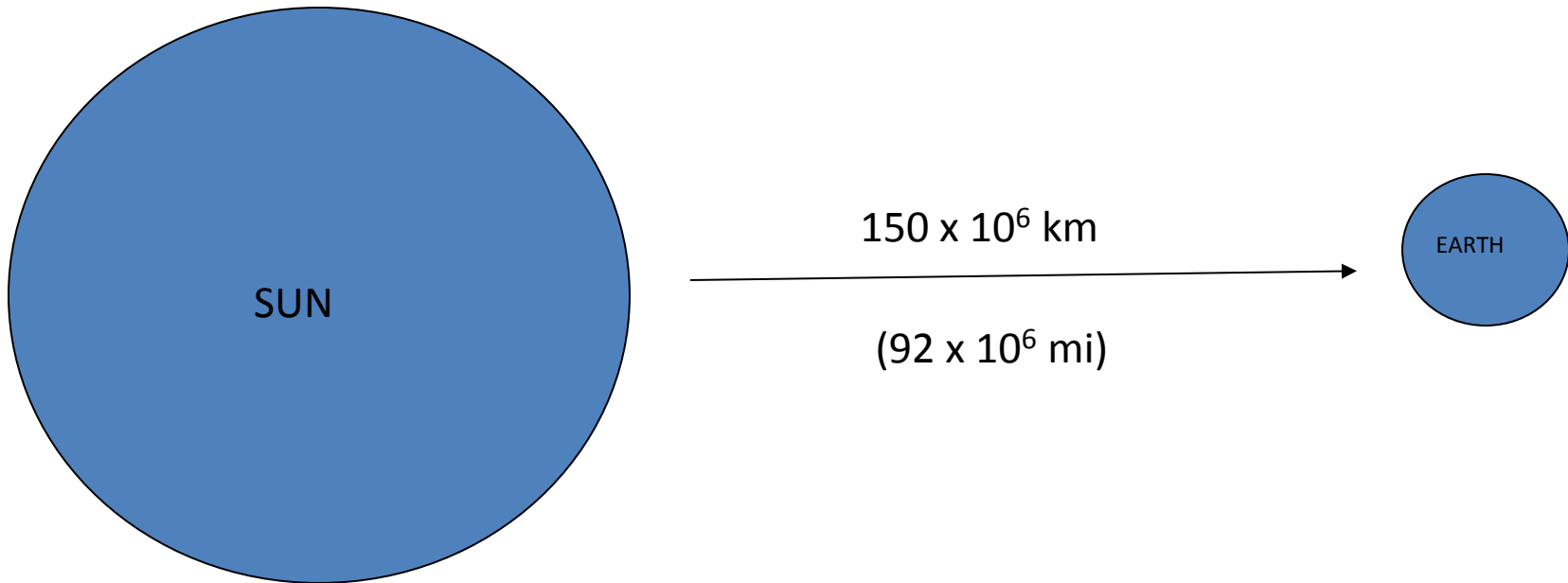


What factors affect climate?

