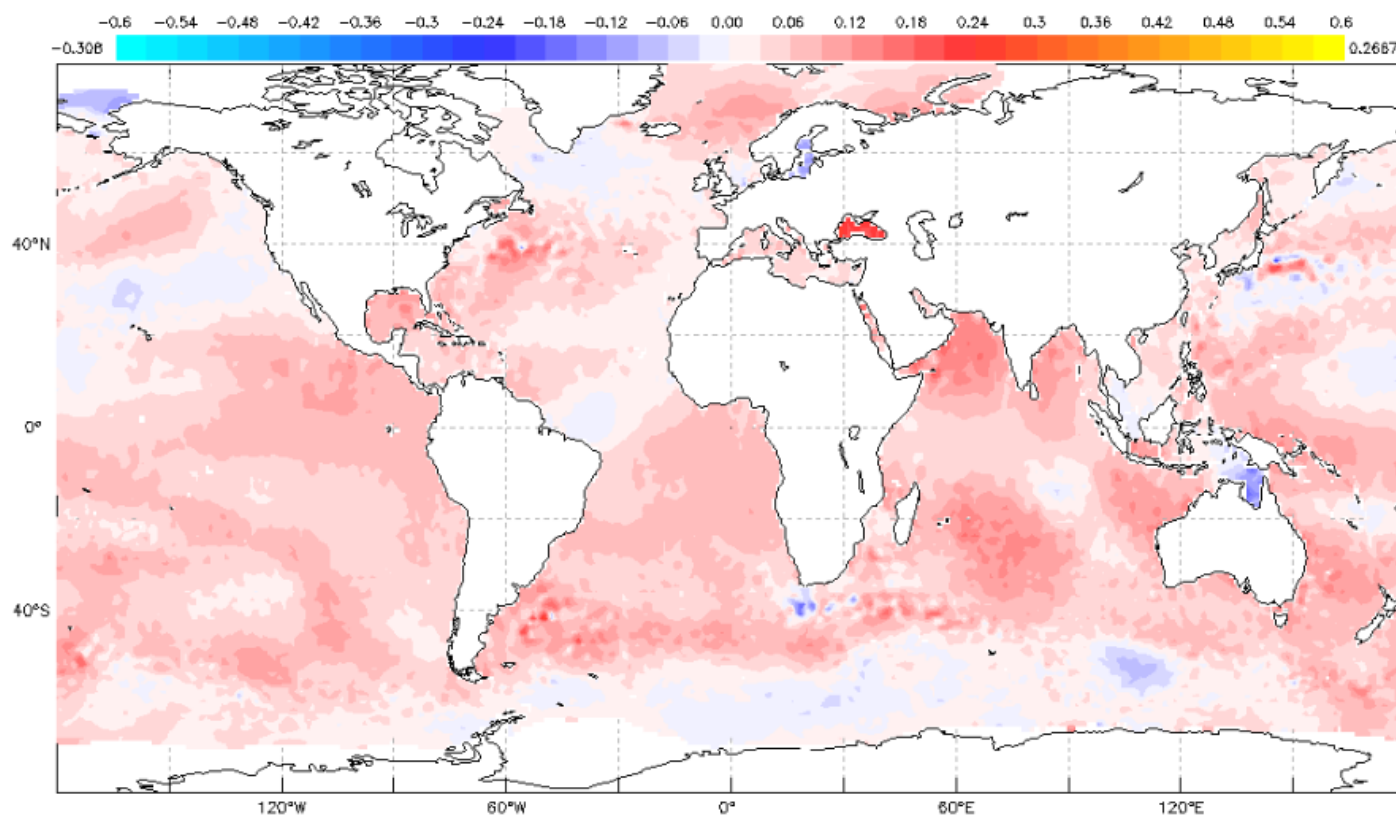


## My NASA Data - GLOBE Connections

### GLOBE Connections: Sea Level Rise



GLOBE protocols and learning activities that complement the Sea Level Rise phenomenon are outlined below.

