Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Period\_\_\_\_

**Lab: El Nino**

**Purpose:**

* Interpret maps and graphs that display sea surface temperature (SST)
* Understand the benefits and disadvantages of maps and graphs for SST
* Apply data skills to a real problem – detecting an El Nino event

**Pre-Lab Questions**

1. Review Chapter 12 Weather: What is an isotherm?
2. Review Global Winds:
   1. What is the name of the Global Wind system that blows between 0-30 N/S?
   2. Does the wind system blow W E **or** W E ?
3. Review Oceanography: What is upwelling? Where does it occur?

**Activity #1 Reading Sea Surface Temperatures Using a Map**

**Use the provided Activity #1 colored 1990 map to answer the following questions.**

1. Lines of latitude in the map above indicate:
   1. Degrees of temperature
   2. Degrees north and south of the Equator
   3. Areas of equal temperature
   4. Representations of colors to indicate temperature
2. What was the monthly average temperature at 160E 10S?
3. What was the monthly average temperature at 120W 10S?
4. What is the difference in monthly average temperature along the line 10S, between 160E and 120W? (Show your work.)

**Use the provided Activity #1 colored 1990 & 1991 maps to answer the following questions.**

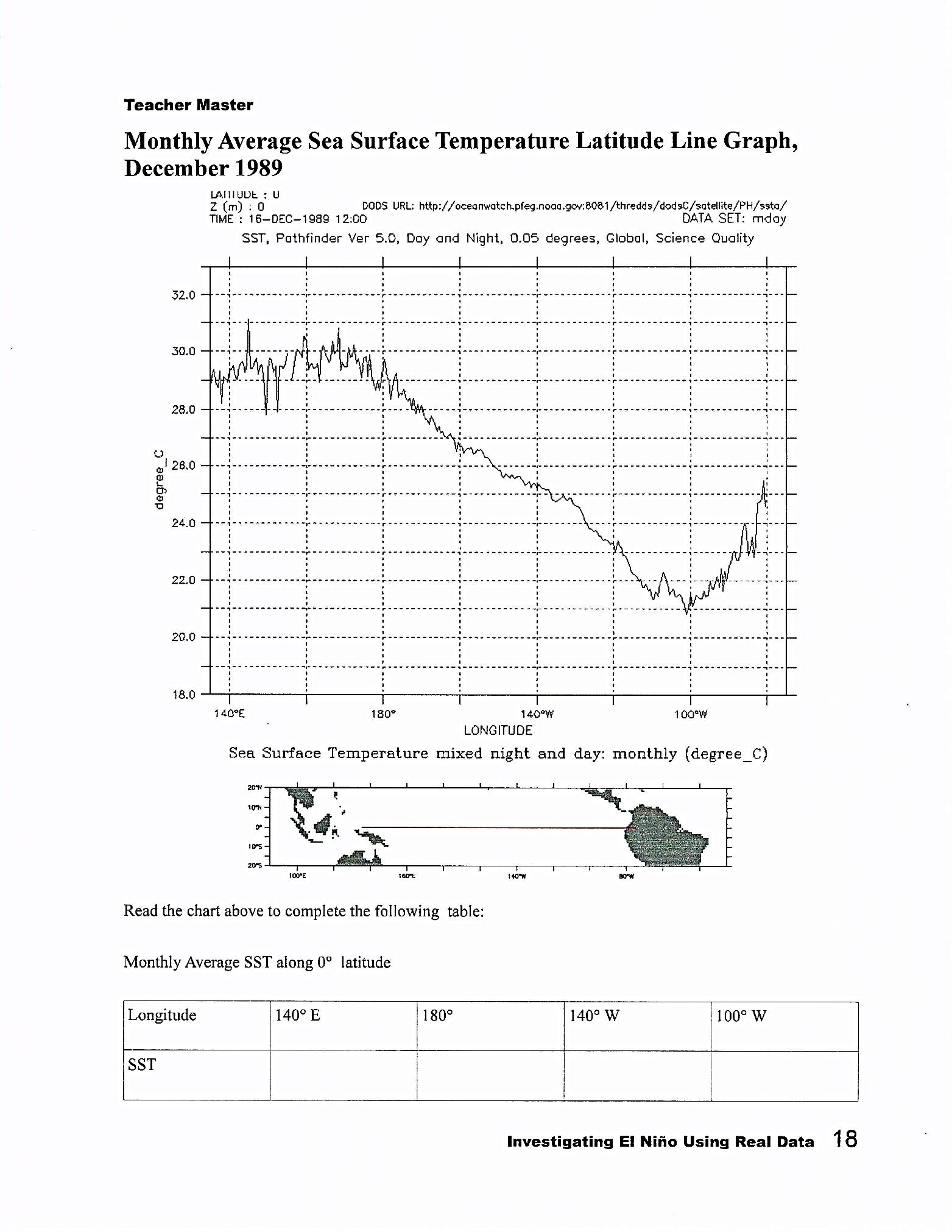
1. Compare the December 1990 and December 1991 maps.
   1. How are they alike?
   2. How are they different? (Hint: Look at the size of the areas of high temperature.)
2. The 1990 and 1991 maps have differences. Why is it important for researchers to look at data form more than just these two years to determine sea surface temperature change?

