Bell Ringer

Finish Characteristics of Climate

Wind

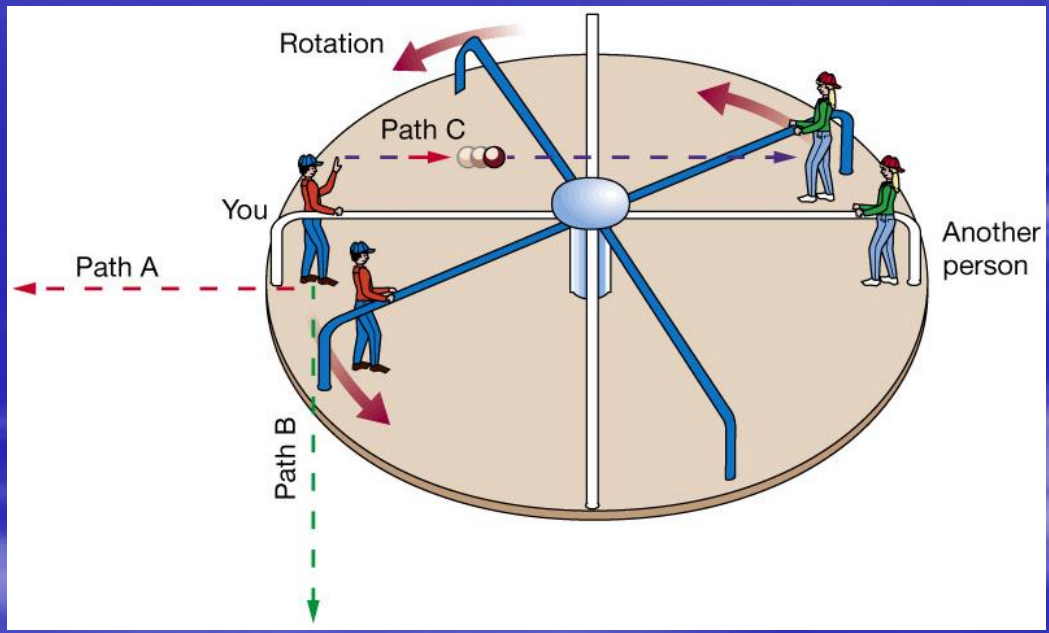
Coriolis Effect

- Newton's second law: a body in motion will continue in motion (unchanged) unless acted upon by an outside force.
  - Liquid (water) and gas (air) are not attached to the ground so they obey this law.
  - We are 'attached' to the ground, thus we just do what the ground does.

- This causes moving objects to APPEAR to follow curved paths:
  - In Northern Hemisphere, curvature is to right
  - In Southern Hemisphere, curvature is to left

A merry-go-round as an example of the Coriolis effect

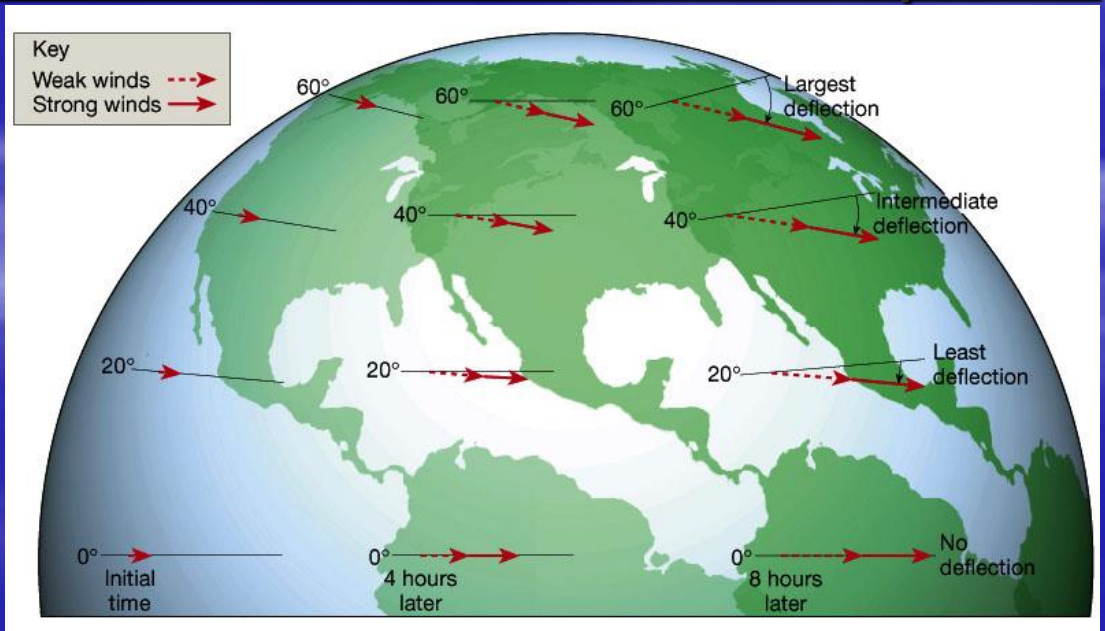
- Throw a ball (it follows Newton's law and does not change direction or speed once it leaves your hand)
- To an observer above the merry-go-round (not on earth), objects travel straight (Path B or C)
- To an observer on the merry-go-round, objects follow curved paths. You rotate away, but your sight is still into the center of the merry go round)
- The ball does not curve…you curve!



https://www.youtube.com/watch?v=mPsLanVS1Q8

Coriolis Effect and Latitude

- Changes with latitude:
  - No Coriolis effect at Equator (Spinning neither clockwise nor counterclockwise)
  - Maximum Coriolis effect at poles



What does this have to do with wind?

