GLOBAL ATMOSPHERE CONVECTION CURRENTS

In nature all things flow down gradients from high to low

H → L

ex1. ball sitting on a hillside --> rolls down the hill

(high potential energy goes to low potential energy)

ex2. high temperature --> low temperature

(high kinetic energy moves to low kinetic energy)

ex3. high concentration --> low concentration

(dye in water spreads out until its equal)

ex4. high pressure --> low pressure

(pressurized air in a balloon pushes out into lower pressure air)

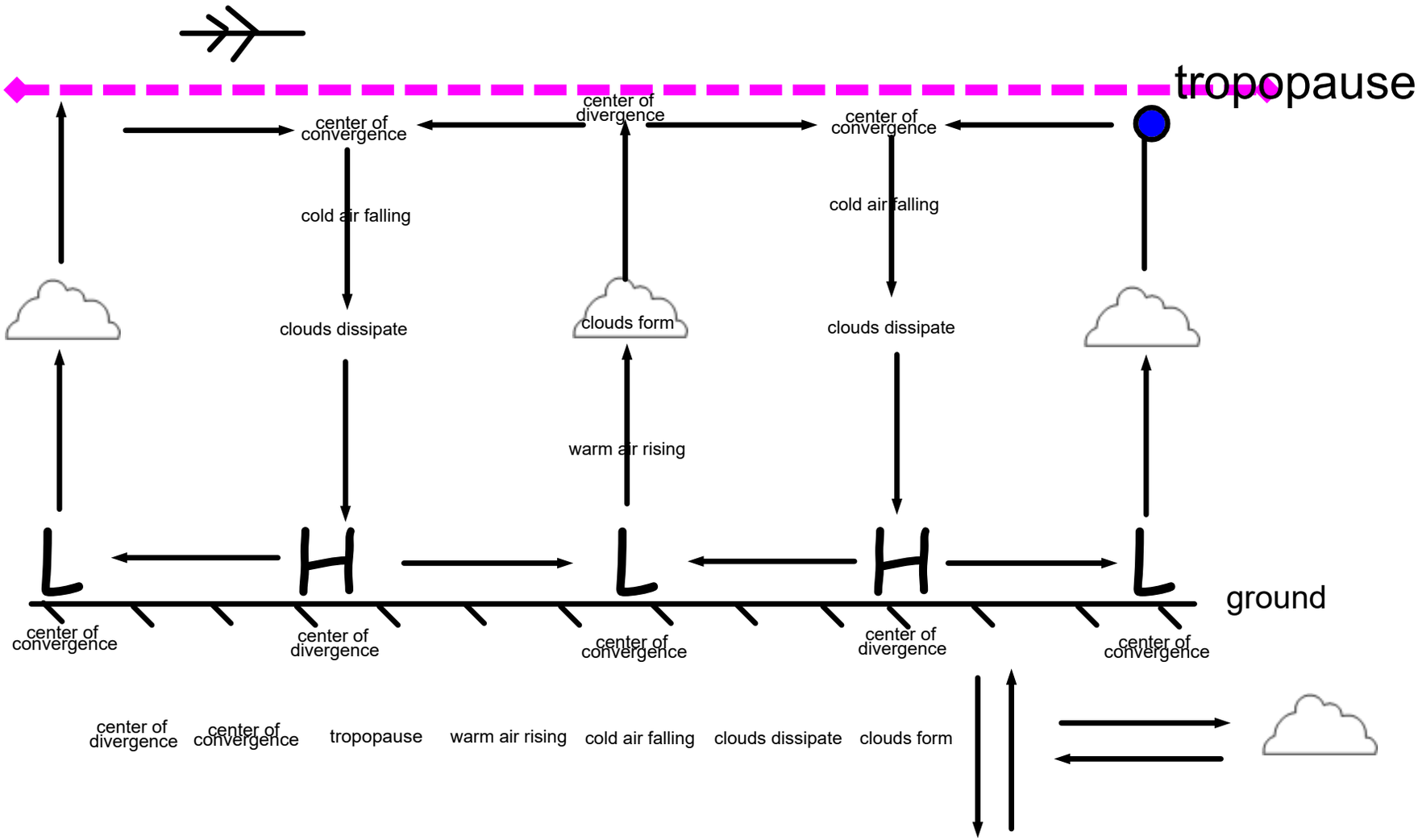
CONVECTION MODEL

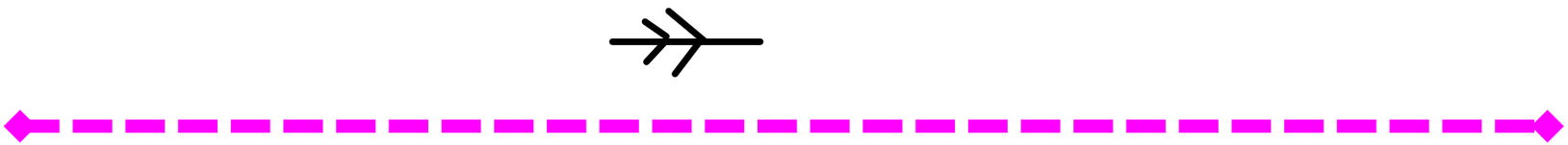
- Explains the circulation of the atmosphere

H = high pressure

L = low pressure

⟶ = direction of air flow


tropopause
center of convergence
center of divergence
center of convergence
cold air falling
cold air falling
clouds dissipate
clouds form
clouds dissipate
warm air rising
L
H
L
H
L
ground
center of convergence
center of divergence
center of convergence
center of divergence
center of convergence
center of divergence
center of convergence
tropopause
warm air rising
cold air falling
clouds dissipate
clouds form



