

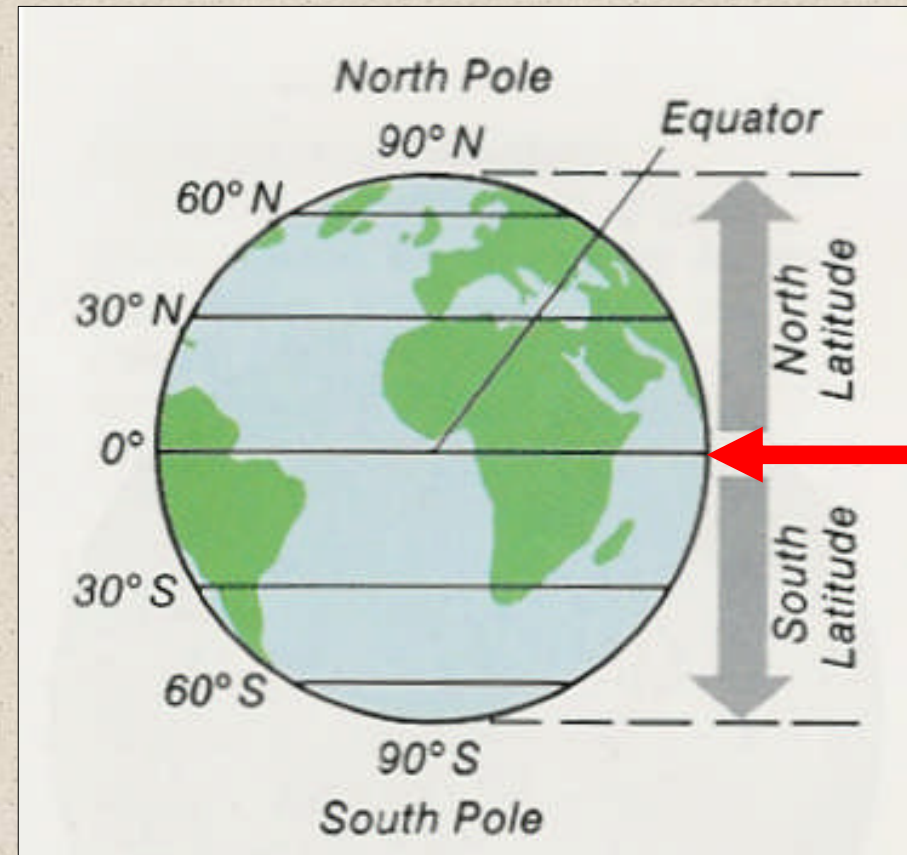
Controls of Temperature

-Why Temperature Changes from Place to Place-

- **LATITUDE**
- **SEASONS**
- **ALTITUDE (ELEVATION)**
- **LAND VS. WATER**
- **OCEAN CURRENTS & WIND DIRECTION**
- **TIME OF DAY**
- **OTHER FACTORS**
- **CITY COMPARISON**

LATITUDE

- Latitude- degrees north and south of the equator.
- Places near the equator get the most intense rays from sun and thus absorb the most heat.