Dr. Michael J Passow
DMAE Science

Energy from the Sun (mostly light and heat)
radiates to Earth

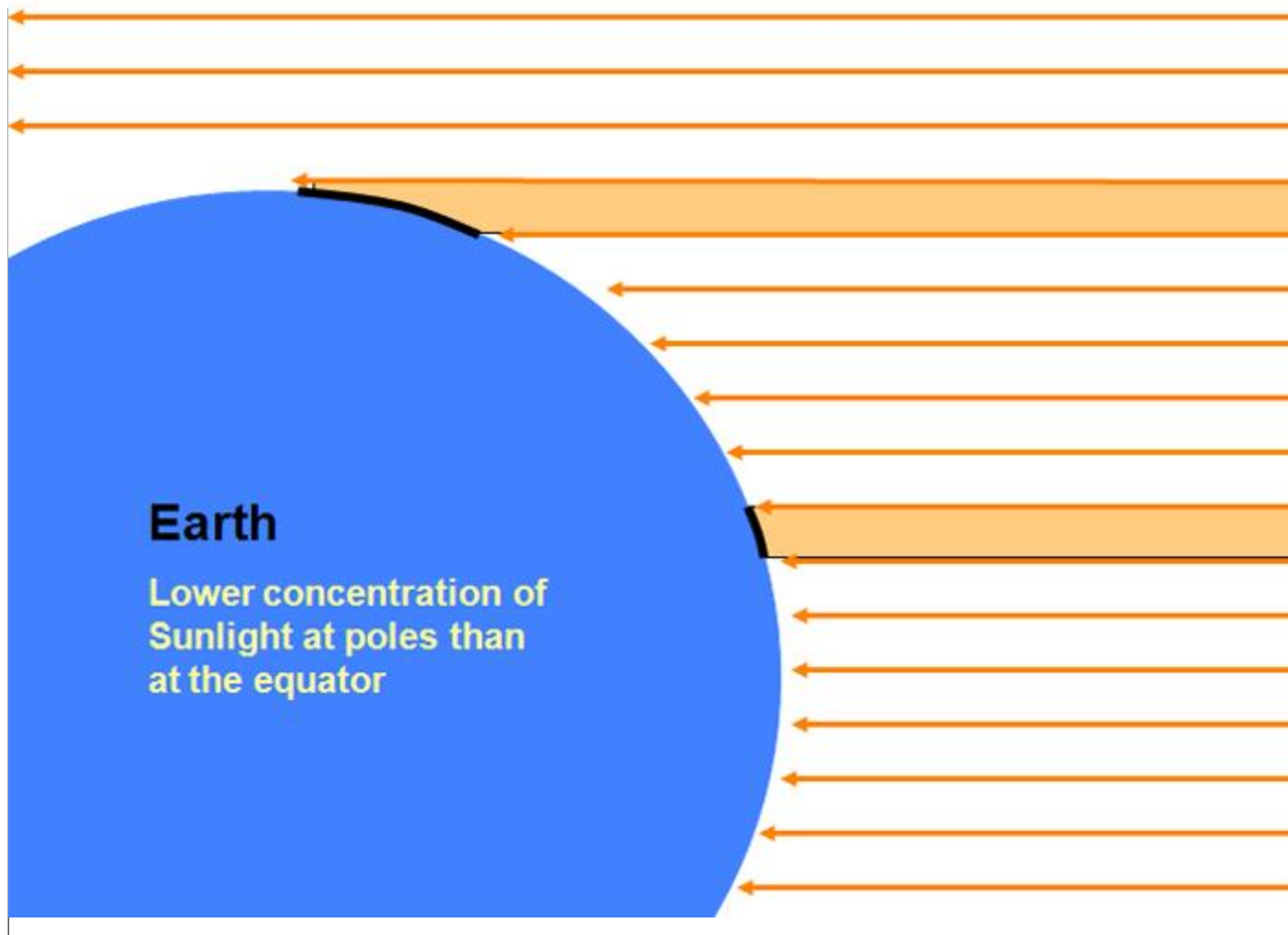


Reminder of Key Terms

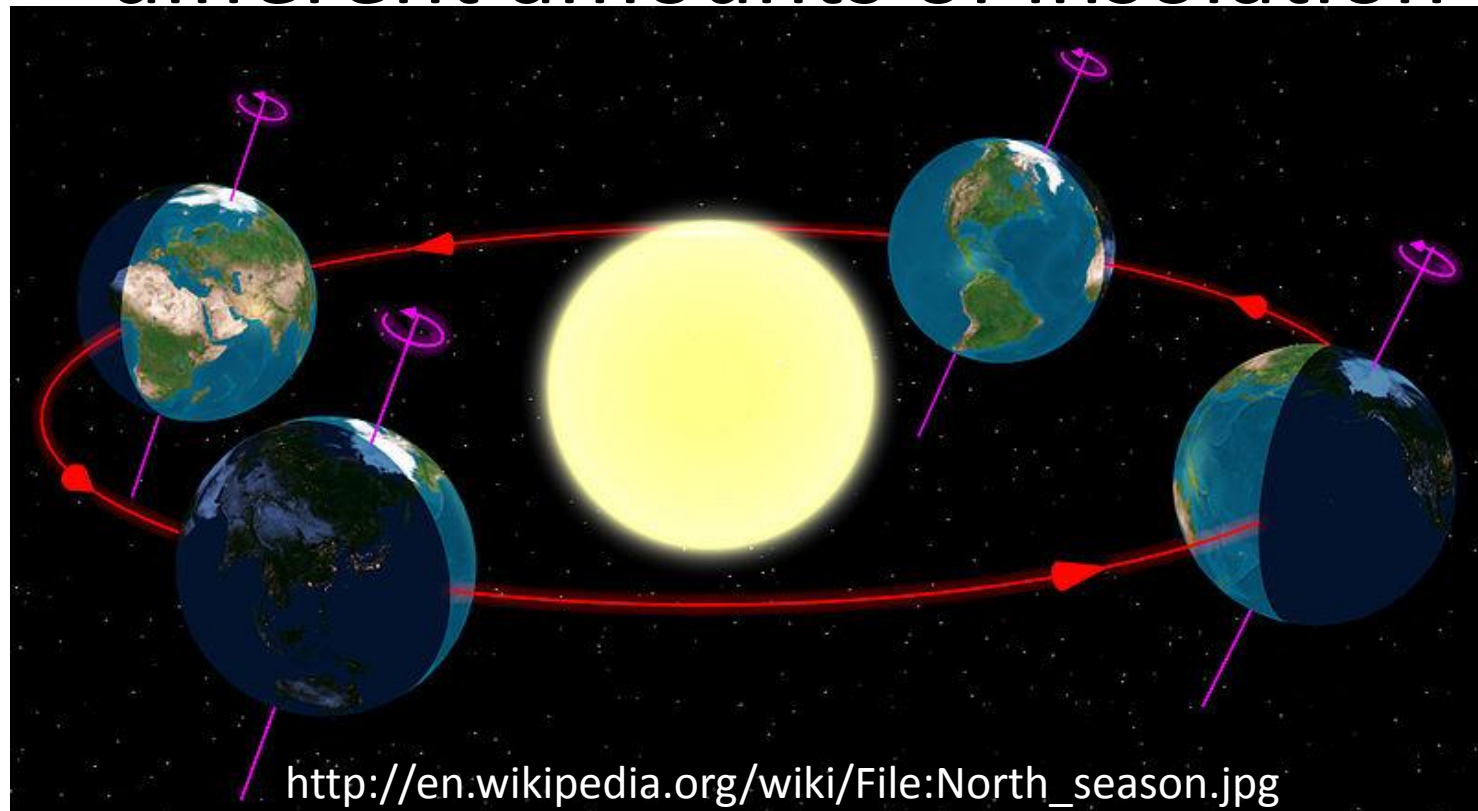
- Energy
- Radiation
- Convection
- Conduction
- Latitude
- Longitude
- Evaporation
- Condensation