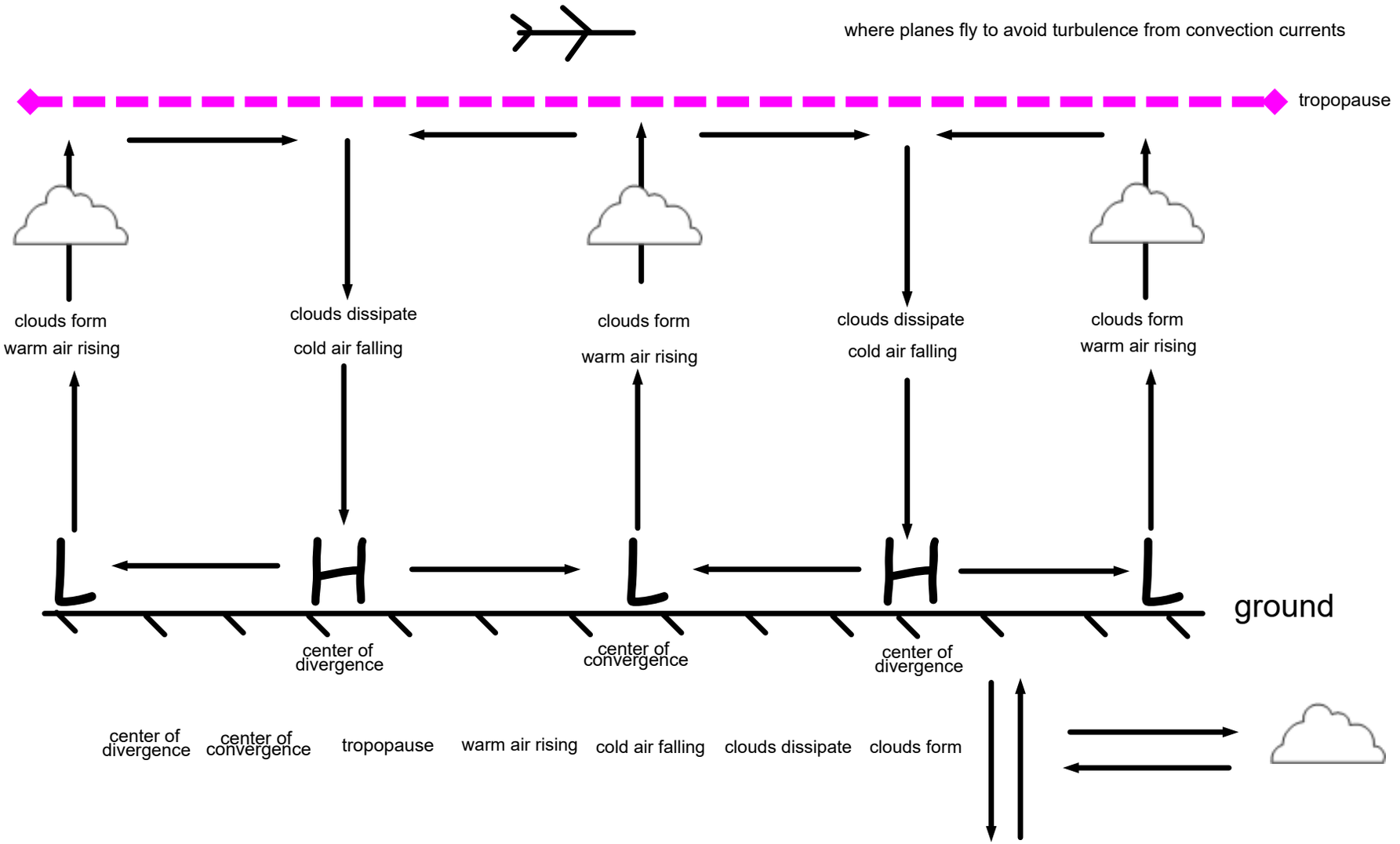

L
H
L
H
L
ground

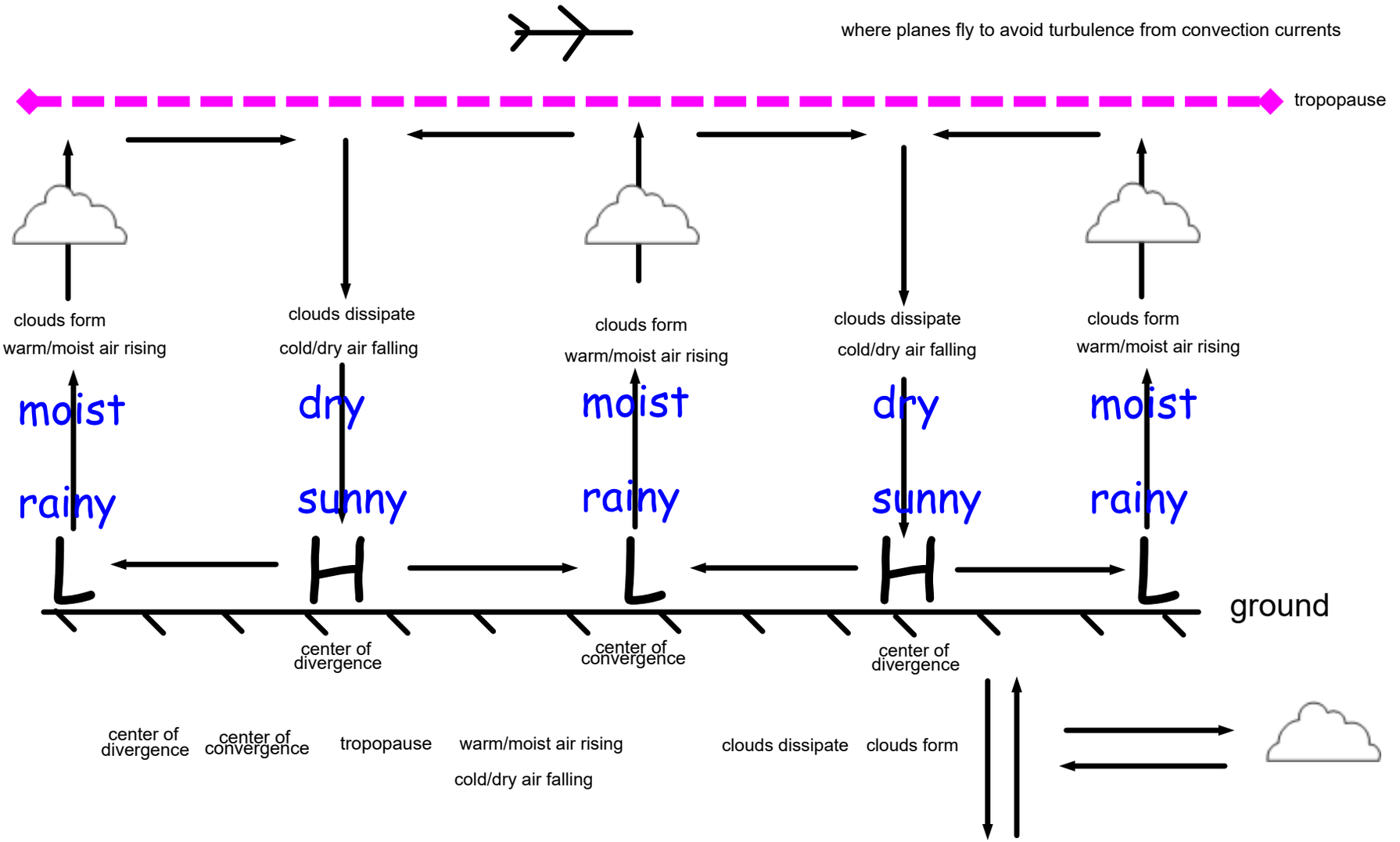
Why do I care?

