My NASA Data - Mini Lesson/Activity

Data Jigsaw: Exploring Sea Level Rise with Others

Grade Band

- 9-12

Time

- 30 minutes

Overview

As human activity warms the Earth, the extra heat energy goes into the land, atmosphere, ice, and oceans. Earth's oceans absorb about 90 percent of the excess heat (World Meteorological Organization). This increases the water volume of the oceans. Another 4 percent of the excess heat melts ice sheets and glaciers. Both of these changes contribute to sea level rise. NASA measures these changes in sea level height using satellites. The data collected by satellites, much like the datasets included in this activity, are used by scientists to better understand how the Earth is changing.

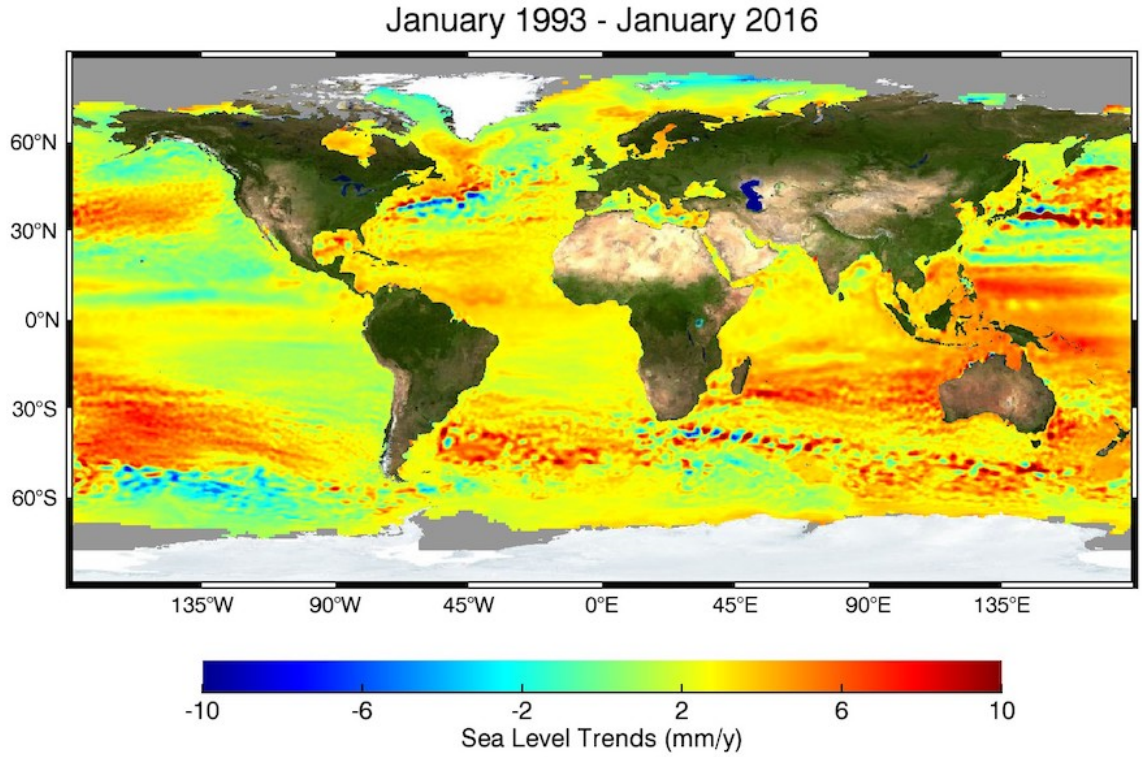
This activity is perfect for practicing analysis of data related to Earth Materials and Systems as we help students in grades 6-12 use models to recognize patterns in data. Students will analyze four data visualizations focused on the topic of sea level. They use a jigsaw method to explore and communicate their findings to their peers. They will also practice constructing evaluations from evidence and communicate their findings to others.

Student Directions

Check with your instructor for groups and how to share your results.

1. Students work in groups of four. Each member within the group will become an expert on one of the resources below. (All resources are found in the Google Slide provided.) Students spend five minutes observing and analyzing the data with the expectation that they need to be able to explain the data's pattern and trends to their groups.

