

AOSC201: Weather and Climate Lab

Week 4: Temperature

Section 103/105

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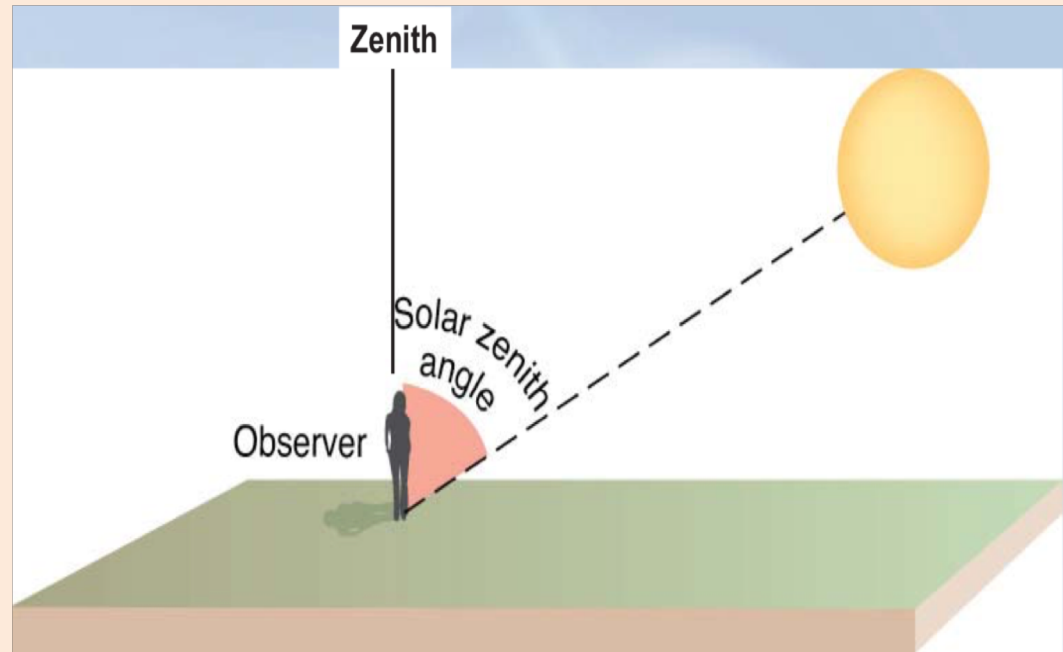
DEPARTMENT OF
ATMOSPHERIC &
OCEANIC SCIENCE

Week 4 Lab: *Temperature*

- ❑ Lab #10 of Lab Manual (pages 65-72)
- ❑ 50 points in total
- ❑ INDIVIDUAL Work for the entire lab

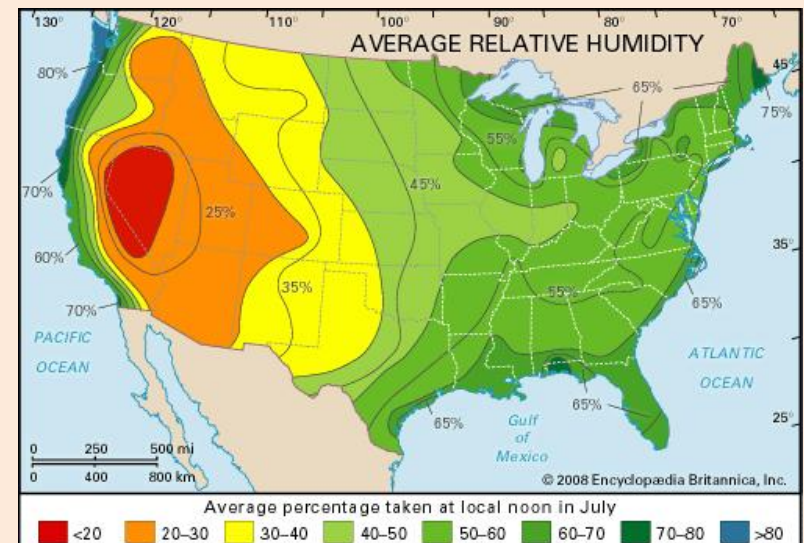
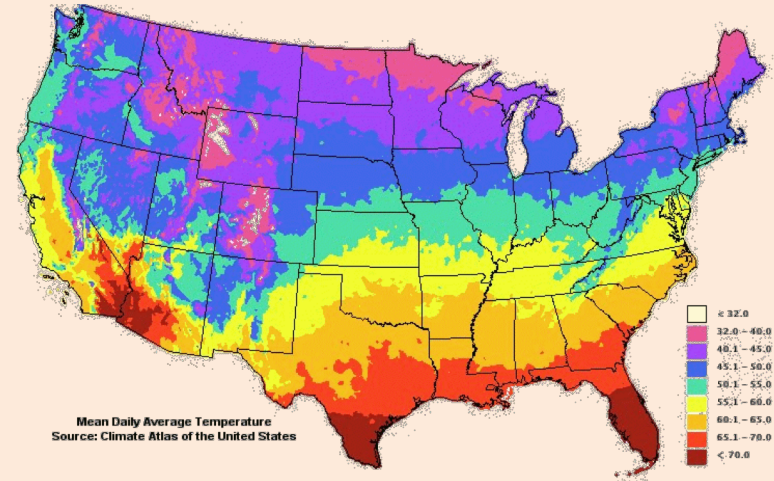
Solar Zenith Angle

