

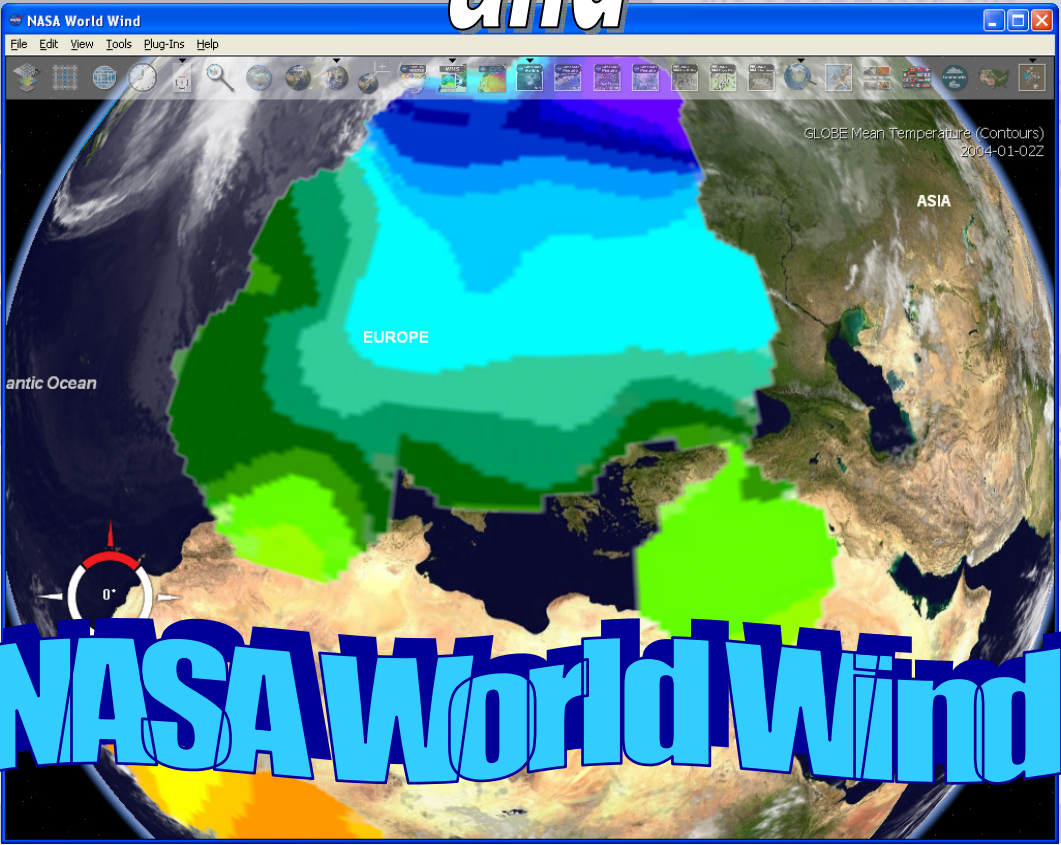
# Viewing GLOBE data in Google Earth and World Wind

**Google Earth**



*and*

**NASA World Wind**



**Dr. Feodor Surkov, GLOBE Russia Country Coordinator**  
**Mr. Gary Randolph, GLOBE Regional Consortia Coordinator**

# How to *Quick Guide* for viewing GLOBE data using Google Earth:

Go to [www.globe.gov](http://www.globe.gov), move the mouse over *For Students*, down to *Maps and Graphs*, then down to *Google Earth* (see below) and click.

The screenshot shows the GLOBE Program website interface. At the top, there are language options: English, Español, Français, Русский, اللغة العربية, Deutsch, Nederlands. The main header is "The GLOBE Program" with a "Log in" link. Below the header is a navigation bar with tabs: Home, Projects, For Students, For Teachers, For Scientists, For Partners. A dropdown menu is open under "For Students", listing categories: Research Projects, Data Entry, Finding Data, Maps & Graphs, Chief Scientist's Blog, GLOBE Stars, Chief Scientist's Honor Roll, Elementary GLOBE, Community & Events, and Quizzes. The "Maps & Graphs" category is expanded to show: Maps, Graphs, Diurnal Graphs, Special Visualizations, NASA World Wind, Google Earth (highlighted in yellow), Investigation Activities, and Tutorial. The main content area features a globe image and text: "Explore our pages for students!", "Investigate the Earth System through our projects.", "Contribute your research project!", "2007 GLOBE Annual Conference", and "2008 GLOBE Learning Expedition" (New update: 12 July 2007). A "NEWS" section lists: "GLOBE Africa Regional Meeting and Training in South Africa", "Seasons and Biomes March Workshop Engages Educators", "Welcome to the New Version of the GLOBE Web Site", "Latin America and the Caribbean Regional Meeting and Workshop", and "Chief Scientist's blog entry: What affects Earth's climate?" with a "more..." link. The footer contains navigation links: About GLOBE, GLOBE Countries, Community and Events, Contact, and the tagline "Global Learning and Observations to Benefit the Environment". Logos for UCAR, Colorado State University, NASA, NSF, and U.S. Department of State are displayed. A search bar with "SEARCH" and "Go" buttons is on the left, and "Site Map", "FAQs", "Policies", and "Help" links are on the right. A "Sponsors and Cooperating Organizations" link is at the bottom center.

