My NASA Data - GLOBE Connections

GLOBE Connections: Changing Albedo Values

GLOBE protocols and learning activities that complement the Changing Albedo Values phenomenon through hands-on investigations are detailed below. Students can conduct their own investigations and see how their data related to global patterns by using GLOBE and My NASA Data together.

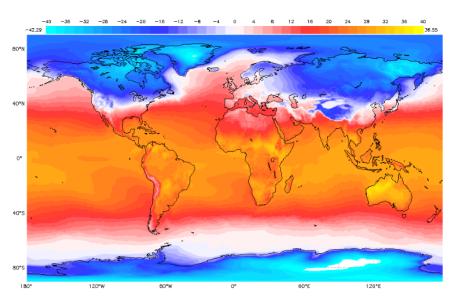
The <u>GLOBE Cryosphere Protocols & Related ESDE Datasets</u> page outlines the complementary Earth System Data Explorer data available by GLOBE protocol.

Changing Albedo Values

When sunlight reaches the Earth's surface, some of it is absorbed and some is reflected. The relative amount (ratio) of light that a surface reflects compared to the total incoming sunlight is called albedo. A surface with a high albedo will reflect more sunlight than a surface with low albedo. Surfaces with high albedos include sand, snow and ice, and some urban surfaces, such as concrete or light-colored stone. Surfaces with low albedos include forests, the ocean, and some urban surfaces, such as asphalt.

GLOBE protocols can be used to study factors that can lead to albedo changes and the impacts of those changes.

Protocols



Surface Air Temperature - February 2019

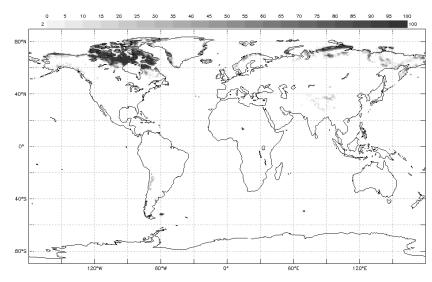
Earth System Data Explorer - Monthly

Air Temperature

Measure the current air temperature when an instrument shelter is not available. Current air temperature is measured using a thermometer held in the open air but in the shade for at least 3 minutes. Higher air temperatures can lead to melting snow and ice and lower albedo.

Student Outcomes:

- Weather can be described by quantitative measurements.
- Weather changes over different time and spatial scales.
- Weather changes over seasons.



My NASA Data Biome/Land Cover

Classification - Tundra

Land Cover Classification

Students locate, photograph, and determine the MUC class for 90 m x 90 m areas of homogeneous land cover. Long term changes in snow and ice cover and albedo can lead to changes from tundra to forest land cover.

Student Outcomes:

• Students will learn how to scientifically describe and classify a Land Cover Sample Site.

Snowboard Construction: A snowboard is a thin, flat surface that rests on top of earlier layers of snow. New snow falls on top of it and can be measured with a meter stick.

Student Outcomes:

Prepare the snowboard to collect more snow

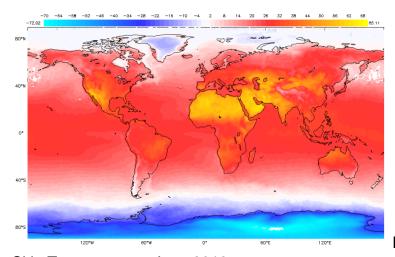
Measure the amount of new snow that has collected on your snowboard Measure the total depth of snow on the ground. Obtain samples of new snow and snowpack for pH measurement Obtain samples of new snow and snowpack to determine the water equ Prepare the snowboard to collect more snow. A meter stick (or a longer measurement pole if snow accumulates to more than a meter in depth ☐ Integrated 1-Day Data Sheet ☐ A straight-sided container ☐ Pen or pencil ☐ The overflow tube from your rain gauge ☐ Labels for snow samples ☐ Two clean sampling jars with covers for the pH samples ☐ A container for the snowpack rain equivalent sample In the Field nsert the measuring stick vertically into the snow until it rests on the ground. Be careful not to mistake an ice layer or crusted snow for the ground. Read and record the depth of the snowpack. Repeat the measurement in at least two more places where the snow is least affected by drifting. 3. Report all three of these numbers as the total snowfall. If the snowpack is so small that a depth cannot be read, record the letter "T" (for trace) for total snowpack. After a new snow has fallen on earlier snow, gently insert the measuring stick vertically into the snow until it touches the snowboard. Read and record the depth of new snow. If no new snow has fallen, record 0.0 as the depth of new snow. 6. Report these numbers as the depth of new snow. If the snowfall is so small that a depth cannot be read, record the letter "T" (for trace) for new snow. If the snow on the snowboard has been disturbed before you can take an accurate measurement, report "M" for missing. . Record the number of days since the last reading of snow on the snowboard.

Solid Precipitation Protocol

Solid Precipitation: Students will measure the amount of new snow that has collected on your snowboard in comparison with the total depth of snow on the ground.

Student Outcomes:

- Students will measure the amount of new snow that has collected on your snowboard
- Students will measure the total depth of snow on the ground
- Students will obtain samples of new snow and snowpack for pH measurement
- Students will obtain samples of new snow and snowpack to determine the water equivalent
- Prepare the snowboard to collect more snow



Earth System Data Explorer - Monthly Daytime

Skin Temperature - June 2019

Surface Temperature

Students use an infrared thermometer (IRT) to measure the temperature of Earth's surface. Increasing surface temperature can lead to melting snow and ice and decrease albedo.

Student Outcomes:

• Students will learn to use an infrared thermometer, and understand how different surfaces radiate energy.

