

MY NASA DATA Lesson:

March of the Polar Bears: Global Change, Sea Ice, and Wildlife Migration *by Venugopal Bhat, Seattle, Washington*

Purpose:

Students will use NASA satellite data to study temperature and snow-ice coverage in the South Beaufort Sea, Alaska. The data can be used to correlate with USGS ground tracking of polar bears, and to relate this to global change, sea ice changes, and polar bear migration. The data can be used to draw conclusions surrounding any migration patterns in the region.

Background:

The polar regions of the Earth (Arctic and Antarctic) have some of the most extreme climates on Earth, with temperatures usually well below freezing all year. The Arctic polar region is mainly sea ice floating upon the Arctic Ocean, whereas the Antarctic region is a continent with permafrost, glaciers and surrounding sea ice.

Scientists expect and are observing that global warming due to the increase of greenhouse gases will first impact the polar regions and the expanse of sea ice. Even a few degrees increase in temperatures will cause sea ice to break away and float into warmer waters, or to melt in place. The melting of polar sea ice will not only prompt climate and weather changes, but will also impact the ecosystem in the Arctic.

Local impacts are already being seen in the study of the polar bear habitat, diet and migration patterns. In this lesson, you will explore the changes in temperature and sea ice coverage in the South Beaufort Sea, north of Alaska. You will then consider how the changes you observe in the data may affect the migration of polar bears in the region.

Procedure:

Before you start using the climate tool click on the three links below to learn about polar bears, their habitat, and migration patterns. Discuss with your lab partner the information about polar bears that you have learned that you think will be important in this lab.

[Polar Bear Background Information \(WWF\)](#)

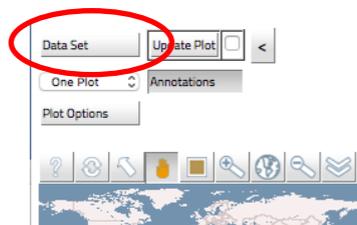
[Polar Bears International website](#)

[NASA Global Climate Change website](#)

[Global Warming and Polar Bears](#)

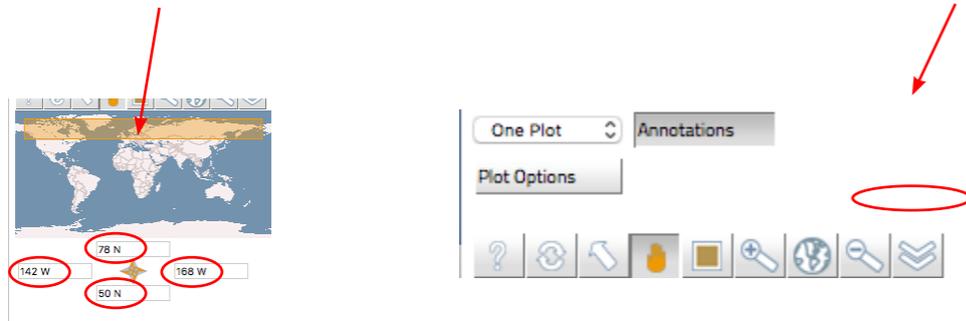
Maps Part I: Monthly Near Surface Air Temperature Color Plots (June 1995 and June 2005)

1. Go to the [MY NASA DATA Live Access Server – Advanced](#)
2. If not automatically prompted with data parameter selections click on “Data Set” in the upper left corner of the screen. Then click as follows, Atmosphere, Atmospheric Temperature, Monthly Near Surface Air Temperature (ISCCP). Click Close.



