

**Lab 1: The Geographic Grid**

- Cartographers have devised a grid system to cover the entire earth
- The earth is spherical, therefore the grid must be able to follow a curved path (not rectilinear)
- Maps are flat representations of the spherical earth, therefore they are always skewed in some way
- Parallels of Latitude: run East-West, vary in length – longer at Equator, narrower at poles
- Meridians of Longitude: run North-South, same length, pass through both poles
- We use coordinate pairs (coordinates) to locate places, measured in degrees (ex. 43°30'N, 10°E)
- Know: Equator, Prime Meridian, International Date Line, North and South Poles
- Calculate distances in angular degrees (N-S and E-W)
  - Convert angular degrees into miles and kilometers

**Lab 2:**

- Weather vs. climate
- Understanding weather data
- Extreme/record data in order to better understand limits of weather for a place
- Structure of the atmosphere (temperature)
  - Troposphere, Stratosphere (ozone+UV), Mesosphere and Thermosphere
- Environmental Lapse Rate

**Lab 3: Earth-Sun Relationships**

- The earth's orbit around the sun is elliptical (perihelion & aphelion)
- The earth is tilted 23.5° off the orbital plane
- The tilt is always pointed in the same direction resulting in:
  - Different heating/cooling patterns (seasons) because of different sun angles & lengths of day
- Arctic and Antarctic Circles (degrees & importance)
- Tropic of Cancer and Tropic of Capricorn (degrees & importance)
- Winter and summer solstices (dates & sun location)
- Spring and fall equinoxes (dates & sun location)

**Labs 3a & 3b: Sun Angle, Surface Area of Radiation (SAR) and Beam Intensity (BI%) Calcs**

- The sun angle (or altitude angle) is the angular distance from the ground to the sun
- The zenith angle is the angular distance from the sun to a point exactly overhead (90°)
- These are complementary angles (add up to 90°)
- You can determine the sun angle by knowing the observation latitude and the latitude of 90° sun
- Latitudinal Distance is the same as the Zenith Angle!!
- Salem gets higher sun angles in the summer, lower in the winter
- The sun is always 90° somewhere between the: Tropic of Cancer (23.5°N) & Tropic of Capricorn (23.5°S)
- $SAR = 1 / \sin(\text{sun angle})$
- $BI\% = \sin(\text{sun angle})$  ← written as a percentage!

**Lab 5: Atmospheric Moisture**

- 3 states of matter and the 6 changes of state (Water vapor = water as a gas)
- Humidity and humidity calculations:
  - Relative humidity = Actual / Capacity (Capacity is related to temperature)
  - Dew point = temp where saturation is reached
  - Using the sling psychrometer
- Saturation = 100% relative humidity
- Warmer the air, the high the capacity to hold water vapor, cold the air, the lower it is.
- As air rises, it cools, it can hold less water vapor, reaching saturation, then condensation
- Condensation is NOT precipitation!
- Condensation in the atmosphere = Cloud development

**Darwin Festival:**

- Questions regarding the lecture or program you attended. It will be general in nature

You will be allowed **one sheet of 8.5" x 11" paper with any notes you choose to write on it. You may write on one side only.** Only the four basic math functions (addition, subtraction, multiplication and division) will be required. **You should bring a calculator – cell phones may not be used.** You may choose which questions to answer (4 of 6 for example) and you should expect problem sets of a similar type as we have done in these labs with short essay questions to examine the concepts.