

Severe Weather

A Reading A-Z Level T Leveled Book

Word Count: 1,775



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SEVERE WEATHER



Written by Bruce D. Cooper
Illustrated by Cende Hill

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Introduction

Weather can be calm and peaceful, or it can be fierce and violent. We experience fierce, violent weather in the form of storms. Every place on Earth can experience some type of violent storm. We will explore types of violent storms, but first let's look at the causes of weather.



Threatening storm clouds gather over a road.



Sun, air, and moisture are the building blocks of weather.

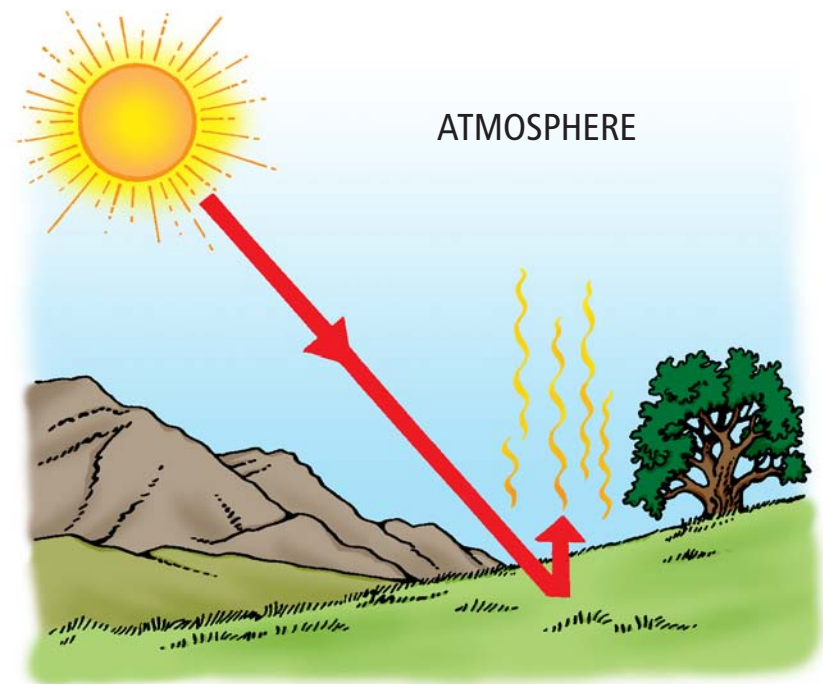
Building Blocks of Weather

When you think of good weather, you probably think of sunshine, but you might be surprised to know that the sun is responsible for bad weather, too. In fact, the sun is responsible for all weather.

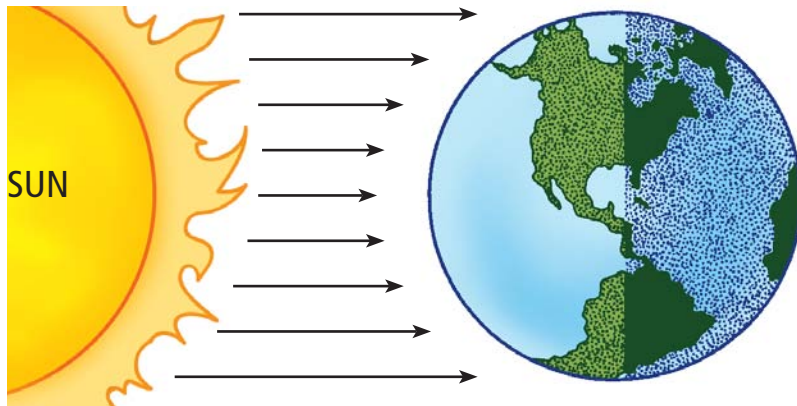
Let's talk about the things that make the weather what it is—the building blocks of weather. These are **temperature**, air pressure, wind, and moisture. Let's learn how the sun affects these things.