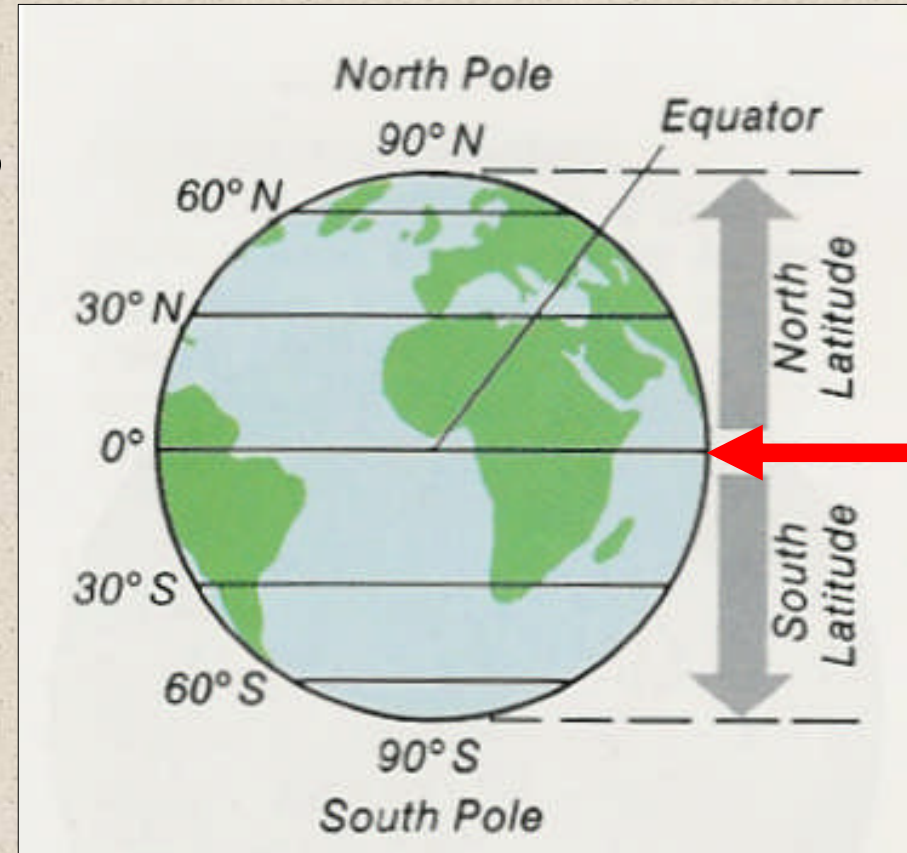


Vertical Ray Focused on Equator.

First Day of Spring and Autumn

LATITUDE

- Vertical Ray is when the sun is directly overhead at noon on a given day.