**Activity #2 Looking at Sea Surface Temperature (SST) Another Way**

In the last activity, you used maps displaying SST over a large surface area in the Pacific Ocean. Now you will look at that same data, but this time using a graph along a single line of latitude from west to east. This kind of graph displays finer details and can make it easier to see and measure relative differences in SST.

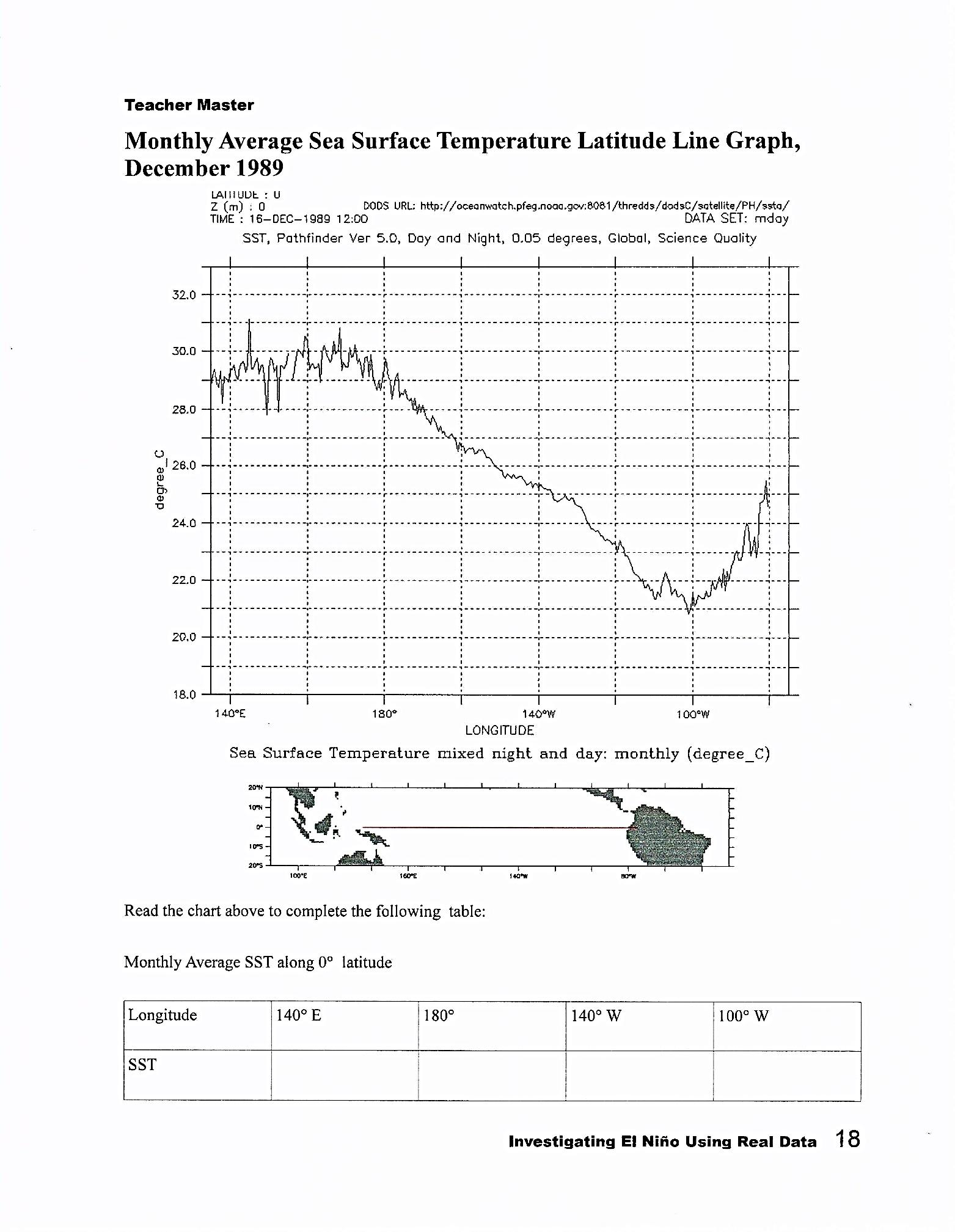
NOTE:

* The X axis show longitude.
* The Y axis shows monthly average sea surface temperature in degrees Celsius.
* The graph shows the temperature along the Equator.



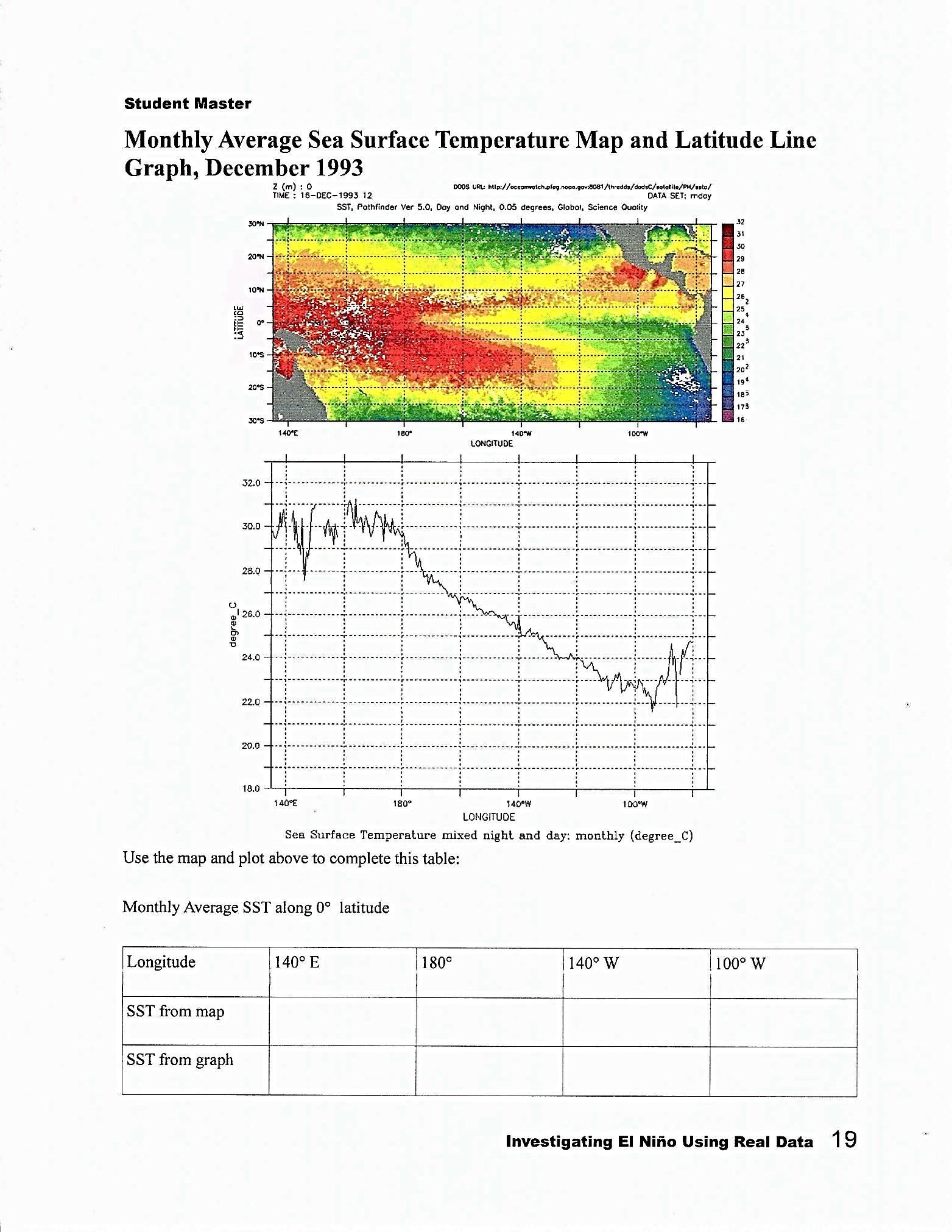
**The graph above shows the temperatures along the equator in 1989.**