Temperature

Weather is caused by changes in the **atmosphere**, the air that surrounds Earth. All weather begins when energy from the Sun strikes the earth. When sunlight hits the earth, it is either absorbed by the earth or reflected back into the atmosphere. The sunlight that is absorbed changes to heat. This heat comes off the earth's surface like heat from a hot stove, and it heats the air that surrounds Earth.



The Earth's surface heats the air above it.



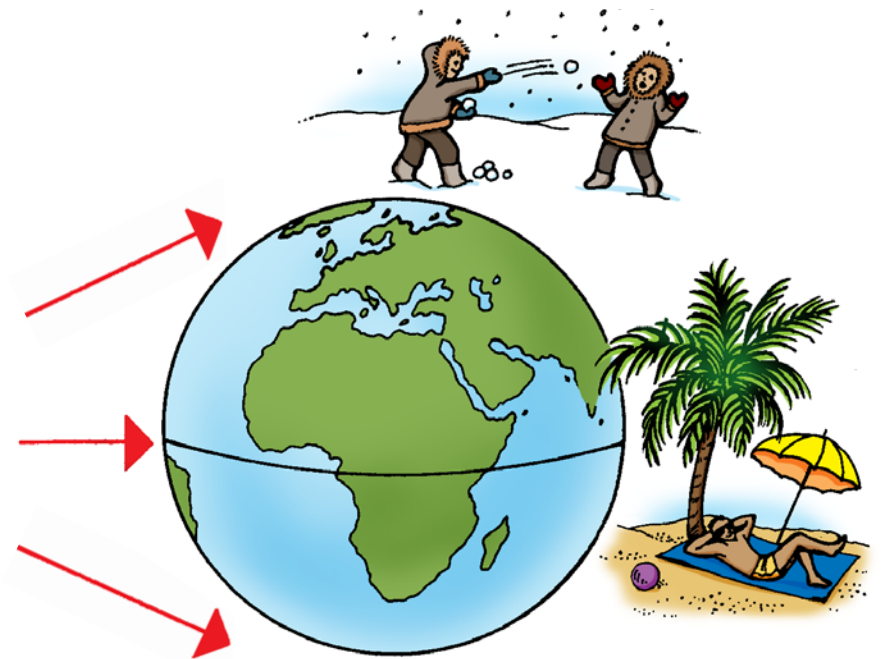
Sunlight only hits half the Earth at any one time.

Now, not all of the Earth is heated equally. Since the Earth is a giant rotating ball, only half of it is facing the sun at any time. While the sunny side gets heated, the dark side loses heat. In addition, some places absorb more sunlight than others. For example, if sunlight strikes a dark surface, it will be absorbed more quickly, and the surface will get hotter. Also, land heats up more quickly than water.