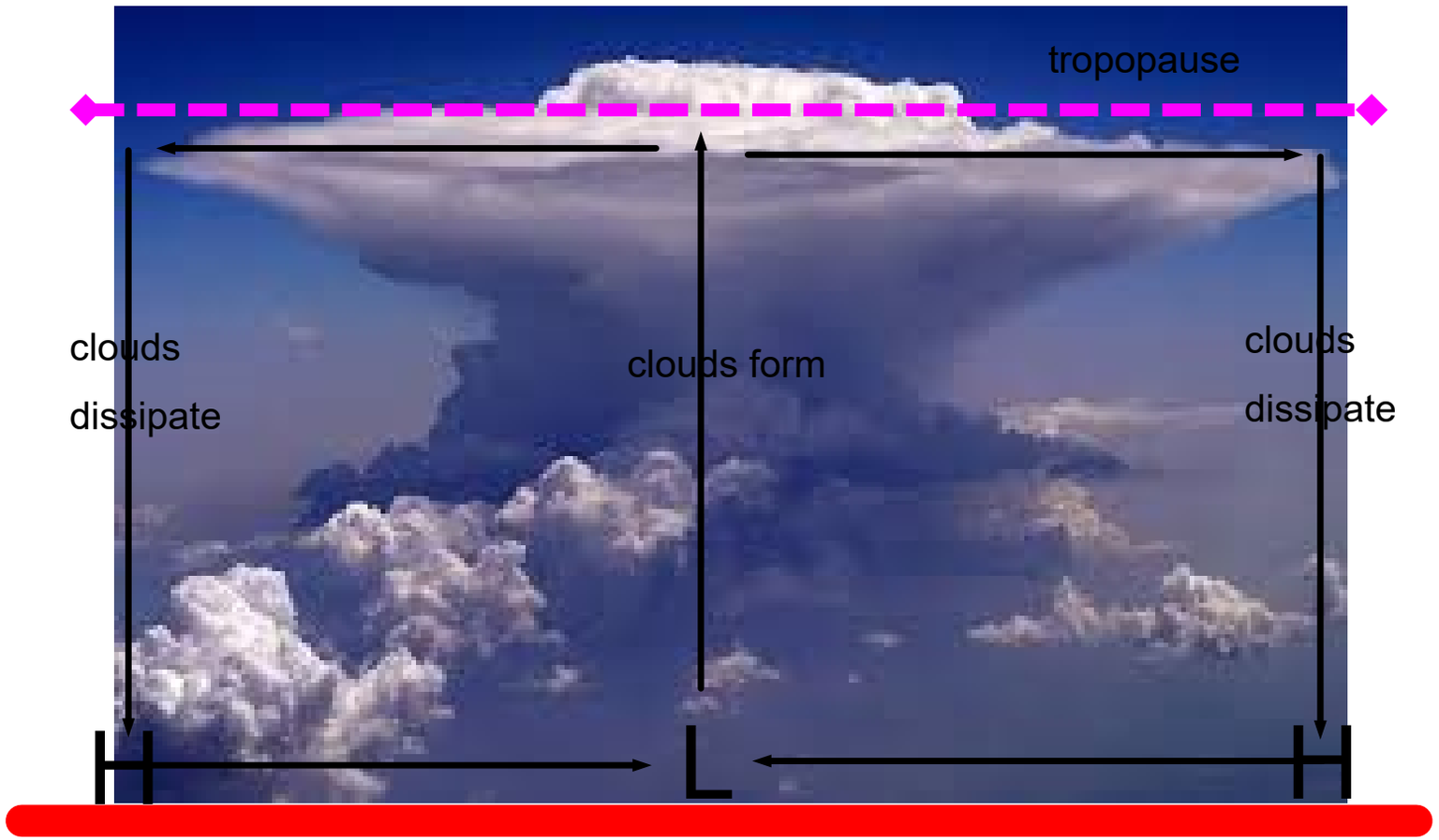
Convergence and divergence make the difference between a grey day and a sunny day.

Center of Convergence - where air comes together at the area of lowest pressure, causing the air to rise and create clouds, and precipitation.

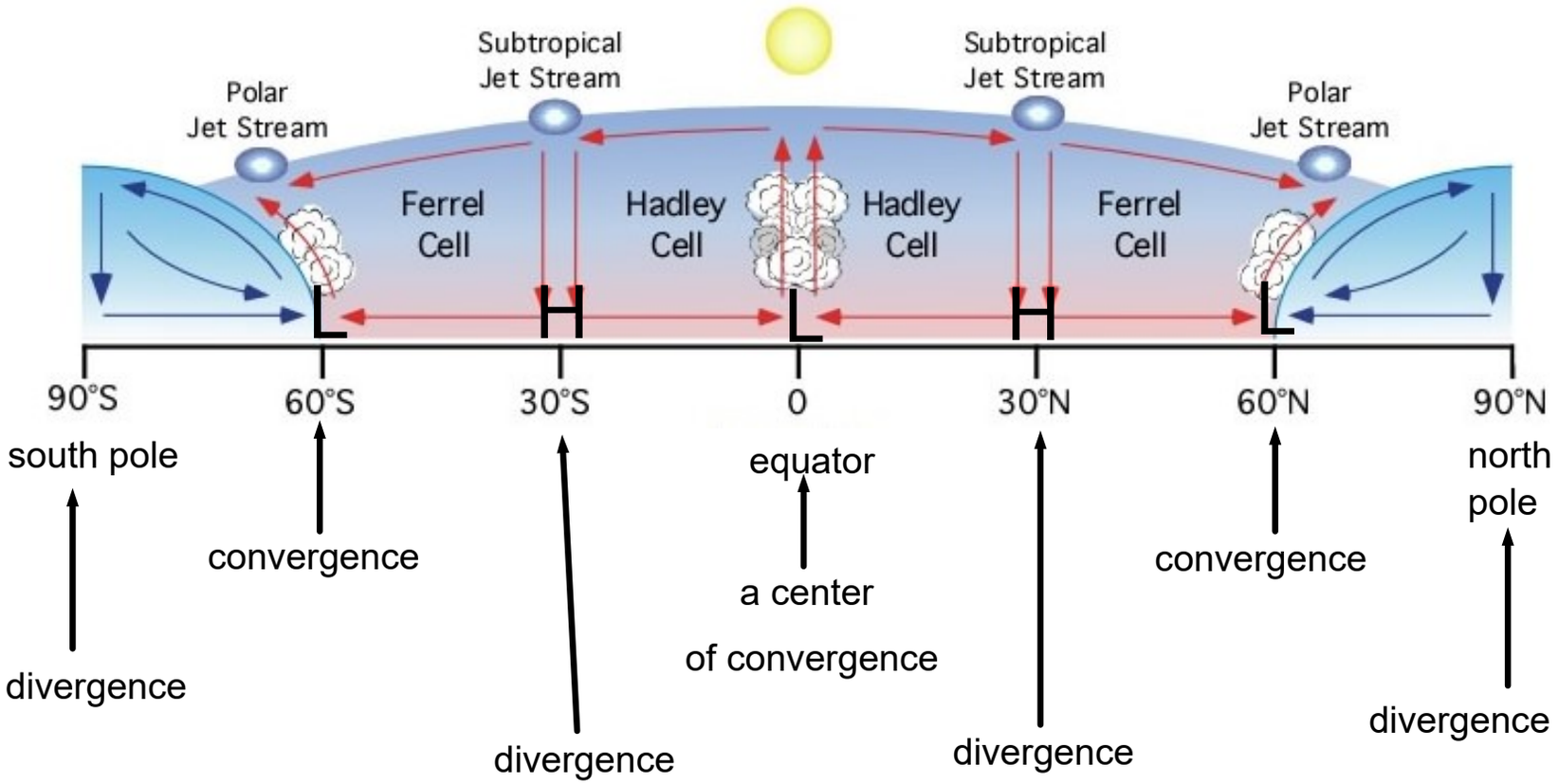
Center of Divergence - where air heads away from the area of highest pressure. This causes air to fall, and clouds to dissipate and leave clear skies.

