

My NASA Data - Mini Lesson/Activity

Explore Albedo Values: Student Activity



The screenshot shows the NASA Earth Observations (NEO) website interface. At the top, there is a navigation bar with categories: ATMOSPHERE, ENERGY, LAND, LIFE, OCEAN, NEWS, and ABOUT. To the right of the navigation bar, there are buttons for "3 IMAGES" and "ANALYZE". Below the navigation bar, the main content area is titled "ALBEDO (1 MONTH)". The central part of the page displays a world map where different regions are shaded in various shades of blue, representing albedo values. To the right of the map, there is a sidebar with a blue "ADD TO ANALYSIS" button. Below this button, it says "Currently viewing: February 2017" and "Permalink". Underneath, there is a "Downloads" section with a file type dropdown menu set to "JPEG". There are two radio buttons for "Color" and "Grayscale". Below these are four download options with their respective resolutions:

Resolution	Dimensions
1.0 degrees	360 x 180
0.5 degrees	720 x 360
0.25 degrees	1440 x 720
0.1 degrees	3600 x 1800

Student Directions

1. Introduce or review the concept of albedo with students by showing the [NASA Climate Bits: Albedo](#) video.

[Video: ClimateBits: Albedo](#)

Video

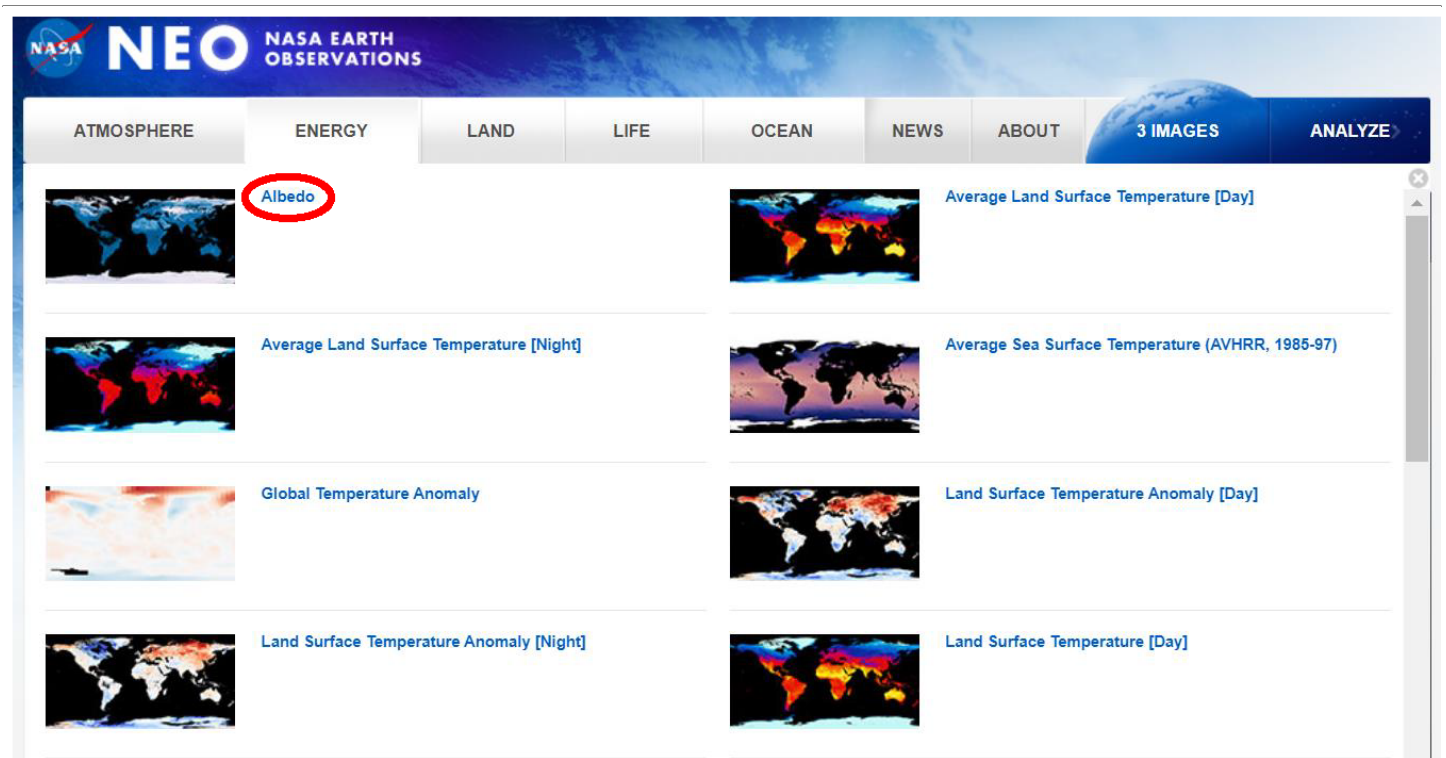
ClimateBits: Albedo | <https://www.youtube.com/watch?v=d1U7X1k3d0Y> | Source: ClimateBits