Visit the [GLOBE Hydrosphere Protocols & Related ESDE Datasets](#) page that outlines the datasets available in the Earth System Data Explorer. These data complement student GLOBE investigations using the following protocols.

#### [Sea Level Rise](#)

As we explore sea level rise around the world, new questions arise. One such question is what is driving the regional differences in sea level rise. In some parts of the world sea levels are increasing, while in other parts of the world, sea levels are decreasing or remaining relatively constant, including, in recent decades, the California coast.

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Glacier and land ice melt can also be regionally different. While the ice sheets of Greenland, Antarctica and most of the world's glaciers are melting, a distinction must be made between increased glacial discharge into the oceans due to global warming, a more permanent type of ice loss, and regional changes in the precipitation and evaporation that is feeding those glaciers and ice sheets, which vary regionally on the scale of decades.

## Protocols

GLOBE protocols are used to collect data looking at factors that might contribute to sea-level rise. Students can implement the protocols to collect data and share their data with other GLOBE students around the world.

- **pH Protocol** - Students use either a pH meter or pH paper to measure the pH of water. If using the pH meter, the meter needs to be calibrated with buffer solutions that have pH values of 4, 7, and 10.
- **Salinity Protocol** - Students use a hydrometer to measure the specific gravity of the water sample, and use a thermometer to measure the temperature. With these two values, students will use tables to determine the salinity.
- **Water Temperature Protocol** - Students use a thermometer or probe to measure the temperature of the water.

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## Protocol Bundle

The ocean protocol bundles can complement explorations of sea level rise.

[Ocean Protocol Bundle](#) - Oceans are complex ecosystems, which implies that their study needs to take into consideration several interrelated physical parameters, not to mention the mechanisms and processes which reflect the interaction between land and oceans along coastal zones as well as the interaction between the atmosphere and oceans. This group of protocols is to be jointly implemented to improve our knowledge about oceans.

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## Learning Activities

# Building a Thermometer



Welcome

Introduction

Protocols

Learning Activities

Appendix

## Purpose

To build an instrument that can be used to measure water temperature

## Overview

Students will construct a soda-bottle thermometer, which is similar to the thermometer used by GLOBE schools. Both are based on the principle that most substances expand and contract as their temperature changes. This experiment also demonstrates the principle of heat transfer.

## Student Outcomes

Student will understand why and how a standard thermometer works.

## Science Concepts

### Physical Science

Substances expand and contract as they are heated and cooled.

### Geography

The temperature variability of a location affects the characteristics of the physical geographic system.

### Scientific Inquiry Abilities

Identify answerable questions.

Design and conduct scientific investigations.

Construct a scientific instrument.

Develop explanations and predictions using evidence.

Communicate results and explanations.

## Time

Two class periods

1. To do experiment - one class period

2. To discuss principles of expansion, contraction, and heat transfer through conduction and convection - 15 to 30 minutes

3. To record class data onto board or overhead and make graphs - 30 minutes

4. To have each group present to the class their results, ideas for other variables to test, and any problems that they encountered - 30 minutes

## Level

Intermediate

## Materials and Tools

(per group of students)

Ice

Water

One liter plastic soda bottle

Clear or white plastic drinking straw

Modeling clay. A one-pound block of modeling clay should be enough for

25 to 30 thermometers

Two 2-liter plastic soda bottles - the tops of these bottles need to be cut off

Scissors or knife to cut the top off the 2-liter plastic bottles

Food coloring (yellow does not work as well as red, blue, and green)

A watch or clock with a second hand

A metric ruler

A marker, grease pencil, or pen to mark the side of the straw

*Building a Thermometer Activity Sheet*

## Preparation

Assemble materials.

Review principles of heat transfer.

## Prerequisites

Ability to make a graph

[Source: GLOBE Website](#)

**Building a Thermometer:** Students construct a soda-bottle thermometer, which is similar to the thermometer used by GLOBE schools. Both are based on the principle that most substances expand and contract as their temperature changes. This experiment also demonstrates the principle of heat transfer. The thermometer can be used to measure water temperature.