What is Wind?

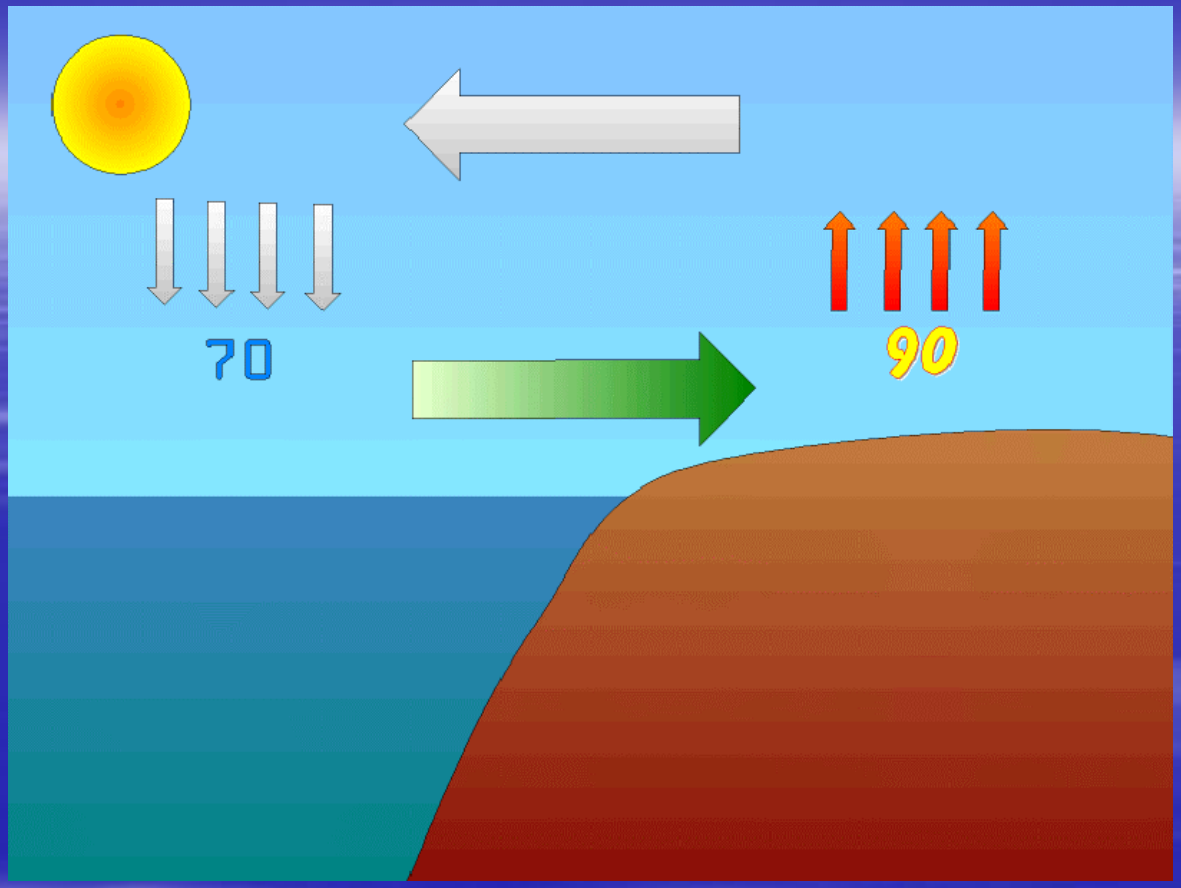
- The next major part of the weather cycle is **wind**. It is defined as **the horizontal movement of air. The main cause of wind is circulation of the atmosphere due to convection.**

Two Types of Wind

- The **two basic types of wind** are classified by the size of the earths surface that they extend across.
- If a wind **covers a major part of the earth's surface**, it is called a **global wind**. There are several of these, and we will discuss them later.
- If a wind only **covers a small area** (a few miles) these are called **local winds**.

