Fall 2016 Names:

**Arctic Sea Ice Extent Activity**

As the Earth orbits the sun, the seasons change, and so does the amount of sea ice floating in the oceans. As air and sea temperatures get warmer in the summer months, ice melts, and when colder fall and winter temperatures return, so does the ice cover. The extent to which sea ice grows and melts each year varies depending on how extreme air and water temperatures become and how much ice (if any) survived the last year's melt season. At any given time during the year, millions of square kilometers of ocean are covered by floating sea ice. Scientists keep a close eye on sea ice coverage and how it changes with time because it helps regulate the planet's heat, moisture, and salinity exchange in the polar oceans. Sea ice is also an important animal habitat, which in turn, affects human communities.

**Sea ice extent** is a measurement of the area of ocean (usually given in units of km2 or mi2) where there is at least some sea ice. **Sea ice concentration** is the proportion of a given area of the ocean that is covered by ice, and is usually stated as a percentage ranging from 0% (open water) to 100% (totally ice-covered). Scientists' measurements of sea ice extent include only areas where sea ice concentration is at least 15%. Arctic sea ice is considered to be a key indicator of global climate conditions. For this investigation, you'll explore how Arctic sea ice extent changes over different timescales.

1. Open the National Snow and Ice Data Center's [Sea Ice Animation Tool](http://nsidc.org/data/seaice_index/archives/image_select.html%22%20%5Ct%20%22_blank). http://nsidc.org/data/seaice\_index/archives/image\_select.html
2. Set the parameters to show sea ice extent in the **northern hemisphere**, beginning in January 2010.
3. Explore how Arctic sea ice extent changes over the course of a full year. Use the "next" button (second one in from the right side) in the animation control bar to advance the animation one month at a time.

**During what month was the Arctic sea ice at its minimum extent?**

**During what month was the Arctic sea ice at its maximum extent?**

**True or False? Arctic sea ice completely disappeared during the summer of 2009? 2008? 2007?**

4. Now, set the parameters to show sea ice extent in the **northern hemisphere**, beginning in January of the last full year before you started this lab (so use January 2015 if you are completing this in 2016).

5. Use the "next" button in the animation control bar to advance the animation one month at a time through the entire year. As you examine each frame, write down the total extent (in square kilometers) of sea ice for that month and how it compares to the median ice edge shown as a pink/purple line. This line allows you to see how the sea ice extent during a given month compares to the typical extent for that month.

6. Using graph paper, make a plot of Arctic sea ice extent vs. time in months for the year 2015.

**Describe your plot. How does sea ice extent change over the course of a year? Explain.**

**Do you think you would see exactly the same pattern in the data if you chose a different year? Explain.**

Repeat steps 4 and 5 for the 4 years before the year you just plotted (2014, 2013, 2012, 2011).

Combine all of your data and create a 5-year plot of sea ice extent.

Answer the following two questions and turn this sheet and your graphs in before you leave class today.

**(1) Describe your plot. How does sea ice extent change over the course of 5 years?** (pay careful attention to the changes year to year) **How does this plot compare to your 1-year plot. Explain.**

**(2) Why is it important to understand how sea ice changes over time?**