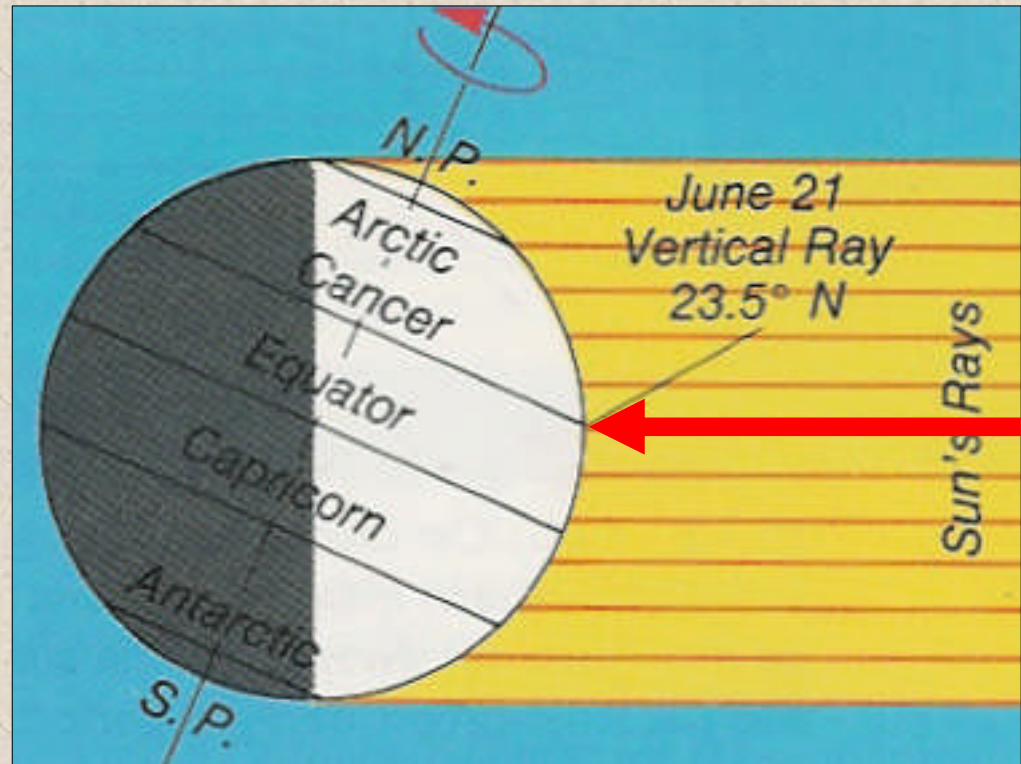


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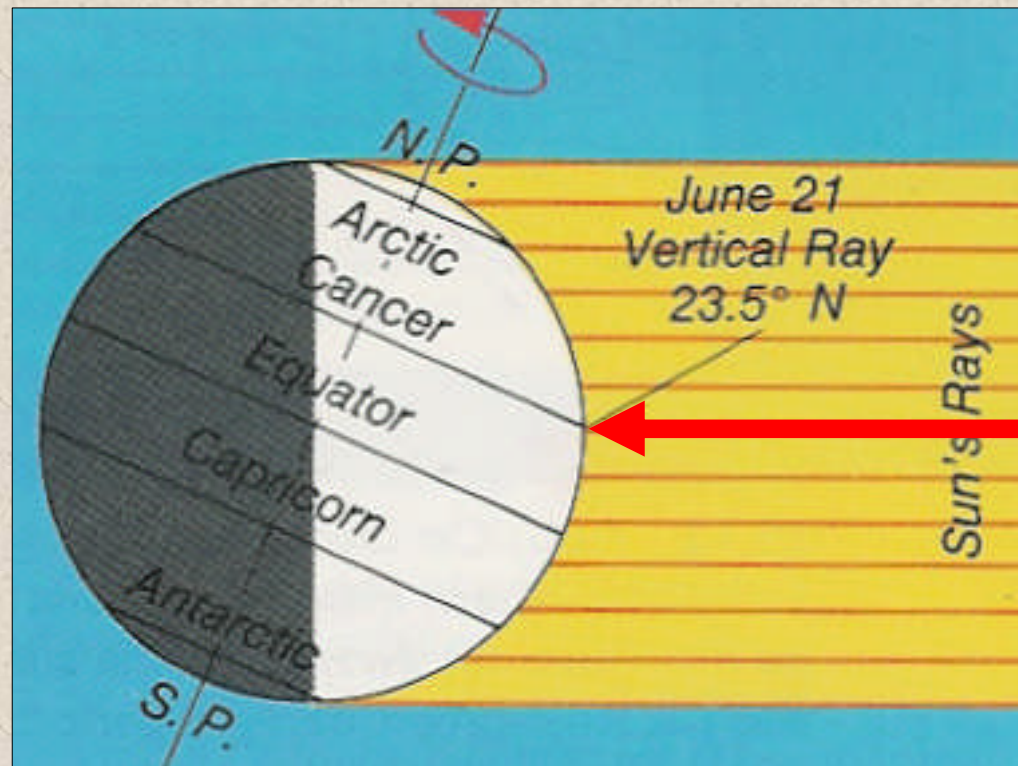
SEASONS

- Vertical ray shifts everyday (north or south) due to the 23.5 degree axial tilt of the Earth and the revolution of the Earth around the Sun.

