
My NASA Data - Lesson Plans

Changing Freshwater Reservoirs

Grade Band

- 6-8
- 9-12

Time

- 30 minutes

Overview

Students are divided into three different groups and are assigned a category of drivers of change in regional trends of freshwater storage (Climate Change, Human Activity, and Natural Variability). Then they will brainstorm what each term means and predict what regions of the globe may experience a change in freshwater linked to this category.

Procedure

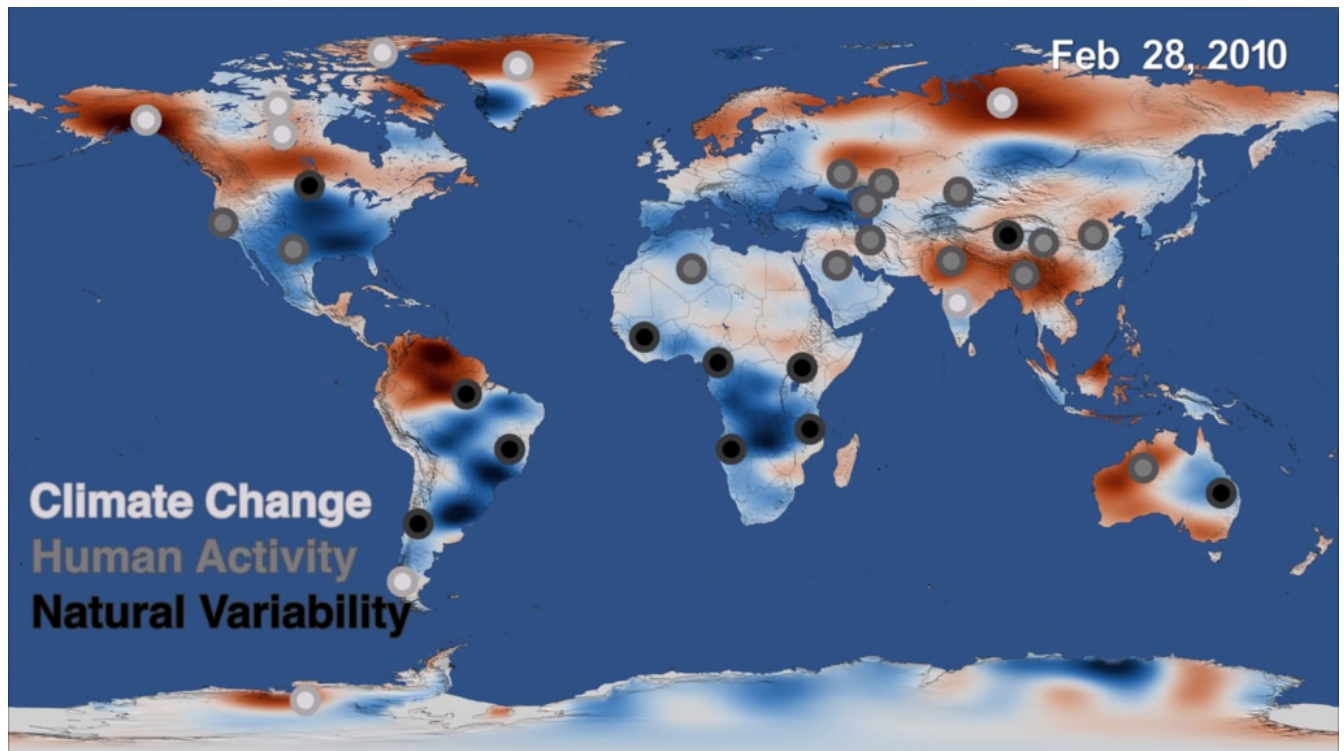
Freshwater is found in lakes, rivers, soil, snow, groundwater and ice, and is one of the most essential of Earth's resources, for drinking water and agriculture. However, the distribution of freshwater around the planet is changing.

