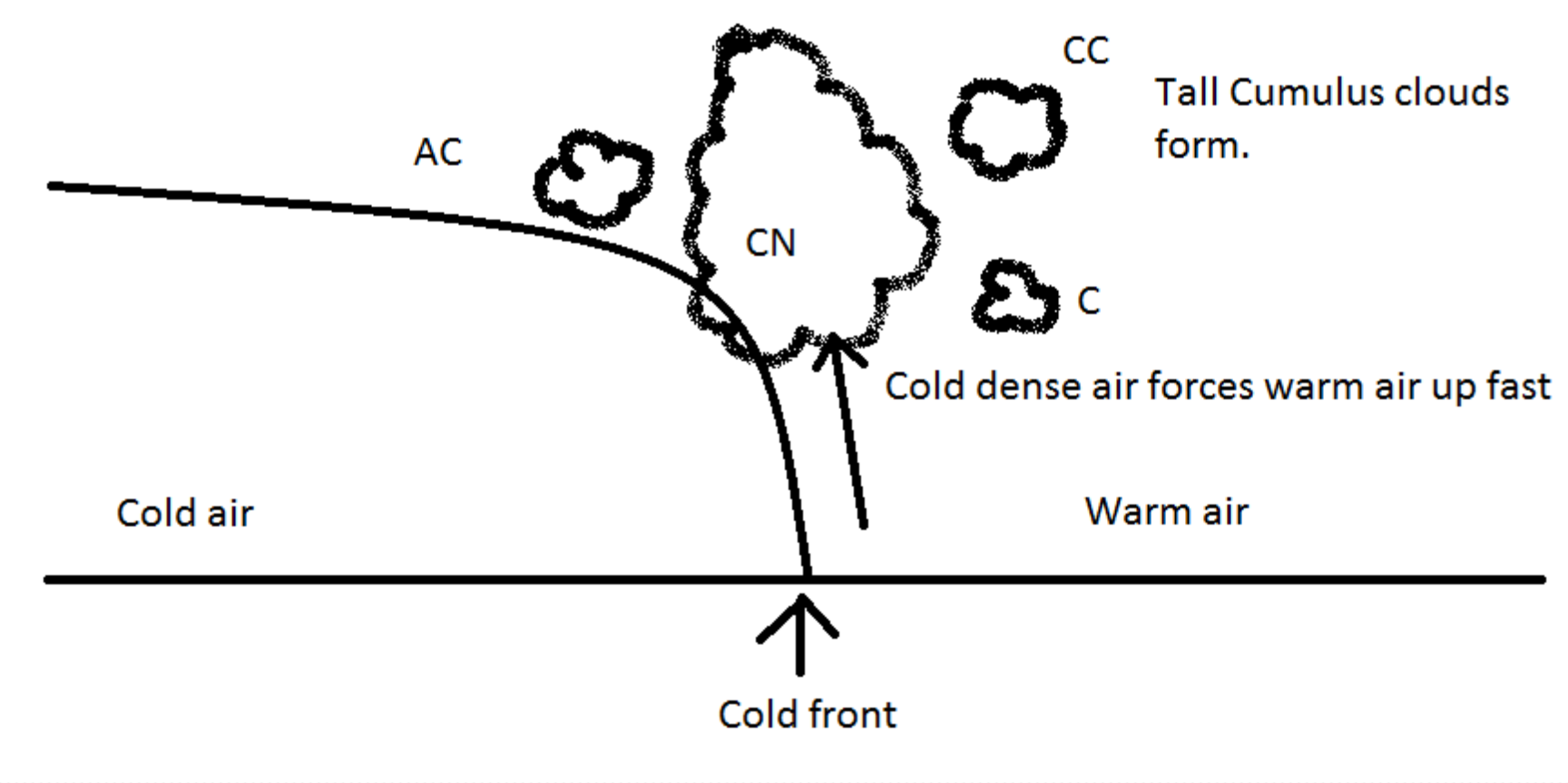
Symbols show direction of movement.