Earth is a 3-D sphere

- How does the **intensity of insolation** change as **latitude increases**?
- Why does the intensity of insolation change as latitude increases?



Most regions outside the Tropics have warm and cold seasons because Earth's axis is tilted and receive different amounts of insolation



Regions within the Tropics often have climates with wet and dry seasons

- Summer monsoon—
“rainy season”



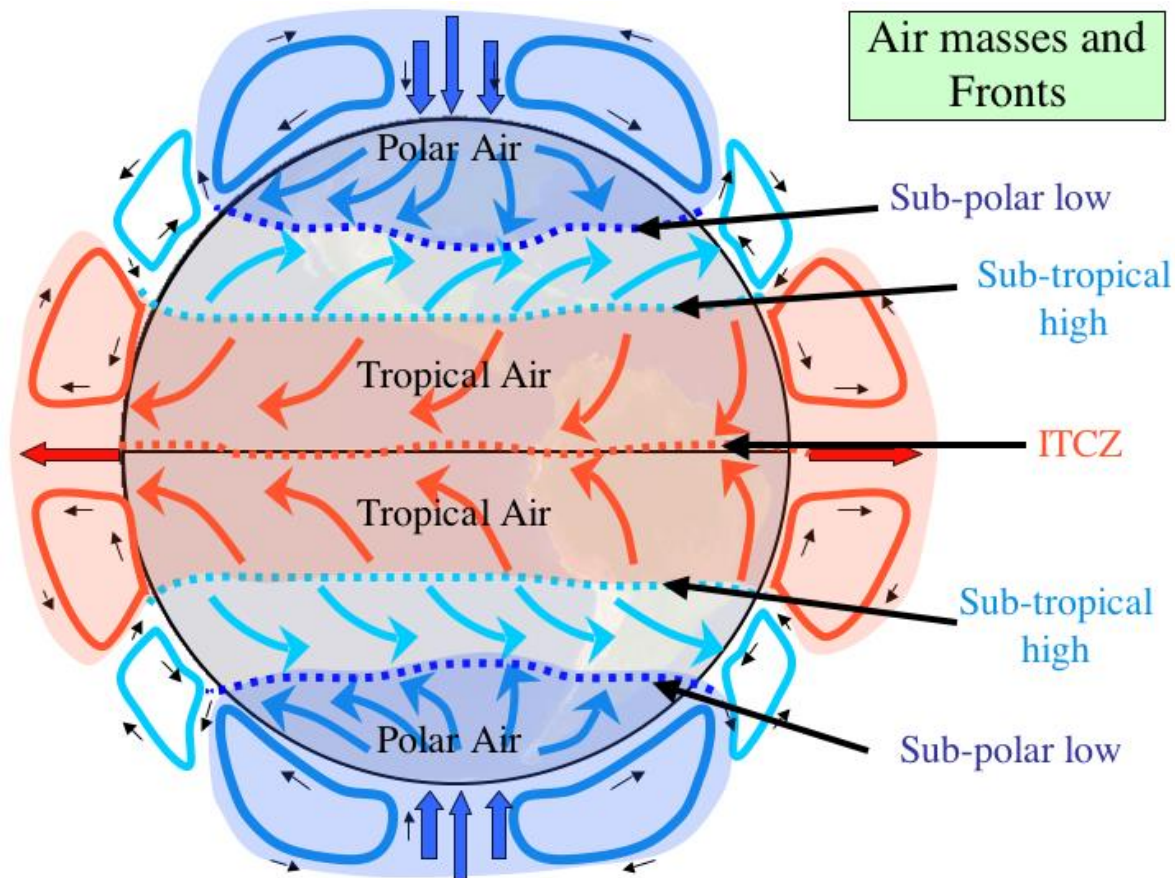
<http://www.thegeminigeek.com/wp-content/uploads/2009/06/monsoon.jpg>