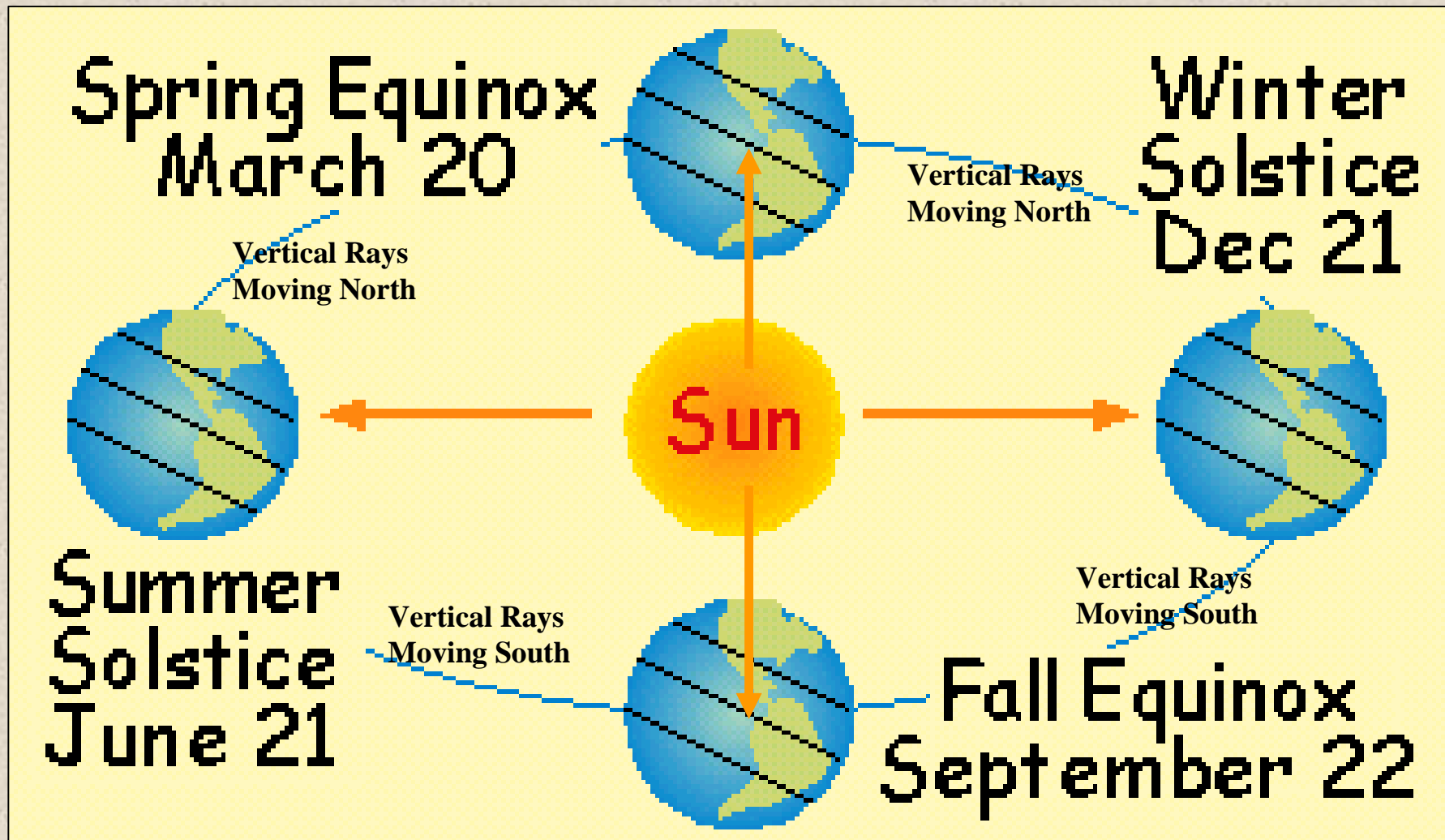


SEASONS

- Due to this tilt, the total length of daylight from day to day changes from place to place.



