Rain Activity 3

Stormy Weather

What Makes a Thunderstorm

Objectives and Standards
- To understand how water travels through the water cycle in a closed system

NSTA Standards Addressed
Content Standards
A, B, C, D, G

4-H SET Abilities Addressed
Predict
Observe
Communicate
Summarize/Relate
Interpret/Analyze/Reason

Supplies Needed

-Clear container (9x11 baking pan recommended
-cool water with blue food coloring
-warm water
-red and blue food coloring
-ice cube tray

Preparation Needed

Mix water with blue food coloring (about 1 drop per cube) and pour into ice cube tray; freeze.

Background

Thunderstorms happen when two very differently characterized air masses are forced together by wind movement or some other event. Not only do the air masses have to contain water in them to yield rain in the storm, but warm and cool conditions must combine. Warm air is capable of holding more water vapor in it than cool air. When a low pressure, high density cold front comes in, it forces the warm, moist air mass upward. The higher in the atmosphere you travel, the cooler the temperature is. This activity allows us to see how a cool, dense mass can force a warmer, less dense mass upward, as well as observe the instability of the masses once this has occurred. Finally, if we let them interact long enough, the system re-equilibrates.

CoCoRaHS Extension Ideas

1) In addition to daily precipitation reports, CoCoRaHS allows you to upload information about intense rainfall and snowfall events. During the next predicted thunderstorm in your community, keep a piece of paper near the window and record when the rain first starts, when the heaviest rain occurs and subsides, and write a descriptive note about the storm event every 15 minutes during the storm. You can then record these observations along with your daily rainfall report or under the "intense precipitation" section once you've logged into your account.

2) Your group may wish to repeat the experiment multiple times with different shaped basins, or by adding clay to the bottom of the same basin in multiple configurations to 'change the topography' of the dish, thereby changing the way the warm and cool fronts interact, and present these findings to each other.

Activity

1. Pour warm water into the container to about one inch in height. Ask youth what will happen when you add blue ice cubes to one end and red food coloring to the other.
2. Add 2 or 3 prepared ice cubes to the end of the container opposite the ice cubes. Drop the ice cubes in slowly so that the water is not disturbed.
3. Immediately after placing the ice cubes into the container, add 3 drops of red food coloring to the other end of the container.
4. Observe what happens to the water. Where does the cold water travel in the container? Where does the warm water travel? Why?
5. Leave the container for a short period of time and re-examine after all of the ice has melted and the water has come to room temperature. What has happened?
6. Repeat with a container of a different size or shape, or by adding more or less water, and predict what changes you might see and why.

Discussion

The warm water represents a normal, warm summer day. The addition of the ice cubes represents a cold front moving into the system. Cold air is denser than warm air, and as we saw in the activity, the cold forces the warm air up. Forcing the warm, moist air up into the atmosphere cools it, which creates rainfall. Further, the air is then unstable, creating high winds and other characteristics typical of a thunderstorm.

If you used a container with a different shape (circular, one with an uneven bottom, etc.) you may notice other phenomena. For instance, low points in a container with an uneven bottom may allow concentration of the cold blue food-colored water. This water is more dense and can concentrate in the low points without mixing, just as some pockets in a community may experience more or less rainfall, even if they are only a mile apart. The group may wish to repeat the experiment with different containers repeatedly, or change the shape of the same container by adding clay, creating topography (see CoCoRaHS extensions). In this way, your group can replicate the effect of moutains (create rain shadows) and see what other effects topography can have on climate.

Some places in your container may not be affected by the food coloring and remain clear for an extended time. This also represents the spatial variability of storms. Monitoring the variability of storms and precipitation is one of the reasons CoCoRaHS was established. Now your group understands why!

Once all of the water returns to room temperature, the water has freely mixed and is of equal density. The result is that the water has turned a shade of purple. This represents the aftermath of a storm. The storm is nature's way of dealing with unequal high and low pressures. Once the pressures have been neutralized, the system re-equilibrates, just like the water in your pan.

Please send us your feedback!

As a 4-H Educator, you know what has worked well, what has not, and how we can improve the *Tracking Climate in Your Backyard* curriculum. Please share your feedback about the curriculum. We'd love to receive copies of any reports or newspaper coverage about completed *Tracking Climate in Your Backyard* projects.

Fax or mail your completed feedback to Trisha Smrecak, Museum of the Earth, 1259 Trumansburg Rd., Ithaca, NY, 14850 or fax to: 607-273-6620.

Check the activity completed	Suggestions for improving the activity
Rainfall Activities ☐ Make It Rain ☐ Where Does the Rain Come From? ☐ Stormy Weather	
Snowfall Activities ☐ Confetti Snow Maps ☐ How Much Water? ☐ Edible Education ☐ The Snowflake Game ☐ Snow Journaling	
Temperature Activities ☐ Energetic Weather ☐ Shade of the Old Oak Tree ☐ Temperature Through Time	
Wind Activities ☐ Why Does the Wind Blow? ☐ Make Your Own Wind Dial	
Hydrologic Cycle Activities ☐ The Incredible Journey ☐ Understanding Evapotranspiration ☐ Pinecones: Mother Nature's Weather Forecasters ☐ What is a Watershed?	
Climate Activities ☐ Where is My Backyard? ☐ Soak up the CO_2 ☐ Buckets O' CO_2 : How Your Backyard Can Change the Ocean ☐ Raise the Waters	
CoCoRaHS Participation ☐ Precipitation measurements and other activities	

Please share your suggestions for improving the Tracking Climate in Your Backyard curriculum.

How have you used Tracking Climate in Your Backyard in your community?

Thank you for completing the Tracking Climate in Your Backyard curriculum feedback. We appreciate learning about how you are using the curriculum and receiving your suggestions for improving it.

Organization _____ **Contact Person** _____

Email _____ **Date** _____