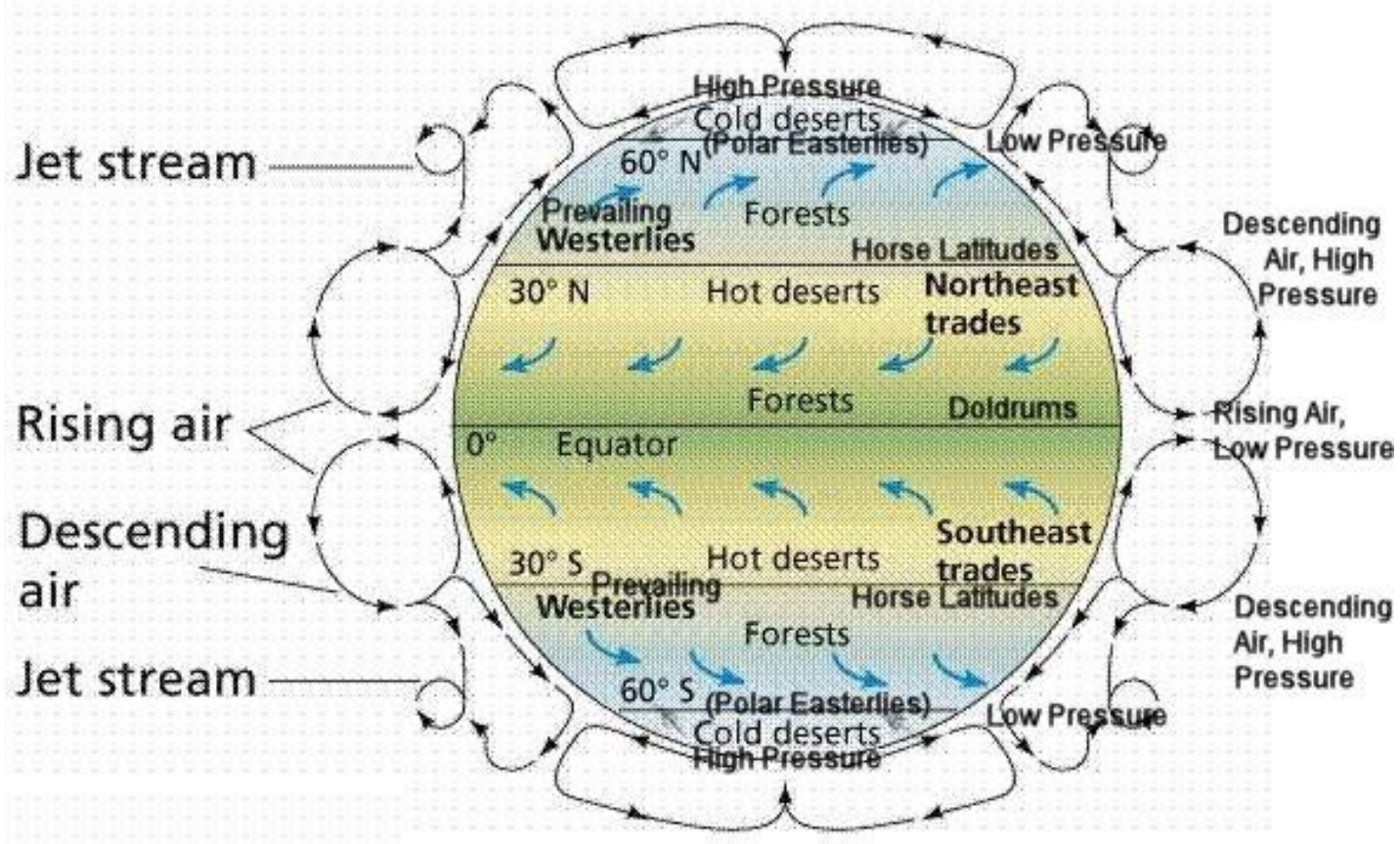
http://www.cse.unsw.edu.au/~andrewt/i/dry_season_fire_full.jpg

Atmospheric Circulation

Variations in heating and cooling, and Earth's rotation (Coriolis effect) produce three general climate zones in each hemisphere.