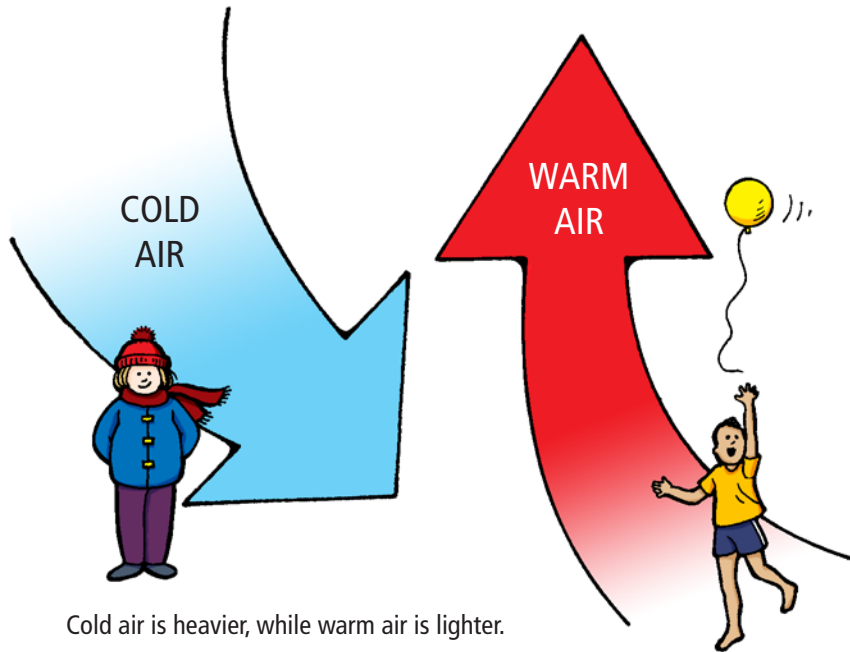
TRY THIS: Unequal Heating

Place a piece of black paper and a piece of white paper in the sun. Let them sit for a couple of hours. Feel both pieces of paper before and after. Which one gets warmer? Place a thermometer on each piece of paper to see how much warmer one is than the other.

The Sun's rays also strike more directly near the equator, which means that water and land around the equator get hotter. Sunlight strikes areas around the poles at a sharp angle. Angled light does not get absorbed as much as direct light, which explains why the poles are colder. Also, the poles are covered with snow and ice, and these light-colored surfaces do not absorb sunlight as well.



The angle of sunlight creates cold poles and a warm equator.



Cold air is heavier, while warm air is lighter.

Air Pressure

The air in the atmosphere has weight, and it is being pulled toward the Earth by gravity. Because it is pulled down, it pushes against things. This is what we call **air pressure**. We know that cold air is heavier than warm air, and because of this, it pushes down with more pressure. This air is called high-pressure air. Scientists have learned that high-pressure air always moves toward warmer, low-pressure air. The colder air being pulled toward the Earth pushes the warmer air up.



Wind can be gentle or violent.

Wind

Wind is caused by the unequal heating of the Earth. The unequal heating causes some air to be warmer than other air, which leads to a difference in air pressure. The unequal heating and the differences in air pressure set air in motion, creating wind. The greater the difference in temperature and pressure between two large masses of air, the stronger the wind along the borders of these air masses.

Moisture

The Sun also heats water in lakes, rivers, and, most importantly, oceans. The Sun's energy causes water to evaporate and form **water vapor**, which is an invisible gas. Water vapor in the air has a lot to do with the weather we experience.

TRY THIS: **Make Your Own Cloud**

When you are outside on a cold winter day, you can usually see your breath. This happens in the same way that clouds are formed. The air of your breath is warm and moist. When you breathe out, the warm, moist air rises and meets the cold outside air. The water vapor in your breath changes to tiny drops of water and turns into a little cloud.



Do You Know?

It takes about a million cloud droplets to form an average raindrop.

Warm air can hold more moisture than cold air, and cold air constantly pushes this warm, moist air upward. As this warm air rises, it cools down, and the water vapor begins to get squeezed out. When this happens, the water vapor changes to tiny water droplets that form clouds. The water droplets continue to cool and join together in clouds. In time, they get so big that they are pulled to the earth by gravity. **Precipitation** is the name we give to this water falling to the earth.

Precipitation can be in the form of rain, snow, or ice. The kind of precipitation that falls depends on the temperature in the clouds and the temperature between the clouds and the ground. This table shows the conditions needed for different kinds of precipitation.

Now that we've learned about the building blocks of weather, let's learn what happens when conditions are extreme. Remember, violent storms happen when temperature, air pressure, wind, and moisture are extreme.

Conditions Needed for Different Kinds of Precipitation

	Rain	Snow	Sleet and freezing rain	Hail
Temperature in the clouds	Above or below freezing	Below freezing	Above freezing	Above freezing in the lower cloud and below freezing in the upper part of the cloud. Also, high winds blowing upward in the cloud.
Temperature between the clouds and ground	Above freezing	Below freezing	Below freezing. May start as ice, then melts, then freezes again as it passes through freezing air near the ground.	Above freezing

Do You Know?