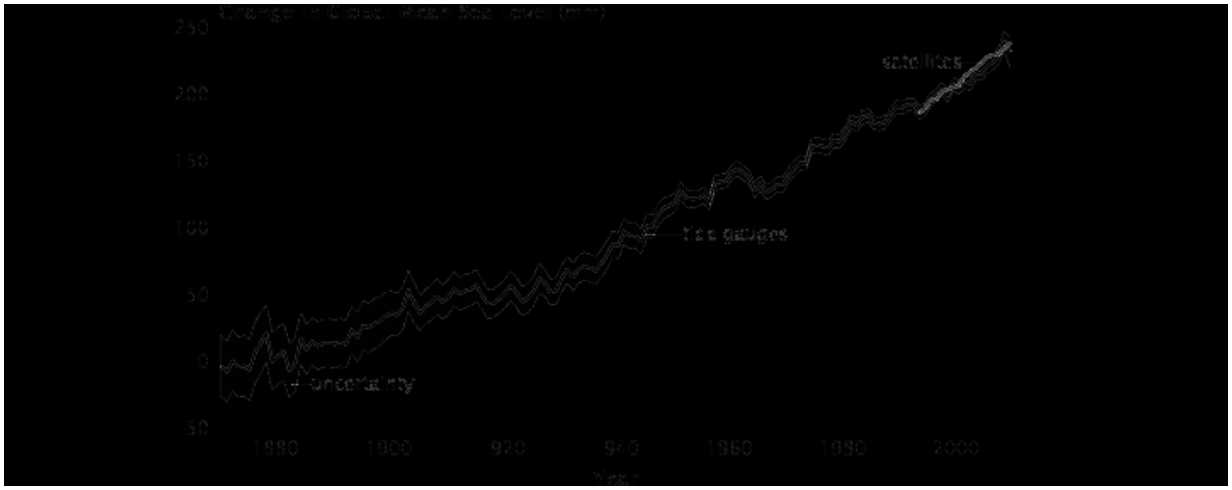
    - Resource 1: Sea Surface Height 1993-2016



https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/185_0.jpeg

- For over 20 years, satellite altimeters have measured the sea surface height of our ever-changing oceans. Credit - NASA

◦ Resource 2: Global Mean Sea Level



https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/Global_Mean_Sea_Level.png

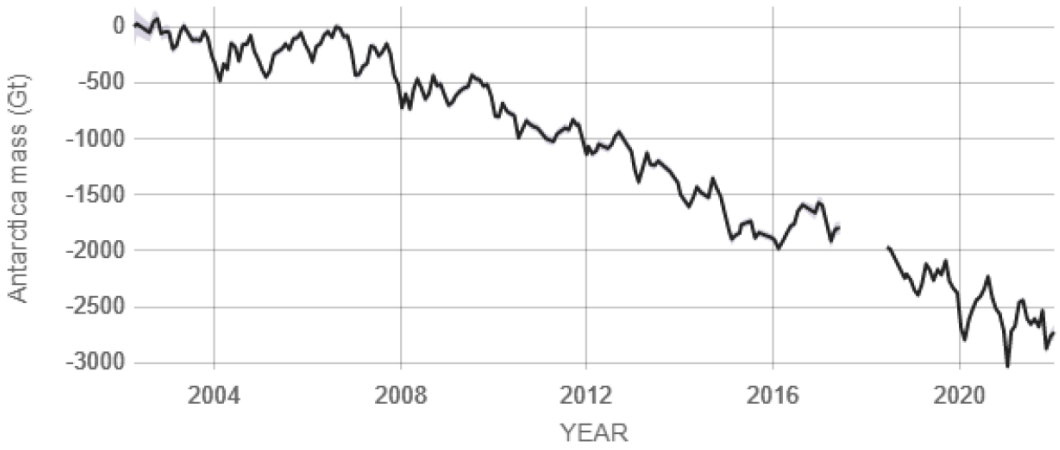
- Data source: Satellite sea level observations. Credit: GSFC/PO.DAAC

◦ Resource 3: Antarctica and Greenland Ice Mass Variation Since 2002

- These line graphs plot variation in ice mass for Antarctica and Greenland since

April 2002.