Note: You may need to click on these titles two or three times to open them

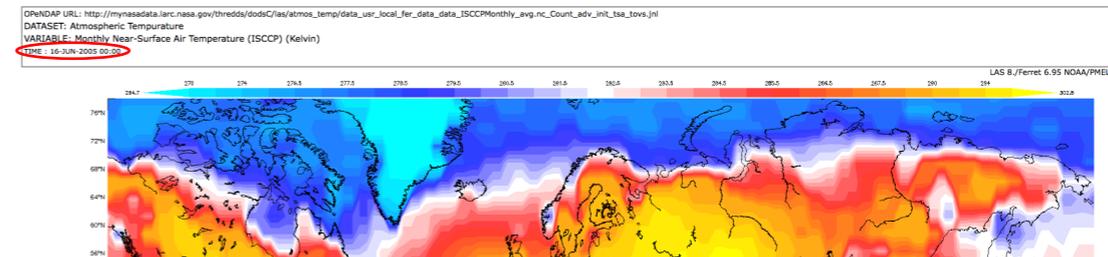
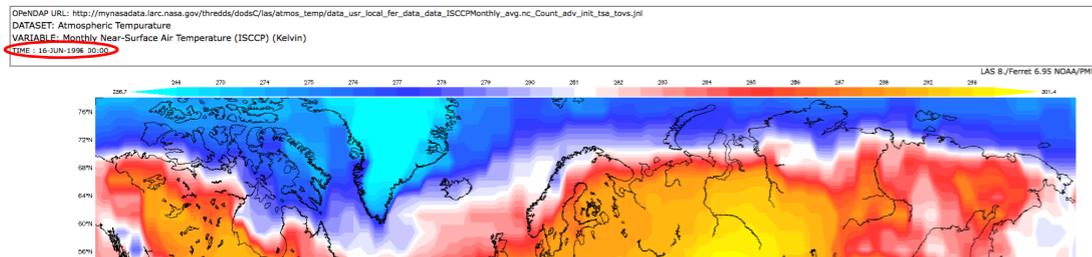
- Enter coordinates for region in the compass rose below the navigation map to the left of the screen:
Lat 78 N to 50 N, Long 142 W to 168 W. Change your date to: June 1995.



- Click the 'Update Plot' button to see your changes. Then click 'Print' to open your plot as a separate page in your browser. Print this page.

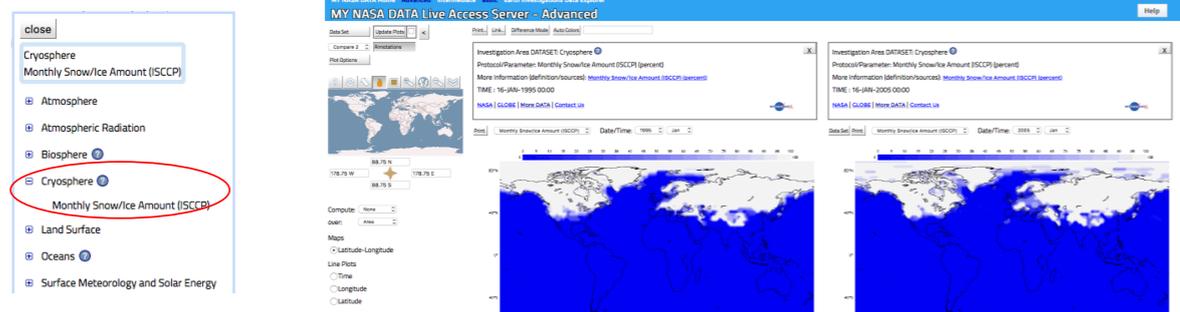


- Generate another Color Plot using the same parameters as in Steps 1-5 above, except for the time, use June 2005. As you did with the first map, print and save this second map for later use. You should now have two maps like the ones below. Be sure to check the dates (located in the red circles below, to make sure your two maps are for June 1995 and June 2005).



Maps Part II: Monthly Snow-Ice Percent Coverage Color Plots (June 1995 and June 2005)

1. Repeat Procedure for Maps Part I (steps 1 – 5) except select Cryosphere, Monthly Snow-Ice Amount (ISCCP). You should see maps on your screen like the ones below right.