The atmosphere is actually more complicated than the simple model



<http://universe-review.ca/I09-15-circulation2.jpg>

Elevation

- The higher the elevation, the cooler the temperature
- Even in low latitudes (near the equator)
 - Andes
 - Himalayas
 - Kilimanjaro (Africa)

- Snow-capped peaks in Peru, near the equator



http://travel.mongabay.com/pix/peru/aerial-andes-Aerial_1026_3164.html

Topography

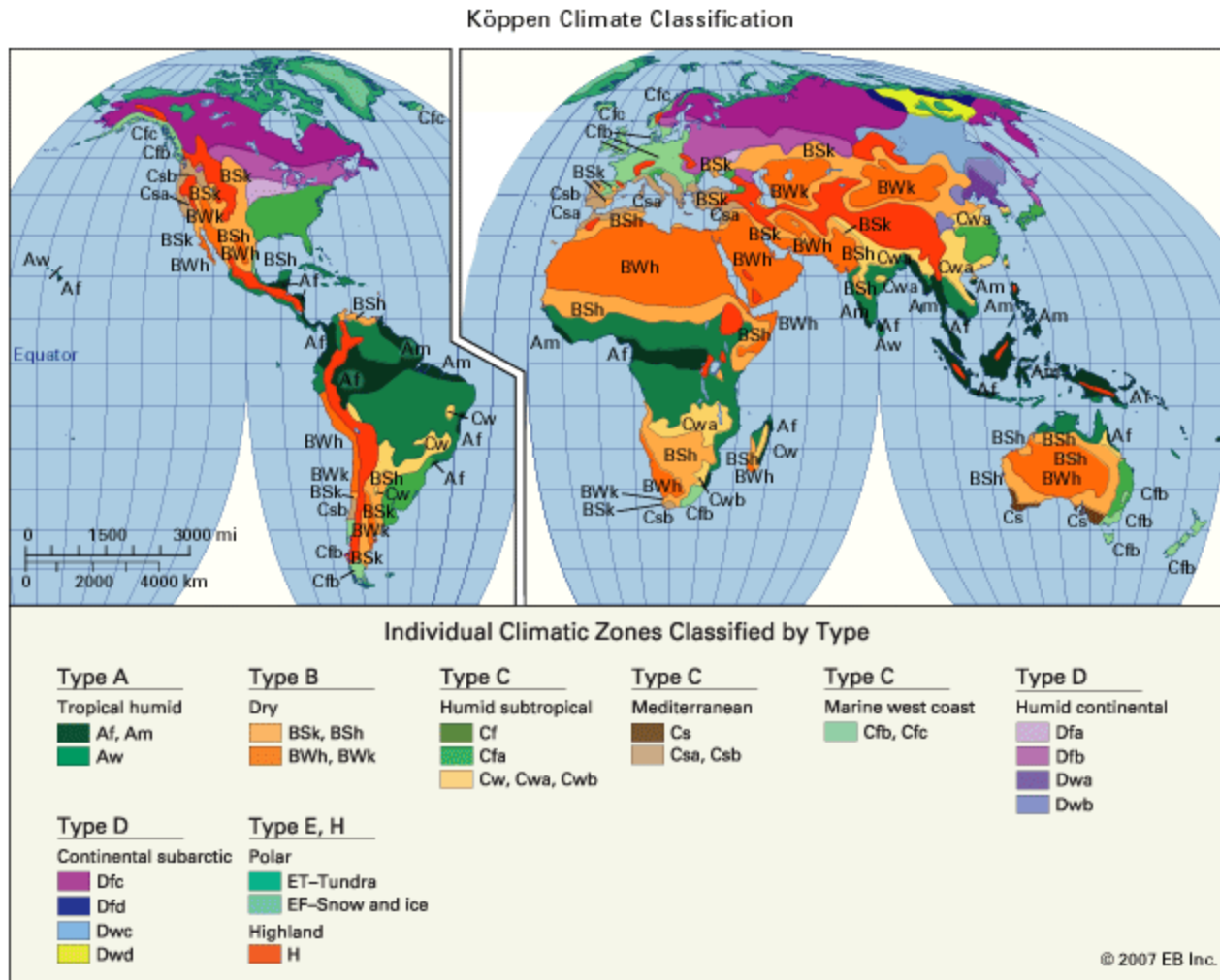


- As air rises up the **windward** side of a mountain, it cools and becomes **saturated**. As it sinks down the **leeward** side, it warms and dries. Areas where this occurs are the Pacific Northwest and the Sierra Nevadas. Behind these are “rain shadow deserts.”