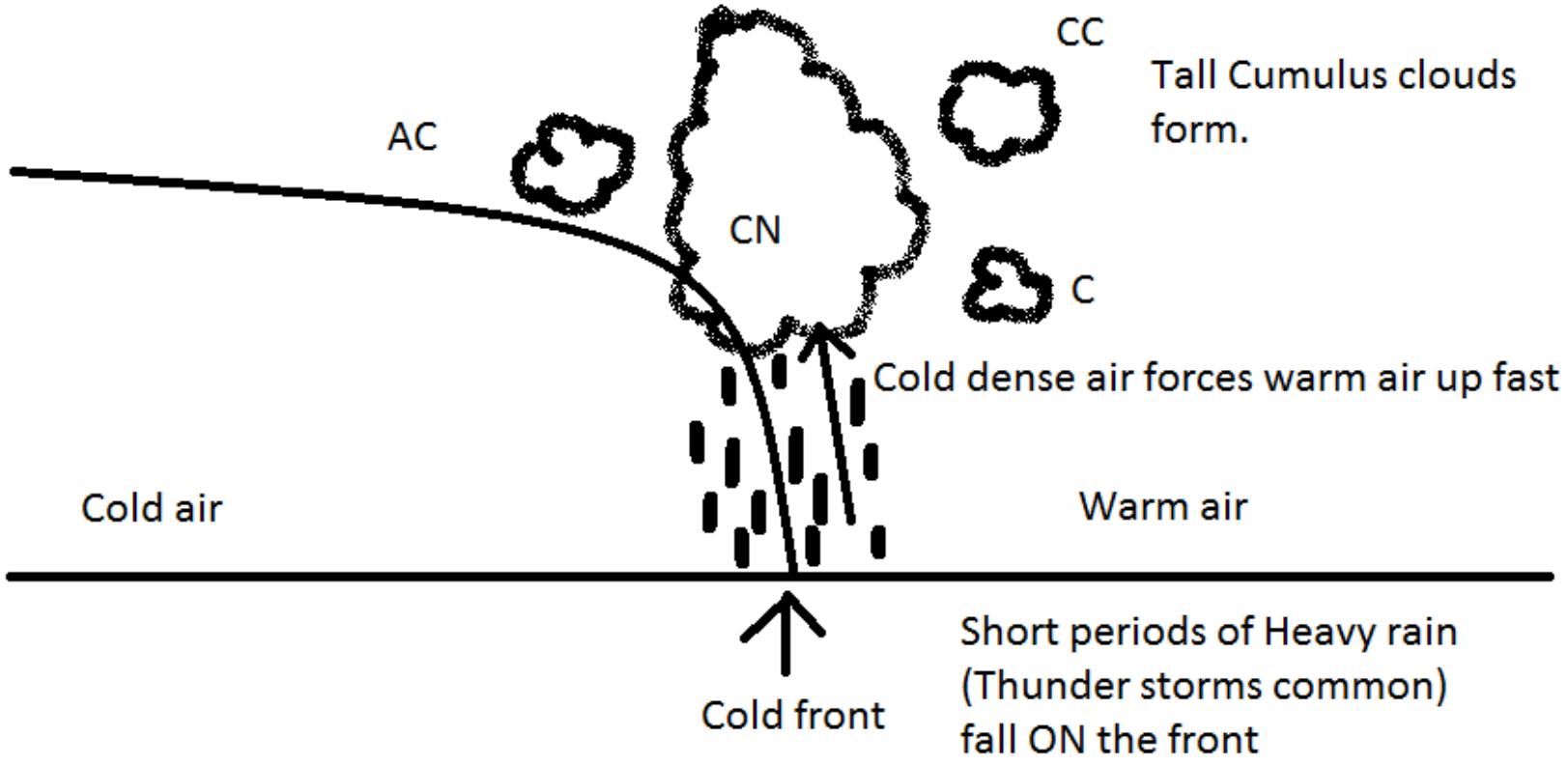
Cold Fronts



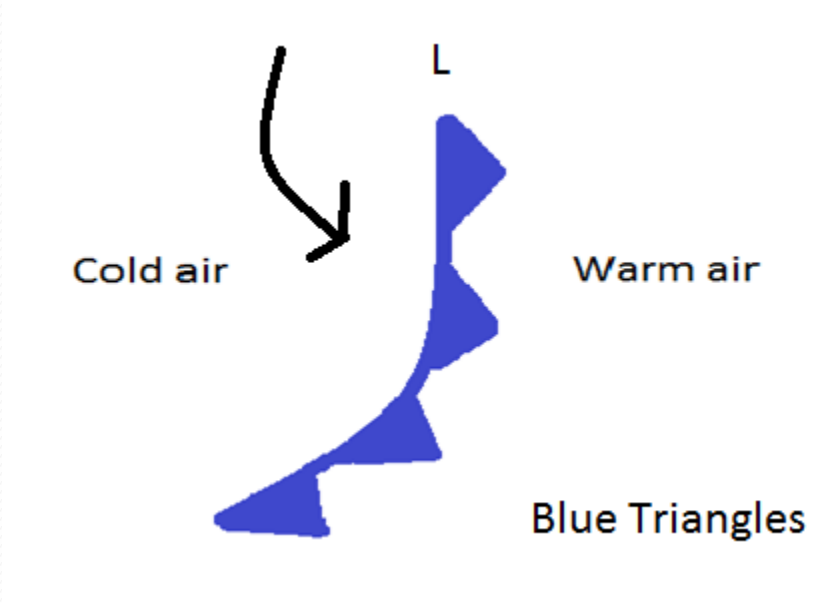

Cold air
Warm air
Cold front

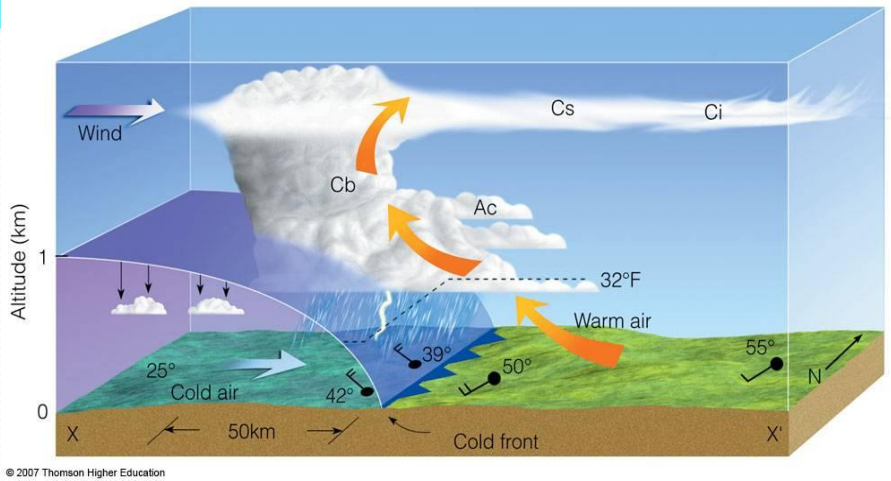

Cold dense air forces warm air up fast
Cold air
Warm air
Cold front

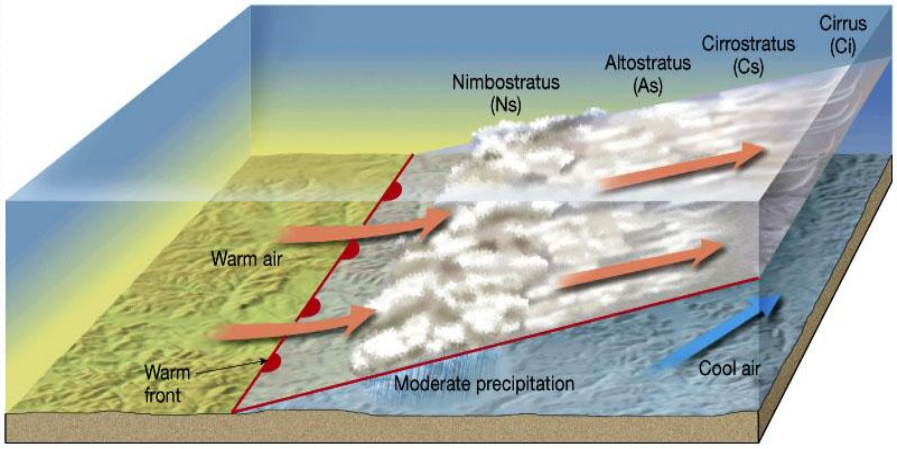

CC
Tall Cumulus clouds form.
AC
CN
C
Cold dense air forces warm air up fast
Cold air
Warm air
Cold front


CC
Tall Cumulus clouds form.
AC
CN
C
Cold dense air forces warm air up fast
Cold air
Warm air
Cold front
Short periods of Heavy rain
(Thunder storms common)
fall ON the front

- Cold Fronts.
- Cold fronts: Fast moving cold air forces warm air up.
- Cumulus clouds get created (Cold = Cumulus)
- Periods of heavy short rain (Thunder common) fall on the front.