- The angle between the sun and a point directly overhead (zenith)
- **Low SZA** = sun is higher in the sky
 - Warmer temperatures
 - More direct solar radiation
- **High SZA** = sun is setting/rising
 - Cooler temperatures
 - Indirect solar radiation
- Expressed in unit of degrees.



US Climate

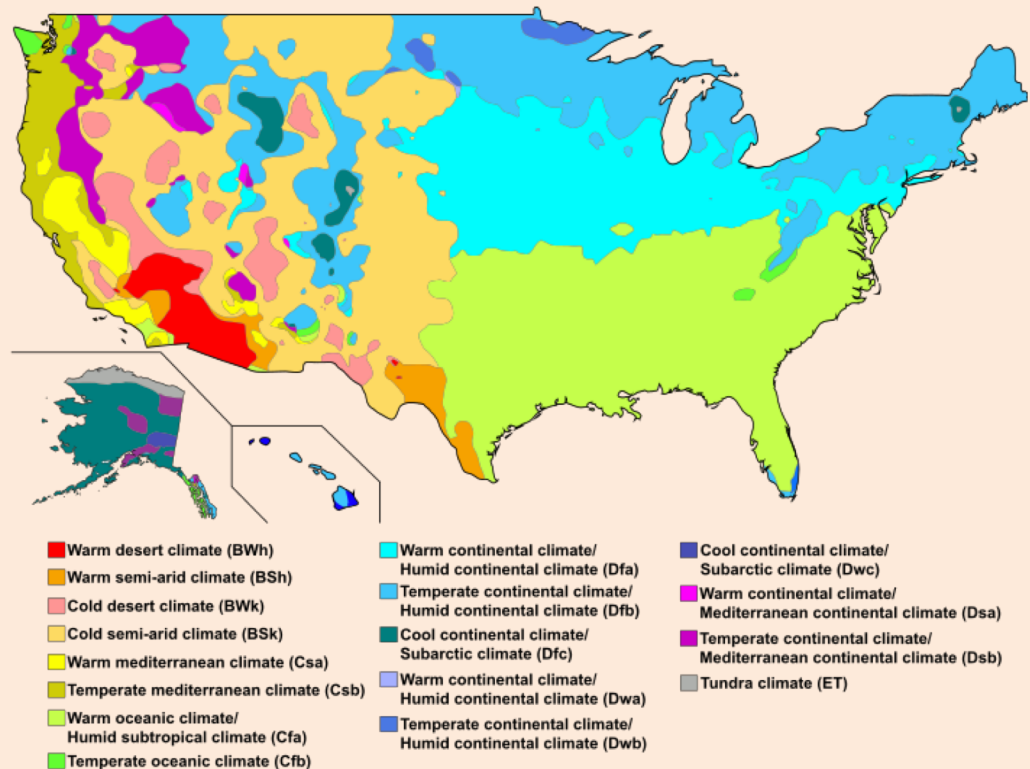
- Imp. factor for temperature variability: location.
- Factors that decide a city's temperature
 - Proximity to a body of water
 - Altitude
 - Latitudinal location
 - Topography
- Thermal inertia = moderation of temperature between a location and its surroundings
 - Dependent on absorptivity, moisture, specific heat, etc...



US Climate Example

- The US has a wide range of climate type
- Example: Köppen Climate Classifications
- Think about how climate is going to be different for different US cities for this lab!

