Moving Air

Students revisit the question posed at the beginning of the unit: What do you know about what causes freshwater and ocean water to move around Earth? They now have an opportunity to show their understanding about how water moves, using the terms density, molecules, and current. Next, students are challenged to apply the knowledge they have gained about density and water to density and air. They watch a video from Thailand showing hundreds of sky lanterns (mini hot-air balloons) floating aloft. Following the video, students attempt to explain what they observed, using the concepts of density and molecules. Finally, they attempt to solve a mystery about the changing direction of winds at the coast during daytime and nighttime. Student learning is focused on the following key concept:

- Dense air sinks, and less-dense air rises. When air rises, denser air flows in to replace it, and this causes air currents (wind).
- Wind is caused by the unequal heating of Earth.

Students also learn:

- Air currents are moving air, that is to say, wind.
- Colder air sinks, and warmer air rises.

<table>
<thead>
<tr>
<th>Moving Air</th>
<th>Estimated Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing Revised Ideas</td>
<td>15 minutes</td>
</tr>
<tr>
<td>Finding Out What Causes Air to Move</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Understanding Mysterious Moving Air</td>
<td>20 minutes</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45 minutes</strong></td>
</tr>
</tbody>
</table>

**UNIT GOALS**

**SCIENCE CONTENT**
- The Ocean as a Heat Reservoir
- Density and Movement of Ocean and Air Currents
- Water Cycle

**PRACTICES OF SCIENCE**
- Making explanations from evidence
- Using models

**NATURE OF SCIENCE**
- Scientific explanations are based on evidence
- Technology plays a role in gathering new evidence

**SCIENCE LANGUAGE**
- Using science vocabulary
- Having evidence-based discussions

Ocean Literacy Scope and Sequence and Climate Literacy Principle Correlations

Ocean Literacy Scope 3.3.4. The weather along coastlines is generally more moderate than inland regions because the ocean absorbs and retains heat more effectively than land.

Climate Literacy Principle 3.6. Climate is regulated by complex interactions among components of the Earth system.
WHAT YOU NEED

For the class:
- projection system
- computer with Internet connection* or resource disc
- 8 slides for Session 1.9
- video, *Lantern Festival in Thailand*

For each pair of students:
- 1 set of Molecule Cards* (from Session 1.8)

For each student:
- Investigation Notebook: pages 3, 5–8, 33–35; optional page 32 (DWR)
- (optional) Copymaster Packet: Tool for Writing: Revised Ideas, Part 1

*not provided in kit

GETTING READY

Before the day of the session:
1. Set up projection system/review multimedia. Set up and test the projection system to be sure all students will be able to see items projected during the session. Spend a few minutes reviewing this session’s materials and supplemental resources found at mare.lawrencehallofscience.org/oss68 or by following the links (eBook) or using the resource disc (print version).
2. Preview video. *Project Lantern Festival in Thailand* (36 seconds) before the session to become familiar with its contents.
3. (optional) Prepare student sheets. Decide if you will use the optional writing scaffold for the embedded assessment. If so, make copies of the following page from the Copymaster Packet:
   - Tools for Writing: Revised Ideas, Part 1 (one for each student)

LANGUAGE OF SCIENCE

VOCABULARY
- absorb
- atmosphere
- climate
- condense/condensation
- currents
- dense/density
- evaporate/evaporation
- evidence
- heat energy
- heat reservoir
- matter
- model
- molecule
- precipitation
- water cycle
- water vapor

LANGUAGE OF ARGUMENTATION
- What do you think?
- Why do you think that?
- What is your evidence?
- Do you agree? Why?
- Do you disagree? Why?
- How sure are we?
- How could we be more sure?
Revised Ideas, Part 1

Imagine you are "underwater" looking sideways at the water in the ocean and could see currents moving at the poles and at the equator. Draw arrows on the diagram to show one place where water would sink, another place where it would rise, and any other water movements you want to include. Add labels to help explain why the water moves the way it does.
Guiding Question:
What causes air currents (wind)?
DAY

Predict how air will move in this area during the daytime.

Ocean
65°F
18°C

Air

Land
80°F
27°C
Answer for DAY

Ocean
65°F
18°C

Air

Land
80°F
27°C
Night

Predict how air will move in this area during the nighttime.
Answer for NIGHT

Land
55°F
13°C

Ocean
65°F
18°C

Air
Dense air sinks, and less dense air rises. When air rises, denser air flows in to replace it, and this causes air currents (wind).

Wind is caused by the unequal heating of Earth.
Tools for Writing: Revised Ideas, Part 1

Word Bank
Here are some words you can use in your writing. You don’t have to use all the words.

<table>
<thead>
<tr>
<th>absorb</th>
<th>evidence</th>
<th>pole</th>
</tr>
</thead>
<tbody>
<tr>
<td>closer together</td>
<td>farther apart</td>
<td>rise</td>
</tr>
<tr>
<td>colder</td>
<td>freeze</td>
<td>salt</td>
</tr>
<tr>
<td>currents</td>
<td>heat energy</td>
<td>salty</td>
</tr>
<tr>
<td>deep</td>
<td>ice</td>
<td>saltier</td>
</tr>
<tr>
<td>dense</td>
<td>molecules</td>
<td>sink</td>
</tr>
<tr>
<td>density</td>
<td>move</td>
<td>surface</td>
</tr>
<tr>
<td>equator</td>
<td>movement</td>
<td>warmer</td>
</tr>
<tr>
<td>ocean</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sentence Starters
These are some ways to start sentences in your writing. You don’t need to use all of them, and you don’t need to use them in this order.

Ocean currents can be caused by ________________________________.

When water absorbs heat energy, ________________________________.

When some ocean water freezes into ice, __________________________.

Water is denser when ________________________________.

Water is less dense when ________________________________.

Water near the poles moves ________________________________.

Water near the equator moves ________________________________.
Daily Written Reflection

What is the most interesting or surprising thing about ocean currents that you have learned so far in this unit?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Make a drawing if it helps you explain. Label your drawing.
Revised Ideas, Part 1

Write about how differences in water density cause some ocean currents. (Use what you know about density, molecules, and currents in your explanation.)

Imagine you are “underwater” looking sideways at the water in the ocean and could see currents moving at the poles and at the equator. Draw arrows on the diagram to show one place where water would sink, another place where it would rise, and any other water movements you want to include. Add labels to help explain why the water moves the way it does.
Day

Predict how air will move in this area during the daytime.

Ocean
65°F
18°C

Land
80°F
27°C
Night

Predict how air will move in this area during the nighttime.
Key Concepts (continued)

Guiding Question #6: What causes air currents (wind)?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________