1. What was the monthly average sea surface temperatures along 0o latitude at the following locations?



**Use the provided Activity #2 colored 1993 colored map and graph to answer the following questions.**

1. Complete the following table using the provided colored map of 1993 and graph. Identify the temperatures using BOTH the colored map and the line graph. USE DECIMALS where appropriate. The graph shows the temperature along 0o Equator.



1. Compare the temperatures you obtained using the map vs. the graph.
   1. Describe any differences.
   2. What are the advantages and weaknesses of the 2 different displays (map vs. graph) of the same temperature data?

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**Activity #3 Detecting El Nino**

**Use the provided Activity #3 colored diagrams of Normal Conditions vs. El Nino Conditions and the information below to answer the following questions.**

The diagrams show the difference in convection, depth of the thermocline and presence or absence of upwelling along the coast of South America. Examine the diagrams and the following information.

* In a typical year, trade winds cause warm surface water to accumulate in the western Pacific Ocean.
* The movement of warm water to the Australia in the west allows cooler, nutrient-rich water to rise to the surface in the east along South America. This rising water is called upwelling.
* During El Nino, the trade winds relax or even reverse. Since the warm surface waters are not transported to the west, the eastern Pacific Ocean becomes warmer than usual.
* This change, in turn, pushes the Eastern Pacific thermocline further down. This stops the usual upwelling of cold, nutrient-rich water to the surface.

**\*\*\*Based on your understanding of the diagrams and the information above, you will use real data to determine and identify a year that El Nino occurred.**

**Examine the provided 3 colored maps and graphs for 1990, 1991, 1993 to answer the following:**

1. In which ONE year did El Nino occur, 1990, 1991 or 1993?
2. **Explain** what provides **evidence** of El **Nino on the colored MAP**. Be specific. (Review the Normal vs. El Nino diagrams and the information above to determine types of evidence to use.)
3. **Explain** what provides **evidence** of El Nino during that year **on the GRAPH**. Be specific. (Hint: how should the slope of the graph be in a normal year vs. El Nino? Should the difference in temperature along the equator be large or small during El Nino?)