





# El Niño



## Suggested Curriculum Area: Suggested Grade Level:

Science ... Math ... Social Studies

5-8

### Learner Outcomes

- Students will access the internet and collect information about the effects of El Niño for their region.
- Students will be able to define global change.
- Students will become aware of climatic changes in their region during an El Niño year.
- Students will interpret data collected from a web site.
- Students will be able to interpret a Standardized Vegetation Index (SVI) and draw conclusions about their region.
- Students will draw conclusions about the effects of El Niño on agriculture in their region.

### Concept Introduction

After studying about global climate change and El Niño, students will collect data about rainfall and temperature variations for their region during an El Niño year. Students will then examine a series of standardized vegetation indices with DataSlate to draw conclusions about the effect of El Niño on their region.

### Tools

- [DataSlate](#)

### Data Sets

- [SVI DataSlate Data set](#) (zip file 2.5 MB)

### Tutorials

- [Introduction to DataSlate](#)
- [Interpreting SVI imagery](#)

## Teacher Preparation

### Technology

This lesson can be used in a one computer classroom as a demonstration, individually in a lab or in groups. The lesson is designed to last about one 50 minute period. Teachers need to be familiar with DataSlate and its basic operations. The on-line tutorial can be used to become familiar with this software. Teachers should also be familiar with all of the web sites students will use. The computer used should be at least a Pentium 90 (166 is better) with 16 MB of ram or a Power Macintosh with 32 MB of RAM. Either platform needs a CD-ROM.

### Lesson

The teacher, if not familiar with ENSO events should review the web pages listed in the resources section of this page. Introduce the concept of Global Change and discuss its definition. Do the same with El Niño and ENSO. Distribute assignments and data sheets. Allow students to complete the activity. Discuss findings as a class. This activity works ideally with cooperative groups.

### Resources

[Teacher Talk Global Change](#) a definition

[What is El Niño](#)

[El Niño, La Nina, and ENSO definitions](#)

[NOAA El Niño Page](#)

[Current Research on El Niño](#)

[Climate Change FAQ](#)

## Curriculum Standards

### [National Mathematics Standards](#)

- NCTM 5-8 Standard 1: Problem Solving
- NCTM 5-8 Standard 4: Mathematical Connections

### [National Science Standards](#)

- NSES 5-8 Content Standard: Earth and Space Science
- NSES 5-8 Content Standard: Science in Personal and Social Perspectives

### [National Social Studies](#)

#### [Standards,](#)

- NCSS Strand III: People, PLaces and Environment
- NCSS Strand VIII: Science Technology and Society

## Assessment Suggestions

### Concept Extensions

- What are the effects of La Nina on agriculture in your region?
- What are the current statistics for your area?

### [References](#)

### [Student Pages](#)

### [El Niño Data Sheet](#)

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# Data Slate

## A Tour with Data Slate

**Launching Data Slate:** To launch data slate, open the program folder and double click on the application. The program will launch and run opening to the screen below. This tutorial is designed to give you basic information about Data Slate. To use this tutorial simply click on an area of the Data Slate picture. A description of what that area does and how to use it will appear in the window to the right.



Data Slate is a JPL produced tool which is designed to show co-registered and layered images. This image shows the selection library for the current version.

Some data sets have comments on remote sensing, in addition, there are useful 'Remote Sensing Tutorials' on the 'First' CASDE CD. The tutorials may be helpful in analyzing these data sets.

**Data Sets:** These are the standard data sets that can be used on the current version of Data Slate. To use a set simply double click on that data set and one of the images will be loaded into channel one of the Data Slate window. Future versions of Data Slate will allow you to develop and use your own sets of images.

## [Description of Data Sets](#)



# The Current Data Slate Library



**Ares Vallis**

Ares Vallis

Panorama - A panoramic view of the local Martian landscape. Find the image which annotates the rock 'names'. Get out your 3-D glasses for 'three-D'! How is this image prepared?