There are approximately 40,000 thunderstorms in the world every day. Every day someone is struck by lightning.

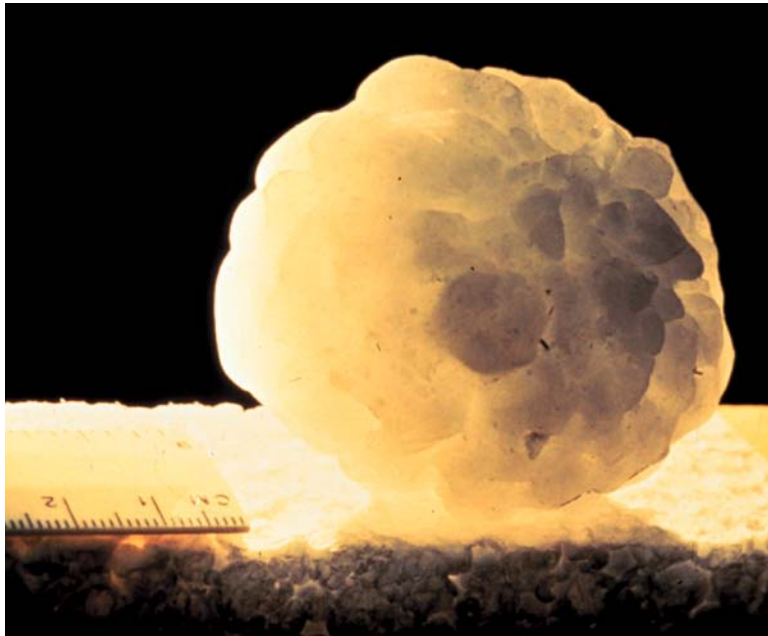


Thunderclouds over the prairie

Thunderstorms

Thunderstorms are the most common type of storm. They usually occur during hot, humid weather, and they form when warm, moist air rises quickly. Tall clouds form, and large amounts of water vapor in these clouds form water drops very quickly.

Strong wind in a thunderstorm can blow large water drops far up in the cloud, where they freeze. Then they begin to fall and collect more moisture. The wind can blow the ice pellets back up into the cloud, where another layer of ice forms on the pellets. Sometimes this happens many times to the same ice pellets. Each time, they get bigger until they become too heavy for the wind to blow them back up. Then they fall as **hail**. Hailstones the size of baseballs and grapefruits have been reported.



The ruler (bottom left) shows the size of this hailstone.

Thunderstorms get their name from the lightning and thunder they produce. Lightning can go from one cloud to another cloud, or it can go from cloud to ground or from ground to cloud.

Lightning, which is very hot, heats the air to cause thunder. The hot air expands very quickly, which creates a shockwave. When the wave reaches your ear, you hear it as thunder.



Lightning usually strikes the tallest object around.



Do You Know?

A bolt of lightning is hotter than the surface of the sun.

You can tell how far away lightning is by counting the number of seconds between the time you see lightning and the time you hear thunder. If you count five seconds, the lightning is 1.6 kilometers (1 mi) away from you. If you count ten seconds, it is 3.2 kilometers (2 mi) away.

Tornadoes

Tornadoes, which have the strongest winds on Earth, have wind speeds that may reach 322 to 480 kilometers per hour (200–300 mph). Tornadoes rarely last more than thirty minutes, but they can do great damage. They can flatten buildings, pick up cars and trucks, and tear out trees by the roots.

Tornadoes form when warm air rises very quickly. Cold air rushes in to replace the rising warm air. It moves in so fast that it begins to rotate or spin, and this spinning causes a funnel cloud to form.

Do You Know?

On average, the United States experiences 100,000 thunderstorms each year, causing about 1,000 tornadoes.



