

# An Ocean of Weather

[http://oceanexplorer.noaa.gov/explorations/02sab/background/edu/me/ldia/sab\\_weather.pdf](http://oceanexplorer.noaa.gov/explorations/02sab/background/edu/me/ldia/sab_weather.pdf)

## Focus on Inquiry

The student will make observations to understand how the temperature (heat transfer) of the ocean affects the air mass above it and ultimately the weather.

## Lesson Overview

Students will examine the close relationship between the ocean and the atmosphere in the South Atlantic Bight. In this activity, students will learn that the ocean and atmosphere work together as a system, will experiment to find out that heat transfer from the ocean is a cause of much of Earth's weather, and will make and explain an ocean water cycle.

<b>Duration</b> Three 45-minute class periods	<b>Setting</b> Classroom/lab	<b>Grouping</b> Groups of 2-3 students	<b>PTI Inquiry Subskills</b> 1.3, 3.7, 4.2, 4.3, 5.2, 5.4, 5.8, 7.2
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Lesson Components	Estimated Time	Inquiry Subskills Used	Technology Used	Level of Student Engagement	Brief Description
<b>Engage (Day 1)</b>	15 min	None	None	2	Students brainstorm about how a hurricane forms.
<b>Explore (Day 1)</b>	30 min	1.3, 3.7, 5.8	None	3	Students observe and record the behavior of a balloon stretched over the mouth of an empty baby food jar when it is placed in hot water. Students observe what happens when an ice cube is placed over the mouth of a small necked jar filled with hot water.
<b>Explain (Day 1-2)</b>	30 min	4.3, 5.2, 5.4	None	3	Students explain their ideas of cause-effect for the two activities in their journals.
<b>Expand (Day 2-3)</b>	30 min	4.2, 4.3, 7.2	None	3	Students research and graph the temperature of the ocean in the South Atlantic Bight and analyze this data.
<b>Evaluate</b>	Varies	None	None	1	Teacher developed rubric for journal entries, explanations and graphs.

### Level of Student Engagement

1	Low	Listen to lecture, observe the teacher, individual reading, teacher demonstration, teacher-centered instruction
2	Moderate	Raise questions, lecture with discussion, record data, make predictions, technology interaction with assistance
3	High	Hands-on activity or inquiry; critique others, draw conclusions, make connections, problem-solve, student-centered

### National Science Education Standards – Inquiry

Develop descriptions, explanations, predictions, and models using evidence.



### National Science Education Standards – Earth Science

Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.

### Louisiana Grade Level Expectations – Inquiry

- Gr. 8, Inquiry GLE#7 – Record observations using methods that complement investigations (e.g., journals, tables, charts) (SI-M-A3)
- Gr. 8, Inquiry GLE#11 – Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams, scatter plots, symbols) (SI-M-A4)
- Gr. 8, Inquiry GLE#12 – Use data and information gathered to develop an explanation of experimental results (SI-M-A4)
- Gr. 8, Inquiry GLE#13 – Identify patterns in data to explain natural events (SI-M-A4)
- Gr. 8, Inquiry GLE#14 – Develop models to illustrate or explain conclusions reached through investigation (SI-M-A5)
- Gr. 8, Inquiry GLE#22 – Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)



### Louisiana Grade Level Expectations Earth Science

- Gr. 8, GLE#25 – Explain and give examples of how climatic conditions on Earth are affected by the proximity of water (ESS-M-A11)

### Materials List (per group)

- 10 six-ounce baby food jars - one per group
- 10 disposable aluminum loaf pans (8" x 3 3/4" x 2 3/8") - one per group
- 10 12-inch balloons - one per group
- 10 centimeter rulers
- 2 hot plates or one double hot plate
- 1 pitcher
- 1 funnel
- 10 clear bottles with small mouths (soda bottles or water bottles) - one per group
- Ice cubes (These need to be wider than the small mouth opening of the water bottle or soda bottle.)
- 1 small cooler (8 or 10 quart size) for storing the ice cubes
- Student Graph Sheet (one per student)
- Student Science Journals or other paper for individual student reflections during activity

### Advance Preparation

1. Obtain materials listed.
2. Put the baby food jars in the freezer for at least 30 minutes prior to the activity.
3. Begin heating the water on the hot plate prior to class.

### Other Information

#### Learning Objective

The learner will...

- explain how the ocean and atmosphere work together as a system.
- experiment to find out that heat transfer from the ocean is a cause of much of Earth's weather.
- make and explain an ocean water cycle.

#### Prior Knowledge Needed by the Students

None

#### Procedure

##### **Engage**

1. Ask students to brainstorm ideas on how hurricanes form. Create a word web of student ideas. Tell students that they will complete an activity to determine the ocean's effects on the weather.

##### **Explore/Explain**

###### **Part 1**

Students observe and record in a science journal the behavior of a balloon stretched over the mouth of an empty baby food jar when it is placed in hot water. Students can use the provided Blackline Master to form their hypothesis, identify independent and dependent variables, and list the materials and procedures.

1. Procedures 1-10 are student exploration of the online lesson.
2. Procedures 11-13 are explanation part of the online lesson.

###### **Part 2**

Students observe and record in a science journal or on the Blackline Master provided what happens when an ice cube is placed over the mouth of a small necked jar filled with hot water.

1. Procedures 14-19 are student exploration of the online lesson.
2. Procedures 20-21 are explanation part of the online lesson.

##### **Expand**

Students research surface temperatures of the ocean in the South Atlantic Bight. Go to the following website to find ocean temperatures on different buoys at sea:

<http://www.ndbc.noaa.gov/os.shtml>.

1. Procedure 22 is the expand component in online lesson and involves creating graphs based on the South Atlantic Bight ocean temperature data.
2. Optional extensions provided in online lesson.



**Evaluate**

1. Grade each student's journal entries for accurate observations, procedures and results. Check for reasonable hypotheses and conclusions.
2. Evaluate student's ability to perform the experiments again and explain what they mean in writing and drawings.
3. Grade the ocean temperature graph for accuracy.

**Blackline Master**

1. An Ocean of Weather

**Supplementary Resources**

**Ocean Explorer**

[http://oceanexplorer.noaa.gov/explorations/02sab/background/edu/media/sab\\_weather.pdf](http://oceanexplorer.noaa.gov/explorations/02sab/background/edu/media/sab_weather.pdf).

A variety of supplementary resources are listed in the online lesson.



# An Ocean of Weather

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Hypothesis: \_\_\_\_\_

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Independent variable: \_\_\_\_\_

Dependent variable: \_\_\_\_\_

Materials: \_\_\_\_\_

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Procedure: \_\_\_\_\_

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Results: \_\_\_\_\_

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Conclusions: \_\_\_\_\_

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