



Students Learning Objectives

- Students will graph climate for a location and compare that to other locations around the globe
- Students will investigate why climates of similar locations are different using graphs, tables, pictures and hints
- Students will make connections between atmospheric/oceanic motion, geographical location, elevation and climate
- Students will make connections between life on earth and climate

Age

6-10th grade

Time

2-4 class periods

Next Gen Science Standards

(Middle School Weather & Climate)

- The roles of water in earth's surface processes
- Weather & climate
- Cause & effect
- Systems & system models

What you will need

- Copies of Part 1 (3 pages included)
- Resources for completing needed vocabulary (not provided)
- Copies of Part 2 (4 pages included)
- Ribbon and a world map (not provided)
- Stations space

Wind, Water & Mountains: The X-Factors of Local Climate

Directions

Pre-assessment

Eliciting Prior Knowledge in pair share/class discussion: Project the Köppen Climate Zones world map (included as page 1 of *Stations* .pdf) and pose the question: What do the colored zones have in common? Why?

Part 1: Creating individual Climatographs

Each student will choose a town/city (location) anywhere in the world and look up its climate at (www.weatherbase.com). You shouldn't need a lot of computer access for this activity. They will graph their location using very detailed directions (included). Using ribbon, you will connect the students' graphs to a world map (not included) laying flat with a pin for each of their chosen locations for a comparison investigation at Station 7. An optional world giant mapmaker kit:

http://education.nationalgeographic.com/education/maps/world-political-mapmaker-kit/?ar_a=1

Vocabulary Terms: Use background knowledge, discussions, textbook glossary, etc. as resources to help the students fill in the needed vocabulary for the stations activity.

Part 2: Climate Variability Inquiry Stations

Station 1: Compares climate graphs and data tables (attached) for Seattle, WA and Antofagasta, Chile and includes diagrams and a map (attached) to help the students understand the effect of PREVAILING WINDS on climate.

Station 2: Compares climate graphs and data tables (attached) for Tokyo, Japan; Sydney, Australia and Bali, Indonesia and includes diagrams and a map (attached) to help the students understand the effect of LATITUDE on climate.

Station 3: Compares climate graphs and data tables (attached) for Bangor, Maine and Bordeaux, France and includes diagrams and a map (attached) to help the students understand the effect of OCEAN CURRENTS like the GULF STREAM on climate.

Station 4: Compares climate graphs and data tables (attached) for Aspen, Colorado and Salina, KS and includes a topographical map (attached) to help the students understand the effect of ELEVATION on climate.

Station 5: Compares climate graphs and data tables (attached) for San Francisco, CA and St. Louis Missouri and includes a short informative article and a map (attached) to help the students understand the effect of PROXIMITY to WATER on climate.

Station 6: Compares two graphs of mystery locations – 1: Quepos, Costa Rica 2: La Paz, Bolivia

Station 7: Using ribbon, connect the students' graphs to a world map (not included) laying flat with a pin for each of their chosen locations.

Climate Extensions: Expand on lesson *final questions* and explore the difference between **global** annual climate variability (effects of El Nino) and **global** climate change (long-term average change). You may want to reference this simulation and resource: <http://www.climate.gov/#understandingClimate>

Assessment: Visit NOAA's Science On a Sphere and use matching presentation with clicker questions to assess the application of their knowledge. Or in the classroom choose new locations around the world and have them estimate the expected climate of that location using the deductive reasoning with concepts that they have developed in this lesson.

Example - Lima, Peru: Provide students with the elevation, latitude, wind direction, a photo, and a world map with direction of ocean currents. They will give possible highs and lows (within a range), big difference vs. little difference between daily highs and lows, wet vs. dry, rough idea of which months with which seasons and a comparable climate somewhere in the world.

Prepared by Hilary Peddicord of Science On a Sphere at Earth System Research Lab, NOAA Boulder





Wind, Water and Mountains: The X-factors of Local Climate

Part 1: Choose a place, anywhere in the world and graph the climate.

