

NAME: _____ DATE: _____ CLASS: _____

MY NASA DATA: Coral Bleaching in the Caribbean

http://mynasadata.larc.nasa.gov/lesson-plans/?page_id=474?&passid=51

Coral Bleaching in the Caribbean

Purpose: Students will use authentic satellite data to determine when the sea surface temperature meets the criteria to induce coral bleaching.

Grade Level: 5 – 12

Estimated Time for Completing Activity:
50 minutes

Learning Outcomes:

- Students will practice analyzing images, maps and graphs from Internet-based educational resources.
- Students will explore the correlation between sea surface temperature and coral bleaching.



Image courtesy CCMA Biogeography Team

Prerequisite

- Familiarity with accessing web sites on the Internet
- Familiarity with using latitude and longitude coordinates

Tools

- Computer with Internet access
- Computer Printer
- Atlas or Map
- Colored Pencils
- Ruler

National Standards:

Geography: Places and Regions

Math: Data Analysis and Probability

Science Content: D Earth and Space Science

AP Environmental Science Topics

Global water problems

Impacts and consequences of global warming

Interactions among species

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Virginia Standards of Learning:

ES.1c: The student will plan and conduct investigations in which scales, diagrams, maps, charts, graphs, tables, and profiles are constructed and interpreted.

ES.2a: The student will demonstrate scientific reasoning and logic by analyzing how science explains and predicts the interactions and dynamics of complex Earth systems.

ES.11c: The student will investigate and understand that oceans are complex, interactive physical, chemical, and biological systems and are subject to long- and short-term variations. Key concepts include systems interactions (density differences, energy transfer, weather, and climate).

LS.1: The student will plan and conduct investigations in which c) data are organized into tables showing repeated trials and means; h) continuous line graphs are constructed, interpreted, and used to make predictions; and i) interpretations from a set of data are evaluated and defended.

LS.11: The student will investigate and understand that ecosystems, communities, populations, and organisms are dynamic and change over time (daily, seasonal, and long term).

LS.12: The student will investigate and understand the relationships between ecosystem dynamics and human activity.

Sci5.1: The student will plan and conduct investigations in which e) data are collected, recorded, and reported using the appropriate graphical representation (graphs, charts, diagrams).

Sci5.6: The student will investigate and understand characteristics of the ocean environment b) physical characteristics (depth, salinity, major currents).

Sci5.7: The student will investigate and understand how the Earth's surface is constantly changing.

Sci6.1: The student will plan and conduct investigations in which c) precise and approximate measurements are recorded; h) data are collected, recorded, analyzed, and reported using appropriate metric measurements; and i) data are organized and communicated through graphical representation (graphs, charts, and diagrams).

Sci6.3: The student will investigate and understand the role of solar energy in driving most natural processes within the atmosphere, the hydrosphere, and on the Earth's surface.

Sci6.5: The student will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment.

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Vocabulary:

[global warming](#)

[latitude](#)

[longitude](#)

[NAVOCEANO](#)

[sea surface temperature](#)

Lesson Links:

[More photos of coral bleaching](#)

[Coral Reef Bleaching](#)

[Live Access Server](#)

[Example Line Plot for 18N, 65W](#)

[NOAA'S Coral Reef Information System](#)

[The Center for Coastal Monitoring and Assessment \(CCMA\) Web Site](#)

[Things You Can Do to Protect Coral Reefs](#)

[Extension Activity Article \(Coral Bleaching\)](#)

Background:

Coral reefs are collections of tiny marine creatures that live inside limestone skeletons attached to rocks on shallow ocean floors. Corals feed on algae that thrive in the sunlit water surrounding the reef. However, when water temperatures get too warm, the algae food source dies and corals turn a whitish color. The coral creatures may die, too, if the warm water conditions remain for an extended period of time.

Although the threshold for coral bleaching varies by region and coral type, scientific observation has determined that coral bleaching may occur when sea surface temperature (SST) exceeds 30C or 86F for a week or longer. During late 2005, a major coral bleaching event occurred when these conditions existed in the Caribbean Sea. In this lesson, you will collect SST data from the MY NASA DATA Live Access Server to explore this event.

The SST data are provided by the U.S. Naval Oceanographic Office (NAVOCEANO), using several sources of data-collection by buoys, ships, aircraft, and satellites. More information and pictures of coral bleaching may be found at the NOAA Center for Coastal Monitoring and Assessment (CCMA) Web site (links above).

