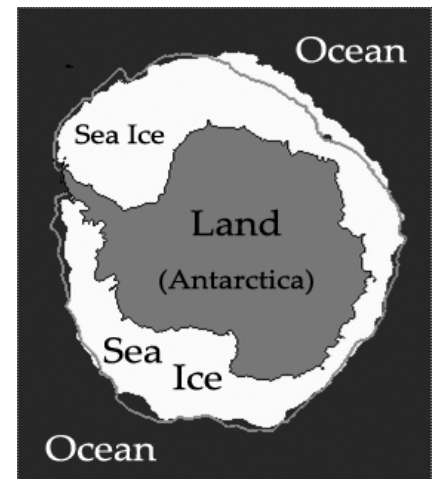


# Graphing Sea Ice Extent in the Arctic and Antarctic

Large amounts of ice form in some seasons in the oceans near the North Pole and the South Pole (the Arctic Ocean and the Southern Ocean). This ice, which forms when sea water freezes, is called **sea ice**. In this activity you will learn about sea ice. The amount of sea ice changes from month to month and from year to year. The size of the area covered by sea ice is called the "**extent**" of the sea ice. In this activity, you will graph the extent of the sea ice over time.



1. We will start off by looking at the sea ice around the North Pole in the Arctic Ocean. Your teacher will give you a piece of graph paper. In a few minutes, you will graph data about the changes in the extent of sea ice in the Arctic Ocean. But first you will need to think about how you expect the sea ice extent to change throughout the year and make a **hypothesis** about how you expect the sea ice graph to look.
2. Pick a colored pencil to use in drawing your hypothesis. You will graph your hypothesis of sea ice extent for each month for a period of three years, from **January 2005 through December 2007**. The x-axis of your graph is time, in months. The y-axis of your graph is the extent of sea ice, in millions of square kilometers. Think of what you know about snow, ice, and the seasons. During what months would you expect there to be the most ice? During which months do you think there would be the least ice? Between 2005 and 2007, the largest extent of the sea ice was about 15 million km<sup>2</sup>. The smallest extent of the sea ice was about 4 million km<sup>2</sup>
3. Your teacher will provide you with actual data of monthly sea ice extent in the **Arctic from January 2005 through December 2007**. Pick a different colored pencil than the one you used to sketch your hypothesis, and plot the actual data on the same graph paper you used to sketch your hypothesis.
4. Compare your hypothesis with the actual data. How similar are the two curves? If there are differences, what might explain those differences?
5. In which month is there the most sea ice? In which month is there the least? Is it the same month each year?
6. Next, let's consider sea ice extent near the South Pole around Antarctica. Think about the ways that the changes in sea ice extent over time near Antarctica might be similar to, and different from, changes in the Arctic. Once again, choose a different colored pencil, and sketch in a curve showing your hypothesis about sea ice extent over time in the **Antarctic**. Do this on the same piece of graph paper you have been using all along. Between 2005 and 2007, the largest extent of the sea ice in the Antarctic was about 19 million km<sup>2</sup>. The smallest extent of the sea ice was about 3 million km<sup>2</sup>.

7. Your teacher will give you another set of data. This set lists actual sea ice extent from **January 2005 through December 2007 for the Antarctic**. Again, choose a different colored pencil and plot this new set of data on your same graph.
8. How does the actual data for the Antarctic compare with the your hypothesis? If there are differences, think about the possible causes of those differences. In which month is there the most sea ice in the Antarctic? In which month is there the least? Is it the same month each year? How does the actual data from the Arctic compare with the actual data from the Antarctic? What might be the causes of the differences between sea ice patterns near the two poles?
9. Now that you have seen how sea ice extent changes throughout the seasons near both poles, we'll take a look at a longer time frame. Let's see how sea ice extent changes (if at all!) from one year to the next. We'll look at a period of 30 years, from **1980 to 2010**. We'll look at data for the time of minimum sea ice each year, and also for the time of maximum sea ice each year.
10. Your teacher will give you a new sheet of graph paper. The y-axis on this graph is the same as the y-axis on your other graph; it represents sea ice extent in millions of square kilometers. The x-axis on this new graph also represents time; but instead of months, it is in years. Choose four different colored pencils to use for graphing on this new sheet. You can use the four colors you used on the earlier graph; just make sure you use four colors that are different from each other.
11. Your teacher will give you two more tables of data. "Data Table #3: Arctic Sea Ice Extent" lists sea ice extent in the **Arctic** for the months of March and September for twelve different years. "Data Table #4: Antarctic Sea Ice Extent" lists sea ice extent in the **Antarctic** for the months of February and September for the same twelve years.
12. Choose one of your colored pencils. Plot the data for 1980 through 2010 for the Arctic for the month of March. You will plot data at 5-year intervals; for the years 1980, 1985, 1990, 1995, 2000, 2005, and 2010.
13. Select another color. Plot the data for 1980 through 2010 for the Arctic for the month of September.
14. Select another color. Plot the data for 1980 through 2010 for the Antarctic for the month of February.
15. Select another color. Plot the data for 1980 through 2010 for the Antarctic for the month of September.
16. Look at the graphs you just made. Does the sea ice extent change over the years for any of the four data sets? Is the amount of sea ice, in either the Arctic or the Antarctic, at the least extent or the greatest extent, changing over this 30-year period? If so, is it increasing or decreasing?