**Atmospheric Influences on Insolation**

- **Insolation (incoming solar radiation) is reduced in the Earth's atmosphere by atmospheric gases, particulates, and droplets.**
    - **This is known as 'absorption'.**
    - **Radiation from the sun is also known as 'shortwave radiation'.**
- **'Reflection' is defined as radiation redirected away from Earth's surface without being absorbed.**
- **'Albedo' is a term which describes the percentage of visible light reflected by an object or a substance.**
    - **Freshly fallen snow has a very high albedo. That is why the atmosphere appears especially bright the day after a snowfall.**
- **When parallel beams of radiation enter the atmosphere of Earth, a percentage of the light is scattered away from its original direction.**
    - **Because blue light is the most readily scattered (because of its short wavelengths), the scattered radiation contains more blue light than any other color.**
        - **This is the reason our sky is blue.**
- **Sunrises and sunsets also appear to be red because at the low sun angle, its rays pass through a larger amount of the atmosphere.**
    - **As a result, light of shorter wavelengths are removed and therefore light of longer wavelengths (i.e. red light) dominate.**
- **High amounts of air pollution, fires and volcanic eruptions can enhance the color of sunsets.**

**Fate of Solar Radiation**

- **Most of the radiation absorbed by the atmosphere is *not* visible radiation.**
    - **This allows us to have vision.**
- **The atmosphere absorbs 25% of incoming solar radiation, while Earth's surface absorbs 45%.**

**Surface-Atmosphere Radiation Exchange**

- **Radiation coming from Earth's surface and atmosphere is known as 'longwave radiation'.**
- **Water vapor and carbon dioxide are excellent absorbers of longwave radiation.**
- **Clouds absorb nearly all longwave radiation.**
    - **As a result, nights with cloud cover are, on average, warmer than overnights with clear skies.**
        - **The clouds 're-radiate' the longwave radiation back to Earth.**

**The Greenhouse Effect**

- **In the absence of 'greenhouse gases' and clouds, Earth's average temperature would be 0°F.**
    - **The Earth's *actual* average temperature is 59°F.**
- **The 'greenhouse effect' keeps us warmer because gases such as water vapor and carbon dioxide absorb most of the longwave radiation emitted by the Earth, which warms the lower atmosphere.**

**Influences on Temperature**

- **Latitude**
    - **Temperatures decrease poleward.**
- **Altitude**
    - **Tropospheric temperatures decrease with increasing altitude.**
        - **Earth's surface is the primary heating source for the troposphere.**
- **Atmospheric Circulation**
- **Contrasts between Land and Water**
    - **Bodies of water take more time to warm and cool as compared to land.**
        - **The cities of St. Louis, Missouri (MO) and San Francisco, California (CA) are located at approximately the same latitude.**
        - **They both receive nearly the same amount of solar energy on a yearly basis.**
        - **However, St. Louis, MO has on average warmer summers and cooler winters as opposed to San Francisco, CA.**
        - **This is because St. Louis is surrounded on all sides by land, which warms up more rapidly in summer, as opposed to water. During the winter, it cools down more rapidly, as opposed to water.**
        - **San Francisco, CA is bordered on its western side by the Pacific Ocean. As a result, its summers are cooler than St. Louis, MO. In addition, San Francisco's winters are warmer than St. Louis, MO.**
- **Warm and Cold Ocean Currents**
- **Local impacts on Temperature**

**Measurement of Temperature**

- **The most reliable thermometers contain mercury which is the only metal that exists as a liquid at normal Earth temperatures.**
- **A *thermograph* gives a continuous record of temperature.**
- **Any thermometer, even the most accurate and precise one can not be placed anywhere one feels like to measure the temperature.**

- **Any thermometer exposed to direct sunlight will give an inaccurate reading because the outer casing will warm up the mercury and give a *false* reading.**

**Temperature Means and Ranges**

- **The 'daily mean' is defined as the average of the maximum and minimum temperature for the day.**
- **The 'daily temperature range' is calculated by subtracting the minimum temperature from the maximum.**
- **The 'monthly mean temperature' is calculated by adding the daily means and dividing by the number of days in the month.**
- **The 'annual mean temperature' is arrived at by adding the monthly means for the year and dividing by twelve.**

**Helpful Link:**

**http://www.weather.gov/jetstream/energy**