Local Winds

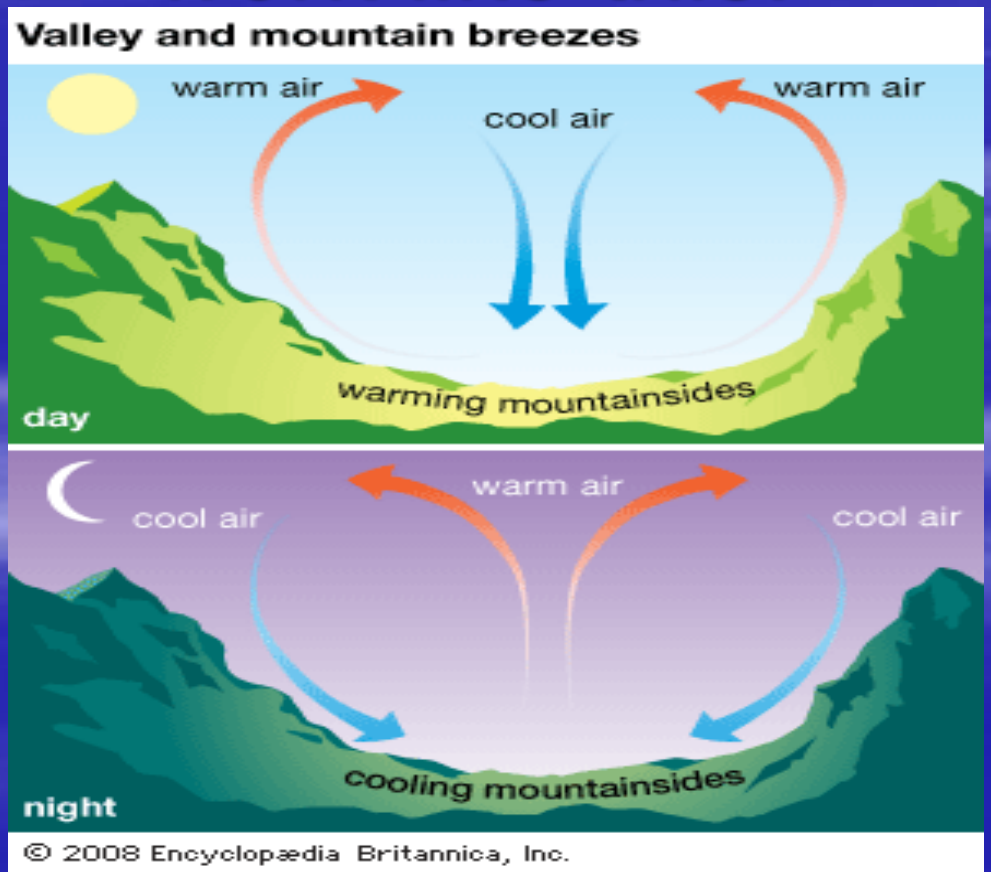
- **Local winds are usually influenced by the way various landforms are heated and cooled, and the way they move air around them**.
- **Local winds** almost always change in a regular, predictable pattern that changes on a daily basis.
- The two places that local winds are most common are along coastlines and in mountainous regions.
- Along the coast, these local winds are known as land and sea breezes, and work like this:



Day sea breezes rotate from ocean to land (shown) but Night sea breezes rotate in the opposite way.

In areas around mountains, like Orem, the local winds are known as mountain and valley breezes. They work like this:

Wind Energy

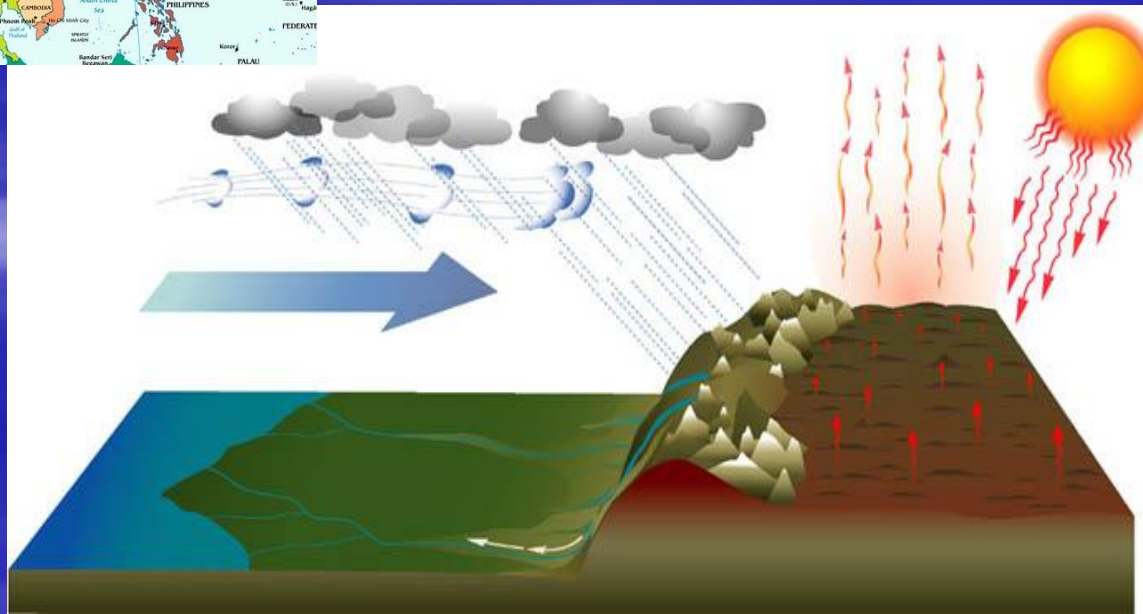


Monsoon

- Another type of wind that is sort of a mix between a small local wind and large global wind is a monsoon.
- These are winds that form for the same reason as local winds, but cover much larger areas instead of changing daily, they change on a seasonal basis.
- The most famous monsoon on the planet occurs on the Indian subcontinent.