## Using GLOBE Data with Google Earth

*A 3D Earth-viewing application developed by Google*

### Introduction

Google Earth is a software program that combines satellite imagery, maps and the power of Google Search that puts the world's geographic information at your fingertips. There are different versions of the software including a Free version.

Google Earth is a GIS program that allows users to overlay datasets of their own choosing. GLOBE is creating datasets that allow you to overlay GLOBE data with other Google Earth datasets so that you can analyze and compare your student data with other data.

The Google Earth application can be downloaded from <http://earth.google.com>. System requirements can be viewed at <http://earth.google.com/download-earth.html>.

### Viewing GLOBE data in Google Earth

Currently only GLOBE student data for Air Temperature can be viewed in Google Earth; different types of GLOBE data will be available at a later date.

Input the date desired into the box as shown below (with default date in the box):

Input a date to get GLOBE Student Air Temperature data for the given day to display in Google Earth

Date: (YYYYMMDD)

Note: You will need to have at least Google Earth version 4. If you have an earlier version it may not work. Visit <http://earth.google.com/earth4.html> for the latest version.

Also, depending on which database is accessed, the time it takes for the GLOBE data to download ranges from 10 seconds to a minute.

Click on the Submit button; the GLOBE database will send a file back to your browser with a prompt to open or save up the file in Google Earth. Click on Open with Google Earth.

Once the data is loaded into Google Earth you can click any of the small GLOBE logos to get details about that site. You can also choose which data to display by clicking the appropriate checkbox or radio button under the "Place" pane on the left side of the Google Earth application window.

A video tutorial on using GLOBE Data with Google Earth is available at: [www.globe.gov/docs/vid/GE\\_minut1.wmv](http://www.globe.gov/docs/vid/GE_minut1.wmv).

### Links to further information

- \* Google Earth User's guide: <http://earth.google.com/userguide/v4/>;
- \* To write your own KML files (for use with Google Earth) visit: <http://earth.google.com/kml/>.

# How to *Quick Guide* for viewing GLOBE data using NASA World Wind:

Go to [www.globe.gov](http://www.globe.gov), move the mouse over *For Students*, down to *Maps and Graphs*, then down to *NASA World Wind* (see below) and click.



The screenshot shows the GLOBE Program website interface. At the top, there are language options: English, Español, Français, Русский, اللغة العربية, Deutsch, Nederlands. The main header is "The GLOBE Program" with a "Log in" link. Below the header is a navigation bar with tabs: Home, Projects, For Students, For Teachers, For Scientists, For Partners. A dropdown menu is open under "For Students", listing categories: Research Projects, Data Entry, Finding Data, Maps & Graphs, Chief Scientist's Blog, GLOBE Stars, Chief Scientist's Honor Roll, Elementary GLOBE, Community & Events, and Quizzes. The "Maps & Graphs" category is expanded, showing sub-items: Maps, Graphs, Diurnal Graphs, Special Visualizations, NASA World Wind (highlighted), Google Earth, Investigation Activities, and Tutorial. The main content area features a globe image and several text blocks: "Explore our pages for students!", "Investigate the Earth System through our projects", "Contribute your research project!", "2007 GLOBE Annual Conference", and "2008 GLOBE Learning Expedition" with a "New update: 12 July 2007". A "NEWS" section on the right lists several articles with blue links. At the bottom, there are navigation buttons for "About GLOBE", "GLOBE Countries", "Community and Events", and "Contact". The footer contains logos for UCAR, Colorado State University, NASA, NSF, and the U.S. Department of State, along with a search bar and links for "Site Map", "FAQs", "Policies", and "Help".

## Using World Wind with GLOBE data

*A 3D Earth-viewing application developed by NASA Ames Research Center*

### Introduction

World Wind lets a user zoom from satellite altitude into any place on Earth, automatically selecting appropriate resolution satellite imagery and elevation data to create aerial views or views of flying across the world in any direction. It was designed to be easy to use, and the only control needed is a two button mouse. Navigation is accomplished with single mouse clicks and the ability to type in any location and automatically zoom to it.