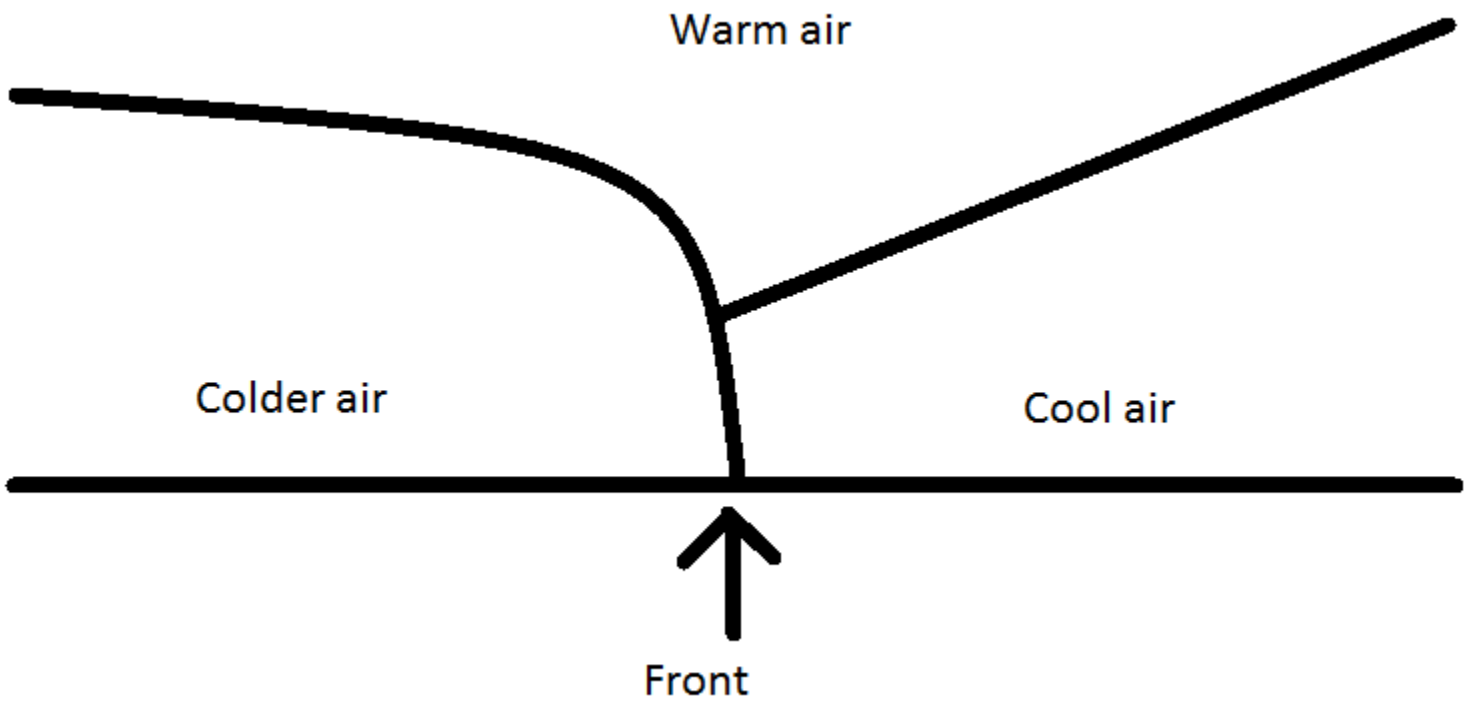


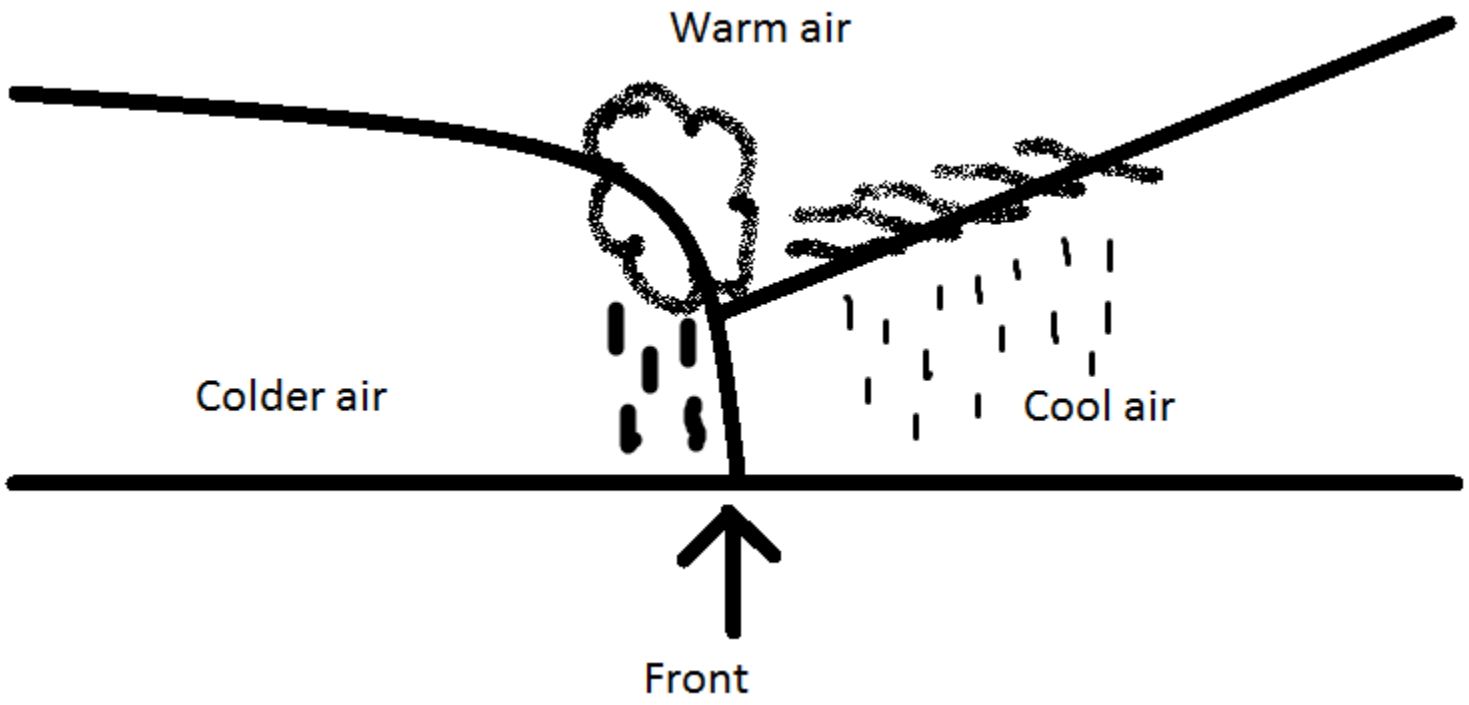


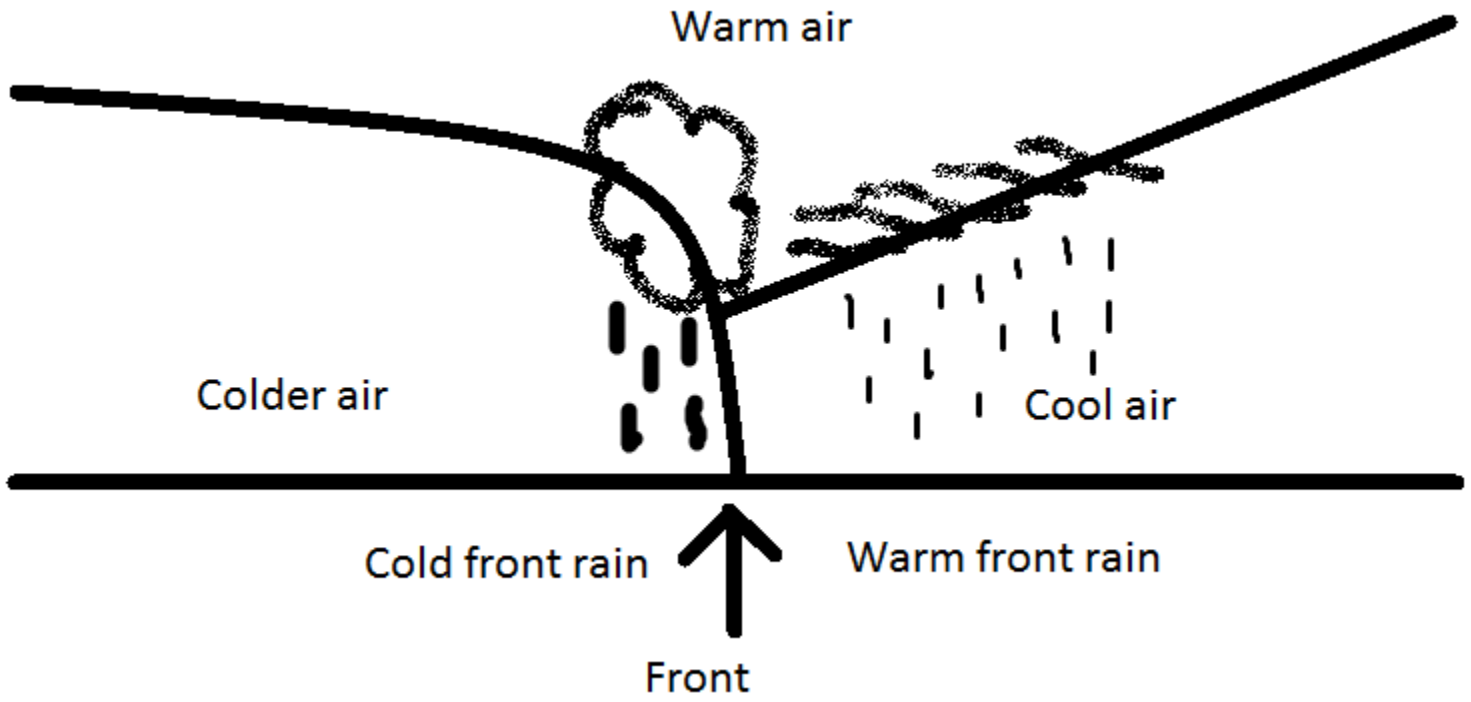


Occluded Front

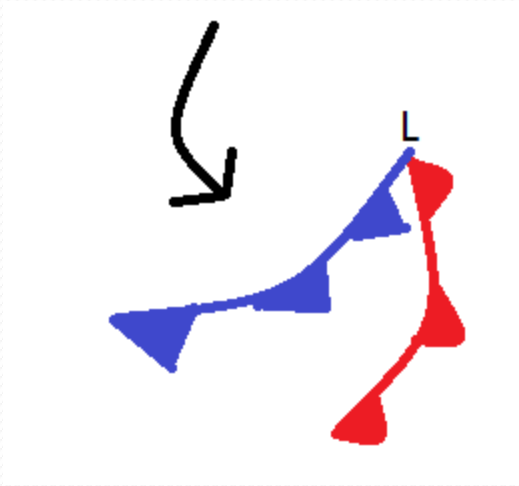
Occluded Front

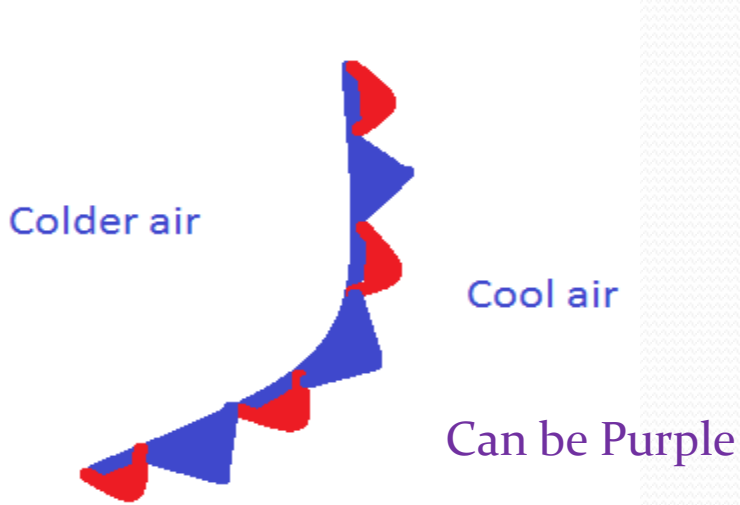



Warm air
Colder air
Cool air
Front

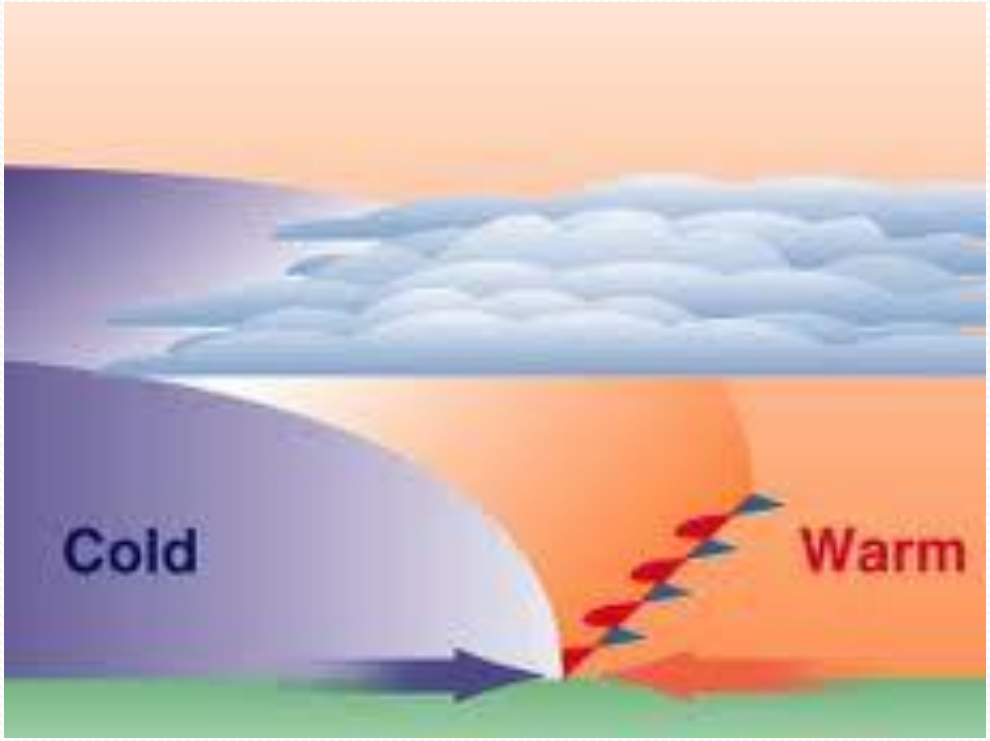

Warm air
Colder air
Cool air
Cold front rain
Warm front rain
Front

- Occluded Front (both fronts included).
- Occluded Front: When a cold front over takes a warm front (cold fronts move faster)
- It acts as a warm front at first and then a cold front.
- Warm and Cold fronts <u>includ</u>ed in Occluded