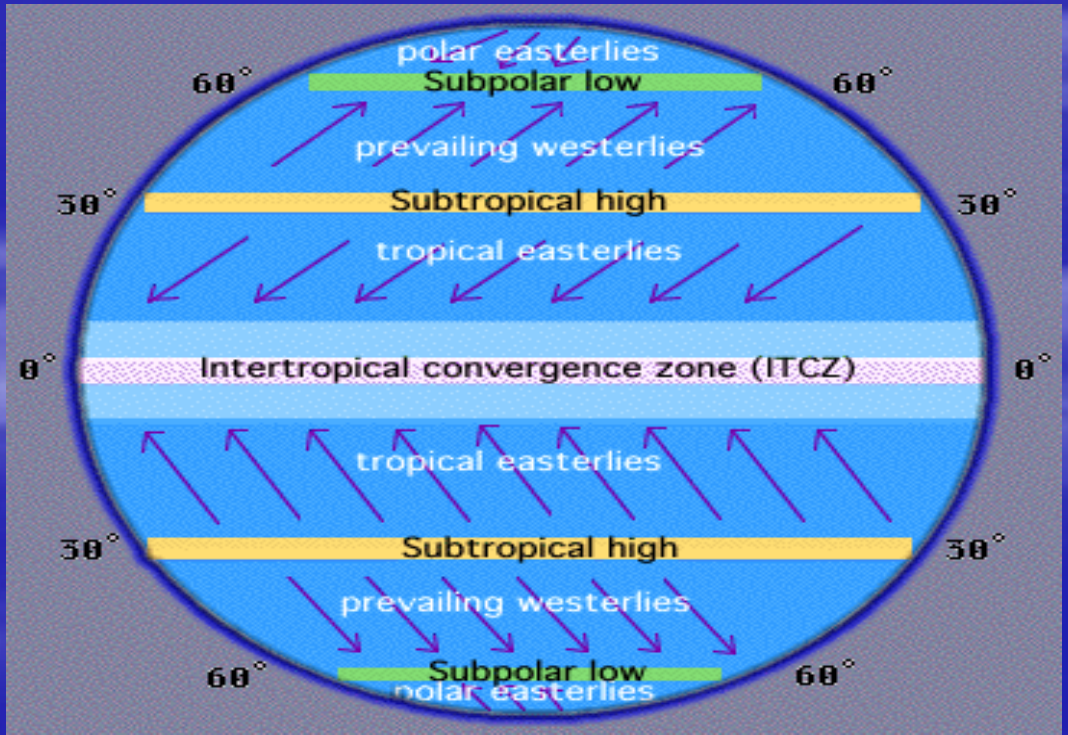
Monsoon

[News Coverage in Phenix, Az.]



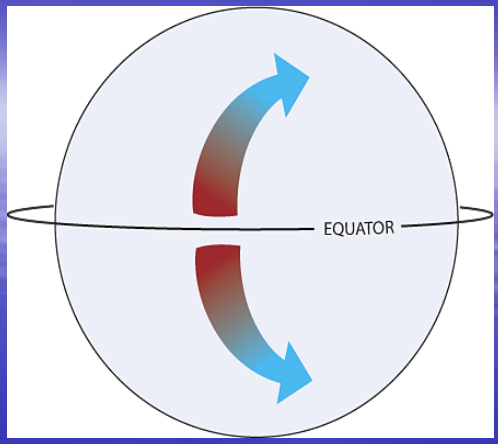
Global Winds

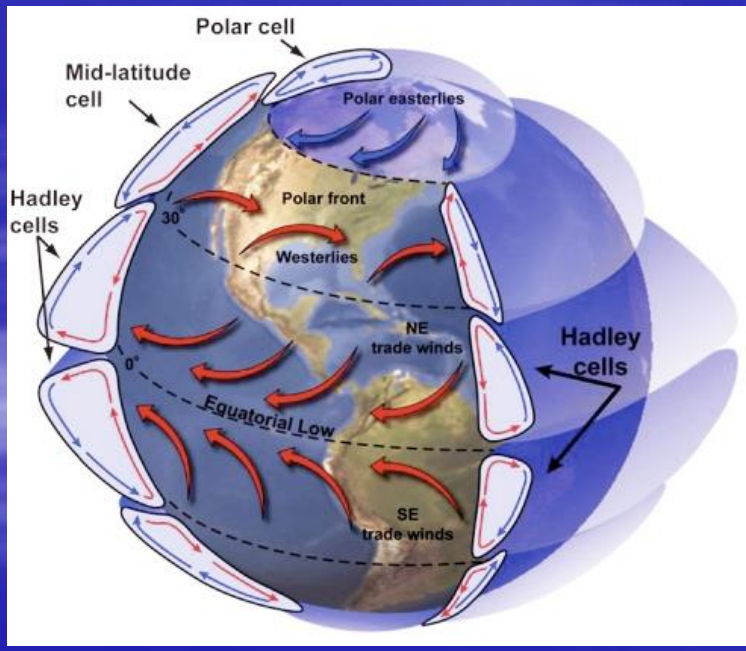
- Global winds are the enormous wind patterns that form over the earth. They basically form because the earth is always hot at the equator, cold at the poles and the atmosphere must circulate in between.



