My NASA Data - GLOBE Connections

GLOBE Connections: Changing Air Temperatures

This resource helps to identify and access GLOBE protocols and hands-on learning activities that complement the Changing Air Temperatures phenomenon.

Visit the <u>GLOBE Atmosphere Protocols & Related ESDE Datasets</u> page that outlines the datasets available in the Earth System Data Explorer. These data complement student GLOBE investigations using the following protocols.

Changing Air Temperatures

Protocols

GLOBE protocols can be used to collect many types of data to examine changing air temperatures. Students can use the protocols to collect data and share their data with other GLOBE students around the world. As scientists continue their study changing air temperatures, they can use these data.

- **1. Air Temperature** Students collect current air temperature is measured using a thermometer held in the open air but in the shade for at least 3 minutes.
- **2. Surface Temperature -** Students use an infrared thermometer (IRT) to measure the temperature of the Earth's surface.

Protocol Bundles

These protocol bundles are related to air temperature.

- 1. <u>ENSO Protocol Bundle</u> This bundle includes atmosphere, hydrosphere, and pedosphere protocols that are used for the GLOBE ENSO (El Niño Southern Oscillation) Campaign which has been formulated to engage students in determining where and how much El Niño affects local places and to put students in contact with the resulting patterns in their local environment.
- **2.** <u>Mosquito Protocol Bundle</u> This protocol bundle combines all GLOBE protocols that are related to the Mosquito habitat mapper app and explains how they are related. You can make a difference in tracking and controlling the spread of mosquitoes and help save your loved ones from getting dengue, Zika, and other illnesses.
- **3.** <u>Urban Protocol Bundle</u> The purpose of the Urban Bundle is to suggest a group of GLOBE protocols that can provide students and teachers with an integrated knowledge of the environment in

urban areas, including various processes and their interactions. Given the many small-scale variations caused by the built environment, such citizen science contributions are particularly needed to adequately characterize the urban environment.

4. <u>Weather Bundle</u> - The purpose of the Weather Bundle is to suggest a group of GLOBE protocols that can provide students and teachers with an integrated knowledge of the parameters and processes which control the weather and are responsible through their changes, for weather events.

Learning Activities

Each of the GLOBE protocols has a set of learning activities to help students learn more about the instruments and procedures for the measurements, the content associated with the protocol and ways students and scientists can use the data that is being collected. There is a link for all atmosphere learning activities and those that have been selected for Changing Air Temperatures are detailed below.

- 1. Atmosphere Learning Activities Introduction (pdf)
- 2. All GLOBE Atmosphere Learning Activities

Phenomenon-Related Learning Activities:

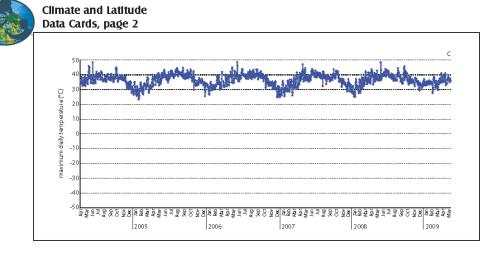


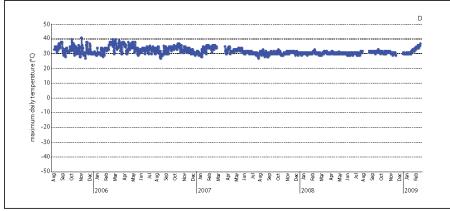
3. Climate and Latitude

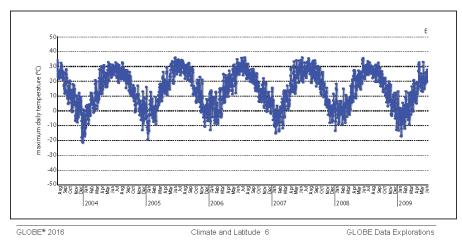
Overview: Students match GLOBE temperature data with its location given what they know about the relationship between latitude and seasonal temperature variations.