1. Go to www.weatherbase.com to find the average temperature and precipitation information for the town/city, country of your choice and record for each month below.

My Location: _____ My Name: _____

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg Low Temp (F)												
Avg High Temp (F)												
Avg Precip (inches)												

Directions for Climatographs Assignment:

In order to compare climates, each graph must be set up EXACTLY the same. Here are the set-up directions for each graph:

1. Turn the graph paper in portrait orientation so that the longest side will be the Y-axis. (short side is X-axis).
2. Label the X-axis "MONTHS". Start January on the far left grid line, count over two grid lines and label February. Continue labeling the months every two lines until you reach December.
3. Label the LEFT Y-axis "Temperature (degrees Fahrenheit)".
 - a. Start numbering at the bottom with (-20)
 - b. Number by 5, every line, until you reach the top (the next label will be -15, then -10, etc.)
 - c. Use a pencil to plot both the high temperature and low temperature averages for each month. Once you have finished your plots, connect the dots using a ruler to create a straight line between each point. Use these colors:
 - i. Red for high
 - ii. Blue for low
4. Label the RIGHT Y-axis "PRECIPITATION (Inches)"
 - a. Start at the bottom with 0
 - b. Number by .5 until you reach the top, unless your location has more than 12.5 inches a year, then adjust the scale to 1 per square.
 - c. Plot the precipitation values in with a pencil and then use a GREEN line and connect the dots. Use a ruler to draw the line.



Vocabulary Terms:

Name:

Prevailing Winds

Rain Shadow

Latitude

Mid-Latitudes

Solar Angle of Incidence

Equator

Elevation

Atmospheric circulation

Sea surface currents

Polar Climate

Temperate Climate

Continental Climate

Tropical Climate



Part 2: Climate Variability Inquiry Stations

Name:

Station 1:

Looking at the map, what do the locations have in common?

What are some differences in their location?

Describe the climates of A & B including their differences.

What is the main reason for the climate variability you see here? Explain your answer.

Station 2:

Looking at the map, what do the locations have in common?

What are some differences in their location?

Describe the climates of A, B & C including their differences.

What is the main reason for the climate variability you see here? Explain your answer.



Station 3:

Looking at the map, what do the locations have in common?

What are some differences in their location?

Describe the climates of A & B including their differences.

What is the main reason for the climate variability you see here? Explain your answer.

Station 4:

Looking at the map, what do the locations have in common?

What are some differences in their location?

Describe the climates of A & B including their differences.

What is the main reason for the climate variability you see here? Explain your answer.



Station 5:

Looking at the map, what do the locations have in common?

What are some differences in their location?

Describe the climates of A & B including their differences.

What is the main reason for the climate variability you see here? Explain your answer.

Station 6:

#1 Mystery Spot

Is it in the northern hemisphere, southern hemisphere or near the equator? How do you know?

Is it near the ocean or far from the ocean? How do you know?

Is it high in the mountains or near sea level? How do you know?

Circle the Mystery Spot #1 based on your answers.

Christchurch, New Zealand

Quepos, Costa Rica

La Paz, Bolivia

Phoenix, Arizona USA



#2 Mystery Spot

Is it in the northern hemisphere, southern hemisphere or near the equator? How do you know?

Is it near the ocean or far from the ocean? How do you know?

Is it high in the mountains or near sea level? How do you know?

Circle the Mystery Spot #2 based on your answers.

Christchurch, New Zealand

Quepos, Costa Rica

La Paz, Bolivia

Phoenix, Arizona USA

Station 7:

Choose a few of your classmates' examples.

Location 1: _____ vs. Location 2: _____

Describe the climate of Location 1:

Describe the climate of Location 2:

What are some reasons that their climates are different or similar?

Final questions

What kind of observations could you make out of a car window that would tell you that climate of a place is wet or dry and cold or hot?

Would you expect climate to stay the same in these places forever? What could change the climate? Just guess if you don't know!