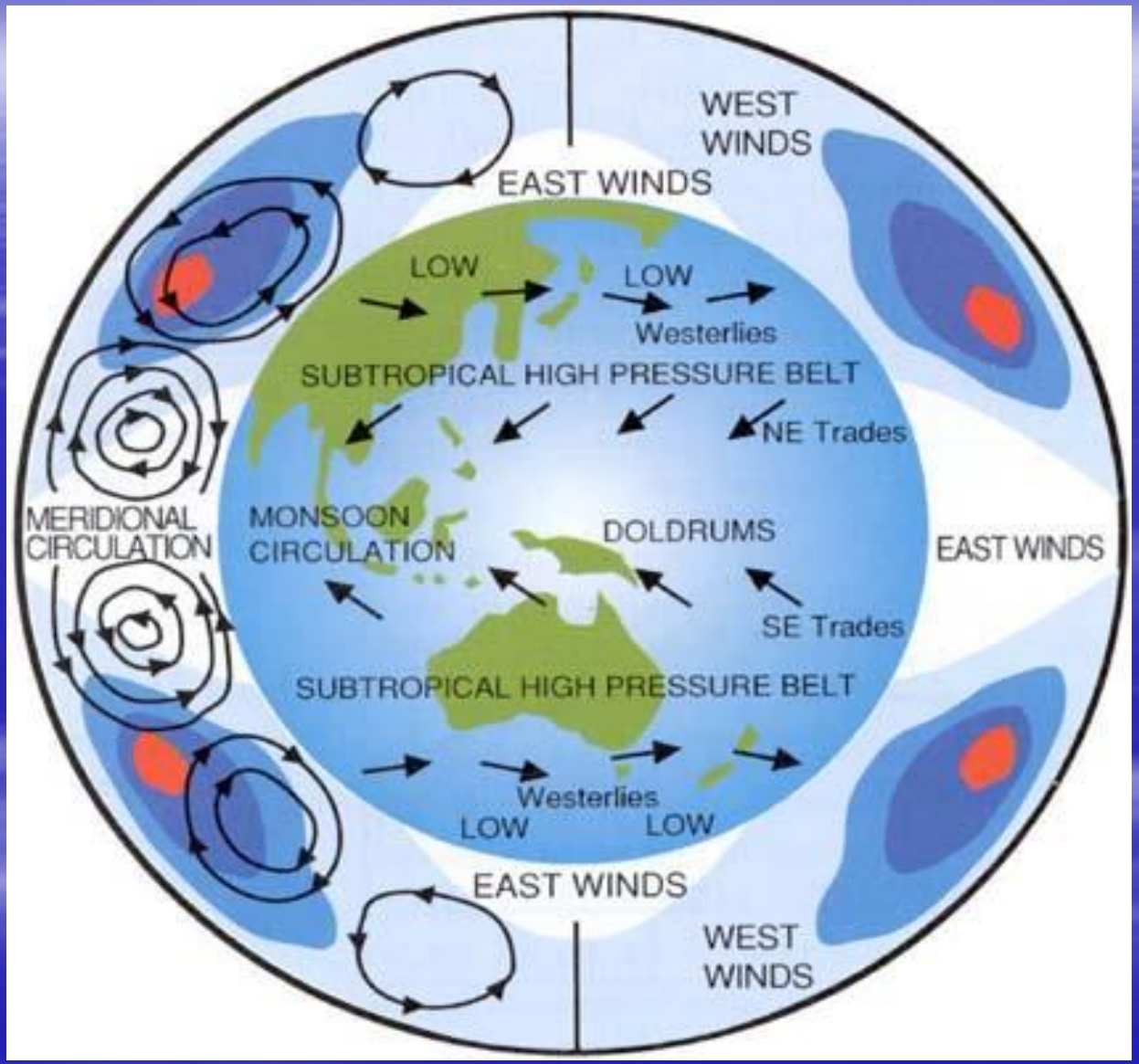
To Make it Twisted

- Remember how our original Earth model has changed?
- The winds do not appear to travel in straight lines, even though in reality they really do.
- This is because of the Coriolis Effect, and occurs because the straight winds blow across a rotating earth underneath.
- This makes the global winds appear to deflect to the left or right, depending on hemisphere.





- The other twist is that the warm and cold air circulating does not move directly from pole to equator.
- Because of the size of the earth, there are several convection cells that complete the pattern, and these cells occur at very regular intervals. These are called Hadley cells.
- Because of this, they greatly affect the climate of the earth beneath them and the direction of the winds that occur there.

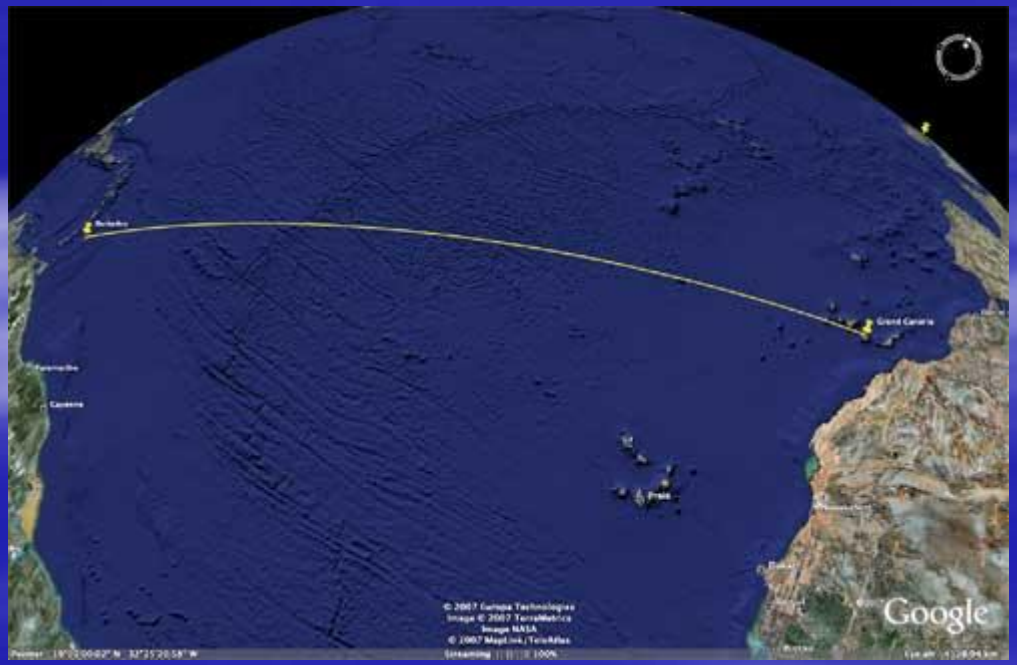

WEST
WINDS
EAST WINDS
LOW
LOW
Westerlies
SUBTROPICAL HIGH PRESSURE BELT
NE Trades
MERIDIONAL
CIRCULATION
MONSOON
CIRCULATION
DOLDRUMS
EAST WINDS
SE Trades
SUBTROPICAL HIGH PRESSURE BELT
Westerlies
LOW
LOW
EAST WINDS
WEST
WINDS