World Wind also allows viewing of other datasets in its 3D environment, including GLOBE data, weather event animations developed by Goddard Space Flight Center, MODIS data updated daily, and various map reference layers such as country borders, city names, etc. Many of the datasets that can be displayed by World Wind are too large to download the entire dataset to the user's machine, so only the parts being viewed are downloaded and stored in compressed format.

The World Wind application can be downloaded from NASA's World Wind web site: <http://worldwind.arc.nasa.gov/download.html>, and can be used under the terms of the NASA Open Source Agreement. It requires a fairly high-end PC to run, including Windows 2000 or XP; Pentium 3, 1 GHz or higher; 256 MB of RAM; 3D graphics card; DSL/Cable internet connection or faster; 2 GB disk space.

### Viewing GLOBE data in World Wind

GLOBE data can be viewed in World Wind through WMS (Web Map Service) by these steps:

1. Start up World Wind with the world called "Earth". (This is the default; other available worlds include Jupiter, Mars, the Moon, SDSS, and Venus)
2. In the top menu bar, click "Tools" and scroll down to the "WMS Browser". This may take several minutes to load and brings up a window with two servers listed, NASA SVS Image Server and The GLOBE Program Visualization Server.
3. Click the "+" sign next to The GLOBE Visualization Server to expand the hierarchy, then click the "+" sign next to the data category of interest (e.g. Air Temperature, Rainfall, etc.).
4. Once a dataset is selected, you can either:
  - \* View the dataset for a particular date by clicking the "Still Image" button; or
  - \* Animate the dataset over some length of time by choosing the "Animation" tab in the lower half of the box; select a date range and click on the play button at the bottom of the box.
5. The data points are now being displayed on the world image. As you click on the Earth it will turn or spin in the direction of the click and will display the new data points as they are available.

### Links to further information

- \* A helpful Key Chart is available on World Wind's Web site at: [worldwind.arc.nasa.gov](http://worldwind.arc.nasa.gov).
- \* The World Wind open source community Web site is at [worldwindcentral.com](http://worldwindcentral.com).

## How to find *GLOBE Investigation Activities*:

Go to [www.globe.gov](http://www.globe.gov), move the mouse over *For Students*, down to *Maps and Graphs*, then down to *Investigation Activities* (see below) and click.



The screenshot shows the GLOBE Program website interface. At the top, there are language options: English, Español, Français, Русский, اللغة العربية, Deutsch, Nederlands. The main header is "The GLOBE Program" with a "Log in" link. Below the header is a navigation bar with tabs: Home, Projects, For Students, For Teachers, For Scientists, For Partners. The "For Students" tab is active, and a dropdown menu is open, listing various resources. The "Investigation Activities" option is highlighted in yellow. Below the navigation bar, there are several sections: "Explore our pages for students!", "Investigate the Earth System through our projects.", "Contribute your research project!", "2007 GLOBE Annual Conference", and "2008 GLOBE Learning Expedition" with a "New update: 12 July 2007". On the right side, there is a "NEWS" section with links to "GLOBE Africa Regional Meeting and Training in South Africa", "Seasons and Biomes March Workshop Engages Educators", "Welcome to the New Version of the GLOBE Web Site", and "Latin America and the Caribbean Regional Meeting and Workshop". A link to the "Chief Scientist's blog entry: What affects Earth's climate?" is also present, along with a "more..." link. At the bottom, there are links for "About GLOBE", "GLOBE Countries", "Community and Events", and "Contact". The footer includes logos for UCAR, Colorado State University, NASA, NSF, and the U.S. Department of State, along with a search bar and links for "Site Map", "FAQs", "Policies", and "Help".

English Español Français Русский اللغة العربية Deutsch Nederlands

The GLOBE Program [Log in](#)

[Home](#) [Projects](#) [For Students](#) [For Teachers](#) [For Scientists](#) [For Partners](#)

Research Projects:  
Data Entry  
Finding Data:  
Maps & Graphs:  
Chief Scientist's Blog  
GLOBE Stars  
Chief Scientist's Honor Roll  
Elementary GLOBE  
Community & Events  
Quizzes:

Maps  
Graphs  
Diurnal Graphs  
Special Visualizations  
NASA World Wind  
Google Earth  
**Investigation Activities**  
Tutorial

NEWS

[GLOBE Africa Regional Meeting and Training in South Africa](#)

[Seasons and Biomes March Workshop Engages Educators](#)

[Welcome to the New Version of the GLOBE Web Site](#)

[Latin America and the Caribbean Regional Meeting and Workshop](#)

Chief Scientist's blog entry: [What affects Earth's climate?](#)