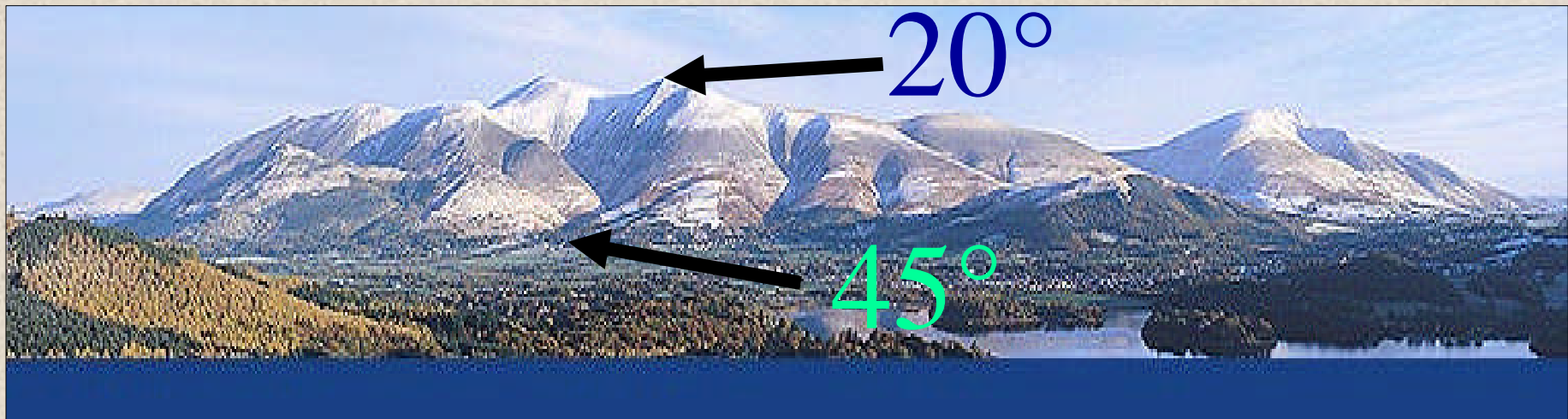
SEASONS



http://www.edumedia.fr/a63_12-4-seasons-2.html

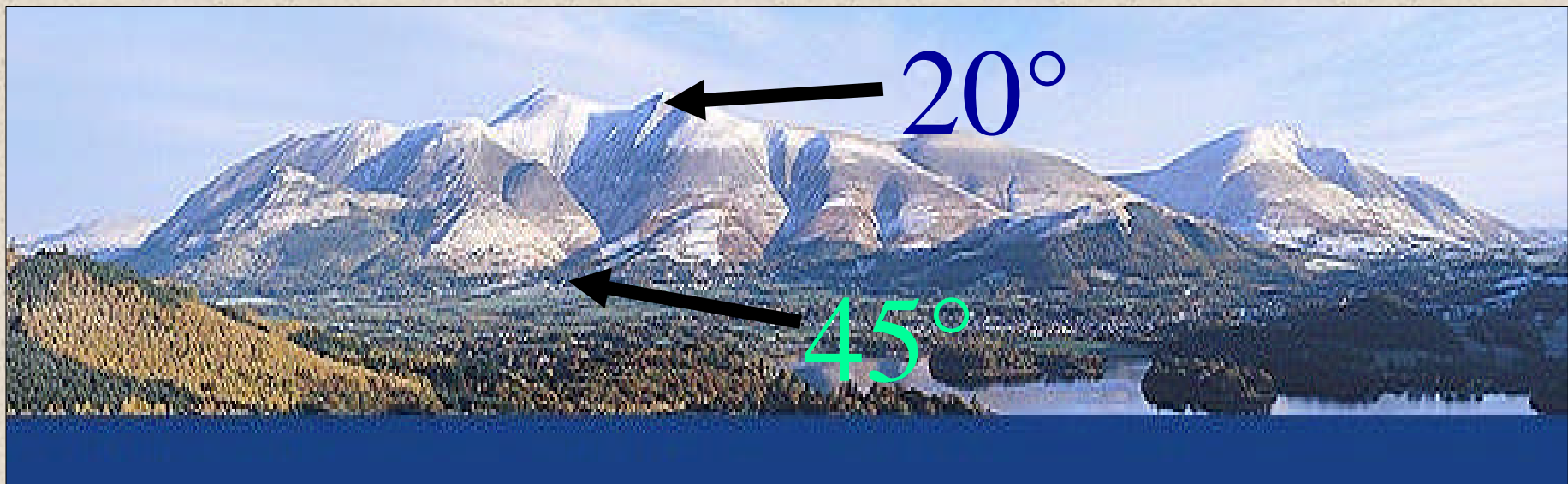
ALTITUDE (ELEVATION)

- In the troposphere, temperature decreases with an increase in altitude.
- Normal lapse rate- 3.5 °F lower for every 1,000 feet you go up.