1. After watching the video, have students go to the [NASA Earth Observations Website](https://neo.sci.gsfc.nasa.gov/) (<https://neo.sci.gsfc.nasa.gov/>). They will select three months of albedo data and use the data probe tool to explore the albedo values in the Arctic region.
2. The first screen will look like this.



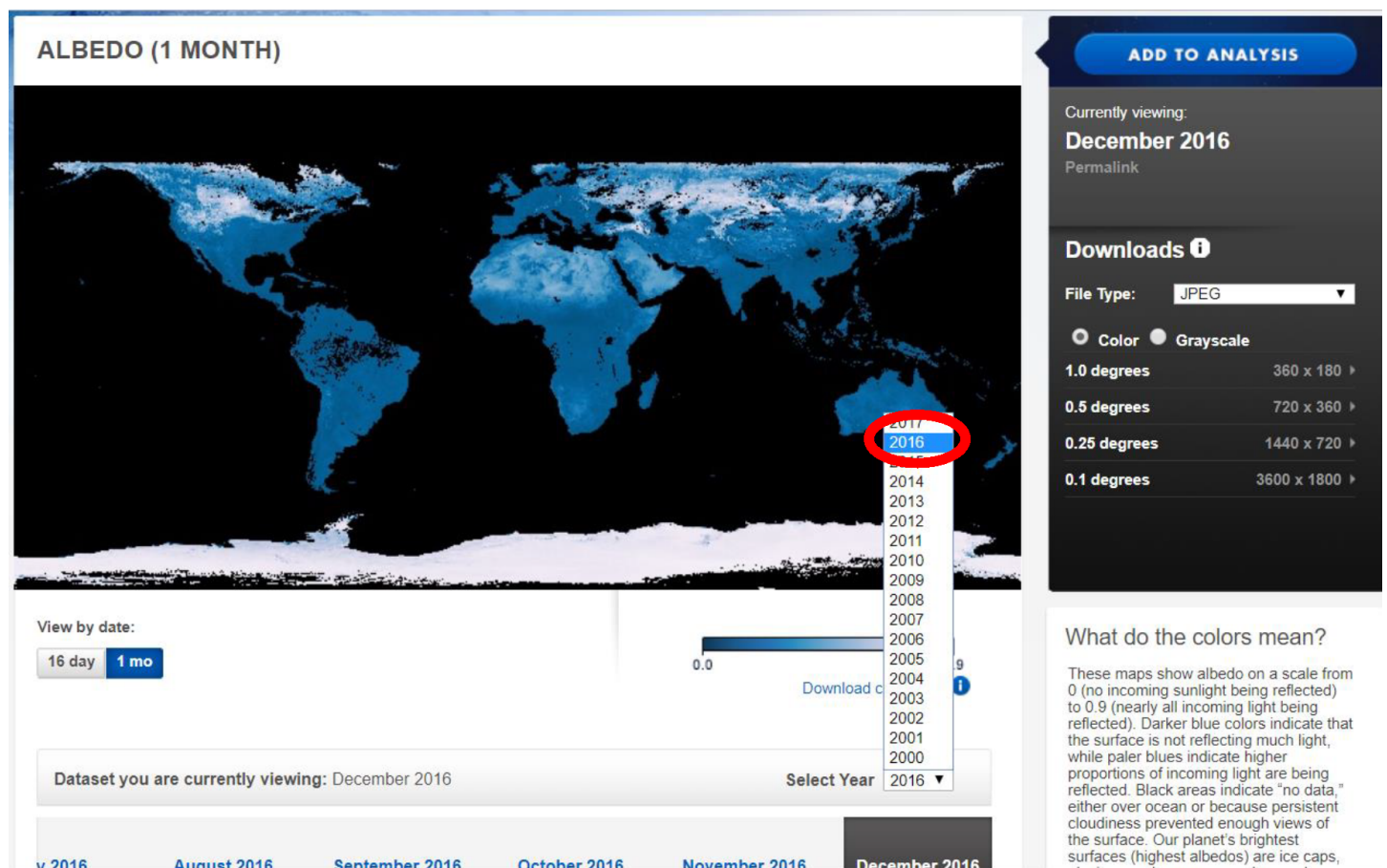
Credit: NASA Earth Observations

4. Have the students click on Energy at the top of the screen as indicated by the red oval in the image above.
5. Students will then click on Albedo.



Credit: NASA Earth Observations

6. When the albedo screen comes up, students should select the dropdown for the year and click on 2016.



Credit: NASA Earth Observations

7. On the next screen, they will slide the date bar to the left and click on the words March 2016.

The screenshot displays the NASA Earth Observations (NEO) website interface. At the top, there is a navigation menu with categories: ATMOSPHERE, ENERGY, LAND, LIFE, OCEAN, NEWS, and ABOUT. To the right of the menu are buttons for '3 IMAGES' and 'ANALYZE'. The main heading is 'ALBEDO (1 MONTH)'. Below this is a large satellite image of Earth showing albedo data. To the right of the image is a sidebar with an 'ADD TO ANALYSIS' button, 'Currently viewing: March 2016', a 'Downloads' section with a file type dropdown set to 'JPEG' and radio buttons for 'Color' and 'Grayscale', and a table of resolution options:

Resolution	Dimensions
1.0 degrees	360 x 180
0.5 degrees	720 x 360
0.25 degrees	1440 x 720
0.1 degrees	3600 x 1800

Below the image is a 'View by date:' section with buttons for '16 day' and '1 mo'. A color scale legend is shown with values from 0.0 to 0.9. Below the legend is a 'Dataset you are currently viewing: March 2016' section with a 'Select Year' dropdown set to '2016'. A horizontal timeline shows months from February 2016 to July 2016, with 'March 2016' highlighted in a red circle. A legend at the bottom indicates 'Data' (blue dot), 'No Data' (grey dot), and 'Currently Viewing' (black dot). On the right side of the page, there is a section titled 'What do the colors mean?' with explanatory text and a 'Related Websites' section listing 'MODIS'.

Credit: NASA Earth Observations

8. After the March 2016 image is displayed, click on Add to Analysis at the top right of the screen.

NASA NEO NASA EARTH OBSERVATIONS

ATMOSPHERE ENERGY LAND LIFE OCEAN NEWS ABOUT

0 IMAGES ANALYZE

ALBEDO (1 MONTH)

ADD TO ANALYSIS

Currently viewing:
March 2016
Permalink

Downloads ⓘ

File Type: **JPEG**

Color Grayscale

1.0 degrees	360 x 180 ▶
0.5 degrees	720 x 360 ▶
0.25 degrees	1440 x 720 ▶
0.1 degrees	3600 x 1800 ▶

Credit: NASA Earth Observatory

9. Follow the same steps to select June 2016 and September 2016. Once the three images are added, students should see that there are three images selected.