[more...](#)

[About GLOBE](#) [GLOBE Countries](#) [Community and Events](#) [Contact](#)

Global Learning and Observations to Benefit the Environment

UCAR Colorado State University NASA NASA NSF U.S. Department of State

SEARCH  Go [Site Map](#) [FAQs](#) [Policies](#) [Help](#)

Sponsors and Cooperating Organizations



## Investigate the Earth System using GLOBE data and visualization tools

Locate and graph GLOBE data to study patterns and relationships in the Earth System and learn about Earth System science! Teachers can also work with your students to develop your own research questions and projects using GLOBE data. Through these projects students do science, creating hypotheses, analyzing data, drawing conclusions, and reporting their findings. Student investigation reports can be submitted to the GLOBE Web site to share the results with the rest of the world. For more information, see [Student Investigations](#) and [Find schools with the most data](#).

### Understanding GLOBE Student Data Activities Student Resources

*Activities using GLOBE data to support scientific inquiry and to inspire student understanding of Earth science. By Gary Randolph, The GLOBE Program, Fall 2005.*

#### Looking at Data Activities

##### ◆ "In Search of GLOBE Data" Projects:

	Download format	Spanish
<a href="#">Creating graphs using GLOBE data: Part 1</a>	<a href="#">PDF</a>	<a href="#">PDF</a>
<a href="#">Creating graphs using GLOBE data: Part 2</a>	<a href="#">PDF</a>	<a href="#">PDF</a>
<a href="#">Creating graphs using GLOBE data: Part 3</a>	<a href="#">PDF</a>	<a href="#">PDF</a>
<a href="#">Creating maps using GLOBE data</a>	<a href="#">PDF</a>	<a href="#">PDF</a>
<a href="#">Advanced search for GLOBE data</a>	<a href="#">PDF</a>	<a href="#">PDF</a>

##### ◆ [Where in the World...?](#)

[PDF](#)

##### ◆ What is the Temperature in...?

<a href="#">The Americas</a>	<a href="#">PDF</a>
<a href="#">Africa, Europe, and the Near East</a>	<a href="#">PDF</a>
<a href="#">Asia and the Pacific</a>	<a href="#">PDF</a>

#### Learning Activities That Encourage Inquiry

[Just Passing Through](#)  
[Earth as a System Poster Activity](#)

For complete activity materials, see [Teacher Resources](#) ← Requires Log in

#### Other Inquiry Activities

[How does location affect trees' seasonal change?](#)

The complete set of activities is available at:  
<http://viz.globe.gov/globe/en/docs/UnderstandingGLOBEStudentData.pdf>

# Understanding GLOBE Student Data

A collection of activities for the classroom focusing on GLOBE student data to support inquiry and to inspire student understanding of Earth science.

“In Search of GLOBE Data” contains two self-paced projects on using the graphing and mapping tools available on the GLOBE Web site. These sequential how-to guides on searching for schools with usable data include questions inquiring into what the user sees or thinks about the data presented. These questions are intended to stimulate the thinking process.

An answer sheet has been provided to assist the teacher in this activity. These student worksheets are followed by an advanced search for GLOBE data. This is a step-by-step, or click-by-click, how-to guide to help expand the list of tools when searching for GLOBE data. There are no questions associated with the Advanced Search, however if the user proceeds directly from the Student Worksheets they may be able to construct their own questions when visualizing the data using these new tools.

**In Search of GLOBE Data – Student Worksheet**

Project #1:  
Part 1: Creating graphs using GLOBE data

Step 1: From the GLOBE Home Page, www.globe.gov, click on [Enter the GLOBE Site](#)

Step 2: Click on [Maps and Graphs](#) listed under [GLOBE Data](#) on the navigation bar on the left side of the Web page

Step 3: Click on [Search](#)

Step 4: Choose [Begin](#) from the dropdown menu and click on [Go](#)

Step 5: Place a checkmark by [L](#) next to the school name above the table of school names

Step 6: The default graph will be displayed

What do you notice about this graph?

Step 7: Scroll down until the [Go](#) button is visible and click on [Go](#)

Step 8: Choose [Quantity](#) from the dropdown menu and click on [Go](#)

Step 9: Place a checkmark by [M](#) next to the school names in the [Maximum Air Temperature](#) column

Step 10: Click on [Go](#) in the green bar

The graph that appears should be similar to the one that was just added

What do you notice about this graph?

Step 11: Scroll down so that the [Go](#) button is visible and click on [Go](#)

Notice that there are several checkmarks in the square [Maximum Air Temperature](#) column

The graph will return on the screen

You are now ready to proceed to

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**In Search of GLOBE Data – Teacher Answer Sheet**

These answer sheets provide a number of possible answers for the open questions within the “In Search of GLOBE Data – Student Worksheets”. These answers are by no means the only possible answers but rather some possible answers. If the student does not provide answers to these questions, the teacher can use the answers provided here to help the student begin to see what story the data can tell.