Water Bodies

- Proximity (nearness) to ocean
- The Jersey Shore and similar places have cooler summers and warmer winters (smaller range) because they are near the ocean
- Greater range inland (middle of the continent)
- Proximity to large lakes (Great Lakes)
- “Lake-effect snow”

Classifying Climates – The Köppen System



What kind of climate do we have?

- Mild winters with coldest month below 18 C but above -3 C
- We are described as “Humid mid-latitude with mild winter”
- Koppen system: Cfa
- Climatologists study “**normals**” and “**anomalies**” (how far away values are from the expected value)

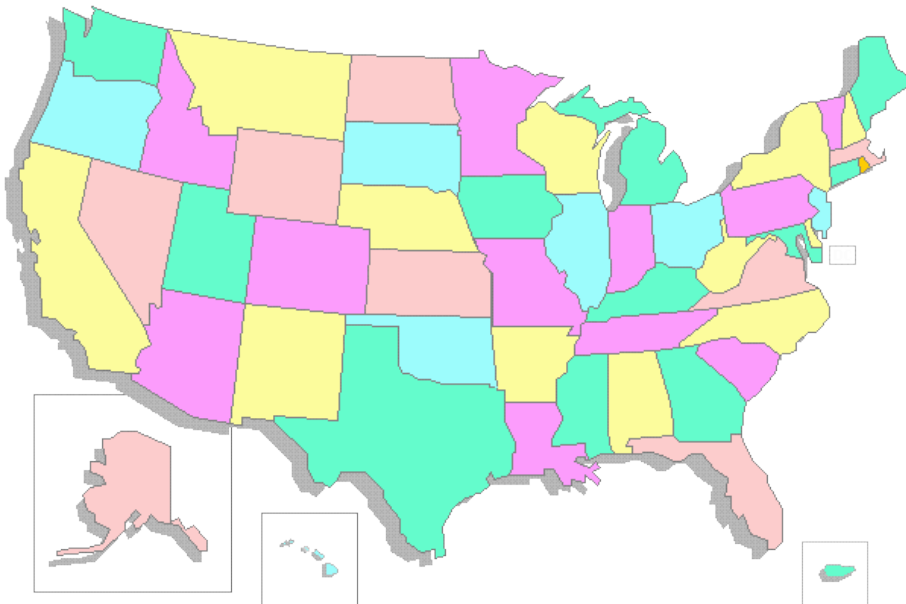
National Climate Data Center

www.ncdc.noaa.gov

- Official US government climate source
- “New” Normals posted 1981 – 2010

<http://ggweather.com/normals/>

- [New Jersey's Climate Data](#)



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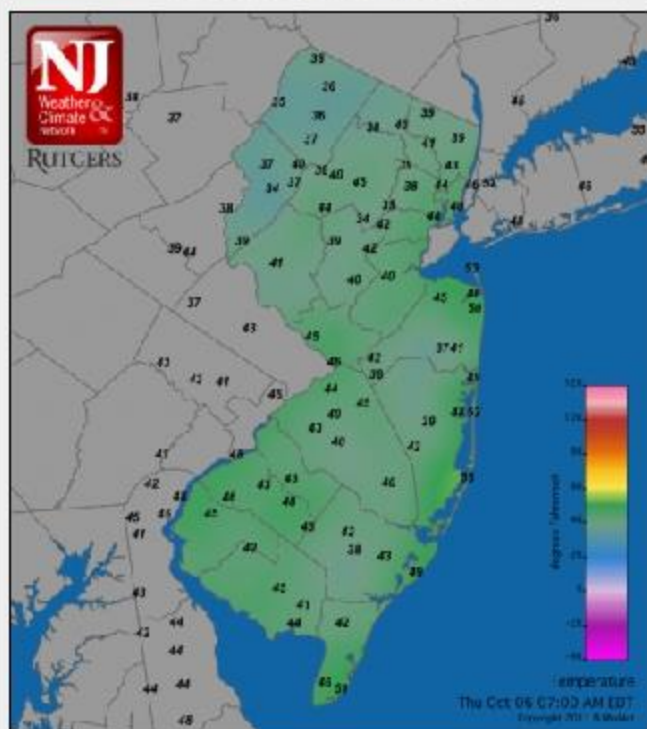
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[Monthly Maps](#)

[Winter 2010-2011 Snow Event Totals](#)