Student Outcomes:

- Match graphs of temperature data with locations given the latitude.
- Explain why they matched each graph to a particular location using the knowledge that seasonal differences are larger further from the equator and temperatures are warmer near the equator.





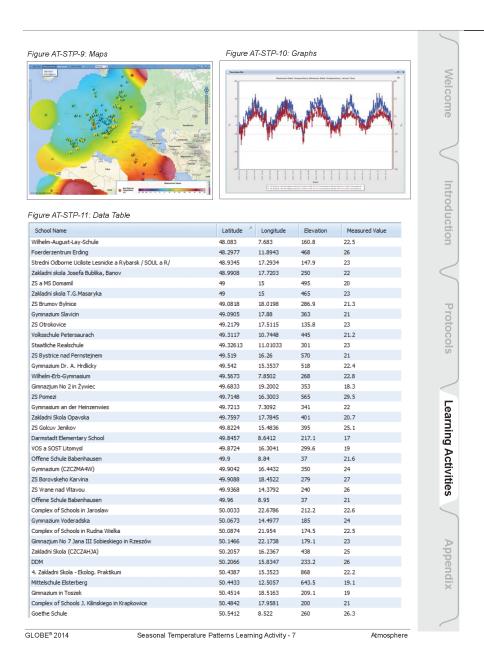


4. How Do Seasonal Temperature Patterns Vary Among Different Regions of the World?

Overview: Students use GLOBE visualizations to display student data on maps and to learn about seasonal changes in regional and global temperature patterns.

Student Outcomes:

- Summarize the effect of latitude, elevation, and geography on global temperature patterns;
- Explore local and regional seasonal variations.



5. Land, Water, and Air

Overview: Students measure temperature change in soil, water, and air as they are exposed to the heating action of the sun.

Student Outcomes:

 Students gain an understanding of GLOBE specifications for the instrument shelter and perform a guided inquiry project.

Land, Water, and Air



Purpose

To help students understand that land and water heat and cool at different rates and that the properties of soil and water influence the heating of air above them

Students measure temperature change in Materials and Tools soil, water and air as they are exposed to (per group of students) the heating action of the sun.

Student Outcomes

Students gain an understanding of GLOBE specifications for the instrument shelter and perform a guided inquiry project.

Science Concepts

Physical Science

Heat transfer occurs by radiation, conduction, and convection. Scientific Inquiry Abilities

Identify answerable questions Design and conduct scientific investigations

Measuring and recording data Develop explanations and predictions

using evidence Communicate results and explanations Organizing data in tables

Graphing Working effectively in groups

Three to four hours total; one to two hours of actual time on task.

Intermediate and advanced

Two plastic buckets at least 30 cm tall Centimeter ruler

Six Thermometers

A means to suspend thermometers over the buckets, such as string and

Arrange for an outdoor area in which to conduct the experiment. (This activity could be performed indoors by substituting a strong artificial light source for the sunlight.) This experiment gives the best results on a sunny, warm day. Divide the students into small working groups. You may want to demonstrate the activity first so that all students understand how to conduct the

Prerequisites

Background

One of the important reasons why we have different kinds of weather throughout the world is because land and water heat and cool at different rates.

For example, afternoon thunderstorms in Florida are often initiated by the fact that during the day the land heats up faster than the water does. (To understand more about this, students should research what causes sea breezes.) In parts of the world that experience monsoons (wind systems that reverse direction seasonally), the rainy part of the monsoon season is characterized by alternating periods of active (rainy) and non-active (not rainy) weather depending on whether the land is dry or wet.

Students may have observed a difference in the heating and cooling rates of land relative to water if they have ever run barefoot across a beach to the water in the middle of a warm. sunny afternoon. They probably remember how hot the land was and how cool and refreshing the water was. If they were at the beach until after sunset and walked barefoot across the beach to the water, they might remember that at this time of day, it is the beach that feels cool, while the water feels warm. Students can study this land/water difference with a simple experiment.

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Studying the Instrument Shelter Learning Activity - 1

Protocols

Learning Activities

Appendix

Source: www.globe.gov