Project #1, Part 1: Creating graphs using GLOBE data

Graph 1: Lyoze Behanzin, in Porto-Novo, Benin

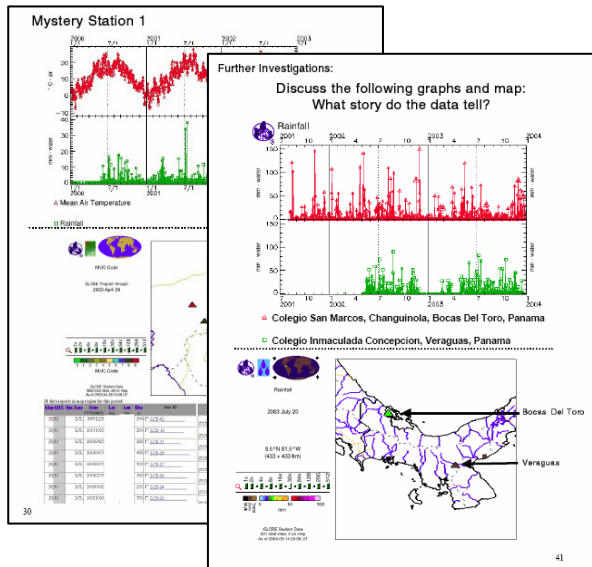
What do you notice about this graph?

Students may notice any of the following:

- 1) The temperature varies from (most often) 28 to 29°C Celsius;
- 2) The temperature throughout the year does not vary much for this school;
- 3) The warmest months for this school are usually between February and April;
- 4) On several occasions, the temperature falls below 25°C Celsius;
- 5) The coldest months for this school are usually between July and October;
- 6) On several occasions, the temperature falls below 25°C Celsius.

Graph 2: Lyoze Behanzin, in Porto-Novo, combined with Escuela Provincial No. 38 Julio Argentina Roca, in Esperanza, and Instituto Industrial “Luis A. Heppig” in Buenos Aires.

What do you notice about this graph?



“Where in the World...?” presents maps and graphs of GLOBE student data without the location identified, prompting the student to determine the locations using prior knowledge and visual clues in the data. Can students determine the location of a school based on the shape of the air temperature graph? Teachers are provided “Graph and Map Notes” in order to assist students with finding the clues in the data. Further investigations and an assessment exercise are also available.

“Just Passing Through” Learning Activity has students time the flow of water through different soils and observe the amount of water held in these soils and observe the filtering ability of soils.

**Earth as a System Learning Activity**  
Activities to accompany the GLOBE Earth System Poster

**Purpose:**  
To identify global patterns and connections in environmental data contained in the GLOBE Earth System Poster to develop an understanding of the interactions of Earth systems.

**Objective:**  
Main: Displaying global environmental data through the course of a year are compared in order to understand how the Earth works as a system.

**Student Outcomes:**

**Science Concepts:**

- Students will be able to apply the concepts of Earth as a System.
- Students will be able to find patterns and connections between and among maps containing different environmental data.
- Students will understand the relationship between time and space in regard to global environmental data.

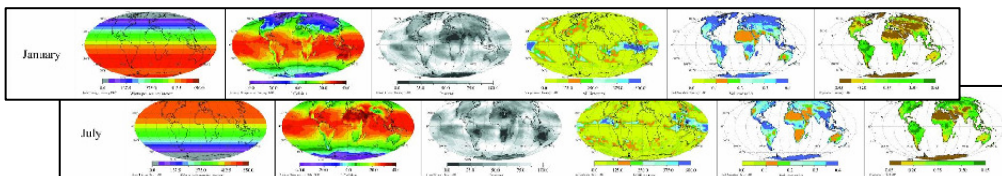
**Scientific Inquiry Abilities:**

- Classroom, analysis, and interpret patterns in a graphic display of data.
- Analysis of mapped data.
- Develop clear facts and explanations using evidence.
- Communicate observations and explanations.

**Level:**  
Secondary

**Time:**  
One to two class periods.

“Earth as a System” Learning Activity has students identify global patterns and connections in environmental data contained in the GLOBE Earth System Poster in order to develop an understanding of the interactions of Earth systems.