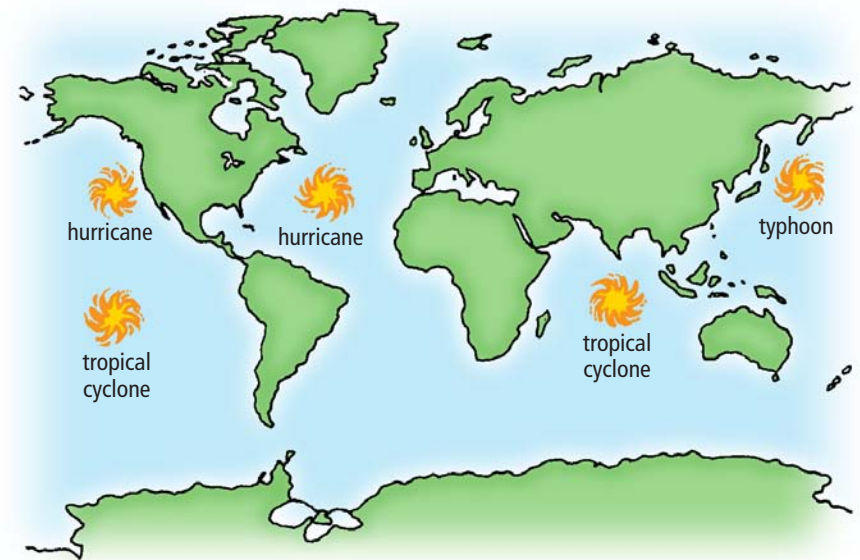


Waterspouts are often beautiful.

When a tornado occurs over water, it is called a **waterspout**. Whirlwinds, sometimes called **dust devils**, form when hot air spins up from the ground over bare soil and deserts. These are different from tornadoes and waterspouts, which spin down from clouds.

Hurricanes, Typhoons, and Tropical Cyclones

During the warm months of the year, great masses of warm, moist air form over warmer parts of the ocean. They begin to swirl around when cooler air moves in to replace the rising warm air. When this happens, huge storms form. These storms have different names, depending on where in the world they occur. Look at the world map to see what these storms are called in different parts of the world.



Tropical ocean storms have different names in different parts of the world.



Hurricanes can cause a lot of damage.

These huge storms can be hundreds of miles across. They have three parts. In the center is the eye of the storm, where the air is calm. The eye is surrounded by a wall of swirling clouds containing strong, violent winds. These winds whirling around the center can reach over 322 kilometers per hour (200 mph). The third part is the rain bands, which are bands of thunderclouds that reach out from the wall and produce heavy rain.

The damage from these storms is done by wind and flooding. When these large storms reach land, they push large mounds of water ahead of them. When these mounds of water hit land, boats and buildings may be swept away and destroyed. The heavy amount of rain can also cause serious flooding.

Do You Know?

A single snowflake can be made of 50 or more individual ice crystals clustered together.



Blizzards make driving very dangerous.

Blizzards

The most fierce winter storm is called a **blizzard**. This is a storm that has heavy snowfall and high winds of over 56 kilometers per hour (35 mph). Sometimes visibility is so limited that the blizzard is called a **whiteout**. Blizzards can dump several feet of snow quickly. This snow blows around and piles up into huge drifts of up to 15.2 meters (50 ft).

These fierce storms can collapse buildings, bury cars and trucks, and knock out electrical power. In the mountains, heavy snowfall can lead to **avalanches**. Avalanches are huge walls of snow that break loose and tumble down a mountainside. They have been known to bury entire villages.



An avalanche buried this car.

Storm Safety

It pays to know what to do when a storm is coming. It can save your life. Here are some safety tips.

Thunderstorm Safety

- Look for shelter, such as a building or car.
No matter what, do not take shelter under trees because trees attract lightning.
- If you are in the open, never lie down on the ground during a storm, because after lightning strikes, it usually spreads out on the ground.
The safest position is to put your feet close together and crouch down with your head as low as possible, curled up in a tight squat.





