

El Niño's Powerful Reach

Educational Activities

Weird and Wacky World-Wide Weather

Summary:

Participants learn the variety of effects that occur as a result of El Niño.

Grade Level:

Intermediate (grades 5-8)
Secondary (grades 9-12)

Learning Objectives:

- Understand natural hazards associated with El Niño
- Understand the transfer of energy
- Understand the conservation of energy in Earth systems
- Understand the interdependence of organisms
- Understand matter, energy and organization in living systems
- Understand how to use maps and technological tools to analyze spatial organization of environments
- Understand the physical processes that shape the patterns of Earth's surface and ecosystems

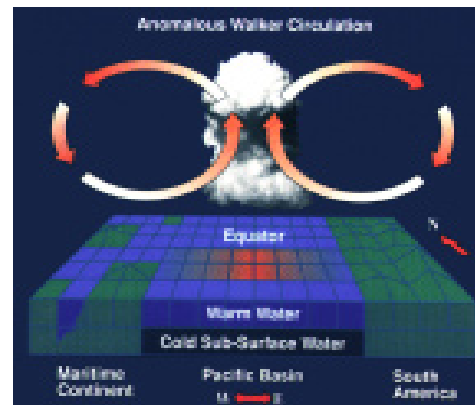
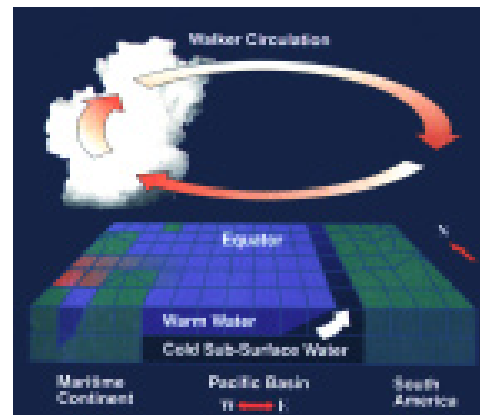
Materials:

- Computer with internet
- colored pencils
- Microsoft Excel
- Arcview3.1

Background:

The evaporation of warm water at the equator causes the condensation of clouds and precipitation at the equator. This process is linked to El Niño events. Review the "Walker Circulation" graphics. Review the Long Distance Connections section of the El Niño Interactive located at http://forces.si.edu/el-niño/01_00.html. Pay close attention to the Monsoon Connections portion.

A. Who was Sir Gilbert Walker and what did he discover about El Niño?



B. What effect does the warming sea temperatures location have on the formation of clouds over the tropical Pacific? Examine the two figures (above) and describe the differences you observe.

The changes you observe in these figures cause a disruptive weather global chain of events.

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The following events occurred as a result from the 1982-1983 El Niño events:

1. Australia- Drought and bush fires
2. Indonesia, Philippines- Crops fail, starvation follows
3. India, Sri-Lanka- Drought causes fresh water shortage
4. Tahiti- 6 tropical cyclones
5. South America- Fish industry devastated
6. Across the Pacific- Coral reefs die
7. Colorado River basin- Flooding/mudslides
8. Gulf states- Downpours cause death, property damage
9. Peru-Ecuador- Floods, landslides
10. Southern Africa- Drought/disease/malnutrition

C. Compare sea temperatures for 1992, 1996, and 1998

1. Go to <http://www.pmel.noaa.gov/toga-tao/el-nino/buoy.shtml>
2. In the section "Where can I find data on El Niño?" Click on TAO moored buoy data
2. Scroll down click on the button marked Lat-Lon plots
3. Click and hold Year, drag down to 1992
4. Click and hold Month, drag down to January.
5. Click Make Plot.
6. Click on the colorful graph to make it larger.
7. Using the color codes you need to determine the ocean temperature for latitude 5°S at longitudes 110°W, 130°W, and 150°W. Make a data table on Microsoft Excel or on a piece of notebook paper to store your data for now .
8. Find the data for all three years for each longitude. (The Month will always be January, simply change the year)
9. Obtain a blank Pacific ocean map. Use three different colored pencils to correspond to the different years to plot your data directly on the map..
10. Begin with 1992. Locate the point 5°S, 110°W on the map. On that point write the sea surface temperature (SST) that corresponds to it from your data table. Do the same for the other two data points for 1992.
11. Now move on to another colored pencil that will represent 1996. Record the SST data for that year on the map beneath the data for 1992. Change your pencil color and do the same for the 1998 data.
12. Compare the data, what can you conclude about sea surface temperature in different years? Does it stay the same or does it vary? <http://projects.edtech.sandi.net/roosevelt/el-nino/studentelnino.html>

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The 1982-1983 El Niño was responsible for the loss of almost 2000 lives and thousands of others lost their homes.

Go to the following websites to find the effects of the 1997 –1998 El Niño event:

<http://darwin.bio.uci.edu/~sustain/ENSO.html>

http://walrus.wr.usgs.gov/el_nino/

D. There have been reports of an increase in seemingly unrelated diseases during El Niño years. Encephalitis, meningitis, bubonic plague and Hanta virus are reappearing. Doctors have seen a five year malaria cycle in India and South American countries. What correlation might be seen between these infectious diseases and El Niño?

E. Explain why you think the increase in shark attacks off the coast of California might be linked to El Niño.

F. Go to the following website to find what other infectious diseases are also related to El Niño <http://www.who.int/docstore/wer/pdf/1998/wer7320.pdf>

G. Print the following map and plot the latitude/longitude coordinates. Plot the latitude and longitude coordinates of the above El Niño events on a world map.

ADVANCED ENRICHMENT ACTIVITY FOR STUDENTS WITH ARCVIEW:

Compare 1998 Pacific Sea Temp with 2001 Pacific Sea Temp

Go to the following website: <http://cdiac.esd.ornl.gov>

In the URL window, change the "http" to "ftp"

Locate and click on the "pub" directory.

Scroll down and double click on "oceans" file

Scroll down and double click on the NOAA_Workshop file

Scroll down and double click on the PMEL_data file

Double click on the DI1989_RT1_89.cvs. Highlight the latitude and longitude columns. Click on Format, then click on Number and increase the decimal places to 3.

Highlight all the data and Click on File. SAVE AS . Then in the save as window, save as a DBF4 file on the C drive in a named folder. (Ignore all the warning messages)

Open Arcview. Make a world map (esri, esridata, World, country95)

Double click on the colored box in the map legend and make into an outline view

Click on the blue bar above the map

Drag the window to the right

Click once on the Table button, and once on the Add button. Find the saved database file. (Be sure to change the type of file to All files)

Click on View in the tool bar. Click on "Add Event theme."

Double click on the colored dot in the legend

In the Legend type window, pull the arrow down to Graduated color

Highlight "Eqtemp_c" in the Classification field.

In the Color ramp field at the bottom of the screen, highlight Blue to Red dichromatic

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Repeat all the above steps for KA1998_01.csv

Both of these data files are for the month of February.

Evaluation:

Compare the sea temperature data for 1989 with 1998. Compare the location of the warmest temperatures. Which of the years do you think was there an El Niño?