

Let's Make a Cloud



Related Subject: Climate and Weather

Group Size: 10-15

Length of Activity: 45 minutes

Objective

Demonstrate the combination of three natural elements, to form a cloud: water vapor, smoke and air pressure.

Overview

Through a hands-on experiment, the participants will see and discuss water vapor and the formation of a cloud.

Recipe for a cloud

Water vapor

Particles in the air such as smoke or dust

Air pressure

Materials and Supplies

Divide the participants into groups of 2 or 3 and give them the following materials:

- Pan with water to boil to show steam or water vapor rising
- Hot plate
- two-liter clear plastic soda bottle
- matches (participant will need adult assistance to light matches)
- warm water

Activity Description

- Boil some water so participants can observe water vapor rising. Ask them why does it rise? Why doesn't it go sideways or just stay in the pan?
- Ask the participants to fill the clear plastic two-liter bottle one-third (1/3) full of very warm water and place the cap on. As warm water evaporates, it adds water vapor to the air inside the bottle. This is the first ingredient to make a cloud.
- Squeeze and release the bottle and observe what happens. You'll notice that nothing happens. Why? Discuss the process with participants. (Squeezing the bottle represents the warming or pressure that occurs in the atmosphere. The release represents the cooling that occurs in the atmosphere. If the inside of the bottle becomes covered with condensation or water droplets, just shake the bottle to get rid of them.)
- Remove the cap from the bottle. Carefully light a match and hold the match near the opening of the bottle, then drop the match in the bottle. Quickly return the cap to the bottle, trapping the smoke inside. In this experiment, smoke is the second ingredient in making a cloud. Smoke is one type of particle that allows water to condense; however, there are many others such as dust or sea salt particles.
- As the water vapor attaches to the smoke particles in the air, a cloud formed.
- Ask the participants to slowly squeeze the bottle hard, and release. What happens? (A cloud appears when you release and disappears when you squeeze.) The third ingredient in making a cloud is a drop in air pressure. A drop in air pressure comes about from air rising and pressure decreases as you go up in altitude.

Discussion

- Ask the participants to recap the entire experiment and discuss what happened in each step.
- How was water vapor created? (Water in its invisible gaseous state, can be made to condense into the form of small cloud droplets.)
- What happened when smoke was added to the bottle with vapor? (smoke provides the particles) What role does smoke play in creating a cloud in the sky? (By adding particles such as the smoke enhances the process of water condensation.)

- What is air pressure and how did you change the pressure in the bottle? What role does air pressure play in the creation of a cloud? (By squeezing the bottle causes the air pressure to drop. A cloud appeared when you released and disappears when you squeeze.)
- Review the roles of vapor, smoke and pressure in creating a cloud.
- Encourage participants to listen to weather reports. Did the weather report include an air pressure report?
- What kind of weather will we have if low air pressure is referred to? High air pressure?

Background

Water vapor; water in its invisible gaseous state, can be made to condense into the form of small cloud droplets. By adding particles such as the smoke enhances the process of water condensation and by squeezing the bottle then releasing it causes the drop in air pressure, which is like air rising to make a cloud. Squeezing the bottle increases the air pressure, like air sinking. This creates a cloud.