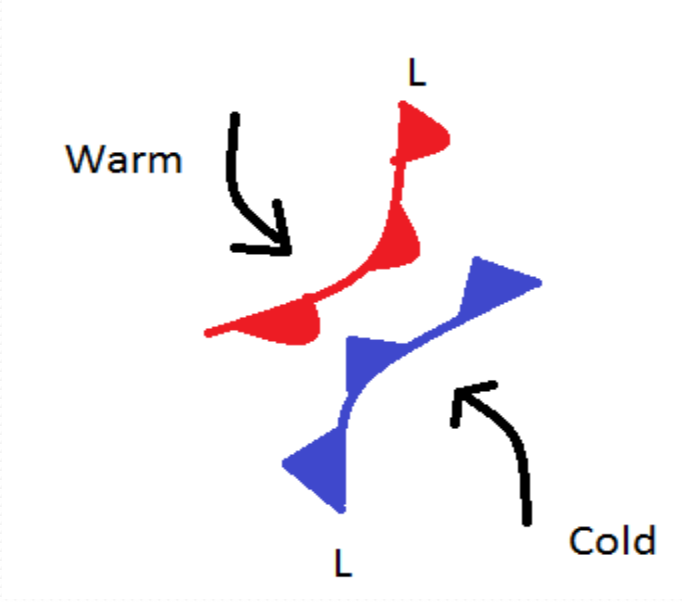


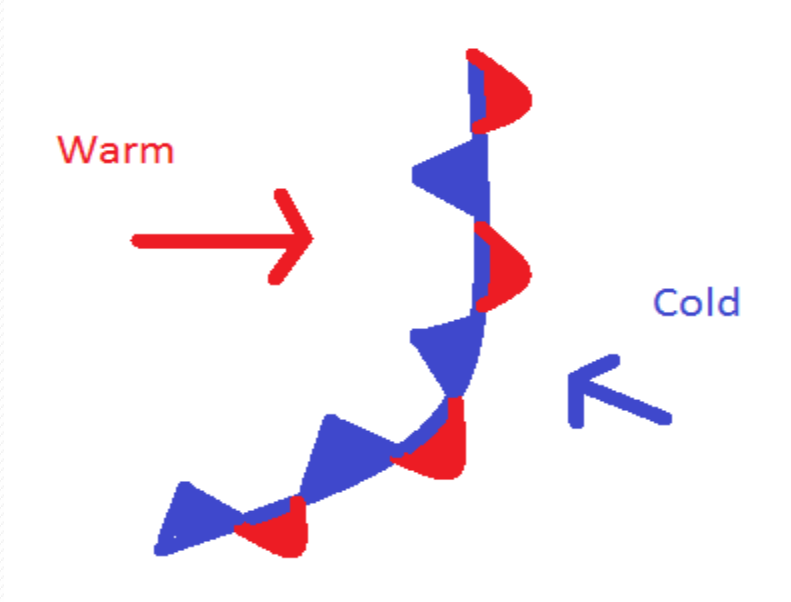


Stationary Front



- Stationary Front.
- Stationary Front: when a warm front and cold front collide they stop.
- This causes long periods of rain in one area.