NAME: _____ DATE: _____ CLASS: _____

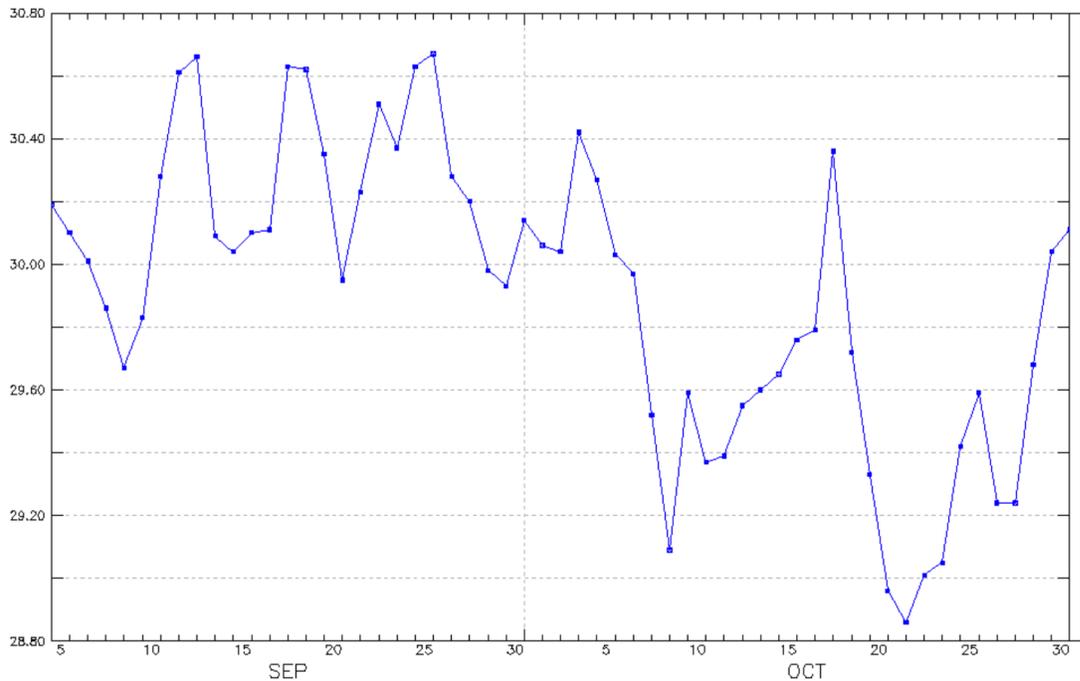
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Procedure:

Part 1: Use the following time series plot to answer the questions at the end of this packet.

Plot 1 –Daily Sea Surface Temperature (GHRSSST) in degrees Celsius over the time period September 25, 2005 to October 31, 2005 (location: 18N, 65W).



Instructions and Questions:

1. On the temperature graph, use your ruler and a blue colored pencil to draw a horizontal line at 30C. Did the sea surface temperature exceed 30C at any time during your time series? Using a red colored pencil, carefully shade the area between the SST line on the plot and the blue line you drew.
2. The line you drew represents the observed temperature criteria for coral bleaching to occur. Examine your red-shaded areas. For what period of time was the SST equal to or higher than the bleaching threshold? Was it long enough to cause coral bleaching? Do you think it was long enough to cause massive coral die off?

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Questions:

1. On the temperature graph you created for your location, use your ruler and a blue colored pencil to draw a horizontal line at 30C. Did the sea surface temperature exceed 30C at any time during your time series? Using a red colored pencil, carefully shade the area between the red SST line and the blue line you drew.
2. The blue line represents the observed temperature criteria for coral bleaching to occur. Examine your red-shaded areas. For what period of time was the SST equal to or higher than the bleaching threshold? Was it long enough to cause coral bleaching? Do you think it was long enough to cause massive coral die off?

Extensions:

Read the Extension Activity News Article in Lesson Links and answer the questions below.

1. Increased sea surface temperature increases both the intensity of hurricanes and coral reef bleaching. Then how can hurricanes reduce the risks of coral bleaching?
2. How will global warming affect sea surface temperatures, hurricane intensity and coral bleaching?

Read and discuss the information on the lesson link 'Things You Can Do To Protect Coral Reefs'.