Researchers used a pair of satellites called the Gravity Recovery and Climate Experiment, or GRACE, to track freshwater movement over the last fifteen years. The twin GRACE satellites were launched in 2002 as a joint mission between NASA and the German Aerospace Center (DLR). The two satellites precisely measured the distance between themselves to detect changes in Earth's gravity field caused by movements of mass on the planet below, caused by shifts in water and ice. They found that some regions' water supplies are relatively stable, others experienced increases or decreases.

Climate change has driven freshwater loss from the ice sheets at the poles, which has implications for sea level rise. Other areas saw groundwater depletions because of humans using water for irrigating crops or increases due to higher amounts of rainfall because of natural variability.

Directions:

1. Review the image below with students. Note to them the three categories marked in the map: Climate Change, Human Activity, and Natural Variability.



[NASA: Freshwater Movements Around the World. Source: NASA Goddard Space Flight Center | https://mydasdata.larc.nasa.gov/sites/default/files/inline-images/GRACE_Flat_2010_1024x576.jpg](https://mydasdata.larc.nasa.gov/sites/default/files/inline-images/GRACE_Flat_2010_1024x576.jpg)

2. Break students into three different groups; assign each group one of the categories of drivers of change in regional trends of freshwater storage (Climate Change, Human Activity, and Natural Variability).
3. Have students brainstorm what each term means and predict what regions of the globe may experience a change in freshwater linked to this category.
 1. Direct students to work as a team to watch the video, looking for the shaded circles connecting regions to the different drivers of change. Also, point out the time mark on the upper right.
 2. Have students review this image and make predictions about what the blue and red colors mean based on prior knowledge. Be sure to correct students who have misconceptions by explaining that the blues indicate areas of more freshwater than average; Reds indicate regions with less freshwater than average.
 3. Teacher Tip: You may want to divide students on each team to observe a different part (e.g., continent) of the world to concentrate their observations. Students will observe the region, date, and color (as well as gradient (light vs. dark) of the color.
 4. Have them create a data table with these headers on the top of a sheet of paper.
4. Show the following video. Students work as a team to make observations. Provide five minutes to share with their team.

[Video: NASA: Freshwater Movements Around the World](#)

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- 12 views

NASA: Freshwater Movements Around the World |
<https://www.youtube.com/watch?v=JFEpBgX192Q> | Source: NASA's Goddard Space Flight Center

1. Watch the video [NASA: Freshwater Movements Around the World](#)
2. Next, have students meet with other team members who share their same region (e.g., continent). Allow five-to-ten minutes for students to share their observations and identify different processes in the Earth System that may be linked to these observations.

Leading questions:

- What is the range of values shown on the scale bar?
- Where in the world do you find the highest and lowest extreme values of the data in your images?
- What patterns do you see? Is the data the same all over the world? How is the data the same or different when comparing land to water? Explain.

Finally, show them the annotated version of the NASA Video and lead a summary discussion.

[Video: A Map of Freshwater](#)

- 24 views
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A Map of Freshwater | <https://www.youtube.com/watch?v=bBzt9faOX04> | Source: NASA's Scientific Visualization Studio

Sources:

1. A Map of Freshwater. (2018, August 16). YouTube. Retrieved October 19, 2022, from <https://www.youtube.com/watch?v=bBzt9faOX04>
2. NASA: Freshwater Movements Around the World. (2018, August 16). YouTube. Retrieved October 19, 2022, from <https://www.youtube.com/watch?v=JFEpBgX192Q>

NGSS Three Dimensional Learning

NGSS Disciplinary Core Ideas

- ESS2A: Earth Materials and Systems
- ESS3A: Natural Resources

NGSS Crosscutting Concepts

- Patterns

NGSS Science and Engineering Practices

- Developing and Using Models

Essential Questions

What does Climate Change, Human Activity and Natural Vulnerability mean?

Why Does NASA Study This Phenomenon?

Freshwater is found in lakes, rivers, soil, snow, groundwater and ice, and is one of the most essential of Earth's resources, for drinking water and agriculture. However, the distribution of freshwater around the planet is changing. Researchers used a pair of satellites called the Gravity Recovery and Climate Experiment, or GRACE, to track freshwater movement over the last fifteen years.