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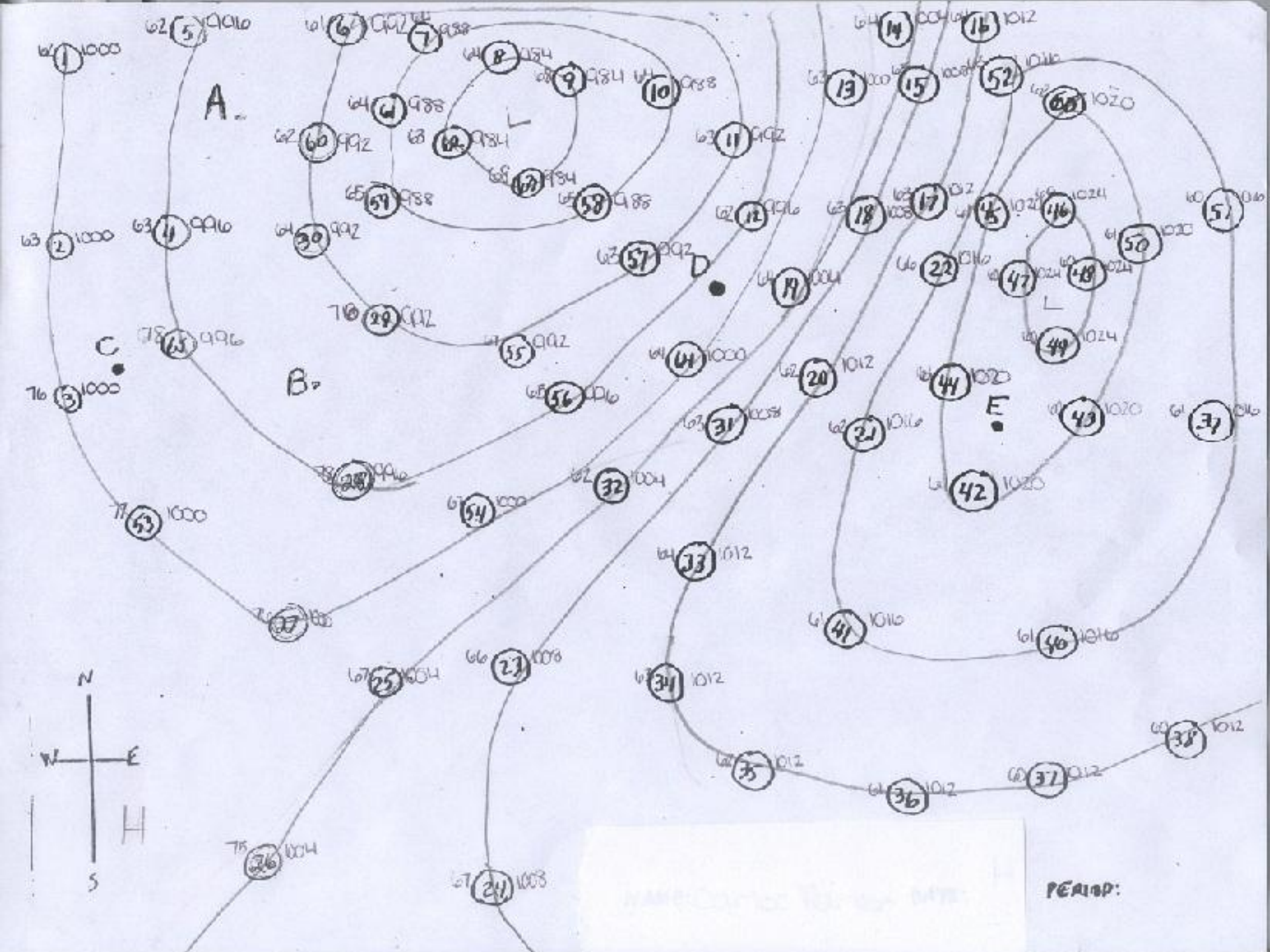
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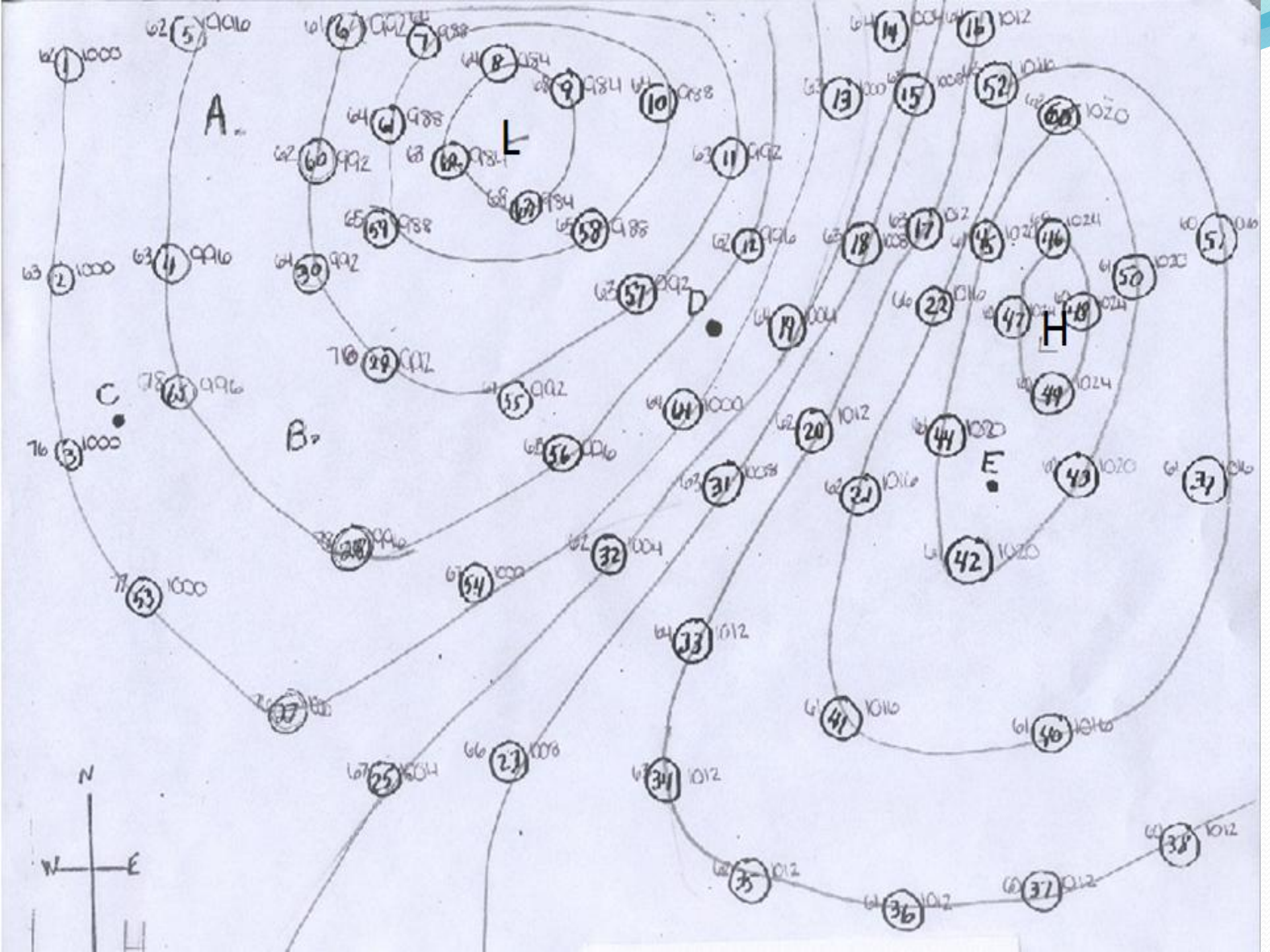
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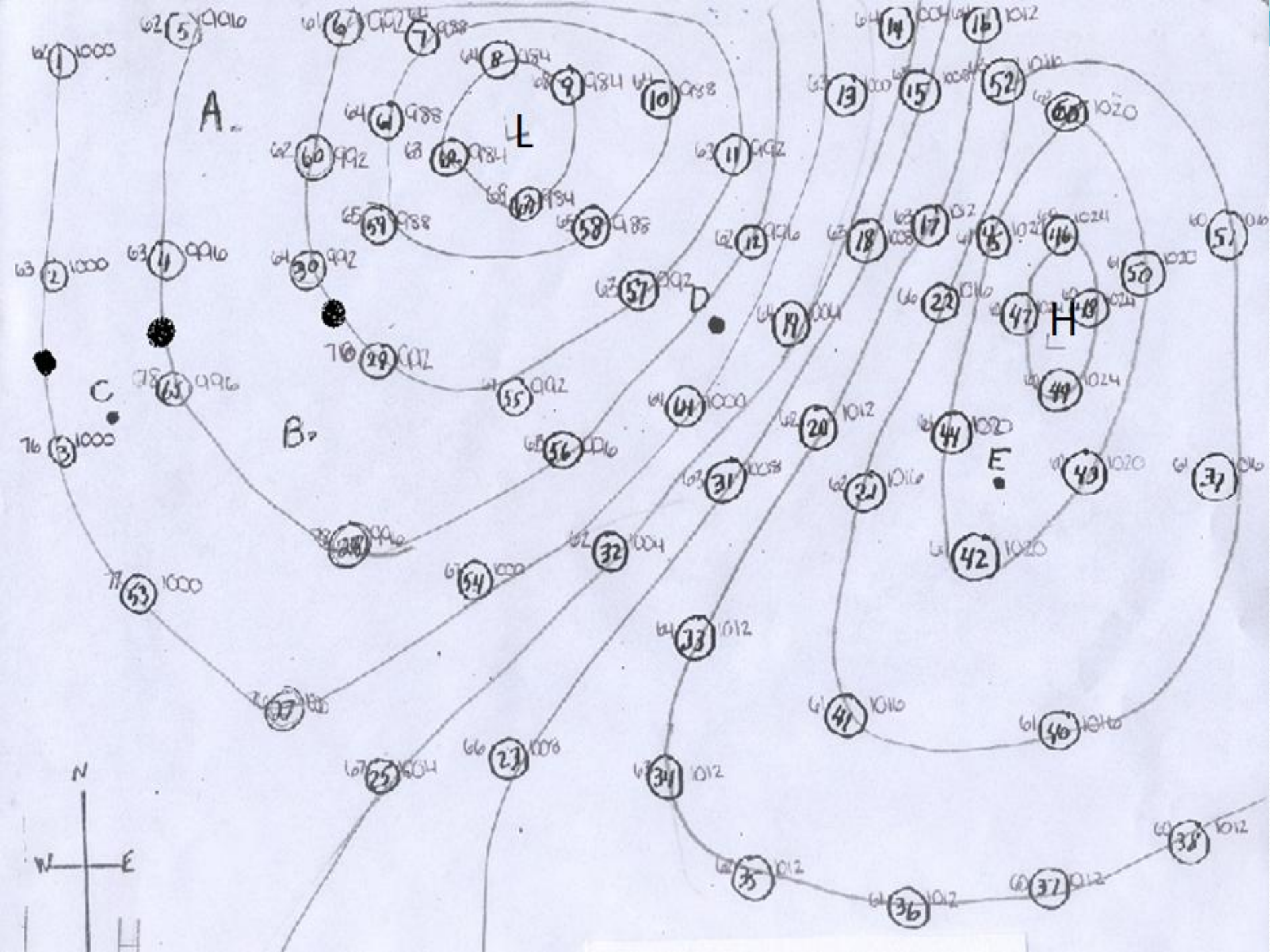