Doldrums

- Narrow areas of no wind at the equator. These occur because hot air is always rising in these areas. Earth's great tropical jungles occur in doldrums areas. Also many hurricanes originate from these areas.

Trade Winds

- These belts of wind move from East to West between 0-30 degrees. Trade winds are named because sailing ships used these to get to the New World.

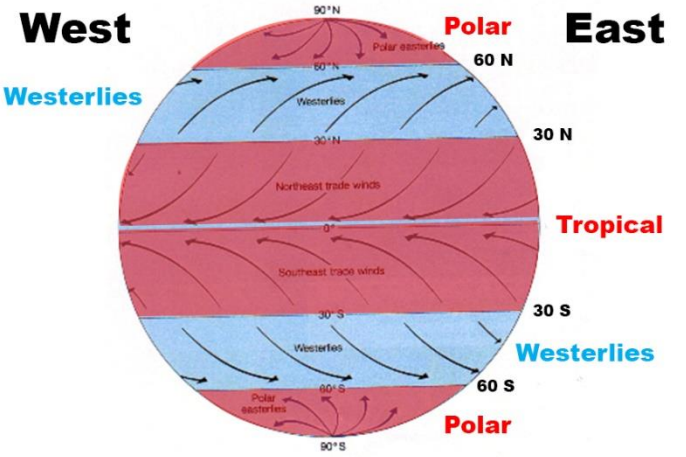


Horse Latitudes

- These form in a narrow region at 30 degrees and is where no wind is flowing. Horse Latitudes form where cool air is sinking. All major deserts are located in these areas. Horse Latitudes were named because ships would get stuck in these regions and they would toss horses into the ocean to lighten their loads so they could keep sailing.

Westerlies

- These are belts of wind that blow FROM west to east at 30-60 degrees. Westerlies are also known as our wind belt. Sailing ships used the westerlies to return back to Europe.