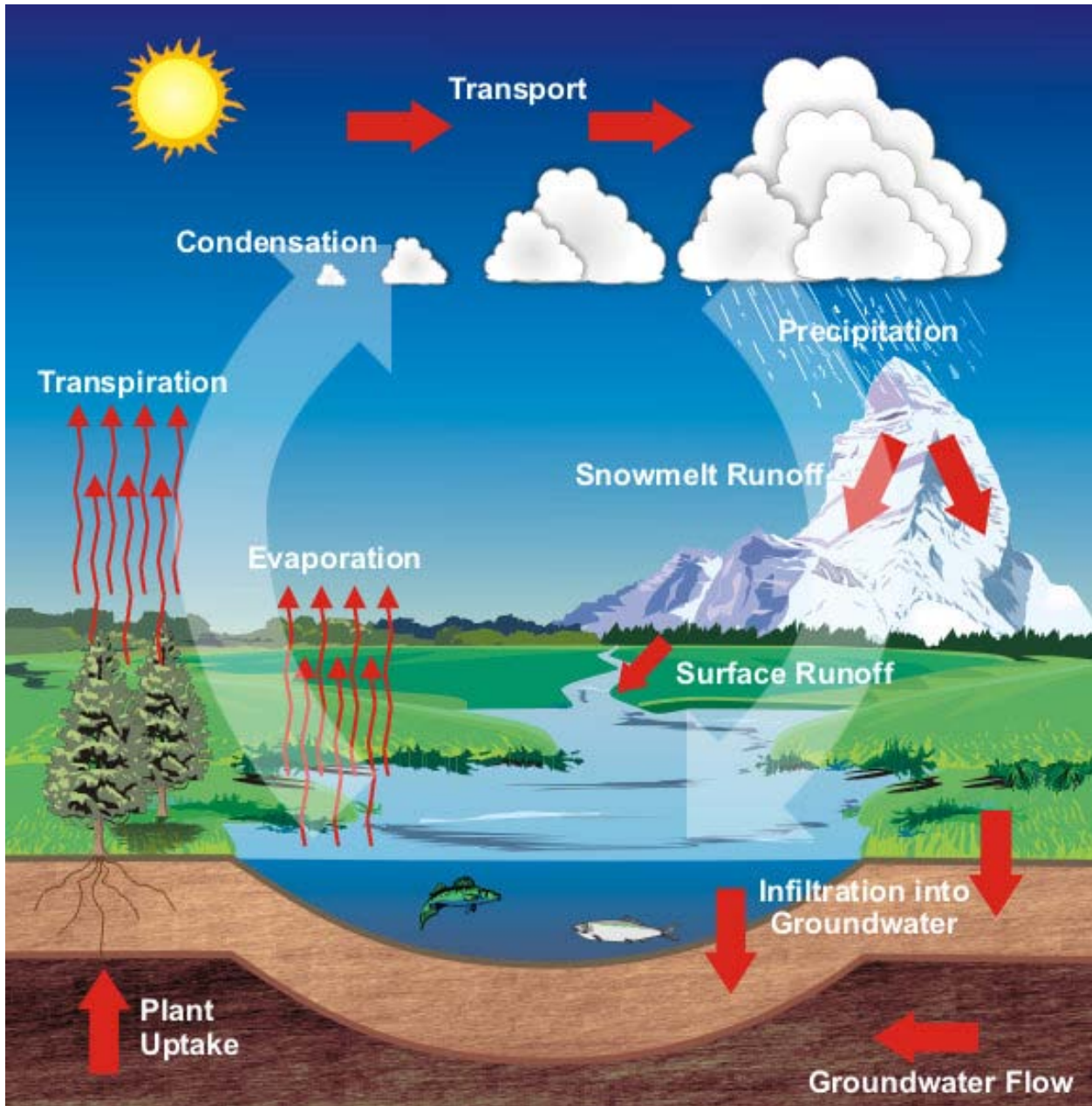
Evaporation: Water evaporates. Why? The heat from the sun causes water to evaporate and become a vapor that rises up into the atmosphere to become a cloud. You can illustrate evaporation by boiling water in a pan over a hotplate so participants can see the vapor rising.

Condensation: All air contains some water in vapor form. Usually, we can't see it but we know it is there by how wet or dry the air feels on our skin as well as our noses and mouths. As warm air rises, it carries water vapor with it. As the air continues to raise, the warm air cools and the pressure eventually decreases enough that the water vapor turns into liquid droplets. These droplets form or condense on smoke and dust particles in the air. The process of changing water vapor into liquid water is called *condensation*. Vapor turns into raindrops forming a cloud.

Precipitation - As more and more droplets of water form into a cloud they start bumping into each other. Some of them stick together and grow to the size of a raindrop (> 1mm in diameter.) As more droplets form into raindrops they get very heavy and eventually fall out of the cloud when the updraft can no longer hold them as a cloud. The cloud bounces and shakes, or precipitates, releasing the droplets in the form of rain, hail, or snow.

Collection: Finally, when rain falls onto land it can run off into a stream or river, which flows to the ocean. This will happen over and over again and is called collection. Some of the rain will fall on land where it percolates or infiltrates into the ground becoming ground water used by humans, animals, and plants.

The Water Cycle



<http://www.srh.noaa.gov/srh/jetstream/atmos/hydro.htm>

National Science Education Standards:

NSES 5-8:

Science as inquiry (8ASI)

Abilities necessary to do scientific inquiry (8ASI 1)

Earth and space science (8DESS)

Structure of the earth system (8DESS 1)

NSES 9-12:

Science as inquiry (12ASI)

Abilities necessary to do scientific inquiry (12ASI 1)

Physical Science (12BPS)

Structure and properties of matter (12BPS 2)

Earth and Space Science (12DESS)

Energy in the earth system (12DESS 1)