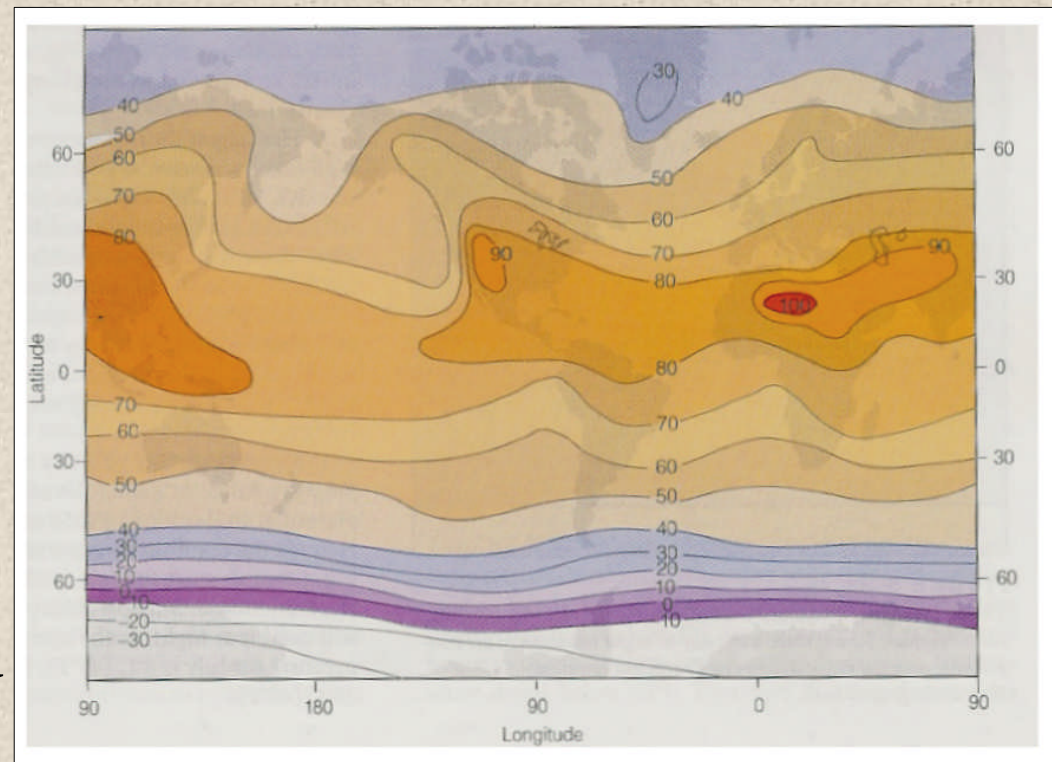
ALTITUDE (ELEVATION)

- Given the temperature difference, this is how you figure out the total change in elevation.
- $\Delta T / 3.5^{\circ}\text{F} = \Delta E / 1000 \text{ feet}$
- $25^{\circ}\text{F} / 3.5^{\circ}\text{F} = x / 1000 \text{ feet}$
- $X = ? \text{ feet}$



LAND VS. WATER

- Earthly surfaces absorb *different* amounts of energy. Biggest difference is between land and water...**why?**



Average July Surface
Temperature

LAND VS. WATER

- Specific heat-
the amount of
energy needed
to raise the
temperature of
1 gram of stuff,
1°C.

<u>Substance</u>	<u>Specific Heat</u>
Water	1.00
Mud	0.60
Ice	0.50
Wood	0.42
Dry air	0.24
Beach sand	0.19
Rock	0.18

LAND VS. WATER

So, the higher numbered values mean more heat energy is needed to raise temperature.