Latest News

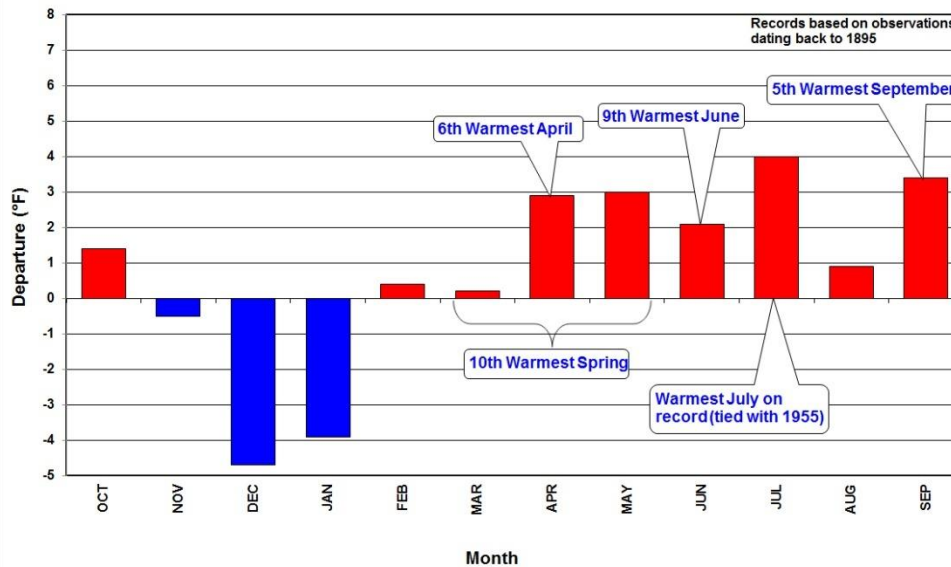


A backyard deck with furniture floats up onto a fence behind a pool destroyed by flood waters during flooding in Lincoln Park (Morris County) on September 8.

Photo by Jerry McCrea/The Star-Ledger

NJ Monthly Temperature Departures (October 2010 - September 2011)

Departures calculated from differences between observed monthly temperatures and 1981-2010 monthly averages

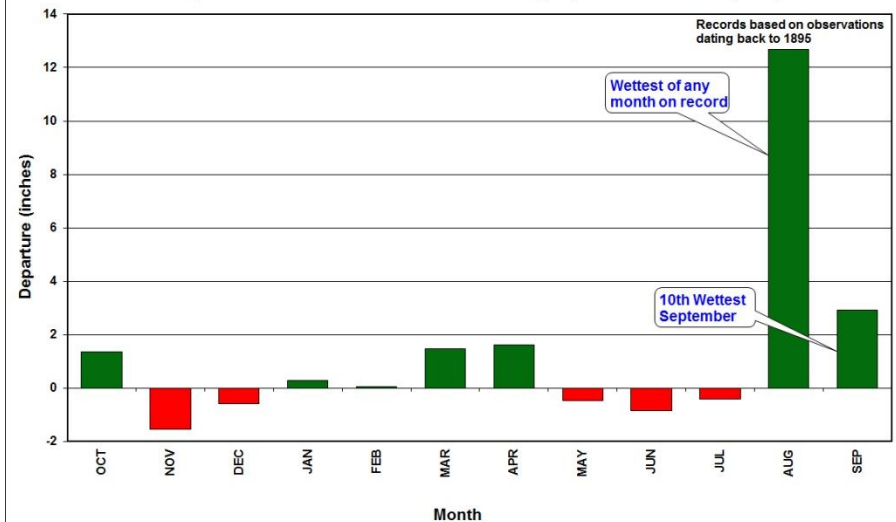


Examples of annual climate patterns, shown with bar charts

“discontinuous data”

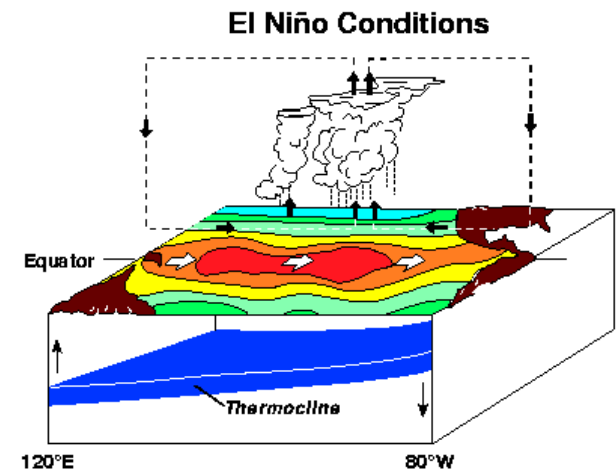
NJ Monthly Precipitation Departures (October 2010 - September 2011)

Departures calculated from differences between observed monthly precipitation and 1981-2010 monthly averages