United States map of Köppen climate classification

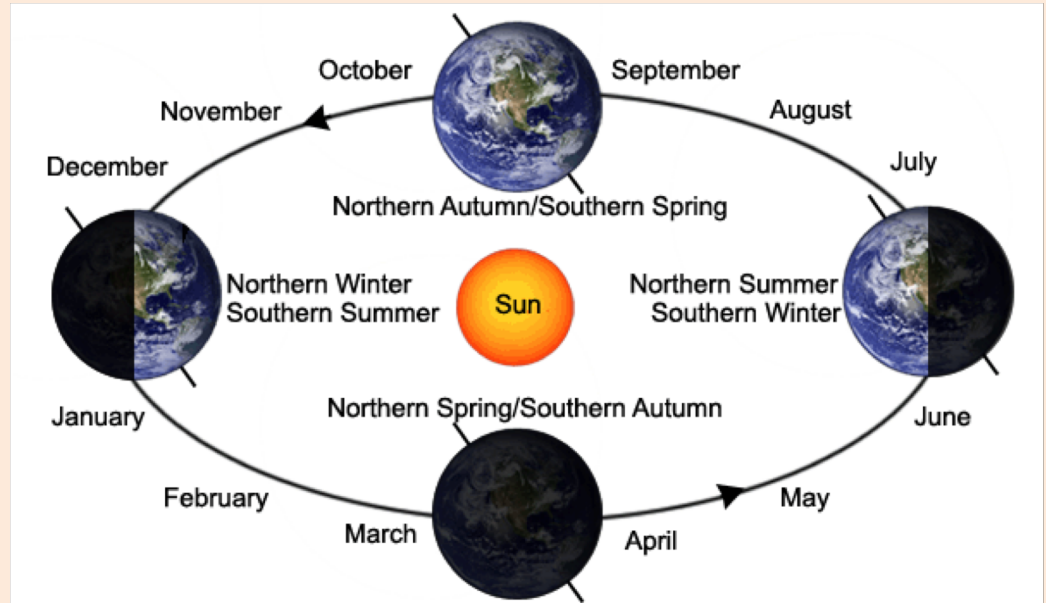


Specific Heat

- Specific heat = heat capacity per unit mass (how much energy it takes to raise a 1 kg substance 1 K)
- Water specific heat: **4185.5** J kg⁻¹K⁻¹
- What does this have to do with this lab you may ask?
 - Why are coastal cities cooler in the summer and warmer in the winter?

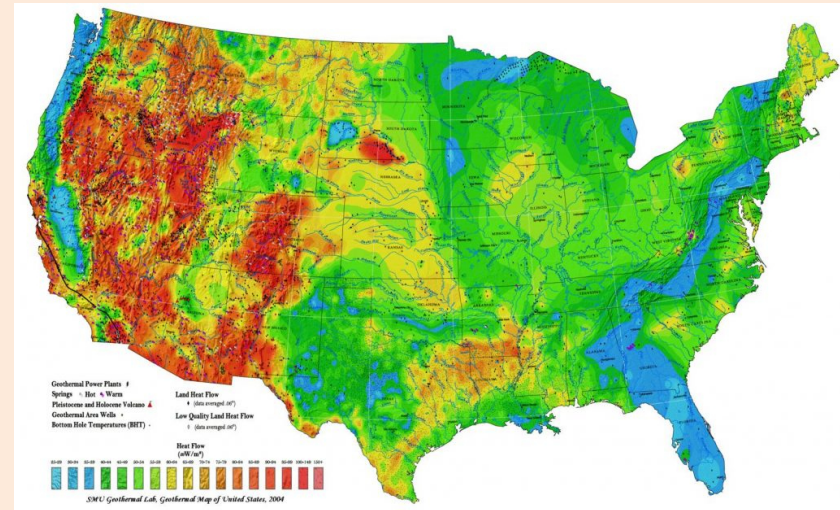
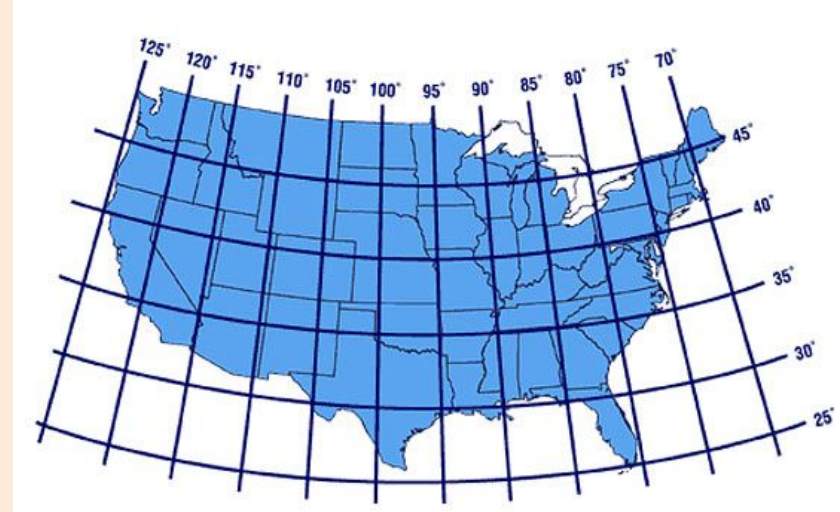
Seasons