Learning Activities

Check out the three learning activities to help prepare students for collecting data and to support the integration of MND with *GLOBE* in your curriculum.





Help students become familiar with the Terrestrial Biome Classifications that the Seasons and Biomes project has adopted. Changes in snow and ice extent contribute to biome classification.

Student Outcomes:

- Use appropriate sources of information
- · Synthesize data from different sources to create a coherent description of the main biomes
- Identify appropriate sources of information
- · Organize data into tables
- · Draw conclusions by synthesizing a variety of data
- Communicate results and explanations



How to Make a Climograph from Your Local Weather Data

Purpose: Students will assemble, analyze and graph the long-term air temperature and precipitation data for their general area, to understand the difference between weather and climate. These data can include snow and ice.

Student Outcomes:

- Weather is a day-to-day phenomenon and climate is a long-term average of weather
- The sun is the major source of energy for changes on the Earth's surface
- Organisms' functions relate to their environment
- Sunlight is the major source of energy for ecosystems
- Identify appropriate data sources
- Perform simple statistical calculations
- Organize data into tables and graphs
- Use appropriate tools and techniques
- Draw conclusions by synthesizing a variety of data
- · Communicate results and explanations



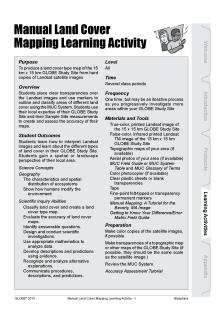
Land Cover Change Detection

Overview: Using Multispec software, evaluate and investigate changes that have occurred in the major land cover types of your GLOBE Study Site by examining the digital files of two Landsat satellite images that were acquired a few years apart.

Student Outcomes:

- Earth has many different environments that support different combinations of organisms
- All organisms must be able to obtain and use resources while living in a constantly changing environment
- All populations living together and the physical factors with which they interact constitute an ecosystem
- Humans can change ecosystem balance
- How to use maps (real and imaginary)
- The characteristics and spatial distribution of ecosystems
- Use land cover data and appropriate tools and technology to interpret change
- Gathering spatial data and historical data to determine validity of change hypotheses





Source: (GLOBE Website)

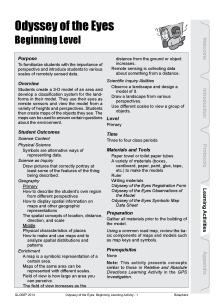
Overview: Produce a land cover type map of the 15 km x 15 km GLOBE Study Site from hard copies of Landsat satellite images

Student Outcomes:

- The characteristics and spatial distribution of ecosystems
- Show how humans modify the environment
- Classify land cover and create a land cover type map
- Evaluate the accuracy of land cover maps
- Use appropriate mathematics to analyze data

· Develop descriptions and predictions using evidence

Odyssey of the Eyes - Beginning

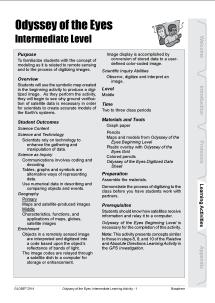


Source: (GLOBE Website)

Overview: Familiarize students with the importance of perspective and introduce students to various scales of remotely sensed data.

Student Outcomes:

- Symbols are alternative ways of representing data
- Draw pictures that correctly portray at least some of the features of the thing being described
- How to describe the student's own region from different perspectives
- How to display spatial information on maps and other geographic representations
- The spatial concepts of location, distance, direction, and scale
- Physical characteristics of places
- How to make and use maps and to analyze spatial distributions and patterns



Source: (GLOBE Website)

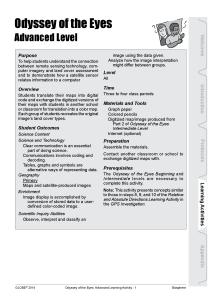
Odyssey of the Eyes - Intermediate

Overview: Familiarize students with the concept of modeling as it is related to remote sensing and to the process of digitizing images.

Student Outcomes:

- Scientists rely on technology to enhance the gathering and manipulation of data
- Tables, graphs and symbols are alternative ways of representing data
- Use numerical data in describing and comparing objects and events
- Maps and satellite-produced images
- Characteristics, functions, and applications of maps, globes, satellite images

Odyssey of the Eyes - Advanced

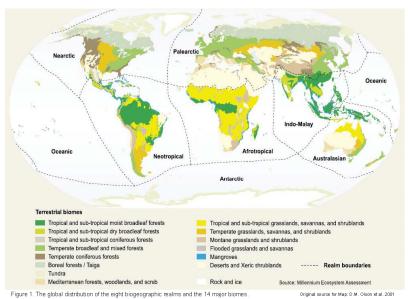


Source: (GLOBE Website)

Overview: Help students understand the connection between remote sensing technology, computer imagery and land cover assessment and to demonstrate how a satellite sensor relates information to a computer

Student Outcomes:

- Clear communication is an essential part of doing science
- · Communications involves coding and decoding
- Tables, graphs and symbols are alternative ways of representing data
- Maps and satellite-produced images
- Observe, interpret and classify an image using the data given
- Analyze how the image interpretation might differ between groups



Source: GLOBE Getting to Know Your

Terrestrial Biomes

What are Some Factors that Affect Seasonal Patterns?

Purpose: Students use GLOBE data and graphing tools to compare the influence of latitude, elevation, and geography on seasonal patterns.

Student Outcomes:

- Weather changes from day to day and over the seasons.
- Seasons result from variations in solar insolation resulting from the tilt of the Earth's rotation axis.
- The sun is the major source of energy at Earth's surface.
- Solar insolation drives atmospheric and ocean circulation.

Source: GLOBE Website