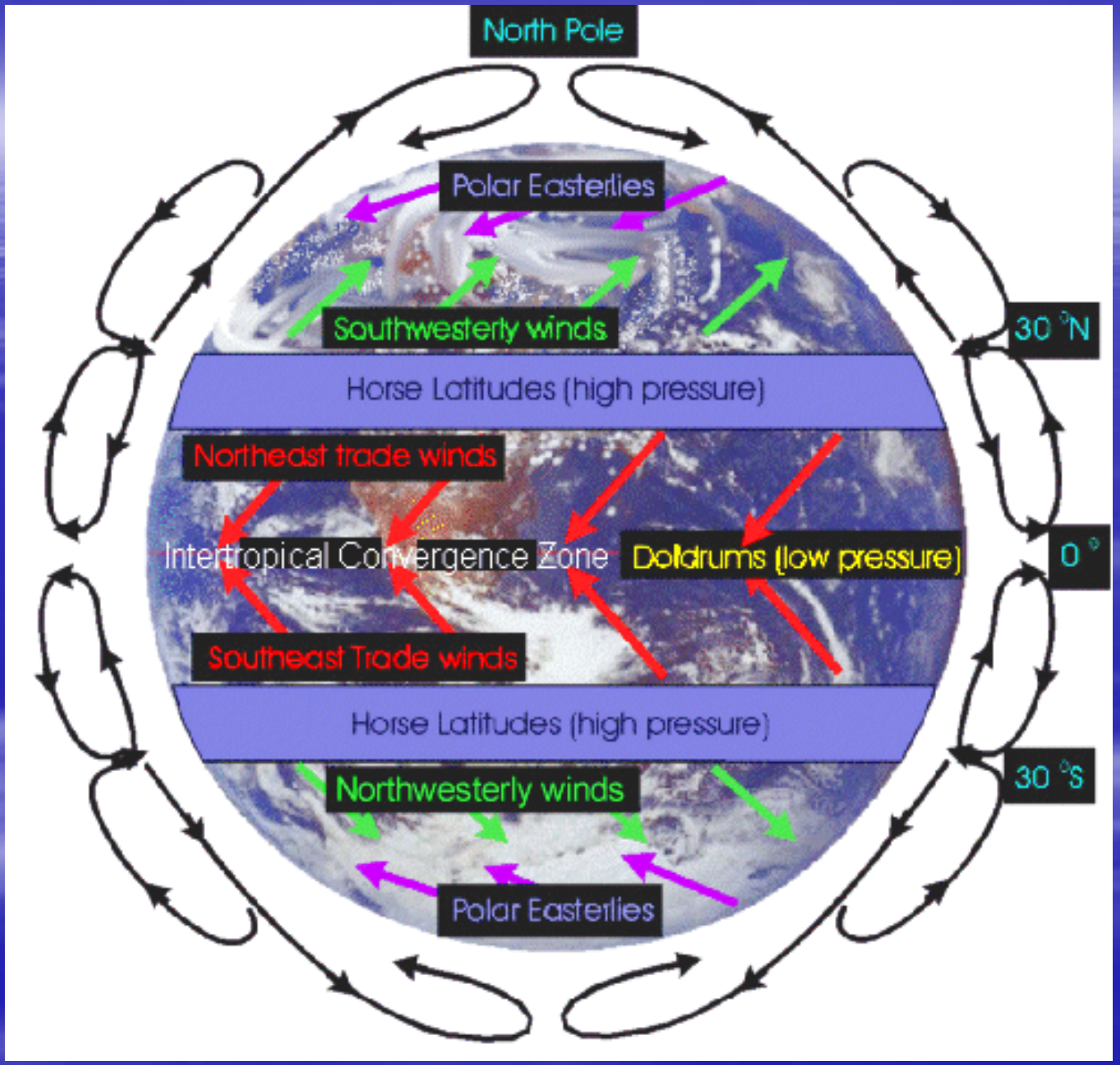


Polar Front

- A polar front is a narrow region of no wind located at 60 degrees. These are caused by warm air rising and are where winter storms originate (Gulf of Alaska).

Polar Easterlies

- A polar easterly is a belt of wind blowing from east to west at 60-90 degrees. These are areas where very cold air from the poles sinks.


North Pole
Polar Easterlies
Southwesterly winds
30 °N
Horse Latitudes (high pressure)
Northeast trade winds
Intertropical Convergence Zone
Doldrums (low pressure)
0 °
Southeast Trade winds
Horse Latitudes (high pressure)
30 °S
Northwesterly winds
Polar Easterlies