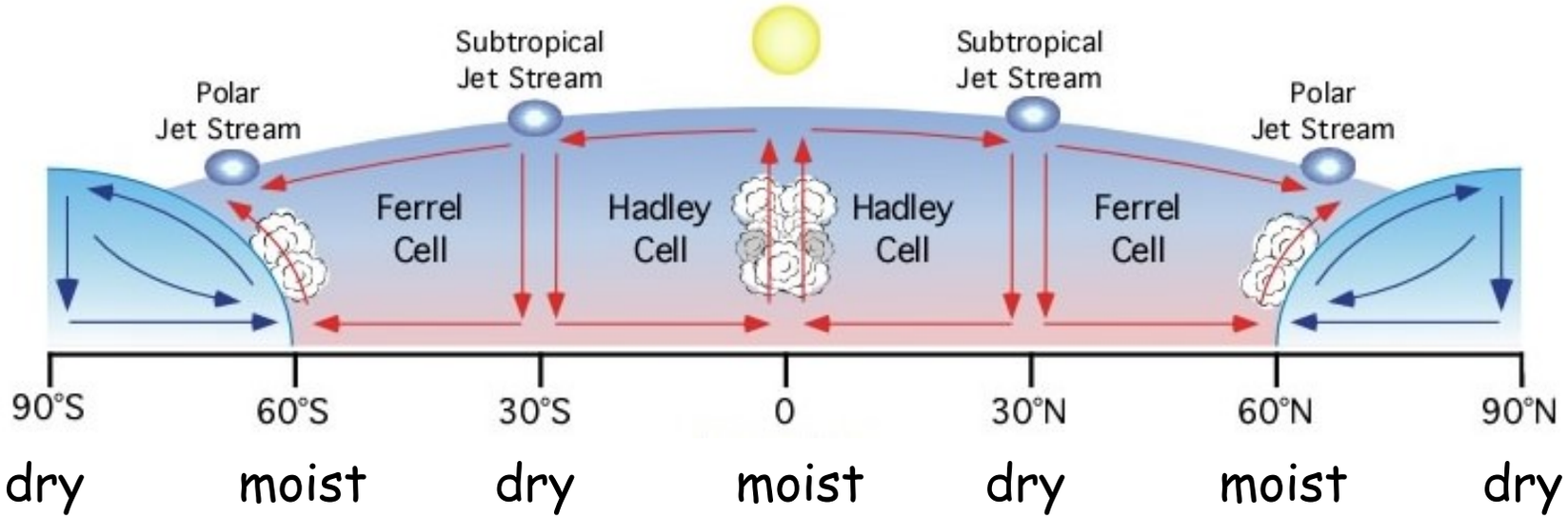

where planes fly to avoid turbulence from convection currents
tropopause
clouds form
warm air rising
clouds dissipate
cold air falling
clouds form
warm air rising
clouds dissipate
cold air falling
clouds form
warm air rising
L
H
L
H
L
ground
center of divergence
center of convergence
center of divergence
center of divergence
center of convergence
tropopause
warm air rising
cold air falling
clouds dissipate
clouds form


where planes fly to avoid turbulence from convection currents
tropopause
clouds form
warm/moist air rising
clouds dissipate
cold/dry air falling
clouds form
warm/moist air rising
clouds dissipate
cold/dry air falling
clouds form
warm/moist air rising
moist
rainy
dry
sunny
moist
rainy
dry
sunny
moist
rainy
L
H
L
H
L
ground
center of divergence
center of convergence
center of divergence
center of divergence
center of convergence
tropopause
warm/moist air rising
cold/dry air falling
clouds dissipate
clouds form

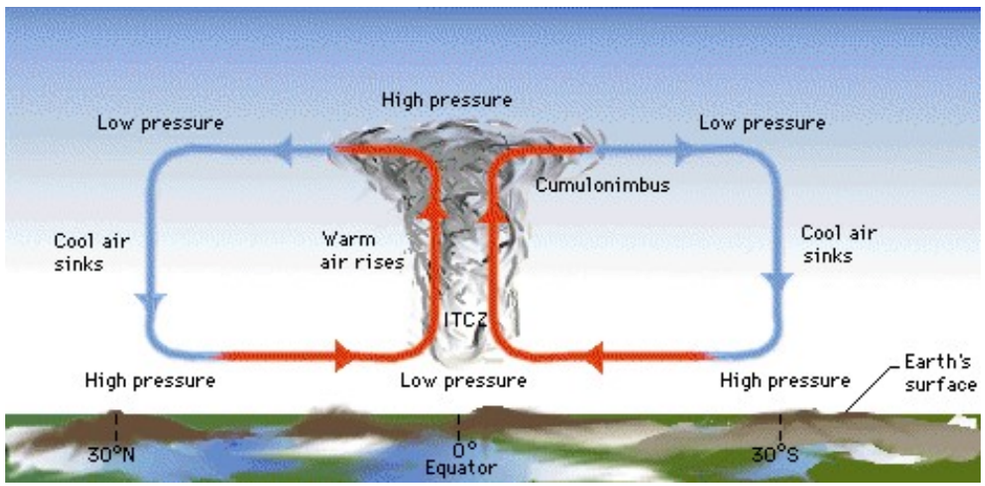

tropopause
clouds
dissipate
clouds form
clouds
dissipate
H
L
H
ground

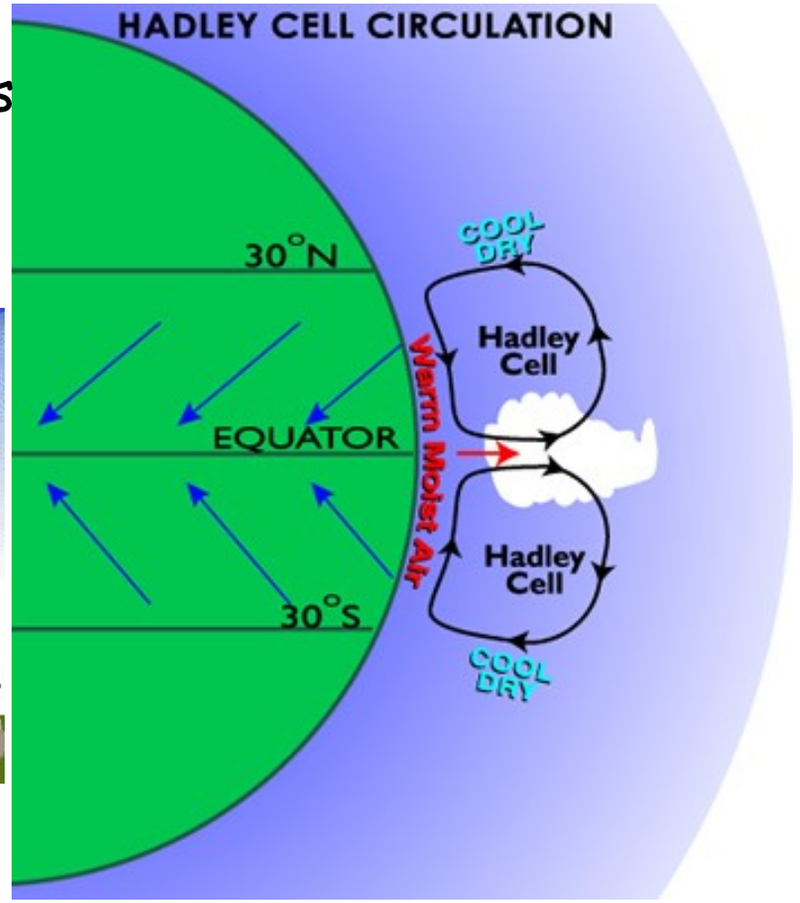
THIS MODEL WORKS FOR INDIVIDUAL CLOUDS OR STORMS BUT IT CAN ALSO BE EXTENDED TO EXPLAIN ALL GLOBAL CLIMATE PATTERNS