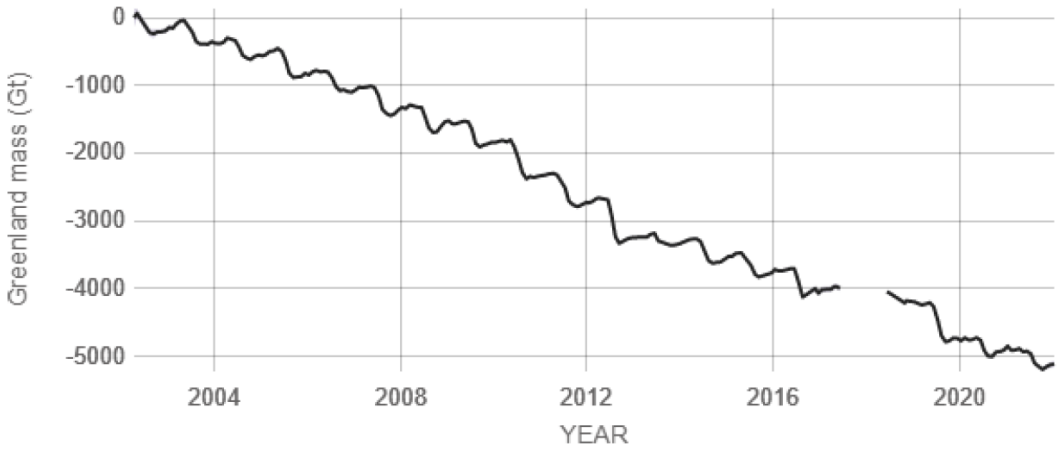
ANTARCTICA MASS VARIATION SINCE 2002



Source: climate.nasa.gov

Data source: Ice mass measurement by NASA's GRACE satellites. **Gap represents time between missions.** Credit: NASA

GREENLAND MASS VARIATION SINCE 2002



Source: climate.nasa.gov

Data source: Ice mass measurement by NASA's GRACE satellites. **Gap represents time between missions.** Credit: NASA

https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/ICE%20MAS%20GRAPHS%20CROPPED.png

- Resource 4: Greenland Ice Mass Variation since April 2002 data table.

  - The data table shows the variation, or change, in the ice mass of the Greenland Ice Sheet since April 16, 2002. The data measurements closest to April 16 for each year are detailed in the table.

Year	Variation from April 2002		Date
	Gigatonnes	Trillions of Pounds	
2002	0	0	4/16/2002
2003	-46	-101	4/16/2003
2004	-300	-660	4/16/2004
2005	-489	-1,078	4/16/2005
2006	-802	-1,768	4/16/2006
2007	-1,024	-2,257	4/16/2007
2008	-1,306	-2,879	4/16/2008
2009	-1,546	-3,408	4/16/2009
2010	-1,836	-4,047	4/16/2010
2011	-2,300	-5,071	4/16/2011
2012	-2,662	-5,868	4/5/2012
2013	-3,238	-7,139	4/20/2013
2014	-3,267	-7,203	4/16/2014
2015	-3,474	-7,659	4/16/2015
2016	-3,737	-8,239	3/17/2016
2017	-3,974	-8,762	4/24/2017
2018	-4,226	-9,317	4/16/2019
2019	-4,752	-10,476	4/16/2020
2020	-4,886	-10,771	4/16/2021

Data source: Ice mass measurement by NASA's GRACE satellites.

Wiese, D. N., D.-N. Yuan, C. Boening, F. W. Landerer, and M. M. Watkins (2019) JPL GRACE and GRACE-FO Mascon Ocean, Ice, and Hydrology Equivalent Water Height RL06M CRI Filtered Version 2.0, Ver. 2.0, PO.DAAC, CA, USA. Dataset accessed [YYYY-MM-DD] at ttp://dx.doi.org/10.5067/TEMSC-3MJ62.

https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/greenland%20mass%20data%20table%20cropped.png

2. After time to analyze data has passed, students fill out their square on the chart (on the PDF or Google Slide). Students with the same resource from each group come together to discuss what they learned. Students address the following questions in the space for each resource.
    - Summarize your resource clearly.
    - What do you still need clarification on from within your resource?
    - What was the significance of the information you learned?
3. Now the original group of four from Step 1 return together. Each member has two minutes to summarize what their resource group has discussed. Students need to fill in the other three parts as group members shares. They can use the questions above as a guide for what they should share out.
4. After each member had a chance to share their summary, together the groups need to answer:
    - What do the data tell you?
    - What was similar within resources?
    - What was different?

Teacher Note

Teachers, these mini lessons/student activities are perfect "warm up" tasks that can be used as a hook, bell ringer, exit slip, etc. They take less than a class period to complete. Learn more on the "My NASA Data What are Mini Lessons?" page.

Teachers who are interested in receiving the answer key, please complete the Teacher Key Request and Verification Form. We verify that requestors are teachers prior to sending access to the answer keys as we've had many students try to pass as teachers to gain access.

NGSS Three Dimensional Learning

NGSS Disciplinary Core Ideas

- ESS2A: Earth Materials and Systems
- ESS2D: Weather and Climate

Crosscutting Concepts

- Patterns
- Stability and Change

Science and Engineering Practices

- Developing and Using Models
- Analyzing and Interpreting Data
- Obtaining, Evaluating and Communicating Information

Document Resources

- Student Activity Sheet Sea Level Rise (pdf)

Google Slide interactive Files

Data Jigsaw: Exploring Sea Level Rise with Others Interactive Slides