

NAME: _____ DATE: _____ CLASS: _____

MY NASA DATA: A Comparison of Land and Water Temperature

http://mynasadata.larc.nasa.gov/?page_id=474?&passid=36

A Comparison of Land and Water Temperature

Purpose: To examine NASA satellite observations of surface temperature and to investigate the seasonal changes of land and water temperature

Grade Level: 7 – 12

Estimated Time for Completing Activity: 50 minutes



Image courtesy Lin Chambers

Learning Outcomes:

- Students will become familiar with the concept of specific heat capacity.
- Students will discover seasonal changes in land and water temperature.
- Students will explain the differences in land and water heating and cooling.

Prerequisite

- Discussion of seasons, temperature or heat
- Familiarity with reading line graphs
- Familiarity with Kelvin and Celsius temperature scales.

Tools

- Computer with Internet access
- Printer
- LCD projector if presenting to the class

National Standards:

- **Geography:** The World in Spatial Terms
- **Math:** Data Analysis and Probability
- **Science Content:** D Earth and Space Science

Virginia Standards of Learning:

ES.13d: The student will investigate and understand that energy transfer between the sun and the Earth and its atmosphere drives weather and climate on Earth. Key concepts include weather phenomena and the factors that affect climate including radiation and convection.

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PS.7: The student will investigate and understand temperature scales, heat, and heat transfer. Key concepts include Celsius and Kelvin temperature scales and absolute zero.

Vocabulary:

[heat](#)

[ISCCP](#)

[radiation](#)

[temperature](#)

Lesson Links:

[Live Access Server \(Advanced Edition\)](#)

[Earth's Big Heat Bucket](#)

[More Specific Heat](#)

[Sample Graph](#)

Background:

Specific heat is the amount of heat required to raise the temperature of one gram of a substance by one degree Celsius. As the Earth's surface materials absorb energy radiated from the sun, they gain thermal energy and their temperatures rise. The rate of temperature rise varies based on the material. This relationship is described by what is called the specific heat of a substance. This lesson compares the specific heat of land, water and air. The wide range of heat capacities is extremely important to the operation of our climate system because it affects how solar energy is put to use, transformed, transferred, stored, and released. See Lesson Links for more information on Specific Heat and its effect on our climate.

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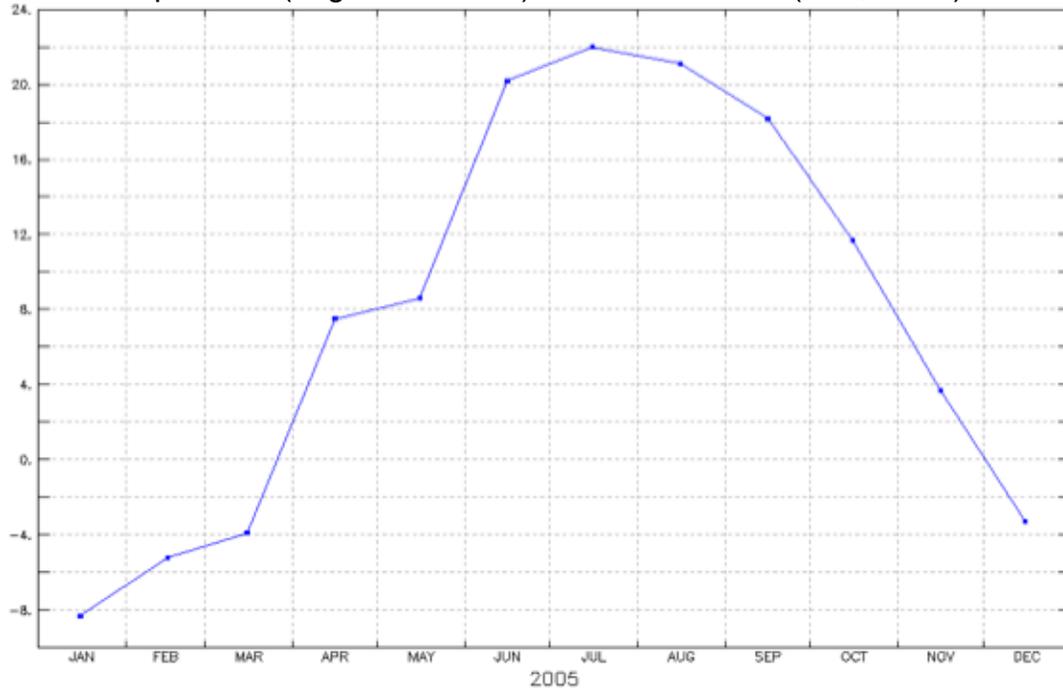
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Procedure:

Use the following 2 plots to answer the questions at the end of this packet.

Plot 1 – Land Temperature (degrees Celsius) for the Year 2005 (44N, 72 W)

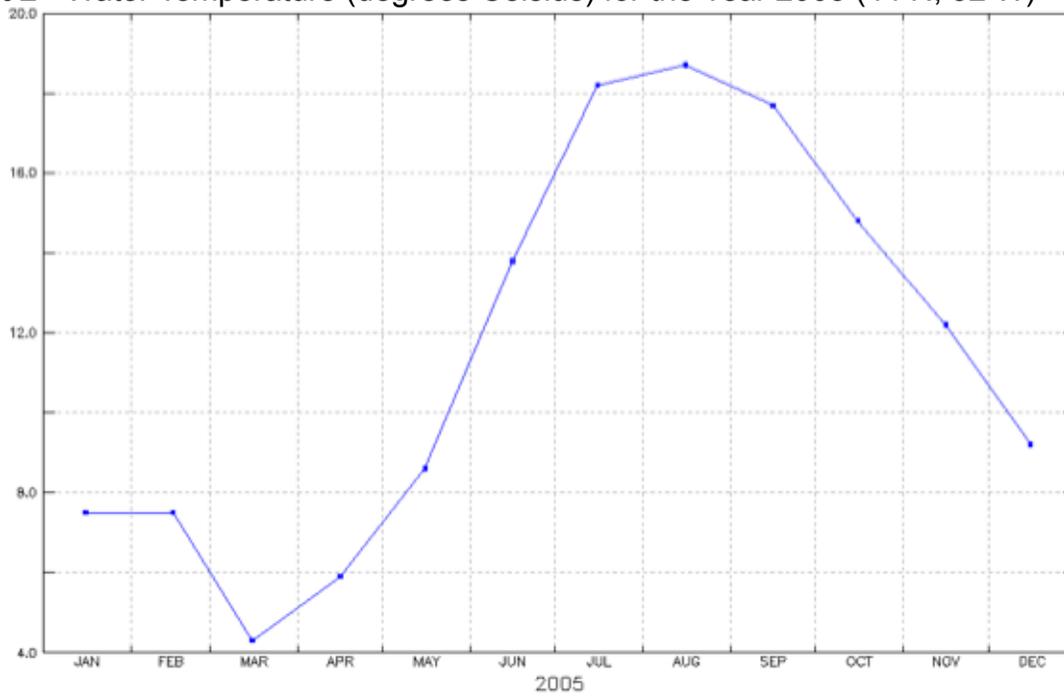


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Plot 2 - Water Temperature (degrees Celsius) for the Year 2005 (44 N, 52 W)



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Extensions:

1. Examine data for the air temperature over your water and land locations. Return to the Live Access Server and change one of the variables to Atmosphere, Atmospheric Temperature, Monthly Near-Surface Air Temperature. Do you see the same seasonal variations and lag times? What conclusion can you draw about the heat capacity of air?
2. Select a land location and a water location at the same latitude, but in the southern hemisphere. Compare the graphs to those of the northern hemisphere. List ways in which they are similar or different, and discuss possible explanations.
3. Repeat the procedures for regions that are farther apart, i.e., the center of the continent vs further out in the ocean. Compare the graphs and discuss possible explanations.
4. Repeat the procedures for a coastal location and a location in the center of the continent. Compare the graphs and discuss possible explanations.