My NASA Data - Interactive Models

The Role of Earth's Features in Earth's Energy Budget

Grade Band

- 6-8
- 9-12

Time

• 50 minutes

Directions

- 1. Using an internet accessible device, students open the link to <u>The Role of Earth's Features in Earth's Energy Budget Interactive Model</u> to begin their exploration of this phenomenon.
- 2. Distribute the <u>The Role of Earth's Features in Earth's Energy Budget Interactive Model Student Sheet</u> (optional). Have students navigate on their own through the interactive model to answer the questions and complete the activities on their student sheet.

The Greenhouse Gas Effect

Vocabulary: greenhouse gases

The effect of greenhouse gases is to take in some of the infrared or heat energy that would normally travel out to space and send it back to the surface. This results in a warming effect on Earth's surface.

Greenhouse gases in Earth's Atmosphere include water vapor (H₂O), carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and chlorofluorocarbons (CFCs), and others.

Review the animation here and answer the question below.





Teacher Note

Earth strives to maintain a balance between the overall amount of incoming and outgoing energy at the top of the atmosphere. This is called Earth's energy budget or Earth's radiation budget. Earth receives incoming energy from the Sun. Earth also emits energy back to space. For Earth's temperature to be stable over long periods of time (for the energy budget to be in balance), the amount incoming energy and outgoing energy must be equal. If incoming energy is more than outgoing energy, Earth will warm. If outgoing energy is greater than incoming energy, Earth will cool.

To learn more, visit:

• The Earth's Energy Budget Phenomena page for background information.

Virtual Teachers: Make a copy of the Google Form of your choice so that you may assign it directly from your Google Drive into your Learning Management System (e.g., Google Classroom, Canvas, Schoology, etc.). Do you need help incorporating these Google Forms into your Learning

Management System? If so, read this

Guide to Using Google Forms with My NASA Data.

Teachers who are interested in receiving the answer key, please complete the <u>Teacher Key Request</u> and <u>Verification Form</u>. 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
- ESS3C: Human Impacts on Earth Systems

Crosscutting Concepts

- Systems and System Models
- Stability and Change

Science and Engineering Practices

- Developing and Using Models
- Analyzing and Interpreting Data

Learning Objectives

- Students will observe the effects of albedo, clouds, aerosols, and greenhouse gases on Earth's Energy Budget.
- Students will differentiate between reflection and absorption.

Essential Questions

- 1. Which parts of the Earth System impact the flow of energy into and out of the Earth System?
- 2. How do clouds, aerosols, and greenhouse gases cause variations in the flow of energy into and out of the Earth System?
- 3. What is albedo, and how does it impact Earth's Energy Budget?

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Student Form