**Just Passing Through**

1. Cut off bottom of 2-liter bottle, leaving at least 2/3 of the original bottle (Diagram A).

2. Cut off top of 1-liter bottle, leaving at least 2/3 of the original bottle (Diagram B).

3. Cut off bottom of 2-liter bottle, leaving at least 2/3 of the original bottle (Diagram C).

4. Discard (or recycle) bottoms of 2-liter bottles.

5. Cut party hose into approximately 100 centimeter (cm) lengths (approximately double layered pieces).

6. Place each double-layered party hose in a small rubber band over each end of the 2-liter bottles (Diagram D).

7. Measure out 100 milliliters of water (about 1/2 cup) into each of the 2-liter bottles (Diagram E).

8. Measure out 100 milliliters of water of water with a graduated cylinder also marked on the bottles. This water will be used to saturate the soil.

9. Choose soil and soil-like materials from substances for students to use (100-gram bottles for the activity).

10. Add soil to 2-liter bottles, party hose, and water to the bottles (Diagram F).

11. Add soil to 2-liter bottles, party hose, and water to the bottles (Diagram G).

12. Place a small amount of each soil on small white paper plates or newspaper for students to observe.

13. Fill 1-liter drinking water bottles with locally available water.

14. The water-gate (or one similar) can be created on clean paper, in students' journals, or on the blackboard.

Experiment	Outcome

**Procedure:**

1. Preparation:

- Present students background information on soil (use the Introduction of the Soil Chapter of the GLOBE Teacher's Guide, or use the book or video from www.globe.gov).
- Ask the groups to determine the soil and soil-like substances, who will record information, who will keep time, who will pour the water.
- Explain that the water that students who have been selected to pour the water will pour the contents of their drinking water bottles into the pre-cut 2-liter bottles to see what happens. There is something in the 2-liter bottles (party hose and soil) that will act as a barrier to the water.

2. Student Inquiry:

- Ask the students to pour the water, have the students (either individual groups or as a class) predict what will happen.
- If students have trouble coming up with predictions, guide them with such questions as: "Which substance will allow the first drop of water through?" or "Which substance will retain the most water?" Have the students indicate what they believe their predictions of how the water will act with the various samples.

3. Experimental Design:

- Ask the students what additional parameters they might consider when doing this activity. The following questions might be used to lead students to designing their experiments:
  1. Check whether how fast or slow the water flows through the individual bottles?
  2. What rate should the water be poured into the soil samples?




# A Landsat Classroom Activity

Approved by NASA Science Mission Directorate Education Product Review

## [Quantifying Changes in the Land Over Time](#) (pdf)

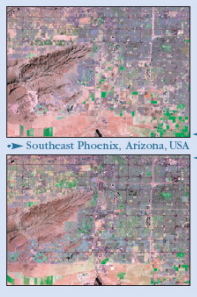
Students learn to identify kinds of land cover (such as roads, fields, urban areas, and lakes) in Landsat satellite images. They decide which land cover types are pervious (allow the passage of water into the soil), and which are impervious, and consider the effects of permeability on ecosystem health. Students then make land cover maps using two Landsat images taken about a decade apart. They quantify the changes in land cover during that time period, make predictions, and think about the consequences for the ecosystem and people. Students justify their predictions and speculations in writing.

National Aeronautics and Space Administration



## Quantifying Changes in the Land Over Time

### A Landsat Classroom Activity



← 1991  
Southeast Phoenix, Arizona, USA  
← 2000


www.nasa.gov

### Quantifying Changes in the Land Over Time with Landsat

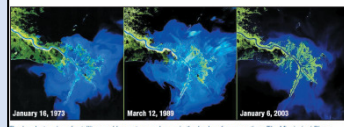
#### Guide for Students

Earth-orbiting satellites are causing a revolution in the ways people find out about the health of our planet and how they solve many practical problems. Working with satellite data involves a great deal of challenge, mystery, risk, and fun, and it is above all creative. The job market is growing for people who can integrate data from remote sensing, geographic information systems, sensor networks, and other geospatial technologies, and the market is expected to continue to grow over the next decades. For more about such "geospatial" jobs, go to: <http://www.esri.com/jobs>.

Sensors on satellites give us the regional and global perspectives for where we live and the issues we face, such as the source of pollution in the air we breathe, how cities are growing, or how coastlines are changing in response to hurricanes and sea level rise. Sensors on NASA satellites collect data about the atmosphere, oceans, ice, biogeochemistry, and land used to make daily global maps of our changing planet. The Landsat series of satellites enables us to see change in the land surface over time.



