

## Thinking About Climate Change

### Changing Arctic Sea Ice Area Over Time

Scientists from the National Snow and Ice Data Center have been collecting data on the extent of sea ice in the Arctic since 1978. Sea ice is frozen sea water which covers about 25 million km<sup>2</sup> of the Earth. It occurs in both the Arctic and Antarctic. It is important because it influences global climate and affects ocean circulation. The first image is from February of 1979, which represents the month of maximum ice coverage. The lower picture represents the extent of minimum ice coverage in the month of September of 2012. In the images below, ice is shown in white and land in gray. The pink line shows the median extent of ice for the month of February and September throughout the 32 year period of record. Notice where the ice is in relationship to the land (grey) and sea (blue). The two images represent extremes (maximum and minimum) of ice coverage over the last 32 years.

1. Examine the two images. Write down two things that you notice that are similar about each image and two things that are different.

*Similar:* \_\_\_\_\_

*Different:* \_\_\_\_\_

2. What part of the world are we looking at? \_\_\_\_\_

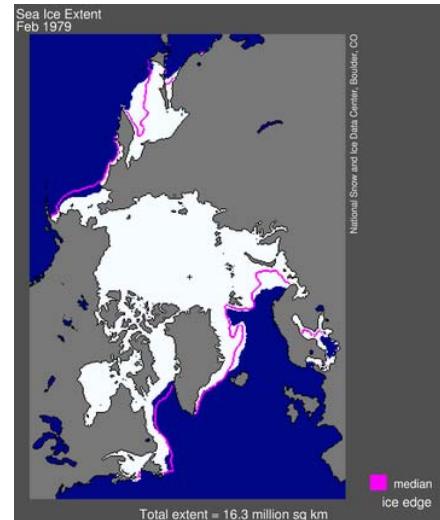
Which country (grey) occupies the upper right side of the image? \_\_\_\_\_

What countries border the lower left? \_\_\_\_\_

What is the large island (grey) in the middle of the image? \_\_\_\_\_

Name the islands on the lower right side of the image. \_\_\_\_\_

Name the water bodies that you can identify in this image.  
\_\_\_\_\_



3. When was the top image taken? \_\_\_\_\_

What season is it? \_\_\_\_\_ What is the area of the ice extent? \_\_\_\_\_ How many square miles is that? \_\_\_\_\_

4. Does the 1979 ice extend beyond the median extent?

If so where? \_\_\_\_\_ Is its extent less than any other area? \_\_\_\_\_

5. What can you say about the ice coverage of the Arctic Sea in 1979? \_\_\_\_\_

6. Now look closely at the second image when was this image taken? \_\_\_\_\_ What season is this? \_\_\_\_\_ What is the area of the ice extent in this image? \_\_\_\_\_ How many square miles is that? \_\_\_\_\_

7. Can you really make a definitive statement that these images show that Arctic ice melt is accelerating? Why or why not? What kind of information would you need to be able to make a valid statement about changing ice sheets? \_\_\_\_\_

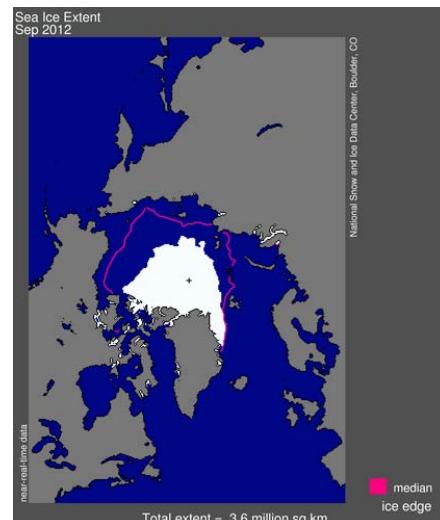


Image source: National Snow and Ice Data Center, Boulder CO. [http://nsidc.org/data/seacie\\_index/](http://nsidc.org/data/seacie_index/)

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1. Examine the two images. Write down two things that you notice that are similar about each image and two things that are different.  
*Similar:* same location, sea ice extent, has a median ice edge line.  
*Different:* different year and month, a lot smaller ice extent on bottom image
2. What part of the world are we looking at? **Northern Hemisphere at the North Pole and Arctic Ocean.** Which country (grey) occupies the upper right side of the image? **Russia** Which countries border the lower left? **Canada and U.S.** What is the large island (grey) in the middle of the image? **Greenland.** Name the Islands on the lower right side of the image. **British Isles.** Name the water bodies that you identify in this image. **Arctic Ocean, Great Lakes, Atlantic Ocean, Pacific Ocean, Bering Sea**
3. When was the top image taken? **Feb. 1979**  
 What season is it? **Winter**  
 What is the area of the ice extent? **16.3 million km<sup>2</sup>.**  
 How many square miles is that? **6,293,440 or 6.3 million sq. miles**
4. Does the 1979 ice extend beyond the median extent? If so where? **Upper NE & NW sides.** Is its extent less than any other area? **Yes, lower NE & NW sides**
5. What can you say about the ice coverage of the Arctic Sea in 1979? **It is entirely covered with sea ice and sea ice extends throughout the bays and shoreline of Greenland.**
6. Now look closely at the second image when was this image taken? **Sept 2012.** What season is this? **End of summer.** What is the area of the ice extent in this image? **3.6 million sq. km.** How many square miles is that? **1,389,968 or 1.4 million sq. miles**
7. Can you make a definitive statement that these images show that Arctic ice melt is accelerating? Why or why not? What kind of information would you need to be able to make a valid statement about changing sea ice? **No, because the two images are depictions of extremes and we would expect the ice to change on an annual basis so minimum ice coverage would occur in the summer and maximum in the winter because of temperature changes. A fair comparison would be to compare maximum and minimum coverage that has been over the 32 year period within the same season (winter or summer).**

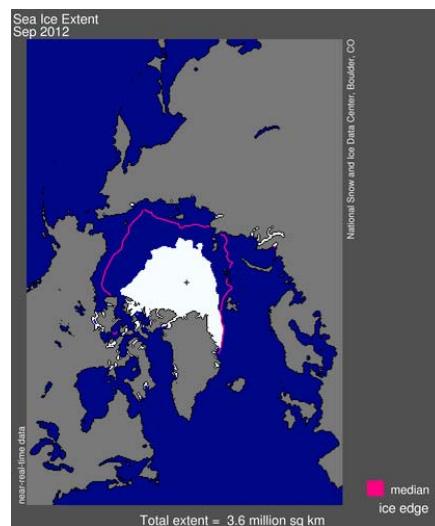
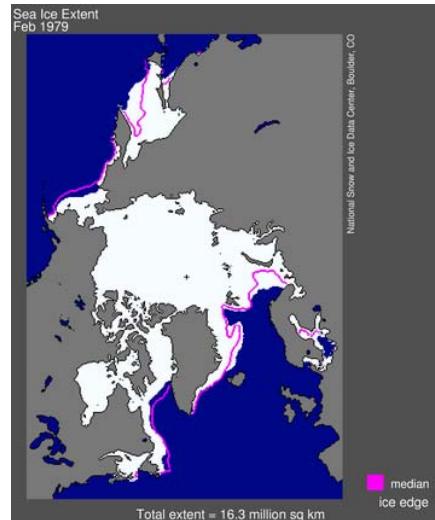


Image source: National Snow and Ice Data Center, Boulder CO. [http://nsidc.org/data/seaice\\_index/](http://nsidc.org/data/seaice_index/)