- Leads to seasonal variations in the amount of solar energy reaching the surface
- During the winter, the SZA is high (sun is lower in the sky)
 - We receive much less solar radiation than we would in the summer
- Just the opposite occurs in the summer



Other important info

- Lines of equal latitude runs east-west
- Lines of equal longitude runs north-south
- Elevation map of US
- Red = higher elevations
- Green/blue = lower elevations



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Question 1 (2 points) Directions:

- Think about what a diagram of this would look like.
- What is the **angle between the zenith and the sun?**

Question 2 (1 point for a & b, 2 points for c) Directions:

- Go to the link: <http://www.esrl.noaa.gov/gmd/grad/solcalc/azel.html>
- For part (c), you are using the website to find **solar elevation** and using that to find solar zenith.
- If you were born in a foreign country, **pick your favorite U.S. city** for part (a).

Question 3 (3 points) Directions:

- **Show all your calculations**, not just the final answer!

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Question 4 (6 points) Directions:

- Plot the temperature data for **Brownwood, Texas** (**TMAX** versus time).

Question 5 (3 points) Directions:

- Use **Jamestown State Hospital, North Dakota**. Plot on the same graph you used for number 4. Mention latitude (in ° North or ° South), longitude (in ° East or ° West), and elevation (in ft) for both the cities.
- **Explain the differences in temp. records** between the two locations – Brownwood, TX, and Jamestown, ND.
- How would **solar radiation** differ between these two cities?

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Question 6 (6 points) Directions:

- Use **Aberdeen, Washington** and **Chula Vista, CA**. Plot both on same graph on page 68. Mention latitude (in ° North or ° South), longitude (in ° East or ° West), and elevation (in ft) for both the cities.

Question 7 (3 points) Directions:

- Be sure to compare the **two cities in #6 to each other**, but **also compare these two cities to the cities in #4 and #5**.
- Do the graphs look different? Why?

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Question 8 (6 points) Directions:

- Use **Parker Reservoir, California** and **Eastman, Georgia**. Plot both on the same graph on page 69. Mention latitude (in ° North or ° South), longitude (in ° East or ° West), and elevation (in ft) for both the cities.

Question 9 (3 points) Directions:

- Hint: Look at google maps (satellite image) to see the difference in surface types.

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Question 10 (6 points) Directions:

- Use **Tahoe City, California** and **Marysville Yuba Co Airport, California**. Plot both on same graph on page 70. Mention latitude (in ° North or ° South), longitude (in ° East or ° West), and elevation (in ft) for both the cities.

Question 11 (3 points) Directions:

- Does altitude explain the differences in temperature between these two cities? Explanation needed for this answer.

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Question 12 (4 points) Directions:

- You are using the city you chose in number 2 or something close to it. Use this website : <https://gis.ncdc.noaa.gov/maps/ncei/summaries/monthly>

- To access the data on the website above:
 1. Change the year to 2014. Click “Update Map”.
 2. Click **Temperature Maximum** (NOT Mean Temperature), and then click “Update Map” again.
 3. Click the wrench to the right of monthly summary, click Location → US State → Select State → Zoom to Location → Click the “Identify” tool to select your desired station.
 4. On the left box of the screen, click “View Station Details”.
 5. On the next page, scroll down to “View Station Data”. Select the appropriate year (2014).
 6. Record the Station Name, Latitude, Longitude, and Elevation.

Finally plot TMAX vs. Month on page 71 for your selected weather station.

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Question 13 (2 points) Directions:

- What are the **main factors** that are driving the temperatures for the city you just plotted? This will depend on what location you used, so use your knowledge from the previous questions to find an answer.

Questions 14 and 15:

- SKIP these questions!

*Thank
you*

A golden fountain pen nib is positioned at the end of the word 'you', as if it has just finished writing it.

Questions ?