NASA NEO NASA EARTH OBSERVATIONS

ATMOSPHERE ENERGY LAND LIFE OCEAN NEWS ABOUT

3 IMAGES ANALYZE

ALBEDO (1 MONTH)

ADD TO ANALYSIS

Currently viewing:
September 2016
Permalink

Downloads ⓘ

File Type: **JPEG**

Color Grayscale

1.0 degrees	360 x 180 ▶
0.5 degrees	720 x 360 ▶
0.25 degrees	1440 x 720 ▶
0.1 degrees	3600 x 1800 ▶

View by date:
16 day **1 mo**

0.0 0.9
Download color table ⓘ

What do the colors mean?
These maps show albedo on a scale from 0 (no incoming sunlight being reflected) to 0.9 (nearly all incoming light being reflected)

Credit: NASA Earth Observatory

10. Have students click on the Analyze button at the top right of the screen.

The screenshot shows the NASA Earth Observatory (NEO) website interface. At the top, there is a navigation bar with categories: ATMOSPHERE, ENERGY, LAND, LIFE, OCEAN, NEWS, and ABOUT. To the right of these categories are two buttons: '3 IMAGES' and 'ANALYZE', with the latter being circled in red. Below the navigation bar, the main content area is titled 'ALBEDO (1 MONTH)'. It features a large world map showing albedo data for September 2016. Below the map, there are controls for 'View by date' (16 day and 1 mo) and a color scale legend ranging from 0.0 to 0.9. To the right of the map, there is a sidebar with an 'ADD TO ANALYSIS' button, 'Currently viewing: September 2016', a 'Downloads' section with a file type dropdown set to 'JPEG', and radio buttons for 'Color' and 'Grayscale'. Below these are four download options: 1.0 degrees (360 x 180), 0.5 degrees (720 x 360), 0.25 degrees (1440 x 720), and 0.1 degrees (3600 x 1800). At the bottom of the sidebar, there is a section titled 'What do the colors mean?' with a brief explanation of the albedo scale.

Credit: NASA Earth Observations

11. On the next screen, students should verify that the mode is basic exploration and the file size is 0.25 degrees. Then they should click on Launch Analysis.

NEO NASA EARTH OBSERVATIONS

ATMOSPHERE ENERGY LAND LIFE OCEAN NEWS ABOUT 3 IMAGES ANALYZE

ANALYSIS OPTIONS

Select Area (optional)

These configuration options are all optional. You may use either the map above to select coordinates for a region you want to analyze or you can enter them in the fields on the left. When you are ready to run the analysis, click on the 'Launch Analysis' button below.

Mode:

File size:

LAUNCH ANALYSIS

IMAGE QUEUE

Albedo (1 month) March 2016
Remove

Albedo (1 month) June 2016
Remove

Albedo (1 month) September 2016
Remove

[Remove all images](#)

REACH US

If you have a question regarding NEO, please email us directly by clicking the button.

Credit: NASA Earth Observations

12. When the analysis screen appears, point out to students that the three months are indicated by different colors. Have students click on Data Probe. They will be able to move the cursor over different locations and see the albedo values for all three months in their respective colors.



ANALYSIS TOOL

[Back to configuration](#)

1. Albedo (1 month) March 2016

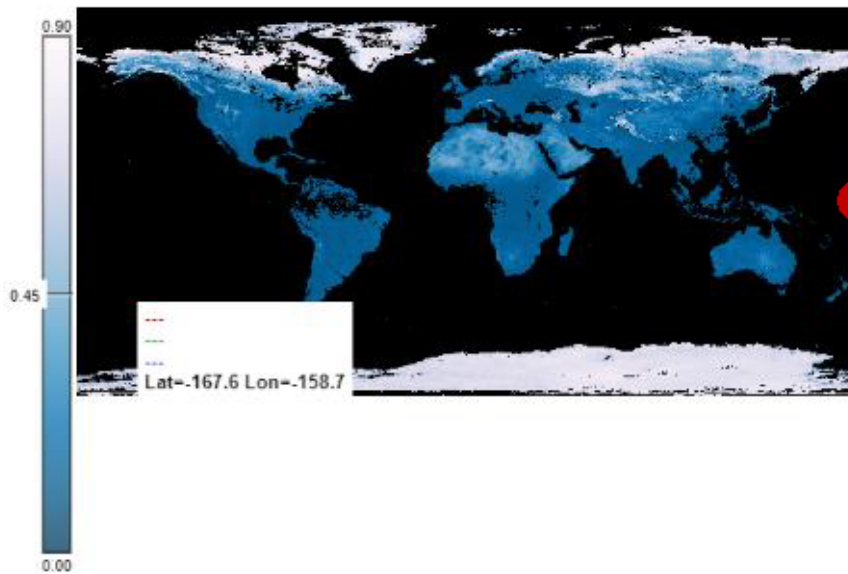
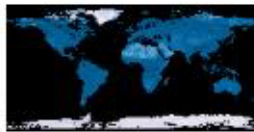
2. Albedo (1 month) June 2016