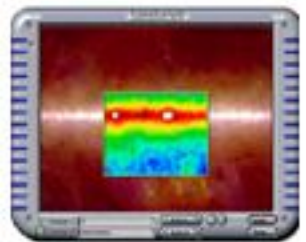


**Safsaf, Egypt**

Safsaf Oasis

SIR-C - Click on the title for information about the data sets. These are Landsat and SIR-C images. SIR-C is an acronym for Spaceborne Imaging Radar on C band (6 cm). Check on the Radar Tutorial from JPL for more detailed information on radar imaging. The full tutorial resides on CD's 'SIRCED01 and 02' SIR-C Education Program CD's from JPL. More information on SIR-C and Imaging Radar may be found at:

<http://southport.jpl.nasa.gov>



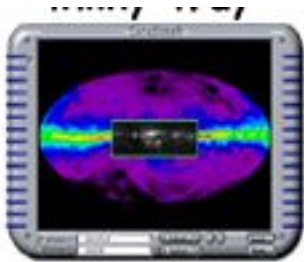
**Milky Way**

Milky Way

When you click on different wavelength interrogations, we are reminded of how little the ordinary eye is able to detect. How much of the electromagnetic spectrum is made up of the visible light section?



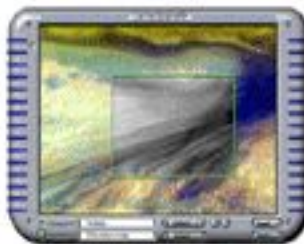
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**Allsky**

All Sky

The 'information' screen tells us that posters are available.



**Jupiter**

Jupiter

A very active atmosphere.



**Cuprite, Nv**

Cuprite, Nevada

Some great comments on remote sensing! Read how minerals are observed and detected by remote sensing.



**San Gabriel Mts**

San Gabriel Mountains

It might be interesting to follow the San Andreas fault line through the image.



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**Pasadena, Ca**

Pasadena

Find the Rose Bowl!



**Grand Is., Ne**

Grand Island, Nebraska

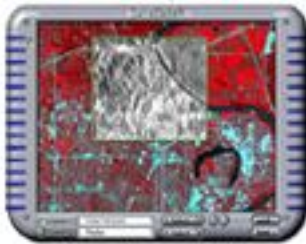
Again, there is more information on remote sensing.



**Alma, Ne**

Alma, Nebraska

Find Alma in all of the images. Alma resides on the North shore at the upper end of the lake. Note that Republican City has moved!



**Omaha, Ne**

Omaha

Page one of this tutorial describes locating some some landmarks in the images. The TM3 band gives a good look at Eppley Airfield. Try overlaying the 'dem' with radar to see the Mormon Bridge area. Perhaps you can see by the terrain why some western migration crossings were done here.



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# El Niño and Plant Growth

## Activity:

During the 20th century the Earth's atmosphere has had tremendous amounts of CO<sub>2</sub> added. Carbon Dioxide is a gas that helps trap heat and contributes to global warming. As the Earth warms, sea temperatures have greater fluctuation. There is evidence that global warming is contributing to more intense and severe El Niño events. In this activity you will investigate the effects of El Niño on plant growth and agricultural production during El Niño years where you live. You will be using the Internet to assist in this process.

## Materials:

- [Data collection sheet](#). (This link will open in a separate window.)
- Pencil
- Computer
- DataSlate software
- Internet connection

You are going to assume the role of an agronomist, an expert in soil management and field-crop production. Your team is investigating the effects of El Niño on the plant growth in your area so you can make a presentation to local farmers. You are interested in the effects of El Niño on the agriculture for your area. You are mainly interested in precipitation and temperature. You will be using Internet to connect to a NOAA, National Oceanic and Atmospheric Administration, web site. From this web site you will collect data on temperature and precipitation for your area during El Niño years. Your task will be to prepare a presentation on what you have discovered.

## Part I Data Collection:

### [El Niño Impact on States](#)

1. Connect to the [El Niño Impact on States](#) web site by clicking on the blue text.
  - From this web site click on your state and you will see a page that has El Niño data for your state.
  - To get background information about your state, click on **Discussion**. Summarize and record your findings on your data sheet. Click the back button on your browser to return to your state's information.