Polar
Jet Stream
Subtropical
Jet Stream
Subtropical
Jet Stream
Polar
Jet Stream
Ferrel
Cell
Hadley
Cell
Hadley
Cell
Ferrel
Cell
L
H
L
H
L
90°S
60°S
30°S
0
30°N
60°N
90°N
south pole
convergence
divergence
divergence
equator
a center
of convergence
divergence
convergence
north
pole
divergence


Subtropical
Jet Stream
Subtropical
Jet Stream
Polar
Jet Stream
Polar
Jet Stream
Ferrel
Cell
Hadley
Cell
Hadley
Cell
Ferrel
Cell
90°S
60°S
30°S
0
30°N
60°N
90°N
dry
moist
dry
moist
dry
moist
dry

Air converges near the equator. This is called the **intertropical convergence zone (ITCZ)**



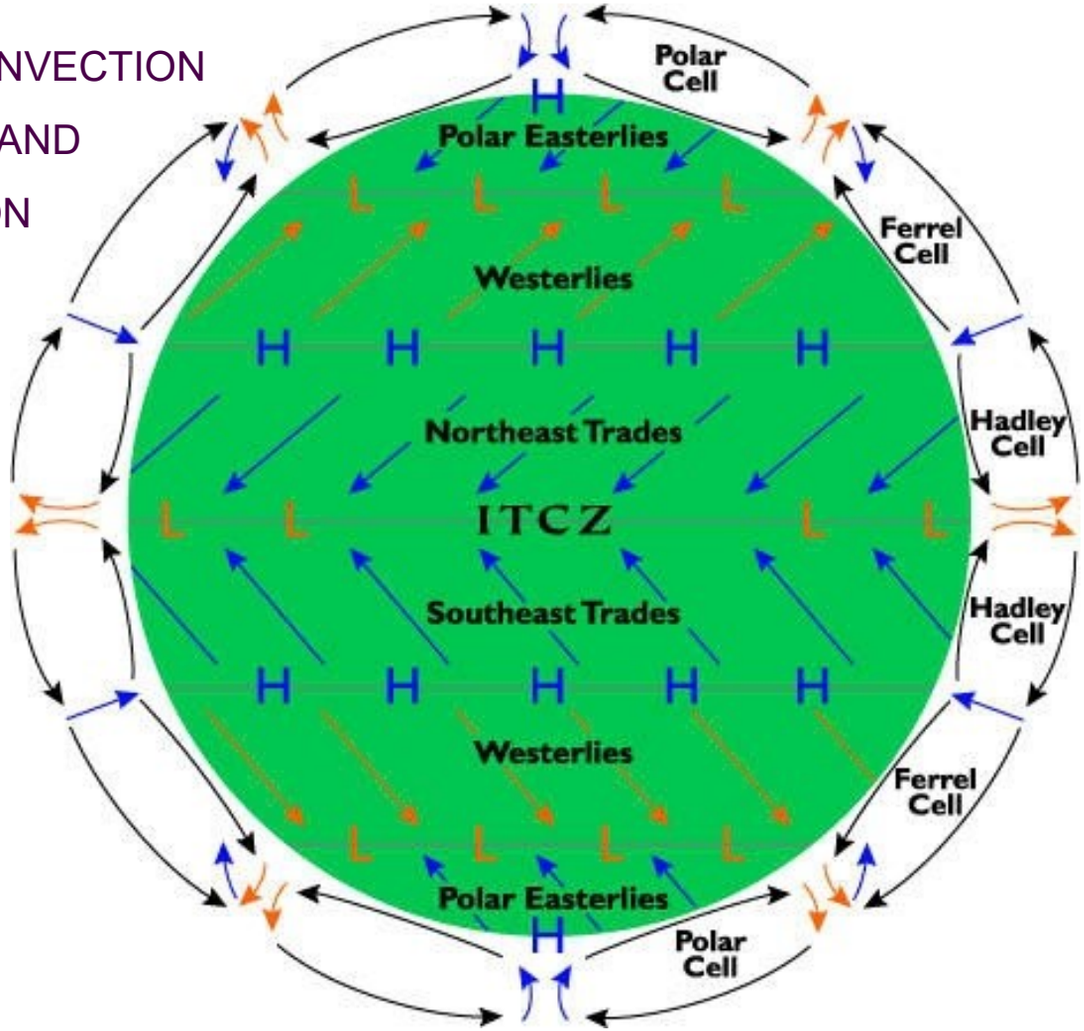


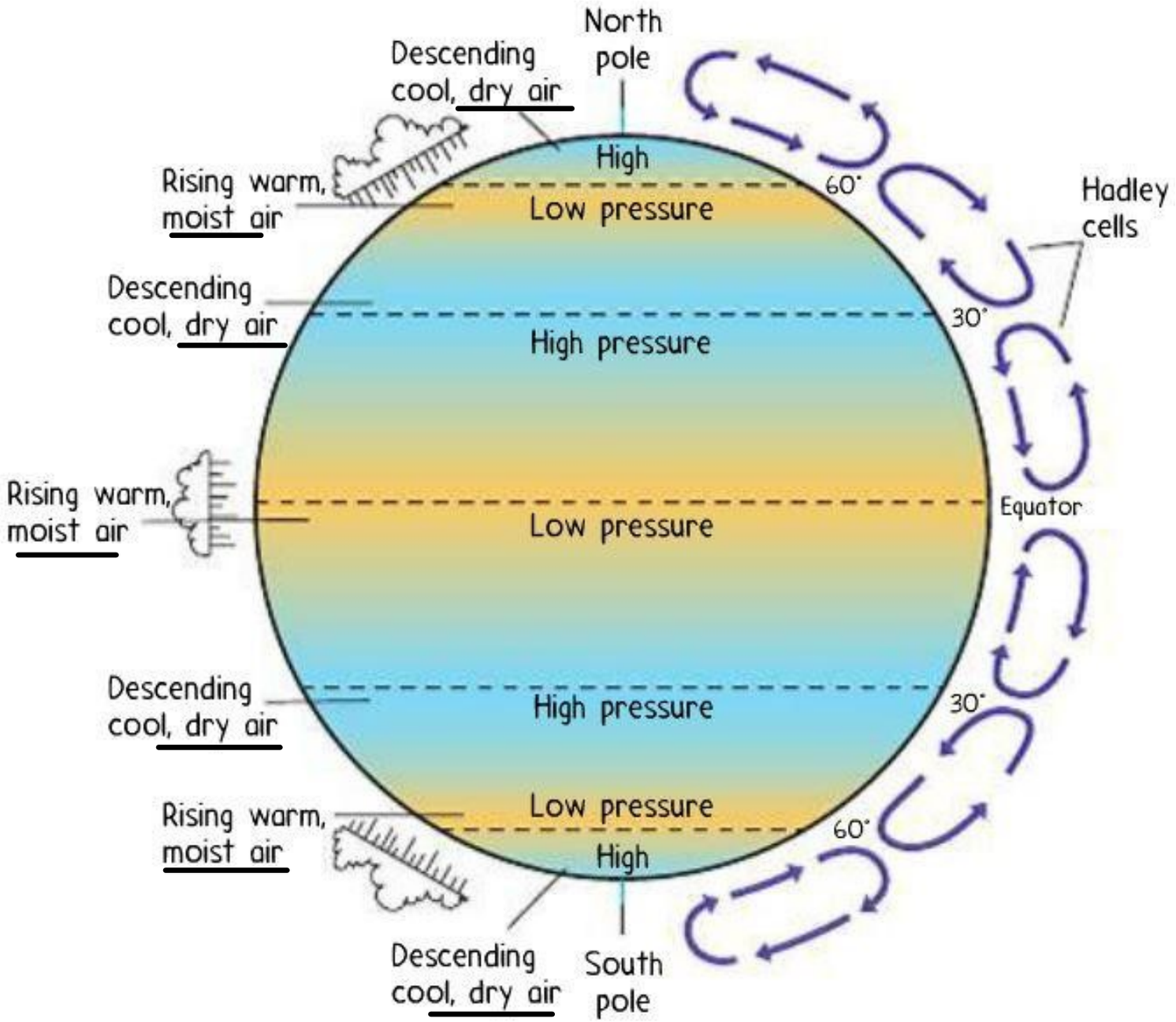
ITCZ - INTERTROPICAL CONVERGENCE ZONE

continuous line of clouds/storms where the trade winds converge.

This line of clouds is visible at all times of the year from space

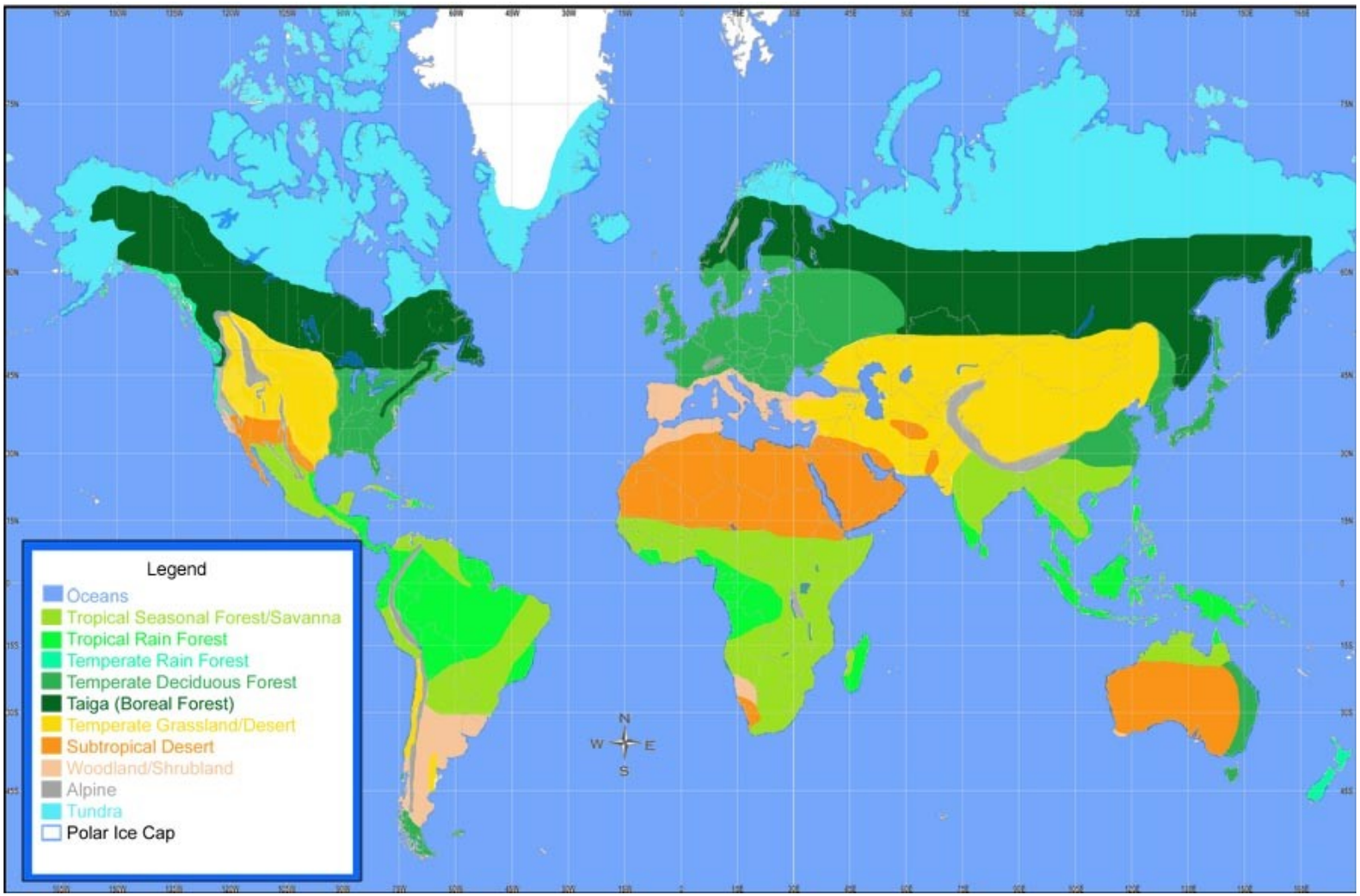
GLOBAL CONVECTION CURRENTS AND CIRCULATION