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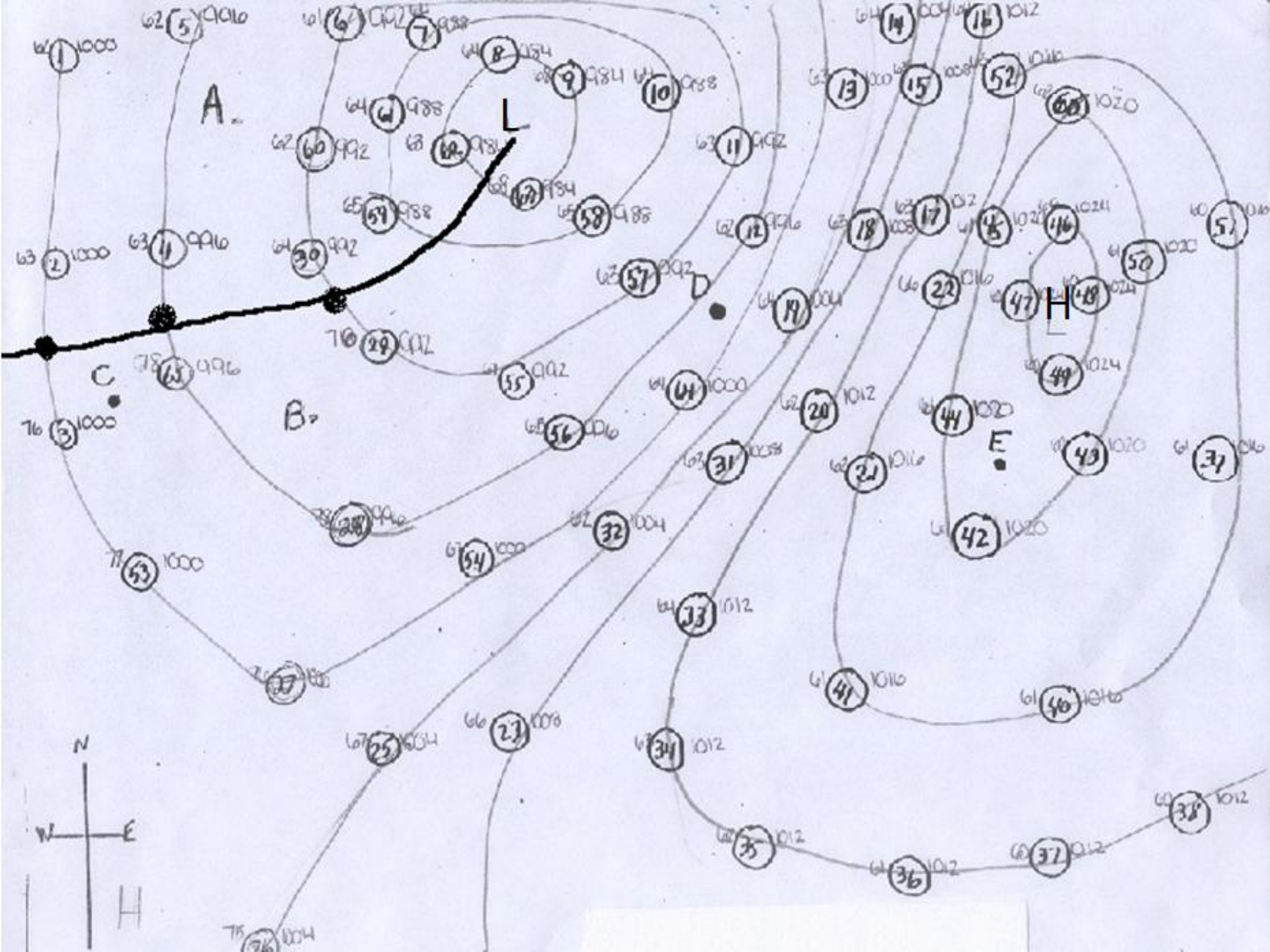
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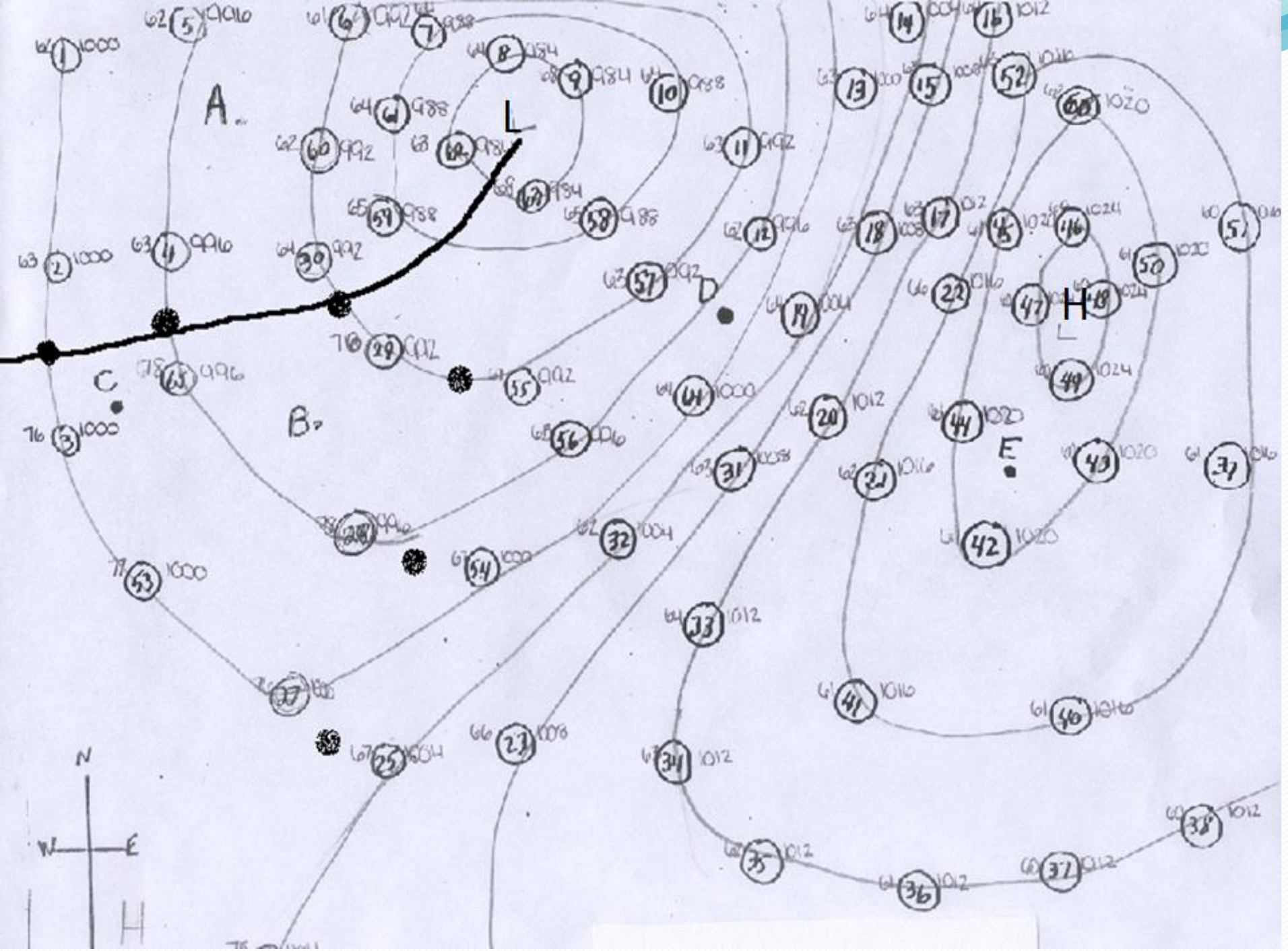
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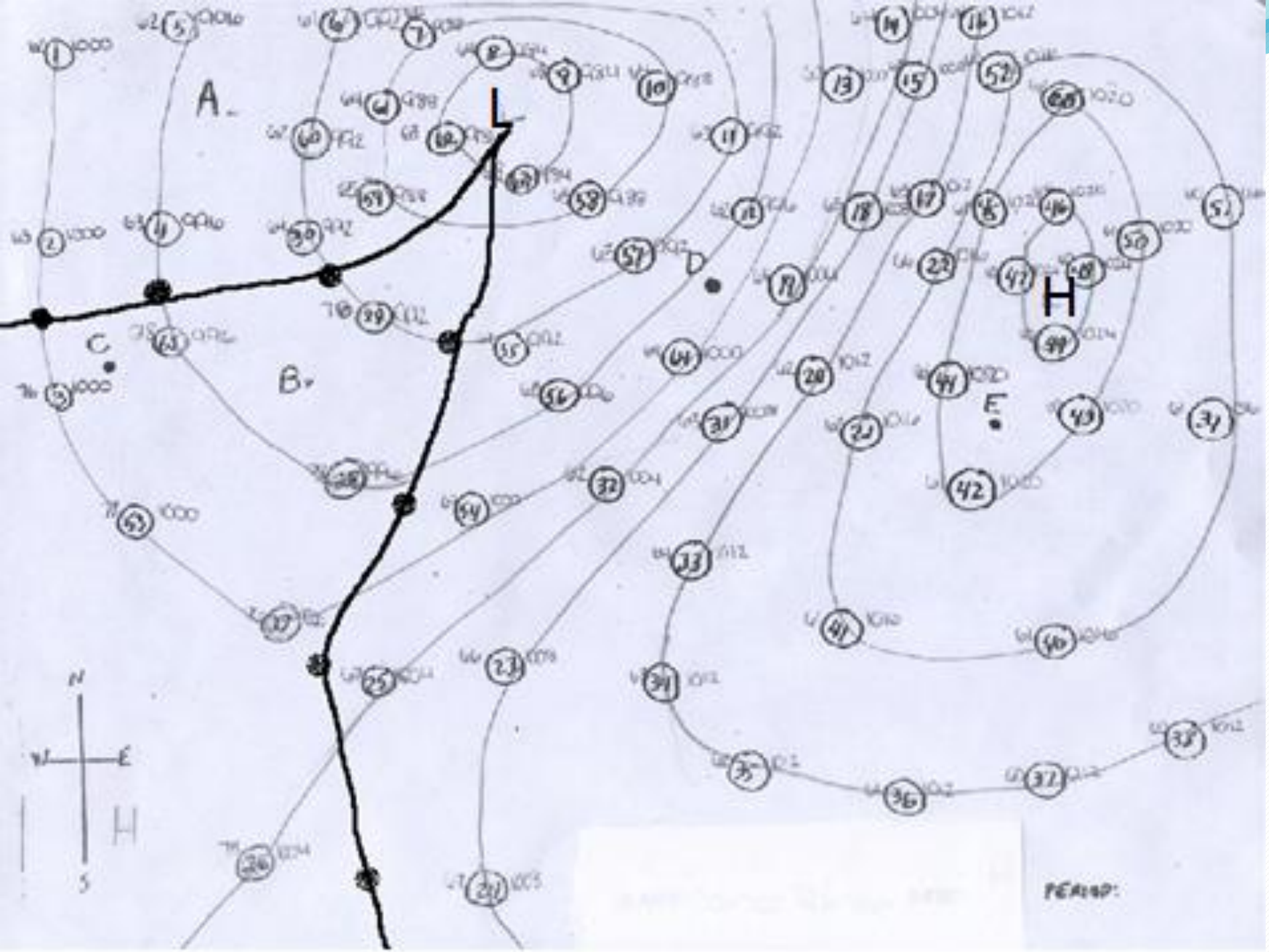
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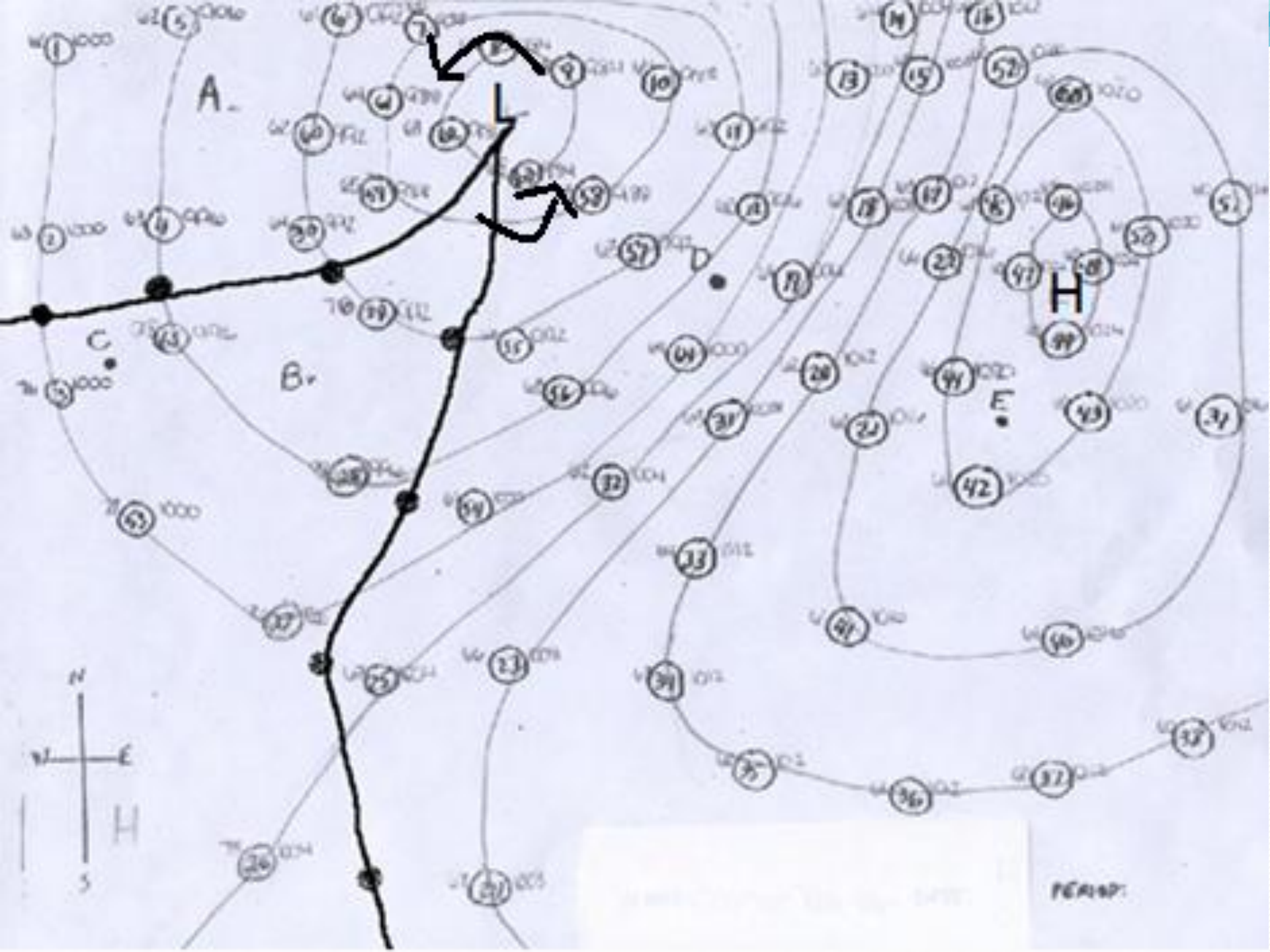
