CLIMATE & WEATHER
What is weather?

- Weather is **short-term** atmospheric conditions in an area.
- It is typically considered in **hours** or days.
What causes weather activity?

- Interactions between leading edges or fronts of moving masses of warm or cold air.
Types of Air Masses

- Warm Front
- Cold Front
- Jet Stream
A warm front is the boundary between a warm mass of air and the cooler air it replaces.

It often results in cloudy, rainy days.
Cold Front

- A cold front is an advancing mass of cold air that stays close to the ground.
- It is often associated with thunderstorms and high winds.
- Cooler, clear weather is the result.
Jet Stream

- **Jet streams** are fast flowing, narrow air currents.
- Jet streams are near the top of the **troposphere** and circle the Earth.
- They have a strong influence on weather patterns.
Extreme Weather

- Tornadoes and tropical cyclones are extremes of weather that cause much damage.
- Tornadoes form over land, and tropical cyclones form over warm ocean waters.
Extreme Weather - Tornadoes

- Tornadoes are most prevalent in the United States and Australia.
- They are funnel-shaped clouds that form when dry, cold air from Canada meets humid air from the Gulf of Mexico.
Extreme Weather – Hurricanes & Typhoons

- Tropical cyclones are formed by low-pressure cells of air moving over warm tropical seas.
- Cyclones forming over the Atlantic Ocean are called hurricanes; those forming over the Pacific Ocean are called typhoons.
Climate

- Climate is the long-term atmospheric conditions of a region, typically considered over decades.
- Average *temperature* and average *precipitation* are the two major factors that determine the climate of a region.
What else determines climate?

- The amount of incoming solar energy per unit area of land
- Air circulation over surface of the earth
- Water circulation
Four major factors determine global air circulation patterns.

- Uneven heating of the earth’s surface
- Seasonal changes in temperature and precipitation due to the tilt of the Earth
- Rotation of the Earth on its axis results in the Earth moving faster beneath air masses at the equator and slower at the poles
- Properties of air, water, and land
Greenhouse Gases

- Gases such as:
  - water vapor
  - carbon dioxide
  - methane
  - nitrous oxide
What do greenhouse gases do?

- They allow light to pass through the troposphere!
  - Mostly visible light
  - Some infrared radiation
  - Some ultraviolet radiation
- This natural warming is the greenhouse effect.
- The Earth would be a cold, mostly lifeless place without this effect.
Human Activities and Climate Change

- Human activities have added to the carbon dioxide, methane, and nitrous oxide in the atmosphere.
- Precipitation patterns, sea levels, and crop growing areas could be altered.
Lab Activities

1. A local Weather Study
   http://www.weather.com/weather/today/Philadelphia+PA+19111
2. Global Warming
3. Reflectance and Absorption of Light