Melissa:

Hello! My name is Melissa and I work at the UCAR Center for Science Education. This video will prepare you to facilitate the Mylar Balloon demonstration with your students which is Lesson 5 of the GLOBE Weather curriculum.

*[on screen text]:*

Lesson 5

Air on the Move

How does air move and change when a storm is forming?

Melissa:

In this activity, students investigate the question, “How does air move and change when a storm is forming?”

By this point in the curriculum, students have learned that, throughout the day, energy from the Sun causes air at the surface to warm and rise. When the warm air includes humidity, this can cause clouds to form and possibly even a storm with precipitation.

In Lesson 5 students are introduced to convection as the explanation for how warm air rises and cold air sinks.

[on screen text]:

Convection

Melissa:

In part 2 of Lesson 5, students use a helium-filled balloon to model convection in the atmosphere. To do this demonstration, you’ll need a Mylar balloon filled with helium, a hair dryer plugged into an outlet, and a drinking straw.

[on screen text]:

1 Mylar balloon filled with helium

1 hair dryer

1 drinking straw

Melissa:

Here are some balloon tips: Buy 2-3 helium balloons; it’s good to have backups, just in case! Use a thin Mylar balloon versus the more expensive ones that tend to be much thicker and harder to heat up. Never use a regular balloon; the Mylar is important for heating the balloon safely. Prep the balloon in advance so that you are ready to move right into the demonstration with your students.

[on screen text]:

Buy 2-3 balloons

Use thin Mylar balloon

Never use regular balloon

Prep balloon in advance

Melissa:

To prepare for the demonstration, you’ll need to remove some of the gas from the balloon. To do this, take the straw and place it about two-thirds of the way into the inlet of the balloon, or until the helium starts to come out. Keep your finger over the open end of the straw so that you don’t lose too much gas.

Gently press to remove just enough gas so that the balloon will remain neutrally buoyant, floating low, but still upright.

When you’re ready, remove the straw to test that you have the balloon just right.

If the balloon is lying on the surface, then you have removed too much helium.

If the balloon is floating up towards the ceiling, then you haven’t removed enough.

It sounds simple enough, but don’t get discouraged if it takes you a couple of tries to get your balloon deflated just the right amount.

Now we’re ready to do the demonstration!

First, you’ll want to heat the gas inside the balloon using the hairdryer. This should take about 30 seconds and you might notice that the balloon expands as the air inside is heated.

Now that the gas inside the balloon is heated, let go of the string, and notice that it rises.

And then it will start to sink again as the gas inside is cooled.

So to review: warm the Mylar balloon with a hairdryer for about 30 seconds.

Now that the air in the balloon is warm, release, and watch it rise.

Notice that the balloon remains aloft for a short time, as long as the air inside the balloon is still warm.

As the air inside the balloon cools, the balloon sinks towards the ground again.

So, how does this model relate to what we’re seeing in the atmosphere?

Throughout the day, energy from the Sun is absorbed by the ground and warms the air near the surface. As the air is warmed, the molecules spread out. Because the warmed air is less dense, it rises.

The warmed air continues to rise, high up into the atmosphere. The rising air often carries water vapor with it, which can lead to cloud formation as the warm air cools at higher elevations.

As the air begins to cool, the molecules move closer to one another, making the air more dense.

So the cool air flows down towards the surface again, just like the balloon in our demonstration!

[on screen text]:

Convection

Melissa:

The convection that we observe in the Mylar balloon demonstration is the same as the process of convection that we observe in the atmosphere.

To see the full lesson plan for this activity head to page 57 of the Teacher Guide at the GLOBE Weather curriculum website (globeweathercurriculum.org).

[on screen text]:

Lesson 5

Teacher Guide

page 57

Melissa:

And to learn more about convection and other weather phenomena, head to the UCAR Center for Science Education website (scied.ucar.edu).

[on screen text]:

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