



Science Objectives

- Students will understand the relationship between energy from the sun and global winds.
- Students will relate uneven heating on Earth with convection in the atmosphere.

Vocabulary

- atmosphere
- circulation
- convection cell
- Hadley cells
- pressure

About the Lesson

- In this lesson, students will make observations of the effect of the unequal heating of the earth on the atmosphere. Students will use their observations to describe trends in winds and weather.
- As a result, students will understand that:
 - The equator receives more energy than other regions on the earth.
 - The unequal heating and cooling of the atmosphere causes global convection cells.

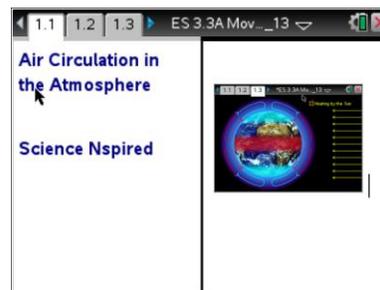


TI-Nspire™ Navigator™

- Send out the *Moving_Air.tns* file.
- Monitor student progress using Class Capture.
- Use Live Presenter to spotlight student answers.

Activity Materials

- Compatible TI Technologies:  TI-Nspire™ CX Handhelds,  TI-Nspire™ Apps for iPad®,  TI-Nspire™ Software



Tech Tips:

- This activity includes screen captures taken from the TI-Nspire CX handheld. It is also appropriate for use with the TI-Nspire family of products including TI-Nspire software and TI-Nspire App. Slight variations to these directions may be required if using other technologies besides the handheld.
- Watch for additional Tech Tips throughout the activity for the specific technology you are using.
- Access free tutorials at <http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials>

Lesson Files:

Student Activity

- Moving_Air_Student.doc
- Moving_Air_Student.pdf

TI-Nspire document

- Moving_Air_.tns



Discussion Points and Possible Answers

Have students read the background information on their student activity sheets.

Move to page 1.3.

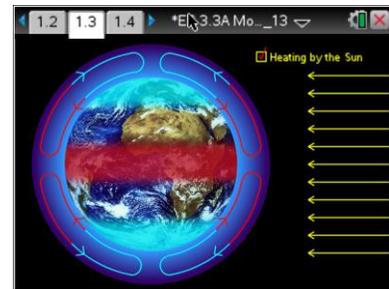
Have students answer question 1 in the .tns file, activity sheet, or both.

Q1. Which region of the earth receives the most light energy?

Answer: C. the equator

Move to page 1.4

1. Have students observe the simulation before selecting the Heating by the Sun button.
2. Have students select the Heating by the Sun button to observe what happens when Earth is heated by the sun. The red, shaded area around the equator represents an area of warmer air.
3. Have students observe the atmospheric circulation arrows. They should specifically note the direction and color of the arrows in the convection cells



Tech Tip: To access the Directions again, select **menu** or **Document Tools** () > **Moving Air** > **Directions**.



Tech Tip: To access the Directions again, select  > **Moving Air** > **Directions**.

Move to Pages 1.4 - 1.8.

Have students answer questions 2 - 6 in the .tns file, activity sheet, or both.

Q2. How did the air in the atmosphere move when there was no heating by the sun?

Answer: A. There was no air circulation.

Q3. How did the air in the atmosphere move when Earth was heated by the sun?

Answer: B. Rising air at the equator moved toward the poles.



Q4. There are two colors representing the air circulation in the convection cells. What does the red color represent?

Answer: A. warm air

Q5. Describe the movement of the air in a single convection cell.

Sample Answer: Student answers will vary; The warm air at the equator rises then flows towards the poles. As it nears the poles it cools and sinks. Then it flows back towards the equator.

Q6. What is happening to the temperature of the air as it moves between the equator and the poles?

Sample Answer: Student answers will vary; The temperature of the air decrease as it rises and moves toward the poles. The cold air at the poles sinks and moves back towards the equator where it begins to increase in temperature.

Move to page 1.9 - 1.12.

Students read the information and observe the diagrams. The diagram on page 1.10 shows how the rotation of the earth creates 6 convection cells: Hadley cell, Ferrell or Mid-Latitude cell, and a Polar cell. The diagram on page 1.12 shows the various wind patterns for convection cells: Trade winds, Westerlies. The Polar Easterlies are not shown.

Move to Pages 1.13 - 1.14.

Have students answer questions 7 and 8 in the .tns file, activity sheet, or both.

Q7. What is the direction of the trade winds?

Sample Answer: Student answers will vary; In both the northern and southern hemisphere they curve toward the equator from east to west.

Q8. Where are the doldrums located?

Sample Answer: The equator.



TI-Nspire Navigator Opportunities

Make a student a Live Presenter to illustrate show how air circulates through a convection cell in the simulation. Throughout the activity, monitor student progress. At the end of the activity, collect the .tns file and save to Portfolio.

Wrap Up

When students are finished with the activity, retrieve the .tns file using TI-Nspire Navigator. Save grades to Portfolio. Discuss activity questions using Slide Show.

Assessment

- Formative assessment will consist of questions embedded in the .tns file. The questions will be graded when the .tns file is retrieved. The Slide Show will be utilized to give students immediate feedback on their assessment.
- Summative assessment could consist of questions/problems on the chapter test or a performance assessment involving students diagramming the motions of the earth's atmosphere and the temperature changes of the air at different locations during circulation in the convection cell.