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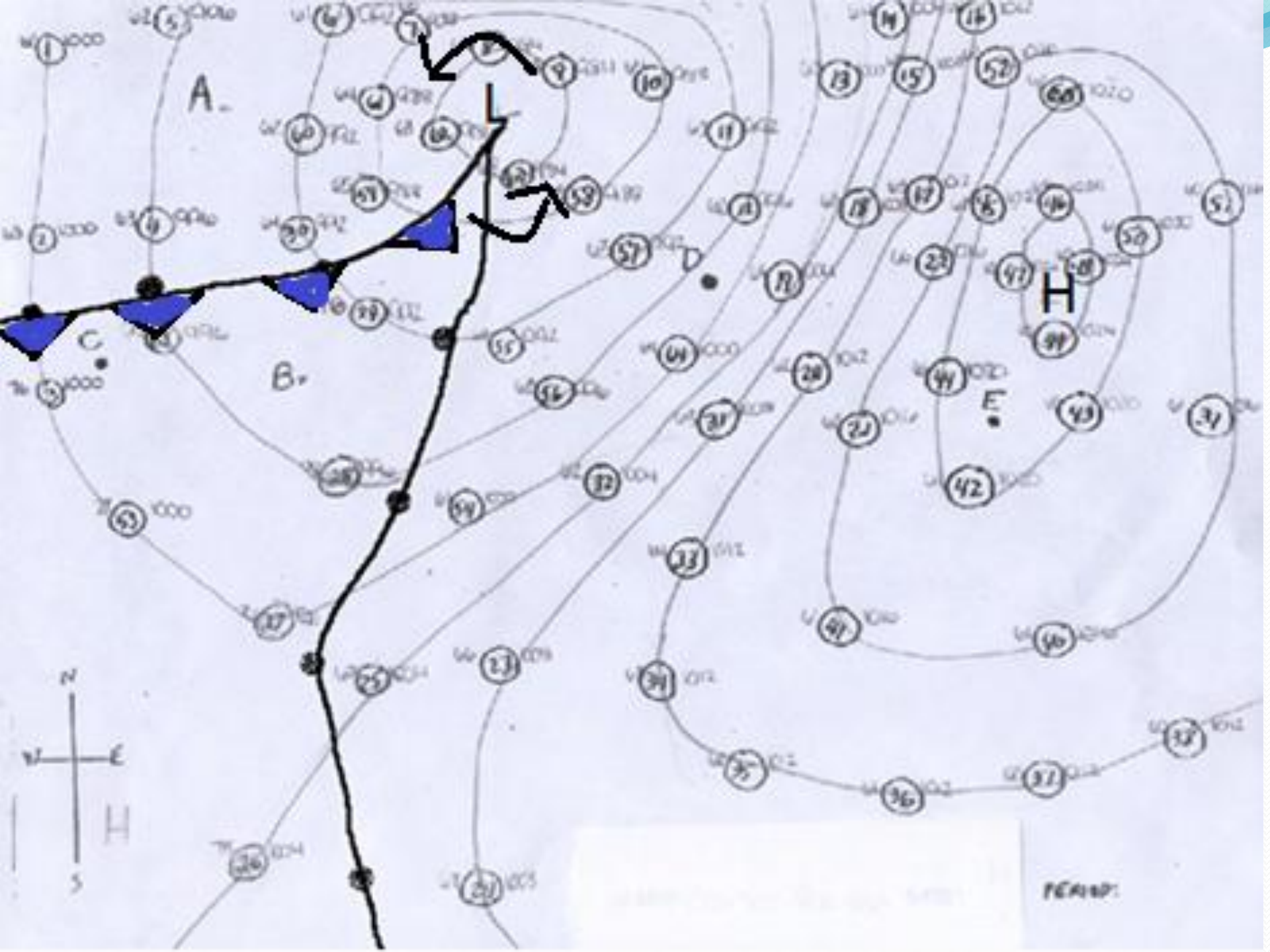
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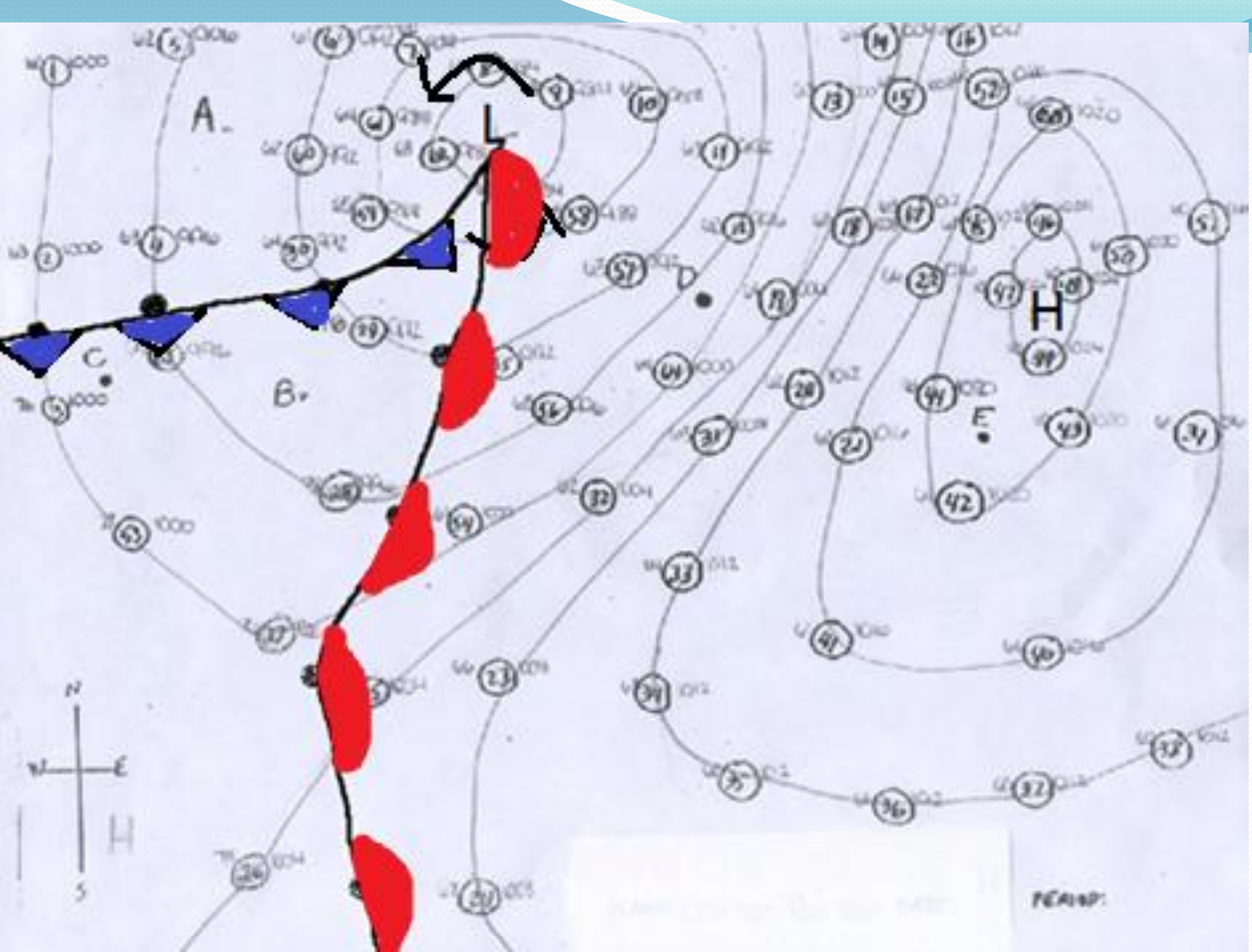
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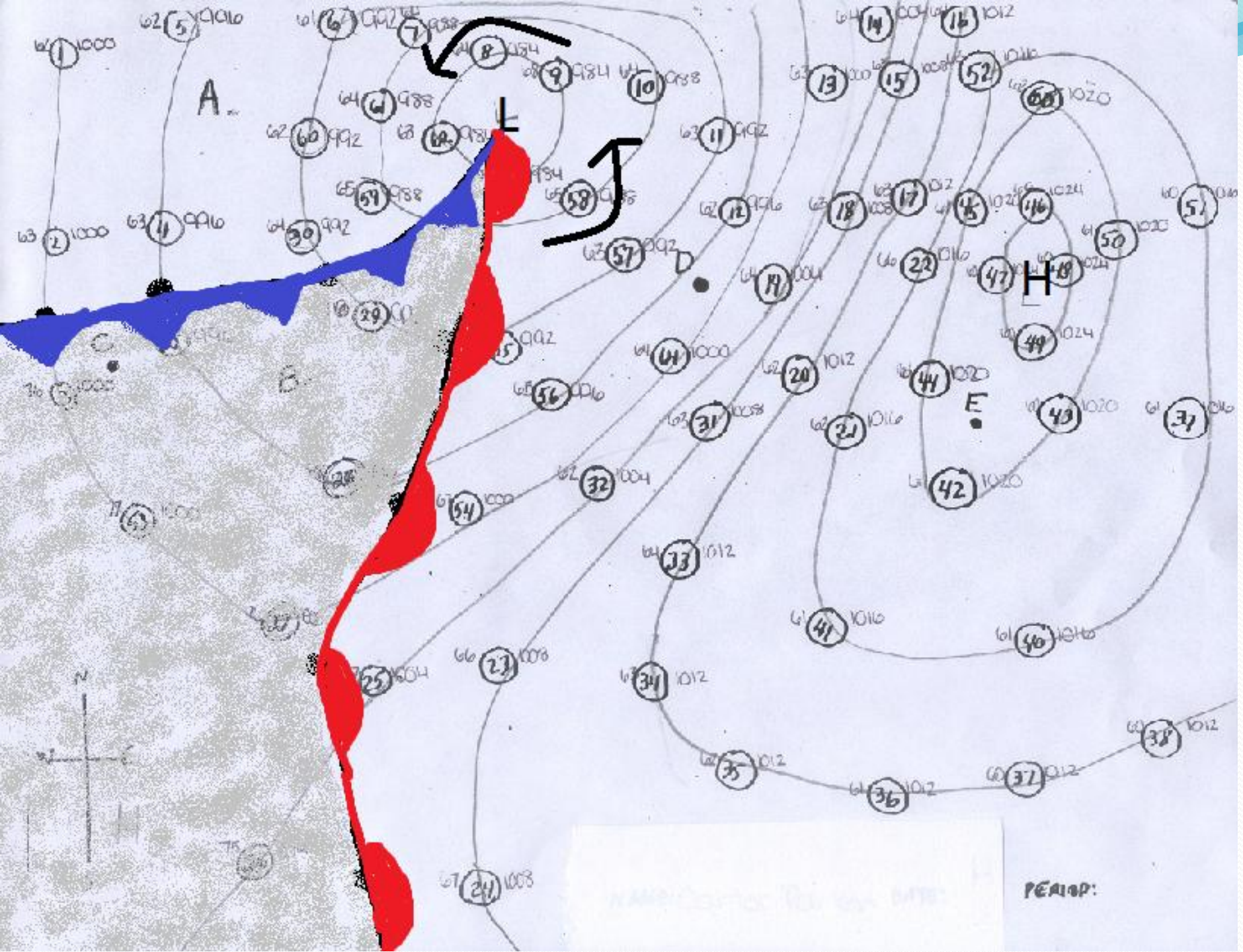