- From your state's main page, click on each time period. This will take you to the United States map that has temperatures for those dates. These maps show average temperatures or precipitation during El Niño events. Examine the key for the map and record on your data sheet the information for your area. Do this with both precipitation and temperature. Be sure and click the back button on your browser to return to a previous page. When finished return to your state's main page.
- Next you are going to compare **Normal vs. El Niño Average Precipitation** for **NOVEMBER-DECEMBER**. Click on **NOVEMBER-DECEMBER** and record on your data sheet the percent above or below normal for the area in which you live. For example, an **El Niño % of Normal 106** means that during El Niño precipitation is 6 percent above normal. After recording this information, return to the main page and do the same for **JANUARY-MARCH**.

## Part II Data Analysis:

### [Standardized Vegetative Index Tutorial](#)

### [DataSlate Tutorial](#)

If you have not done so, read through the Standardized Vegetative Index tutorial by clicking on the blue text. Click the back button on your browser to return to this page when you are finished.

If you have not used DataSlate you may want to go through the DataSlate Tutorial before beginning the next part of the lesson.

- Launch DataSlate by double clicking on its icon. Once the program has launched, click the load button. You will be prompted for a file to load. Navigate to the **SVIJuly** folder and open it. Once inside this folder, locate the file **SVIJULY.LBL**, click on it and then click the 'open' button. This will open the SVI data set. The first image you will see will be the SVI image for July 1989.

- Click and hold the mouse button in the window and drag to your location. Record the color you see for your area in your data sheet. Click the arrow directly to the right of the image title. You will see the same image in 1990. Record the color you see in your data sheet. Continue until you have recorded colors for all years on your data sheet.
- When you reach the legend, compare the color you recorded for each year with the key and record the condition for each year in your data sheet.
- Click back to the 1989 image which was a drought year. Click on the 'channel two' button and a window will open showing the same area during another year. Clicking the arrows to the right or left of the channel two title will display another year in the window. Use this information to make further comparisons of the bold face years .
- Look at the years on your data sheet. Bold faced years are El Niño years. Compare your observations of normal years with El Niño years. Use the notes you made on your data sheet and write a summary of what you have discovered about the effects of El Niño on your area and its effect on vegetation. Make inferences on the effects of crop growth. Present your findings to the class.

## **Part III Results:**

Examine all data and summarize your observations on your data sheet. Does your region tend to be warmer, cooler or normal during an El Niño year? Does your region tend to be wetter, dryer, or normal during an El Niño year? Make a prediction about how agricultural crops will perform during an El Niño year.

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Name \_\_\_\_\_

Student Data Sheet  
Discussion Summary

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**U. S. El Niño Precipitation Rankings**

October-December

November-January

December-February

January-March

February-April

March-May

April-June

**U. S. El Niño Temperature Rankings**

October-December

November-January

December-February

January-March

February-April

March-May

April-June

## Normal vs. El Niño Average Precipitation NOVEMBER-DECEMBER

## Normal vs. El Niño Average Precipitation JANUARY-MARCH

### Data Summary Analysis

To launch Data Slate, click on the Apple Menu. Select CASDE folder, then select Data Slate. Once the program has launched, click the Load button. You will be prompted for a file to load. Navigate to the SVIJuly folder and open it. Once inside this folder, locate the file SVIJULY.LBL. Click on it, and then click the 'Open' button. This will open the SVI data set. The first image you will see will be the SVI image for July 1989.

Year	Color	Vegetation Condition
1989		
1990		
<b>*1991</b>		
<b>*1992</b>		
1993		
1994		
<b>*1995</b>		
1996		
<b>*1997</b>		

\* indicates El Niño years

*<http://ois.unomaha.edu/casde/casde/home/bldgbloc.htm>, Last modified 2/10/99, UNOmaha Office of Internet Studies*

## References

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Hughes, Katherine. What is El Niño? Environmental News Network. [Online] Available <http://www.enn.com/specialreports/elnino/what.asp>. Document date September 22, 1997.

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