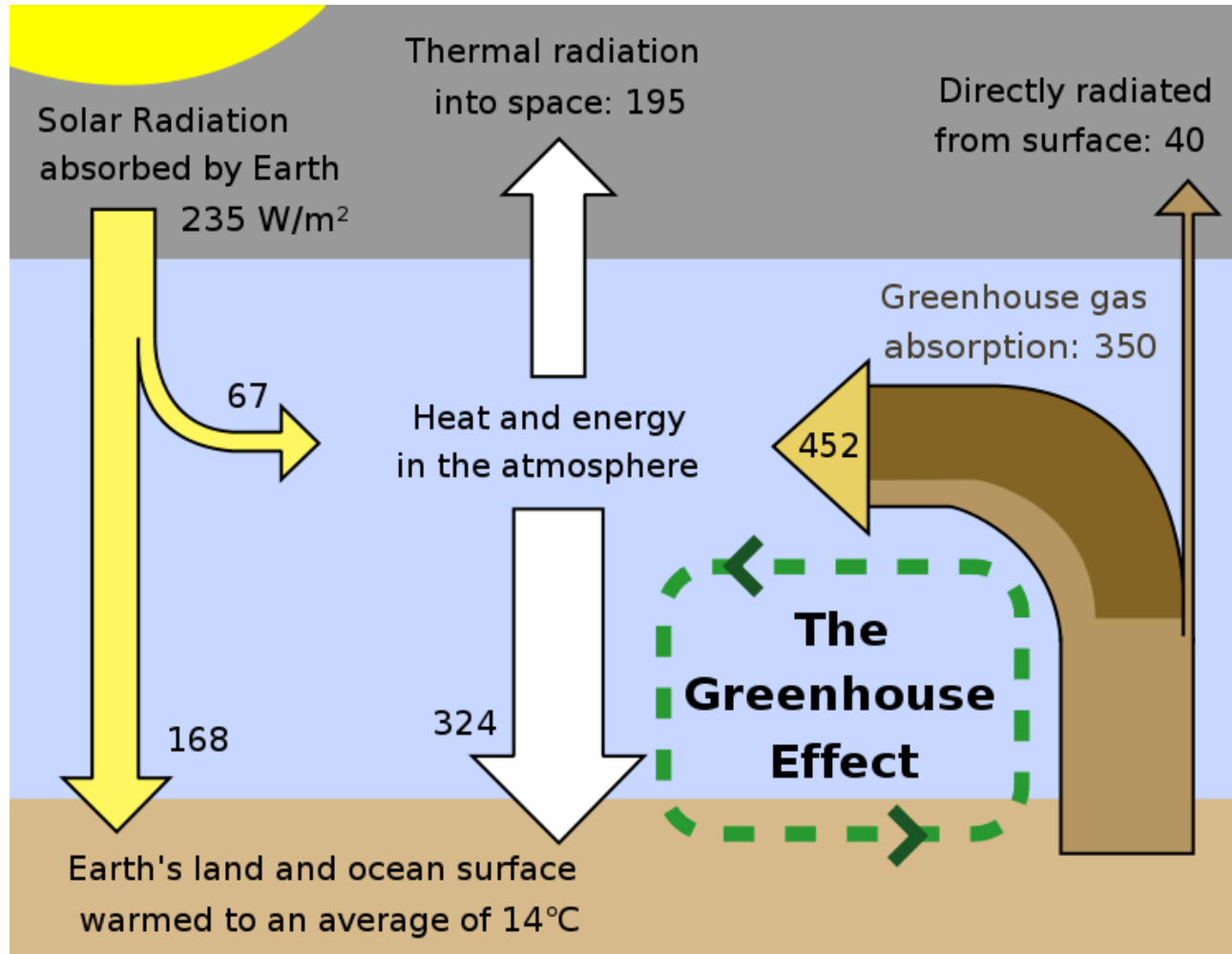


What Natural Processes Can Affect Climate?

- Volcanic eruptions
- Solar Activity
- Earth Motions (very long term)
- Ocean Circulation
 - >General current patterns
 - >El Nino-La Nina conditions



The “Greenhouse Effect” – Natural, but enhanced by Human Activity



What Human Impacts Can Affect Climate?

- Release of “Greenhouse Gases”
 - “Urban Heat Islands”
 - Pollution
-
- IPCC (Intergovernmental Panel on Climate Change) issues reports on potential impacts on Society

Takeaway Points

- Climates result from many factors, such permanent (such as elevation) and some changing cyclically (such as seasonal insolation)
- Climates can be described and classified by annual temperature and moisture patterns
- Natural and human-induced factors can impact climate
- Global climate will change in this century, with major impacts on society, including you!