Satellites, Weather and Climate
Activity: Air & water lab
Created by: Mike Burris, Champlain Valley Union High School, VT

Grade Level: 9-10
Social Studies Curriculum Topic Standards:
Subject Keywords:

Water Cycle Model (demonstration model on counter)

Examine the water cycle model carefully (lift the cloud and look underneath). In this demonstration model, tell what part of the model represents each of the following:

sun-

land-

forests-

ocean-

cold of upper troposphere-

"greenhouse effect" layer of atmospheric gases-

In the model, where are each of the following processes mainly occurring?

evaporation-

condensation-

precipitation-

List several places or kinds or areas in which each of these processes occur in Earth's hydrologic cycle. Do additional research as needed:

evaporation-

transpiration-

condensation-

Is it hot in here, or is it just me?

(lamp, culture dishes, thermometers, ring stand, soil & water at room temperature)

In this experiment, you will see how water and soil compare in their ability to absorb energy (warm up) and release energy (cool down). Collect your data in the tables below, graph it, and use it to answer the follow-up questions.

Make sure you and your partners are using fresh, room-temperature soil and water for your trials, so that your results are not affected by any residual heat remaining from the previous trials of other teams. Suspend the thermometers so that the tops of the bulbs are about a centimeter below the surface of the soil/water.

DATA TABLES

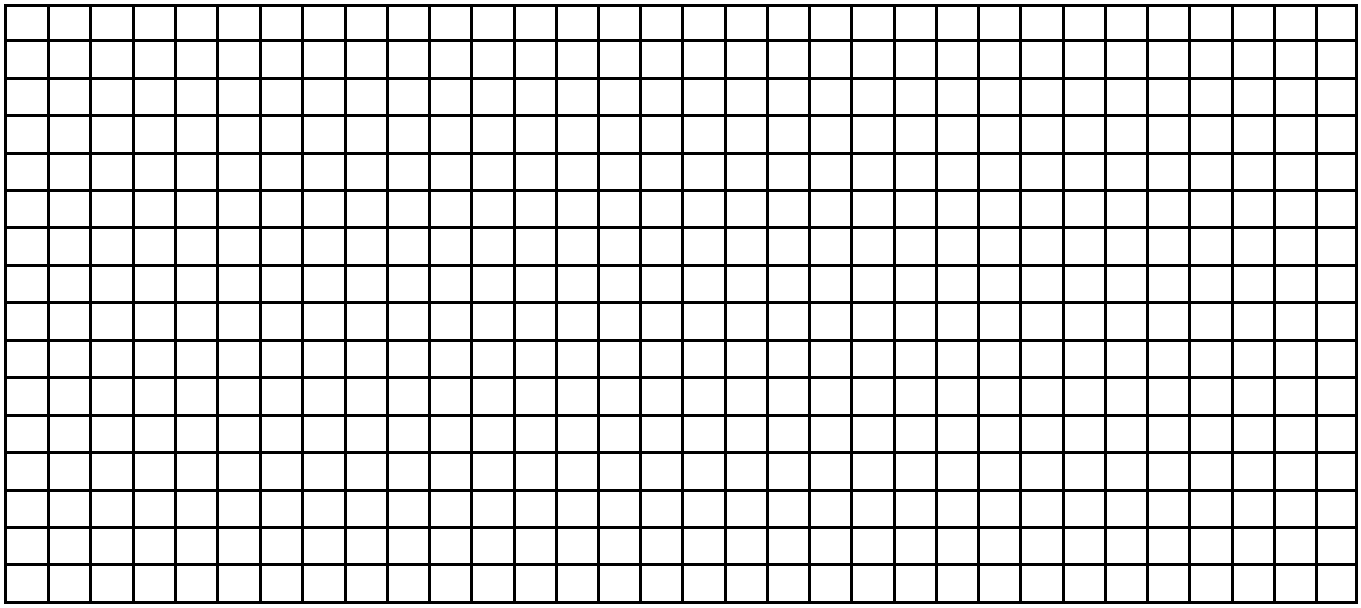
Heating up

Time (min)	Temp. of dark soil surface (°C)	Temp. of light soil surface (°C)	Temp. of water surface (°C)
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Cooling down

Time (min)	Temp. of dark soil surface (°C)	Temp. of light soil surface (°C)	Temp. of water surface (°C)
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Graph: Construct and label a graph showing the temperature changes in both the water and the soil. use different colors to differentiate between the three.



Part VII Analysis Questions

1. In your experiment:

a) which heated up faster- soil or water? If soil, dark or light?

b) which cooled down faster- soil or water? If soil, dark or light?

2. Do your results match what you learned about this concept in class?

3. Over which of the above surfaces would the air temperature be warmer during a sunny day?

4. Would this create high air pressure, or low air pressure over the warmer surface? Why?

5. Warm air is less dense than cooler air. It rises, creating a low pressure zone. Cooler surrounding air creates a high pressure zone and flows toward the area of low pressure. This creates a simple convection cell as the warm air cools as it rises, flows outward, then sinks to the surface, where it is swept toward the low pressure zone of rising warm air again.

a. Use this principle to explain which way a local wind would be likely to blow during an afternoon at the beach-- toward or away from the land? Why?

b. Since winds are named for the direction or area from which they come, would this be termed a land breeze or a sea breeze?

c. Which way would a local wind be likely to blow at the beach after the sun goes down at your beach-blanket bingo party-- toward or away from the land? Why?

d. Would this be termed a land breeze or a sea breeze?

What goes around, comes around

Objects in motion tend to move in a straight line unless acted upon by an outside force. When an object moves on a spinning surface, the rotation of the spinning surface exerts a force called the Coriolis force upon the object to make its path curve. Things in motion curve to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. This force explains the effect of Earth's rotation on weather, wind patterns, hurricanes, tornadoes, rocket launches, and more. The Coriolis Effect explains why tropical storms rotate counterclockwise in the Northern Hemisphere (where they are called hurricanes) and clockwise in the Southern Hemisphere (where they are called typhoons.)

- If there are any marks on the surface of the Coriolis Table before you begin, gently lift the pink sheet away from the white sheet, and they will magically be erased!

- Attach the ball launcher (white, U-shaped ramp) to the edge of the Coriolis Table with the velcro fasteners.

- **Gently** spin the table counterclockwise, and while it is in motion, place the ball on the launcher and let it roll onto the Coriolis Table, where it will trace its path for you. In which direction did its path curve?

- Based on your observation and the information provided above, in which direction does the Earth rotate when viewed from above the North Pole?

- Repeat the procedure in Step 3, but this time spin the table clockwise. In which direction did its path curve?

- Based on your observation and the information provided above, in which direction does the Earth rotate when viewed from above the North Pole?

The Satellites, Weather and Climate (SWAC) Program is funded by the National Science Foundation Geoscience Education grant (GEO-0807787) and the Vermont Department of Education Math & Science Partnership.