What do you know about...

Clouds

- Can you name some cloud types?
- Do they all look the same?
- Do they all block the light of the sun?
- How do they form?
Let’s investigate the process that causes clouds to form.
Make a model cloud in a bottle.

You will need:
• Plastic soda or water bottle with a screw cap
• Wooden matches (Ask an adult to help you with this!)
• A flashlight
• Small cup of warm water

Step 1:
• Add 1 inch of warm water to the bottle
• Screw the cap on top
• Squeeze and release the bottle and observe what happens.
• Shine the flashlight on the bottle. Do you see any changes?

Squeezing increases the pressure and temperature in the bottle. The release lowers the pressure and temperature. Similar to what occurs in the atmosphere.
Clouds are more than just water

**Step 2:**
- Remove the cap from the bottle.
- Ask an adult to carefully light a match and hold it near the opening of the bottle.
- Drop the match into the bottle and quickly replace the cap, trapping the smoke inside. The match will extinguish when it lands in the water.
- Once again, slowly squeeze the bottle and release. What do you observe?
- Shine your flashlight through the bottle at various angles? What do you notice?

**Challenge: Design your own experiment**
- Use water at different temperatures to make clouds.
- What happens if you use 2 matches?
- Does the cloud change when you squeeze more or less?
- Other ideas?
How do clouds form?

- Water
- Drop in pressure/temperature
- Aerosols

**Aerosols are the particulate, or nuclei, for cloud droplets.**

When you look up at the sky, you are looking at more than just air. There are also billions of tiny bits of solid and liquid floating in the atmosphere. Those tiny floating particles are called aerosols or particulates.

What aerosol acted as a nuclei for your cloud in a bottle?
Natural sources of aerosols

- Desert dust storms
- VOCs from vegetation
- Smoke from forest fires
- Ash from erupting volcanos

Manmade sources of aerosols

- Automobile and plane exhaust
- Deforestation

(Photographs copyright (left to right) Western Sahara Project, Jonathan Jessup, Vox, and Ludie Cochrane.)
Aerosol size affects the amount of incoming solar energy that reaches the earth.

The larger the aerosol, the larger the droplet, allowing more solar energy to reach the earth.

Which cloud will allow more insolation to reach the solar panels?

Hint: look at the droplet sizes, and the space between them.
Scientists at Brookhaven National Lab are studying aerosols to better understand clouds, precipitation and climate

Meet the Engineers Whose Programming Helps Enhance Climate Research

Meng Wang, Tami Fairless, and Karen Lee Johnson use teamwork to bring atmospheric data into focus.


Meet Brookhaven’s Arthur Sedlacek, Aerosol Hunter

https://www.arm.gov/news/features/post/57701

Photo credit: Brookhaven Lab
You can learn to recognize clouds with a little practice. Use this Cloud Identification Guide to get started.

See the next slide to find out where to use your cloud observing skills for real citizen science!

file:///C:/Users/slc/Desktop/Mars hall%20cloud%20identification%20guide.pdf
Become an official cloud observer by visiting the NASA GLOBE site and contributing data to their citizen science program!

Your observations will be an important contribution to the world's understanding of clouds.

• [https://scool.larc.nasa.gov/](https://scool.larc.nasa.gov/)

• Learn [how to participate in the NASA GLOBE Cloud Observation Project](https://scool.larc.nasa.gov/).

• Citizen Science Observations can be submitted through the [GLOBE Observer app](https://scool.larc.nasa.gov/).

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