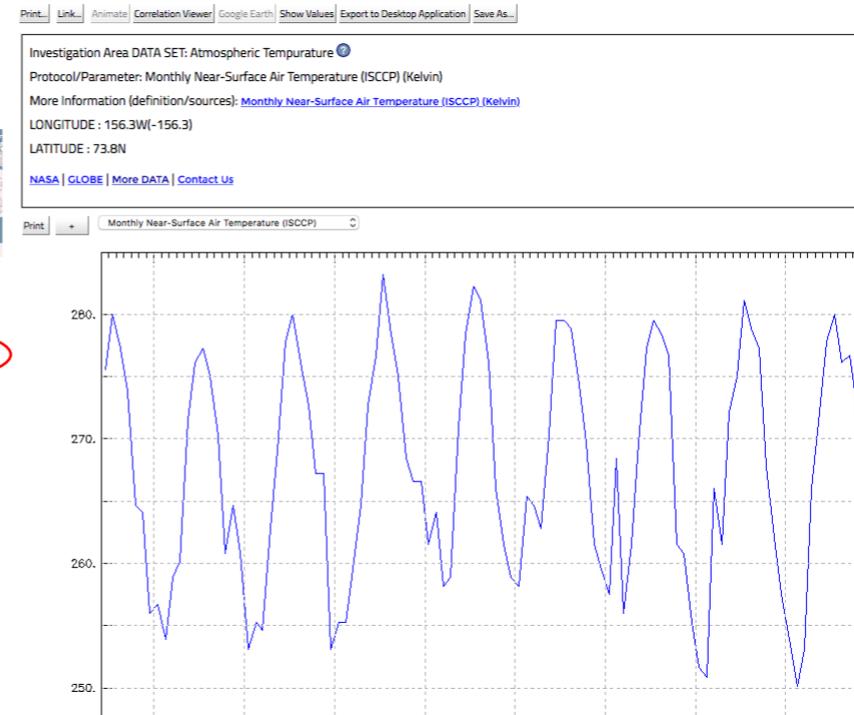
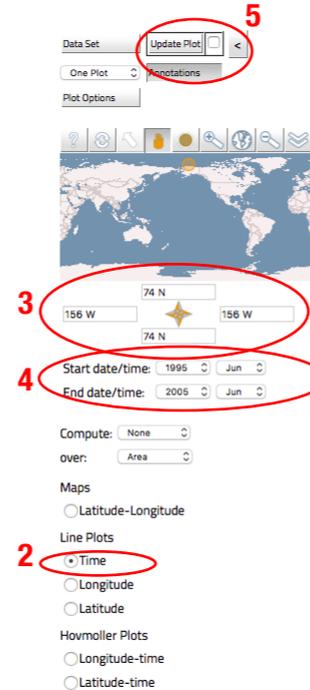
Line Plots Part I: Monthly Near Surface Air Temperature Time Series (June 1995 – June 2005)

1. If not automatically prompted with data parameter selections click on 'Choose Datasets' in the upper left corner of the screen. Then click as follows, Atmosphere, Atmospheric Temperature, Monthly Near Surface Air Temperature (ISCCP).



Note: You may need to click on these titles two or three times to open them

2. Click the 'Time Series' option to produce a Line Plot (see number 2 at right).
3. Change your coordinates to: Lat 74 N, Long 156 W (see number 3 at right).
4. Change your time range to: June 1995, June 2005 (see number 4 at right).
5. Click the 'Update Plot' Radio button to see your changes and then print or save the plot for later use (see number 5 at right).



Line-plots Part II: Monthly Snow-Ice Percent Coverage Time Series (June 1995-June 2005)

1. Repeat Procedure for Line-plots Part I (steps 1-5), except select Cryosphere, Monthly Snow-Ice Amount (ISCCP). Your screen should look like the one below right.



Note: You may need to click on these titles two or three times to open them



2. Print or save the plot for later use. Note: You should now have a total of four color plots (maps) and two line-plots, for a total of six data images.

Questions:

1. Which year is warmer in the South Beaufort Sea region, 1995 or 2005? How many degrees warmer?
2. Which year has more snow-ice amount in the same region? By how much?
3. Using the line plots, examine the seasonal oscillations of the variables. Do you see any trends in the line plots?
4. Write a paragraph describing your findings and conclusions using the data results.
5. Would you expect to see any impact on the habitat and migration of polar bears based on your conclusions?
6. How will the changes that you study affect the people of Northern Alaska and Western Canada? What other information or data would help you answer this question?
7. Do you think there is a global change trend or just a local random variation? Explain your answer. What other information or data would help you answer this question?

Extensions:

1. Choose another animal species (like wolverine or pika or moose) and consider the effects of climate change on their natural habitat and migration patterns.
2. Plan a migratory trip from the viewpoint of a polar bear. For example: Where (location) does your polar bear character begin and end the journey? Describe what your polar bear character experiences along the journey. For additional information, use the Polar Bear International website and Global Warming and Polar Bears links in the Lesson Links section.