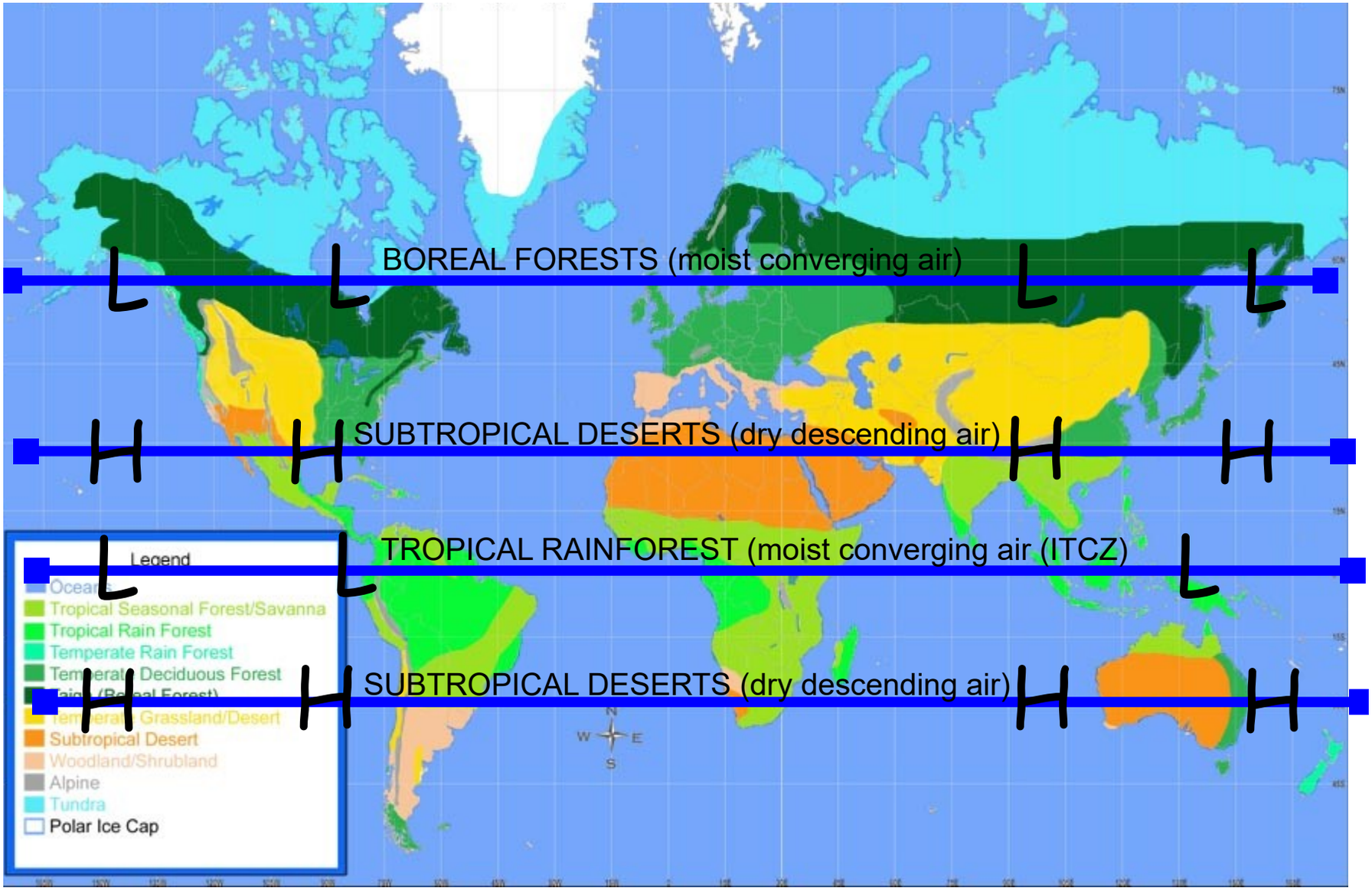


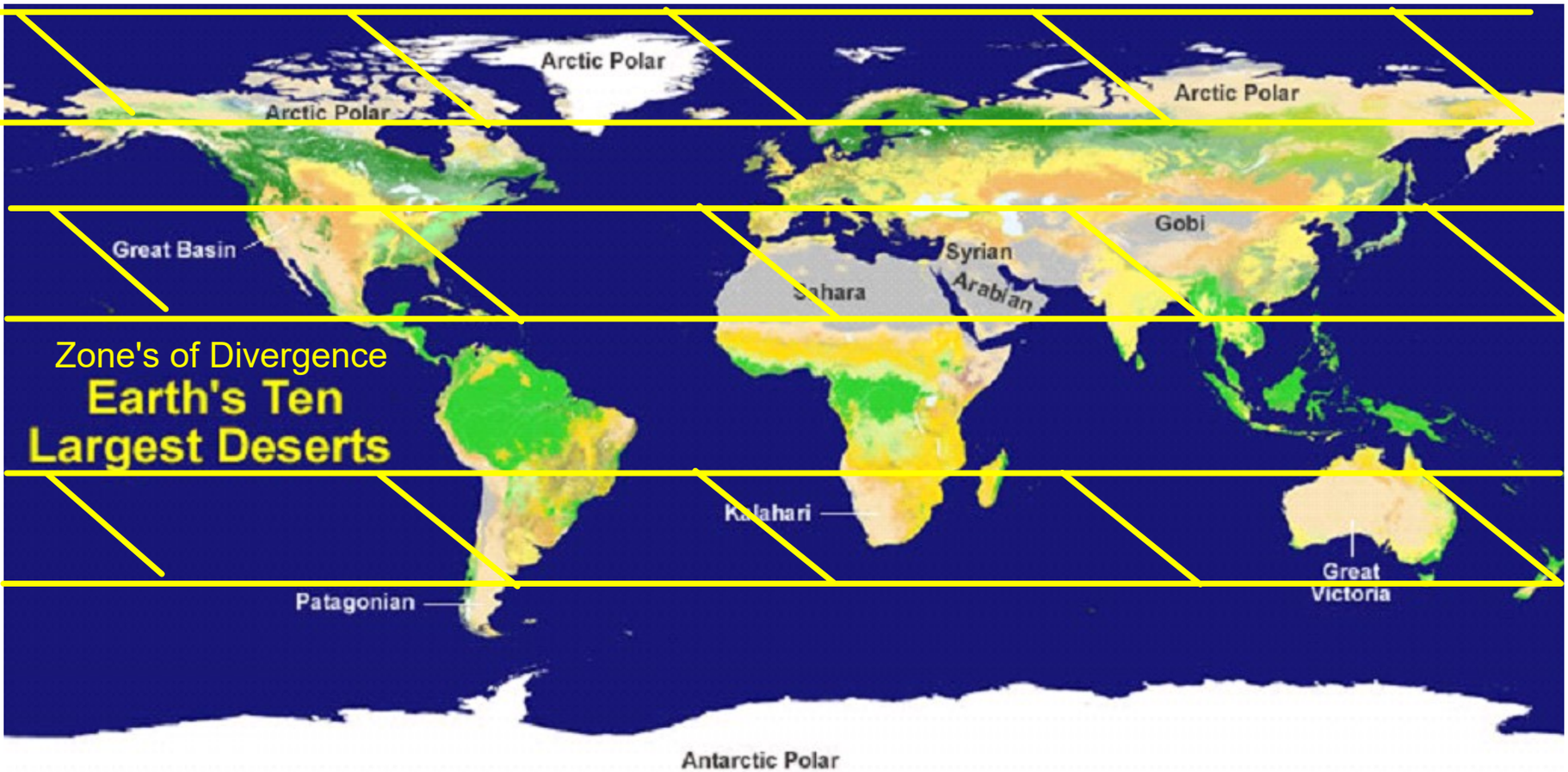

North pole
Descending cool, dry air
High
60°
Hadley cells
Rising warm, moist air
Low pressure
Descending cool, dry air
30°
High pressure
Rising warm, moist air
Equator
Low pressure
Descending cool, dry air
High pressure
30°
Low pressure
Rising warm, moist air
60°
High
Descending cool, dry air
South pole