Information from Earth-orbiting satellites must be checked against observations people make on the ground, in order to be sure we are interpreting the satellite data correctly. Such field campaigns are a critical aspect of NASA research. (Photograph courtesy of Don Dearing)




January 16, 1993    March 12, 1999    January 6, 2000

The Landsat series of satellites enables us to see change in the land surface over time. The Mississippi River deposits sediments from the central United States into the Gulf of Mexico and thereby builds the Mississippi Delta in Louisiana. (Saturn-riding the Gulf) The river is slowly silting, reducing the earth's capacity to carry suspended mud and sand. This sediment is deposited in a fan pattern. Clearly, significant change has occurred in just three decades. Compare a specific part of one image to the same part of an image from a later year to discover some details of this remarkable sequence.


created & produced by the NASA Landsat Education Team 11

### Quantifying Changes in the Land Over Time with Landsat


Densely populated residential urban area with three golf courses. Phoenix is known for its many golf courses. The bright green of the fairways, teeing grounds, and putting greens help you identify golf courses on Landsat images. Can you find other golf courses in the large Phoenix images? Are there new golf courses on the 2000 image?



← This is an example of a golf course under development.



← Today up close, the golf course looks like this:



This image is from Digital Globe's QuickBird satellite.

created & produced by the NASA Landsat Education Team 25


# Earth Exploration Toolbook Activity

## [Using GLOBE Data to Study the Earth System](#)

Locate and graph GLOBE data to learn about concepts of Earth System science with this activity in the EET collection in the National Science Digital Library and the Digital Library for Earth System Education.

### Earth Exploration Toolbook

Step-by-Step Guides for Investigating Earth System Data



#### Using GLOBE Data to Study the Earth System

Nick Haddad, Center for Science Teaching and Learning, TERC, Nick\_Haddad@terc.edu, Author  
Tamara Shapiro Laidley, Center for Science Teaching and Learning, TERC, Tamara\_Laidley@terc.edu, author  
Published: February, 2004

**Description**

**Reynolds Jr Sr High School**

This chapter guides students through the process of locating and graphing data collected by GLOBE Program participants. It is based on an example from the *Earth System Science Investigation*, which is a section of the GLOBE Teacher's Guide. Opportunities for using GLOBE data to introduce basic concepts of Earth System Science are provided.

As they investigate a specific case study, students take full advantage of the features. They superimpose four different sets of environmental data in a single frame. The resulting patterns reveal a relationship that escapes casual observation. The case study provides opportunities to discuss such central Earth System features where energy and matter are stored, at least for a while (such as in the atmosphere or in the oceans) or between reservoirs (such as the evaporation of water energy as one of the major drivers of flux and all Earth system processes).


With more than 15,000 member schools throughout the U.S. and the world, students to expand their investigation beyond a single case study, to seasonal soil moisture variation, and to build a more comprehensive understanding of the process.

This chapter is part of the *Earth Exploration Toolbook*. Each chapter provides direct practice for using scientific tools to analyze Earth science data. Students should begin on the *Introduction* chapter.

The EET web site collects no personally identifying information and so is compliant with the Children's Online Privacy Protection Act. The site is constructed with tools that attempt to ensure the broadest possible access to the data and to comply with section 508 and w3c guidelines.

### Earth Exploration Toolbook

Step-by-Step Guides for Investigating Earth System Data

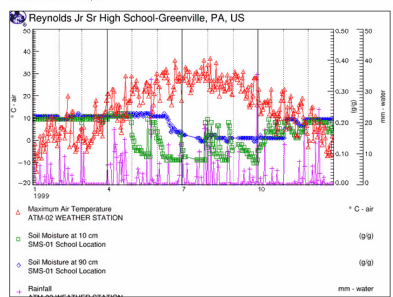


#### Teaching Notes

**Example Output**

This is one of the many graphs students will create using the GLOBE Graphing Tool and data collected by students at the Reynolds Jr. Sr. High School in Greenville, PA.

**Reynolds Jr Sr High School-Greenville, PA, US**



Maximum Air Temperature  
ATLAS40 WEATHER STATION  
Soil Moisture at 10 cm  
SMS-01 School Location  
Soil Moisture at 90 cm  
SMS-01 School Location  
Rainfall

Grade Level  
Grades 7-12

# El Niño Activities

[How Does El Niño Affect Temperature and Rainfall?](#)  
[Looking for the Effects of El Niño in GLOBE Student Data](#)

[El Niño Maps](#) Measured and predicted climatic changes caused by [El Niño](#)

## How Does El Niño Affect Rainfall and Temperature?

Developed by: Valerie LaHart, Cobb Middle School, Tallahassee, Florida, U.S.

Grade level: 6-8

Time: 1-2 class periods, approximately 2 hours

### Overview:

During 1997, a major El Niño developed in the Pacific Ocean. This El Niño continued as of and is expected to strongly affect global weather conditions during the December 1997 through 1998 time period, and perhaps longer.