3. Albedo (1 month) September 2016

Albedo

Albedo

Albedo



Step

Zoom/Beam

Data Probe

Plot

Distance

Outline region

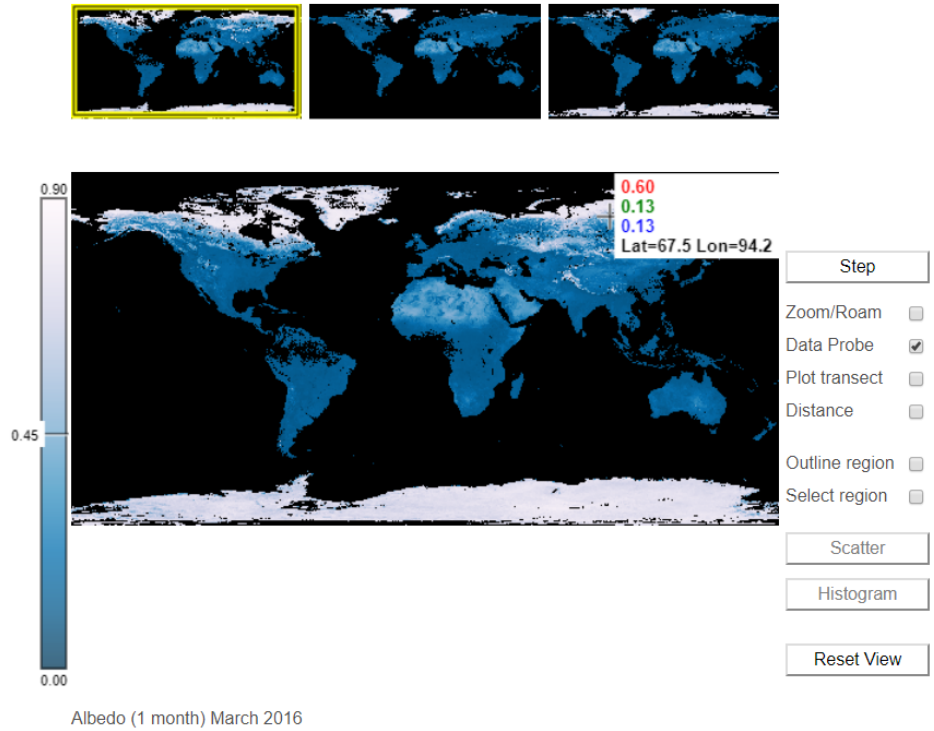
Select region

Scatter

Histogram

Reset View

Albedo (1 month) March 2016



Credit: NASA Earth Observations

13. Let students explore for a few minutes and then have them answer the following questions.

- Fill in the table with the data you collect.

	Latitude	Longitude	Mar-16	Jun-16	Sep-16	Range
Mainland US						
Alaska						
Arctic						
Northern Canada						
Greenland						
Africa						

- After filling in the data, calculate the range for each location by subtracting the lowest albedo value from the highest albedo value.
- Which locations have the lowest range?
- Which locations have the highest range?
- Areas with a higher range experience more change in albedo during the year. What do these areas have in common?

Credit: NASA Earth Observations

Why do you think these areas experience changing albedo?

Students will use the NASA Earth Observations analysis tool to explore changing albedo in the Arctic compared with other areas of Earth. Students should notice that the northernmost areas experience a greater variation. These are areas that have cycles of ice growth and melt throughout the seasons.

Ice has a high albedo. As it melts, the albedo decreases. This leads to changes in albedo in the

Arctic as the seasons change. Areas over land such as Africa and the mainland US experience less change because the reflectivity of the land does not change as much as the melting ice.

My NASA Data Visualization Tool

- [Earth System Data Explorer](#)