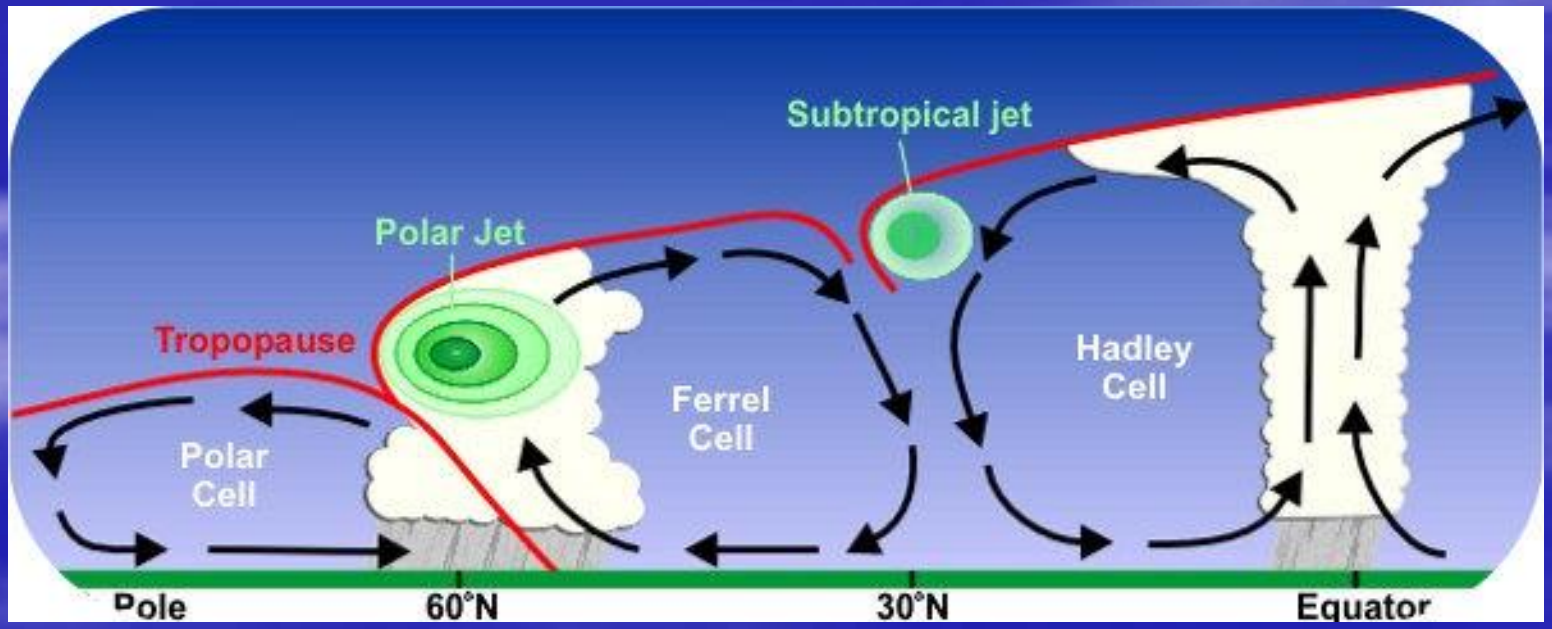
CLOUDS – AIR MOISTURE

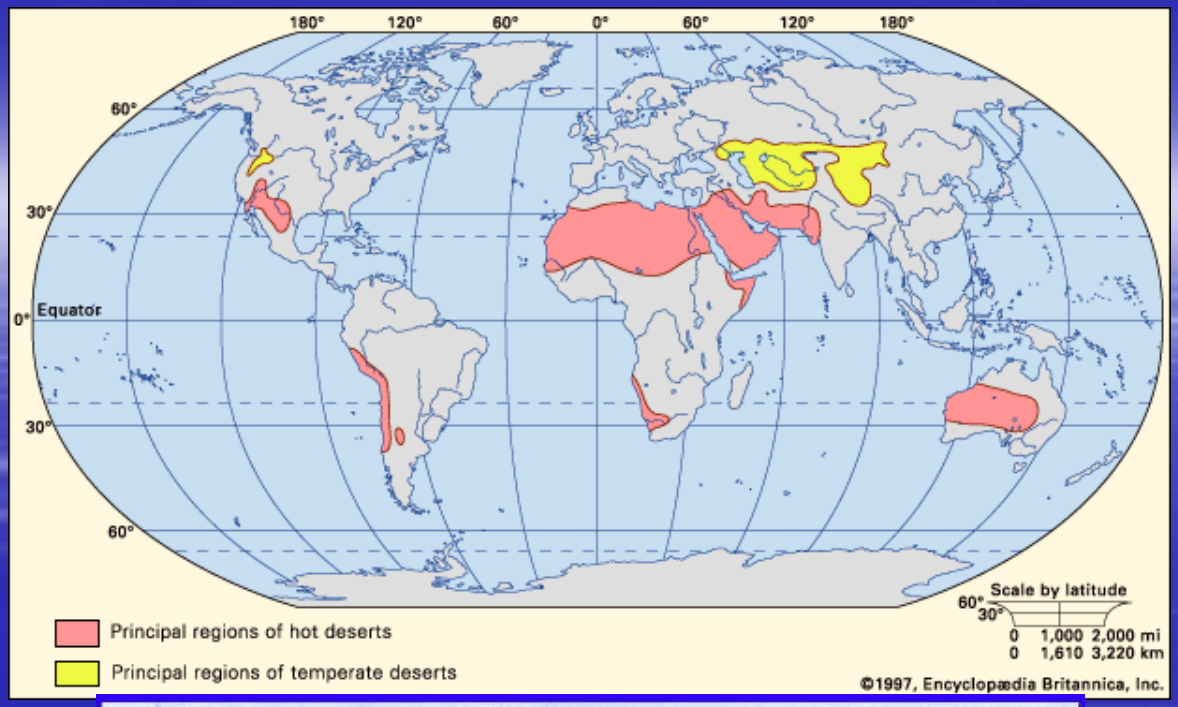
Air and Water

- How much water can air hold?
- (Sponge)
- Humidity
- Relative Humidity

What does this mean for clouds?

- What happens to temperature as altitude increases?
- What will happen to the moisture in the air?
- Where on Earth would you tend to see more rain?
- Where on Earth would you expect to see deserts?




180°
120°
60°
0°
60°
120°
180°
60°
30°
0°
Equator
30°
60°
Principal regions of hot deserts
Principal regions of temperate deserts
Scale by latitude
60°
30°
0 1,000 2,000 mi
0 1,610 3,220 km
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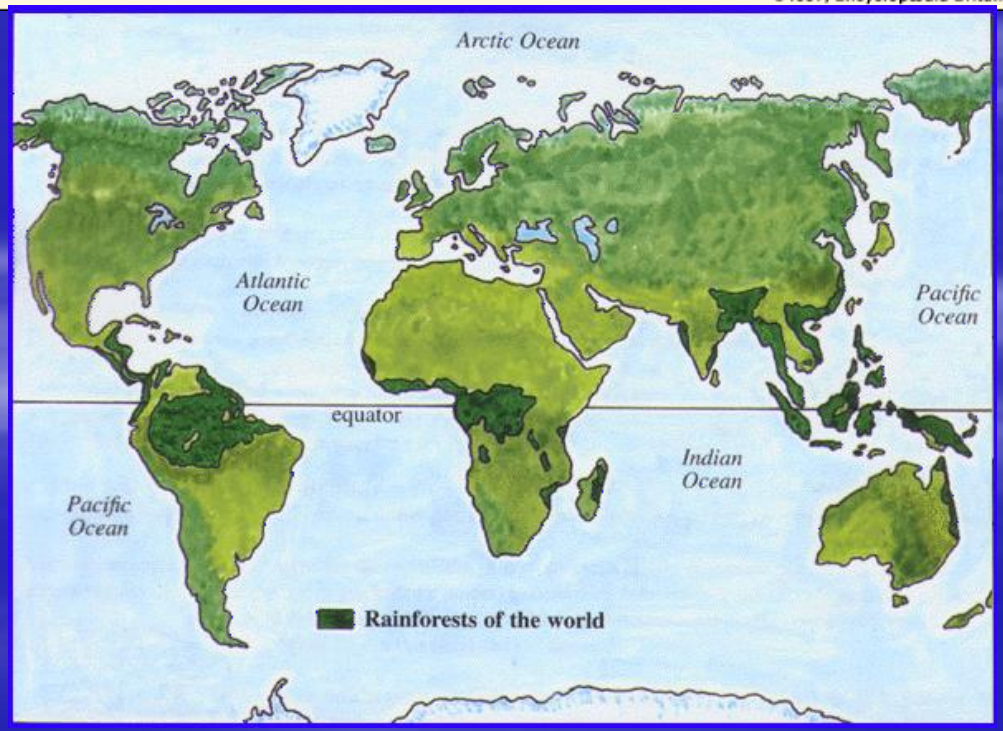
Arctic Ocean
Atlantic Ocean
Pacific Ocean
equator
Indian Ocean
Pacific Ocean
Rainforests of the world