

## Student Master

# Research Project: Exploring El Niño and Chlorophyll Data

You have joined a team of scientists who are studying the effects of El Niño on biological systems in the ocean. Specifically, you are interested in the relationship between sea surface temperature (SST) and productivity, as measured by the amount of chlorophyll-a. Your task is to determine if there is a relationship between sea surface temperature and the distribution of phytoplankton, and, if so, how this relationship is impacted during El Niño. First, you will prepare a research plan that describes where you will conduct your study and why, what investigation methods you will use, and how you will collect data. Once your plan is accepted, you will carry out your data collection, analyze your data, and report your findings to the team.

The team has decided that you will compare two time periods: December 1997 and December 1999.

### Planning your project:

#### 1. Form a hypothesis to answer the research question below.

**Research Question:** Is there a relationship between sea surface temperature and the distribution of phytoplankton? If so, how is this distribution impacted during El Niño?

**Hypothesis:** During an El Niño event, when sea surface temperatures in the eastern Pacific ocean increase, the amount of phytoplankton, as measured using chlorophyll-a, \_\_\_\_\_ (fill in) \_\_\_\_\_.

#### 2. Design a plan to test your hypothesis and answer the research question.

##### What do you need?

- a) More information: Do you need more information about upwelling, phytoplankton, El Niño, and chlorophyll distribution?
- b) Specific data: When you go online to collect data, which of the following maps and graphs will you generate?
- c) Chlorophyll-a maps                      Sea surface temperature maps  
Chlorophyll-a graphs                      Sea surface temperature graphs

**3. Go online and get the data.**

- a) Visit [www.dataintheclassroom.org](http://www.dataintheclassroom.org), and find the El Niño module.
- b) Follow the link to “Get Data.”
- c) Using the form, select the data and parameters you wish to look at.
- d) Click the “Get Data” button.

**4. Use the Data Log Sheet to keep a record of the data you select so you can refer to it later.**

**5. Analyze the data by answering the following questions.**

- a) Which is the El Niño year? Which is the non-El Niño year?
- b) Can you see any patterns between SST and chlorophyll distribution?
- c) Describe the pattern of SST and chlorophyll distribution during an El Niño year.
- d) Describe the pattern of SST and chlorophyll distribution during a non-El Niño year.

It might help your analysis to graph two variables on the same plot. Sample the data and complete the table below. You can graph the data by hand using graph paper or use a spreadsheet.

		Date:		Date:	
Latitude	Longitude	SST	Chlorophyll-a	SST	Chlorophyll-a
	140° E				
	180°				
	140° W				
	100 °W				

**6. Draw conclusions.**

Write down what you learned from your investigation. Use your data to help you decide whether your hypothesis is supported. If your hypothesis is not supported, think about other data you might need to collect.