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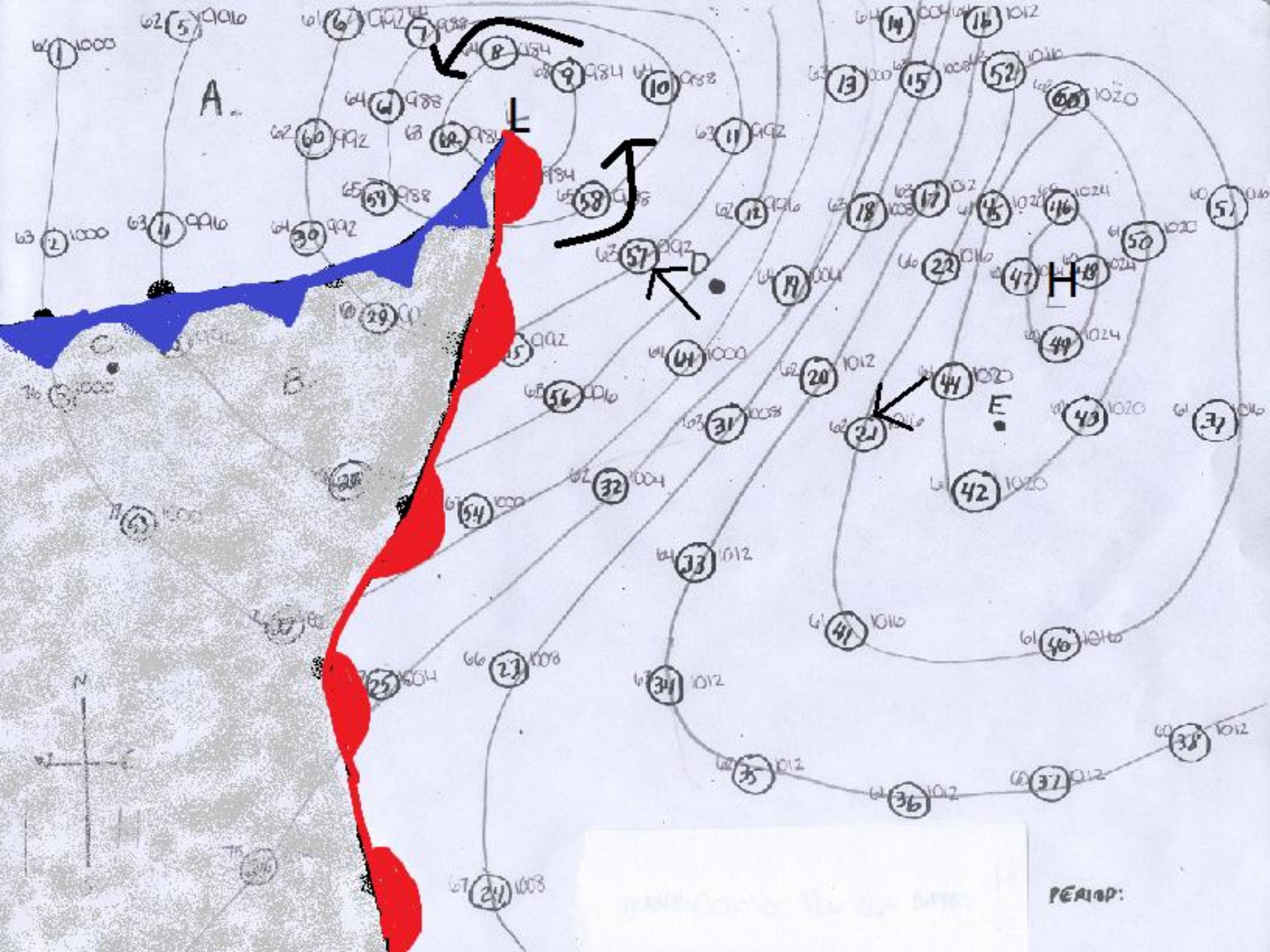
A
L
H
D
E
PEAKD:

Weather Map Lab

Data – Weather Map & Questions

Conclusion –

1) Explain all about: H's & L's

(Name, Sky conditions, Wind direction, Rotation, Tracking)

2) Explain 4 weather fronts

3) Weather Stations

4) Barometer

5) Anemometer

6) Weathervane