

Topic: The Sun's effect on Climate

Standards:

- SC.912.E.7.7 - Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.
- SC.912.N.1.1 - Define a problem based on a specific body of knowledge. Use tools to gather, analyze, and interpret data.

Learning Goals:

- SWBAT identify the relationship of sunspot cycles to Sun radiation output & global temperature through close reading and graphical analysis.
- SWBAT recognize, through observing graphical data, that cyclical conditions cannot explain the persistent change in global temperature increases.

Engage:

1. Students watch [“Ice Age” Trailer](#)
2. “Climate” Definition displayed:
 - a. Climate: the weather conditions prevailing in an area in general or over a long period.
3. Discussion Questions:

(Give the 6 questions on index cards to 6 different students - teacher encourages student driven discussion)

- a. Are the weather conditions on Earth today the same as in the past?
- b. What is the climate in Florida?
- c. When an area has a very cold or very hot day, would you say the climate has changed?
- d. What causes the Earth's weather to change?
- e. How would the sun change Earth's weather?
- f. What do we, as a class, know about sunspots?
 - i. *Teacher records student responses on the board.*



Explore:

1. Students analyze three time periods in Figure 1 - which interval shows the greatest change?
 - a. 1880-1920
 - b. 1920-1977
 - c. 1977-2007
2. Students read article. **Emphasize:** “The solar flares and coronal mass ejections emit powerful radiation and hurl energetic particles into interplanetary space, producing gusts and squalls in the perpetual solar winds blowing from the sun.” **Close reading opportunity.**
3. Questions:
 - a. **Consider the article.** When sunspots occur, is the sun outputting more or less radiation?
 - b. **Compare 1880 and 1960 on both graphs.** How do sunspots relate to Earth’s temperature?
 - c. The NASA Earth Observatory a particularly cold period beginning about 1650, called the “Little Ice Age.” **Could sunspot activity have been a cause?**

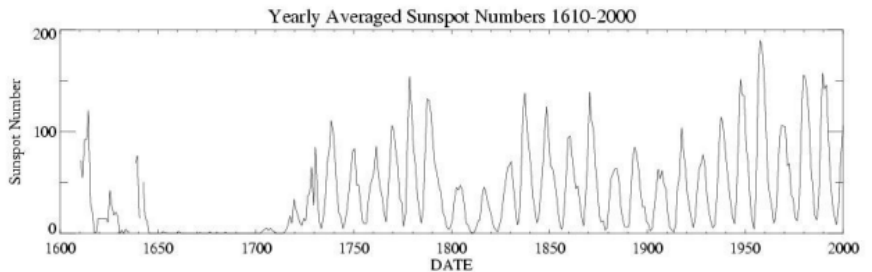
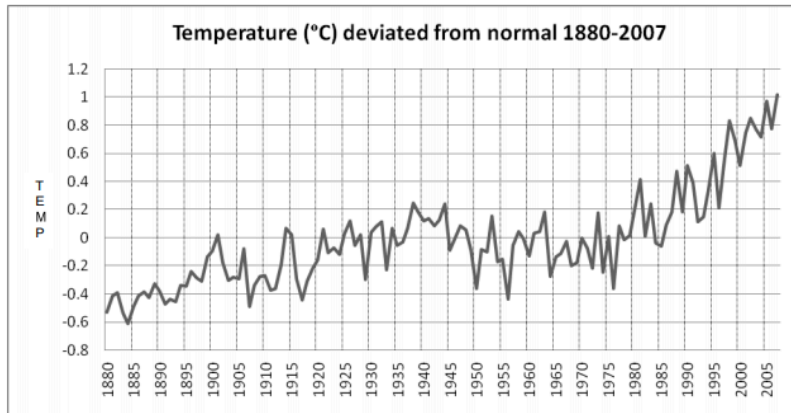
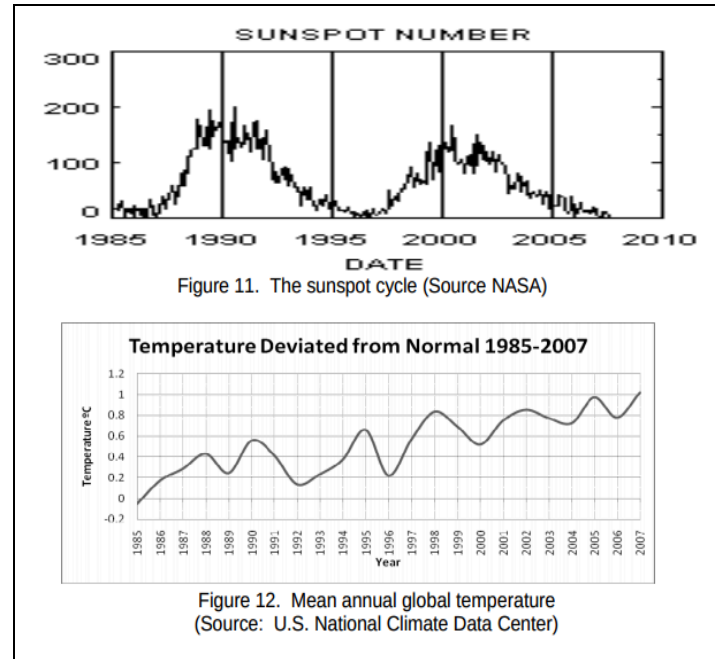


Figure 1. Deviation from mean annual temperature
(Source: U.S. National Climate Data Center)

Consider Figures 11 & 12.

- d. Between 2000 and 2007, was sunspot activity **increasing or decreasing**?
- e. Between 2000 and 2007, was global temperature **increasing or decreasing**?
- f. Does sunspot activity explain the most recent increase in temperature?

As students pursue close reading activities and analyze graph data, teacher supports by reviewing and reinforcing close reading strategies, and assisting individuals in interpreting graphical data.



Explain:

You read a post online in which the author expresses the opinion that “Variations in solar energy output have far more effect on Earth’s climate than people driving SUVs.”

Based on your analysis of the data, do you agree or disagree with this statement? Express your opinion with a respectful response to the blogger (100-200 words). Provide 2 links (to credible sources) that support your response.

***ELL/ESE Accommodation:** Shortened articles, visuals, clearer graphical data (colored overlays drawing attention to important data). Option to replace explanation activity with drawing of low vs high sunspot activity and its effect on Earth’s temp.*

***Hands-on Activity Option:** heat lamp is set over a terrarium. Set to high vs. low, changes recorded. Add insulation and repeat. Compare observations to Sunspot & Earth temp data - relate to greenhouse effect.*

Reference: Sunspot Case Study (<http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46073>)