### Objectives:

- To develop a basic understanding of how El Niño works.
- To learn about "normal" weather conditions in your area, and how they relate to conditions of the world.
- To use GLOBE data to look for evidence of weather changes that might be related to El Niño.

### Procedure:

- Read the short [description of El Niño](#)
- Instructions for [Part I: Your School or Area](#)
- Instructions for [Part II: Global Conditions](#)

### Additional Resources

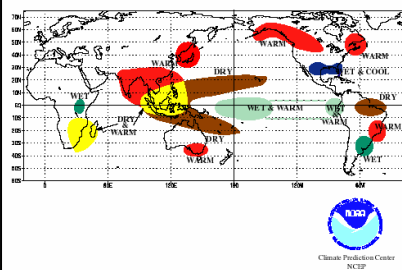
- [Background: What is El Niño?](#)
- [La Niña / El Niño Experiment](#)
- [La Niña / El Niño datasets](#)
- [La Niña / El Niño / Southern Oscillation animations](#)
- [El Niño and La Niña dates](#)

## How Does El Niño Affect Rainfall and Temperature?

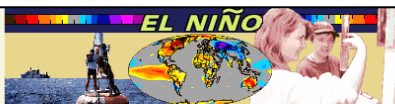
### Part I: Your School or Area

Here you will use GLOBE data from your school, and climatological data from other sources, to examine your local weather conditions and determine how they might be affected by El Niño. Note, if your school does not yet have a year of atmospheric data, you can use a nearby school, or skip to the next section ([Global Conditions](#)). Also, the instructions below specifically mention the December through February time period. However, feel free to use any months you may be interested in!

### WARM EPISODE RELATIONSHIPS DECEMBER - FEBRUARY



- What are "normal" weather conditions for your area? Find the normal mean temperature and precipitation for December, January and February and record these values (you can use the table below). Where can you find this data? Some possible sources: a newspaper, local weather service office or University, weather or climate books, or the internet. (If you are not close to an "official" station, you can use a nearby station, but be sure to record the distance and any other important differences from your site - such as elevation)
- Using the map shown above, make a prediction as to how weather conditions at your school should compare with "normal" for the period December 1997 through February 1998. Should the temperature



## Looking for the Effects of El Niño in GLOBE Student Data

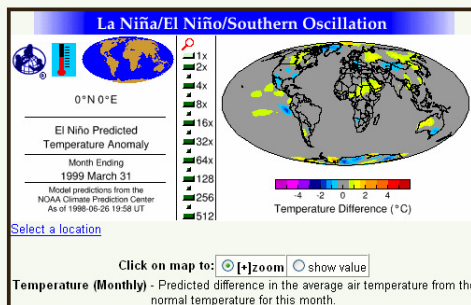
Scientists at NOAA are developing models to predict the global effects of El Niño. They have given us access to their predictions so that we can use GLOBE data to test the accuracy of their model. In the [Experiment](#) which we launched in September 1997, we can use these predictions as hypothesis and test them using the data collected following the GLOBE measurement protocols.

The GLOBE visualizations now include a special set of [model prediction maps](#) designed to visualize the GLOBE El Niño Experiment. Included in the maps are predictions for the monthly temperature and precipitation anomalies from the experimental NOAA model. These predictions were made in 1997.

To help GLOBE teachers and students get started with El Niño, I would like to describe how to do a little local analysis. In looking through the [GLOBE Student Data Archive](#), I found the [Hahira](#) in Hahira, Georgia, USA. They took their temperature and precipitation measurements every 15 minutes in 1998, and this makes it easy to calculate monthly average temperature and total precipitation. Since they didn't have any snow, so I need only consider the rainfall data in this example. To see how to do this analysis, please read through the steps listed below:

- Introduction**
- Step 1:** Find the predicted temperature anomaly
- Step 2:** Find the long-term average temperature
- Step 3:** Find the predicted precipitation anomaly
- Step 4:** Find the long-term average precipitation
- Step 5:** Find the GLOBE school temperature and precipitation data
- Step 6:** Graph the GLOBE school data
- Step 7:** View the GLOBE school data
- Step 8:** Average the GLOBE school data
- Step 9:** Compare predictions and long-term averages with GLOBE measurements

## GLOBE Maps



### Map Data and Display Selection

Data Category:  To load the datasets of a new category, press "Redraw map".

Date: YYYYMMDD:

Map size:  small  medium  large

Datasets in this category (info):

- PREDICTED ANOMALY
- Temperature (Monthly)
- Temperature (Quarterly)
- Precipitation (Monthly)
- Precipitation (Quarterly)
- Sea Surface Temperature (Monthly)
- Sea Surface Temperature (Quarterly)

[About the La Niña/El Niño/SO datasets](#)