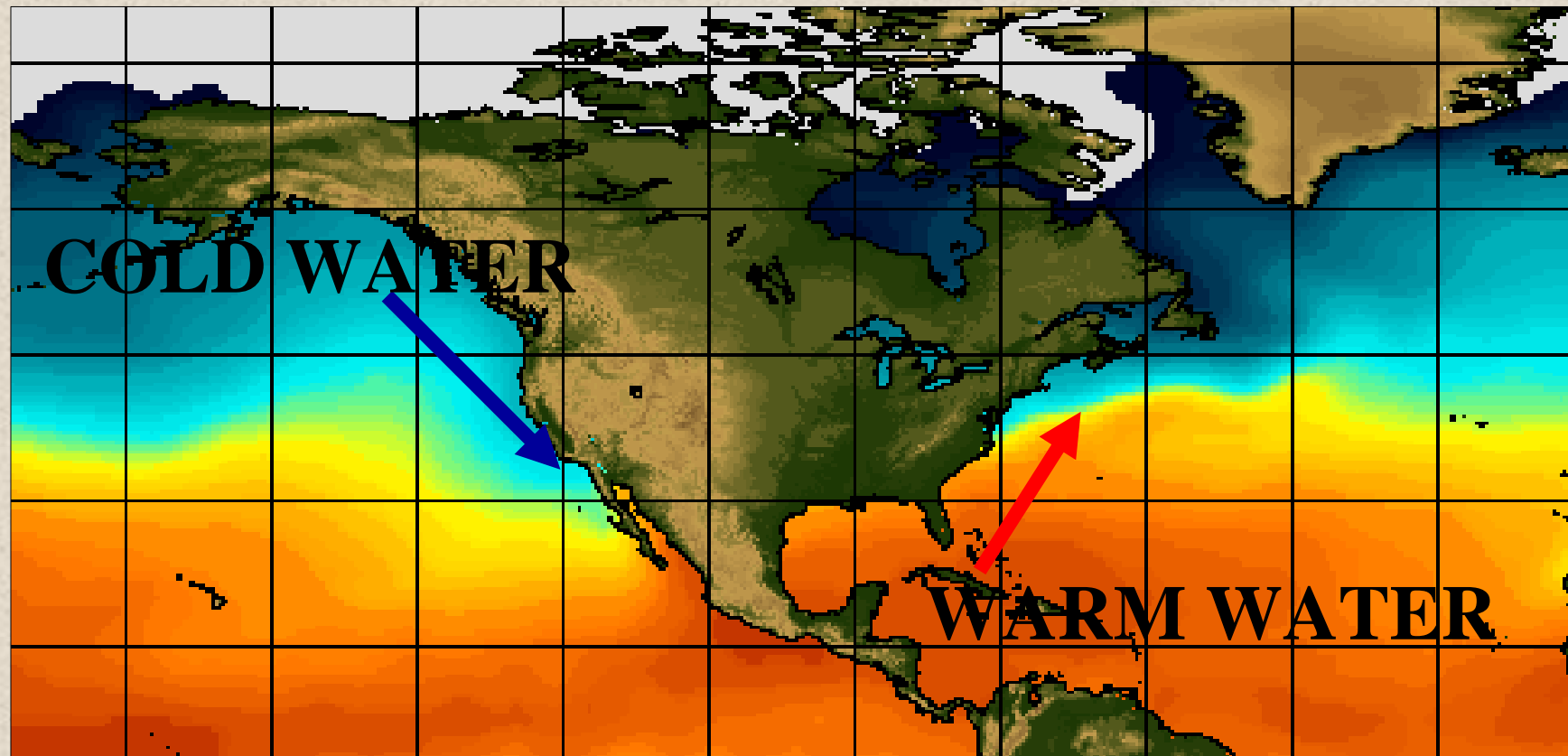
LAND VS. WATER

- Land **heats up quicker** and **cools down quicker** than water.

- 1. Water needs more energy to change its temperature than land (specific heat).
- 2. Water is transparent so radiation goes below its surface unlike land.
- 3. Water can mix, land cannot.
- 4. Water can evaporate and cool much more effectively.

OCEAN CURRENTS AND WIND DIRECTION

- Ocean currents are guided by the prevailing wind direction.



OCEAN CURRENTS AND WIND DIRECTION

- What does the word **modification** mean?
- So, being near a large body of water prevents temperatures from going to the extremes. Thus, extreme temperatures usually occur a fair distance away from a large body of water. Water acts as a temperature **modifier**.

OCEAN CURRENTS AND WIND DIRECTION

Spokane, WA is **10 °F warmer** than Seattle, WA in July.

BUT...

10 °F cooler than Seattle, WA in January. **Why?**



OCEAN CURRENTS AND WIND DIRECTION

•Seattle, WA receives an ocean breeze, Spokane, WA does not...

The ocean breeze **cools** Seattle, WA during the summer.

BUT

the ocean breeze **warms** Seattle, WA during the winter.

*The same holds true for us here on the East coast.
Compare Philadelphia versus Atlantic City when there is
an ocean breeze.*

TIME OF DAY

- **Warmest**- early to late afternoon (between 2 and 5 p.m.)because it takes time for the surface to heat up.

- **Coollest**- just before dawn (5 a.m.)because it takes time for the surface to cool off.

TIME OF DAY

However, weather conditions play a large role as does the season which impacts time of sunrise and sunset. These time of day conditions are the truest under a clear sky with very little wind from midnight to midnight.

OTHER FACTORS

- Local climate
- Surroundings (hills, valleys, urban areas)
- Cloudiness
- Humidity
- Moisture in the ground
- Snow cover on the ground
- Can you think of any others?

City Comparison: Why the Difference in Temperature?

- Philadelphia versus Scranton, Pennsylvania
- Philadelphia versus Atlantic City
- Philadelphia versus Sacramento, California
- Philadelphia versus Melbourne, Australia
- Philadelphia versus Miami, Florida
- Philadelphia versus Juneau, Alaska
- Philadelphia versus Pittsburgh, Pennsylvania

THE END