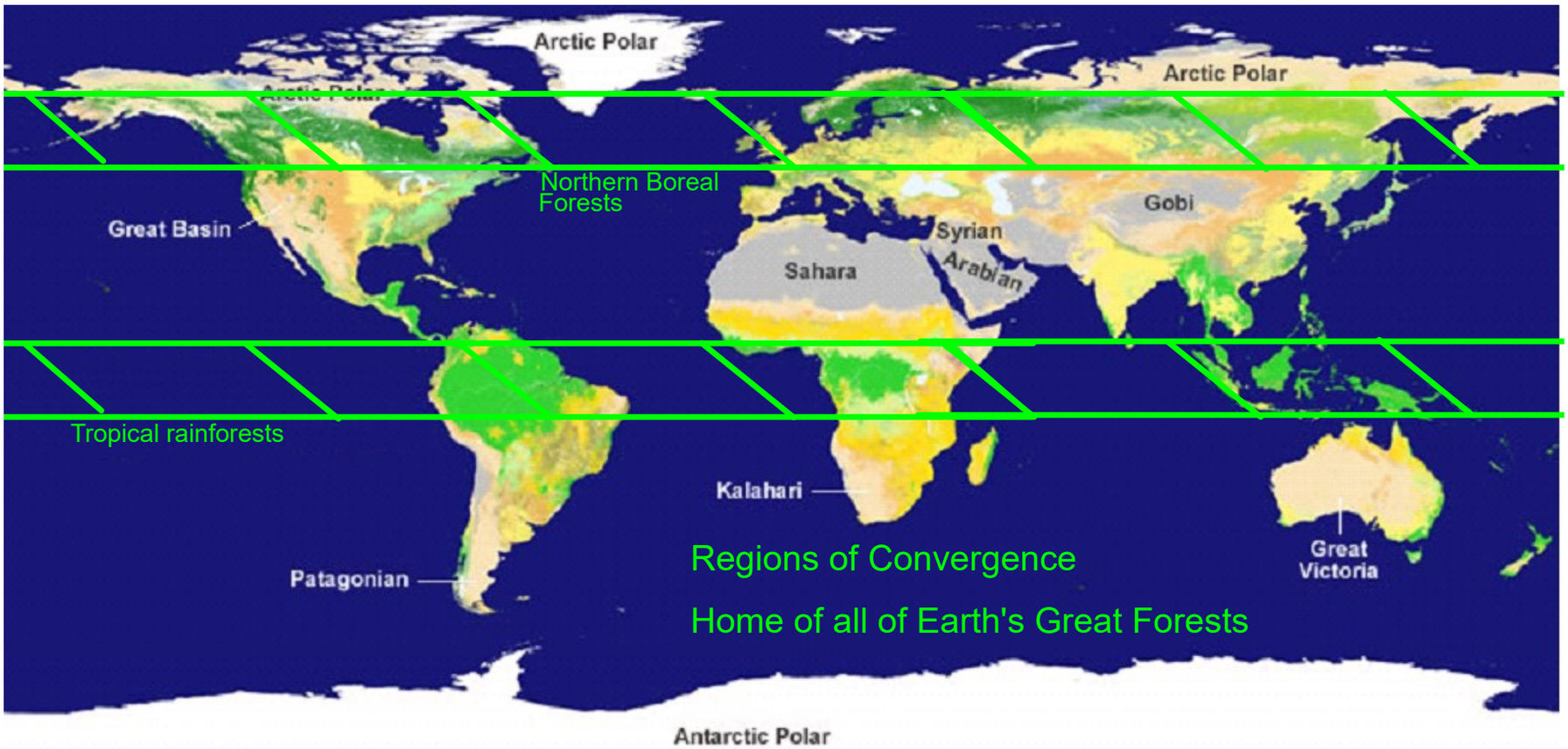
THE BIOMES WE DISCUSSED EARLIER RELATE TO THE LINES OF LATITUDE 0 (equator), 30N, 30S, and 60N

WE SEE BANDS OF DRY, MOIST, DRY, MOIST, DRY, MOIST




BOREAL FORESTS (moist converging air)
SUBTROPICAL DESERTS (dry descending air)
TROPICAL RAINFOREST (moist converging air (ITCZ)
SUBTROPICAL DESERTS (dry descending air)
Legend
Tropical Seasonal Forest/Savanna
Tropical Rain Forest
Temperate Rain Forest
Deciduous Forest
Grassland/Desert
Subtropical Desert
Woodland/Shrubland
Alpine
Tundra
Polar Ice Cap
N
W
E
S

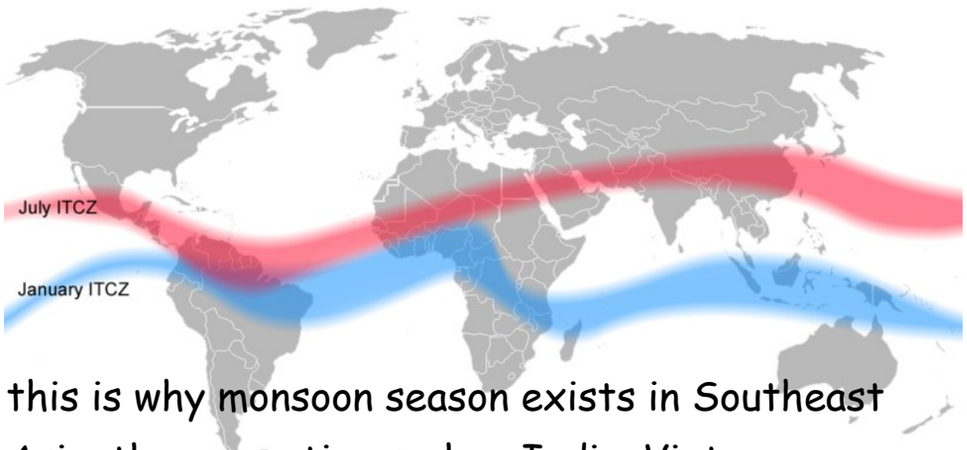

Arctic Polar
Arctic Polar
Arctic Polar
Great Basin
Gobi
Syrian
Arabian
Zone's of Divergence
Earth's Ten
Largest Deserts
Kalahari
Great
Victoria
Patagonian
Antarctic Polar


Arctic Polar
Arctic Polar
Northern Boreal Forests
Great Basin
Gobi
Syrian
Arabian
Sahara
Tropical rainforests
Kalahari
Regions of Convergence
Home of all of Earth's Great Forests
Great Victoria
Patagonian
Antarctic Polar

FYI

- in order to simplify things we have ignored the tilt of the Earth in this discussion.
- because the Earth is tilted the size of the Hadley, Ferrel and Polar cells can all change in size (zones of convergence aren't always exactly 30 degrees apart)
- The ITCZ is always moving north and south as it follows the area that has the most absorbed incoming solar energy
- Also, the polar vortex increases in size dramatically when there is no sunlight hitting the polar region

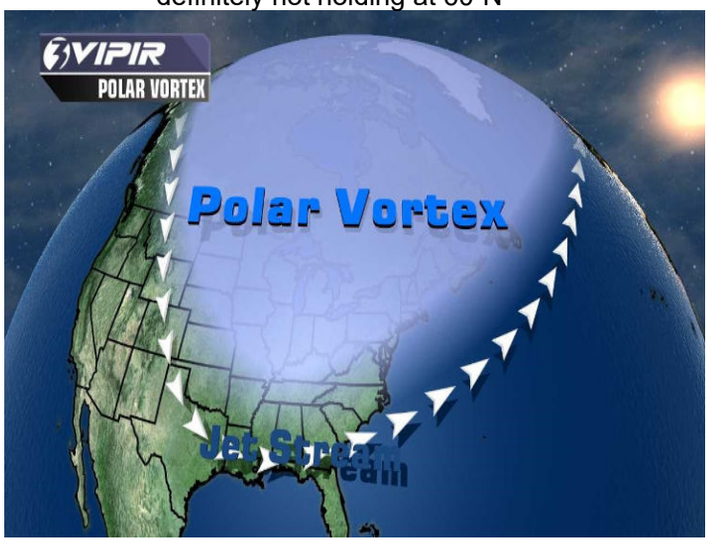
we drew the average line



this is why monsoon season exists in Southeast Asia, there are times when India, Vietnam, Philippines, etc. are within the ITCZ and times when they are outside the ITCZ.

(Wet season when they are in it and dry when they are out of it)

definitely not holding at 60°N



this is why it can stay cold for weeks on end in the winter in Canada