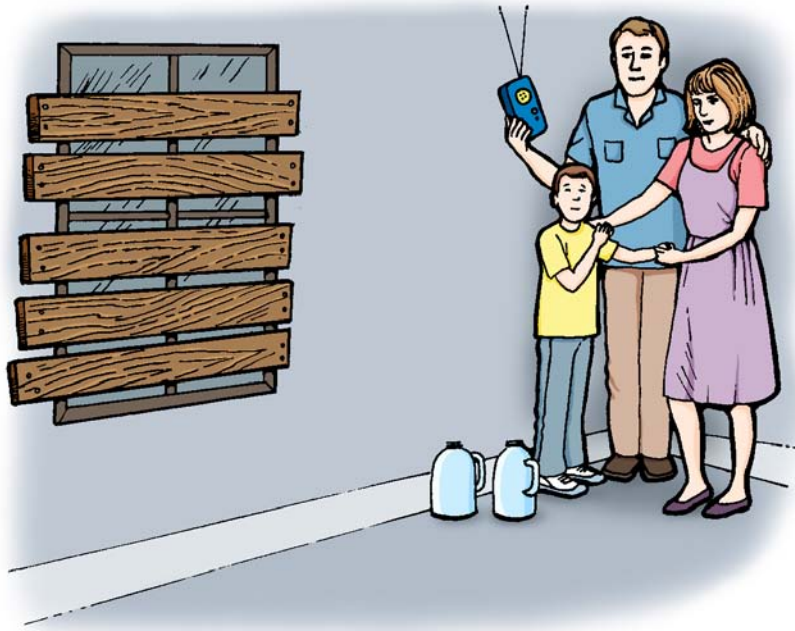
- Do not stand on a hilltop or open field.
- If you are in or on the water, get out or get off.
- Do not carry anything made of metal.
- Do not use the telephone. If lightning strikes the phone line, the strike can travel to you if you are holding the phone. If you must call someone, use a cordless phone or a cell phone.
- Do not use electrical appliances. Lightning could follow the wire.
- Stay away from plumbing pipes (sink, bathtub, or shower). Lightning can cause an electrical charge in the metal pipes.

Tornado Safety

- The key word in tornado safety is **DOWN**. Go to a basement if you can. If you are in a building without a basement, go to a closet or bathroom. In either case, get under a heavy piece of furniture or inside the bathtub and protect your head and neck with your arms.



- Mobile homes usually collapse or get blown off their foundations during a tornado. If you are inside one, get outside, preferably to a basement. Otherwise, lie down in a ditch or depression in the ground and protect your head and neck with your arms.
- Don't get in a car or other vehicle; vehicles have been blown over a mile away by tornadoes.
- Stay away from doors and windows.



Hurricane Safety

- Before a hurricane comes, board up windows. Pick up loose things in the yard. Get a battery-powered radio and store some water.
- If a hurricane is moving into your area, go to higher ground far inland.
- If you cannot leave the area, get inside a concrete building on the highest ground available.
- Stay away from doors and windows.
- Do not go outside.

Glossary

- air pressure** the force of the air in the atmosphere when pulled to Earth by gravity (p. 9)
- atmosphere** a layer of gases surrounding a planet (p. 6)
- avalanche** a wall of snow that slides swiftly down a mountain (p. 23)
- blizzard** a severe snowstorm with cold temperatures and heavy snow drifts (p. 22)
- dust devils** currents of air whirling upward from the ground in a spiral motion (p. 19)
- hail** round pieces of ice that sometimes fall during thunderstorms (p. 15)
- precipitation** moisture that falls to the ground, such as rain, snow, hail, or sleet (p. 12)
- temperature** the degree of hotness or coldness of anything, usually as measured on a thermometer (p. 5)
- water vapor** water in the form of gas (p. 11)
- waterspout** a whirling, funnel-shaped or tubelike column of air occurring over water, usually in tropical areas (p. 19)
- whiteout** a condition that occurs during a severe blizzard when visibility is very limited and everything looks white (p. 22)