

Thunderbolts And Lightning

When Queen sing about “Thunderbolts and lightning, very, very frightening me”, they echo the feelings of many of the population. Who hasn’t jumped at that first crack of unseen thunder, or flinched as lightning split the sky? But what causes a thunderstorm and creates this electrifying weather?

Thunderstorms

Moisture from the oceans is evaporated to make clouds. If cold, dry air is sitting above this warm moist air as it rises, the air can become unstable. This cooler, unstable air is pushed upwards by the warmer air, rising to become a thunderstorm cloud. This can bring powerful winds of up to 50mph, hail and heavy rain and flash-flooding as it travels over land.

Within the cloud, the moisture in the air is moved around by strong winds. Some move the water droplets upwards in updrafts. Here, they rise to meet the colder atmosphere, which then freezes them into drops of hail and ice. Now heavier, they are taken back down in a downdraft, meeting more warmer droplets on their way up. As they meet, electrons are taken off, building an electrical charge in the cloud.

This electrical field grows, with a negative charge on top, separated from a positive charge below by a layer of insulating atmosphere. Eventually the charges build to a point where they overcome the insulation and meet.

Lightning

The meeting charges create a lightning charge. This then tries to find a way to release the electricity, sometimes into the cloud itself. If, however, the cloud is over land, then the negative charge from the cloud will begin to attract positive charges from the earth. These “climb” up tall objects (buildings, trees, poles) to try to connect with the negative charge. Where the positive charge sends out a streamer that meets the negative charge, it results in a lightning strike.

If the lightning hits a beach, it is so hot it can even fuse silica and quartz into glass. These glass tubes take on the shape of the lightning strike and are like hollowed out tubes with small branches. Called fulgurites (after the Latin word for lightning - fulgar) they are a form of petrified lightning.

Thunder

As the lightning connects with the ground, a second, return strike is sent back up the same channel to the clouds. This rapidly heats the surrounding air to around 27,000*c (5 times hotter than the temperature of the sun!) and, in turn, raises the air pressure. The pressurised, heated air explodes out of the channel, compressing all the cooler air around it, which contracts. This creates a shockwave, which we hear as a loud burst of noise – the boom of thunder. As the air continues to vibrate, we hear a rumbling sound. Forked lightning creates a series of lower, more continuous rumbles. As light travels faster than sound, we see the



lightning before we hear the thunder. You can track a storm by counting the number of seconds between the two to find out roughly how far away a storm is from your location.

Staying Safe

Thunderstorms can clearly be dangerous and there are ways to stay safe. Weather tracking systems can now help predict them. In regions where such storms are common, many tall buildings have lightning conductors – metal rods with special cables that divert lightning safely down to the ground away from structures. People are advised to go indoors and stay away from tall or metal objects: “If thunder roars, stay indoors”. Equally, don’t lie down in open spaces to avoid ground currents.

It is perhaps a comfort to know that your odds of being struck by lightning are something like 1 in 1.2 million, with an even lower chance (1 in 19 million) that it would kill you. In fact, around 49 people get struck in the UK every year, and only 3 are fatal strikes. Men are 4/5 more likely to get struck and most injuries are minor burns.

The Guinness Book of Records lists American Park Ranger Roy Sullivan as the survivor of the most strikes – a record of 7 separate lightning bolts. Although, as his job was mainly outdoors in an area where storms were common, this is perhaps not as surprising.

Beauty and Danger

Whilst parents might explain away a thunderstorm to a nervous child as sky gods feeling cross or giants playing bowls, there is in fact a clear scientific explanation for this phenomenon. This in no way detracts from the exhilarating experience of being witness to nature’s extreme effect (whilst safely indoors).

Thunderbolts and lightning – yes please!

RETRIEVAL FOCUS

1. Storms bring three things, what are they?
2. What is the Latin name for lightning glass?
3. Give two pieces of advice to stay safe.
4. How likely are you to get hit by lightning?
5. How many times was Roy Sullivan hit by lightning?

VIPERS QUESTIONS

- I** Why do we feel scared during a storm?
- E** Explain, in your own words, how the lightning charge in the cloud reaches the ground.
- E** Explain how the conjunctions help the reader understand the processes of a thunderstorm.
- E** Why do you think parents tell children a thunderstorm is just, “sky gods feeling cross or giants playing bowls”?
- I** Why does the author call a thunderstorm an “exhilarating experience”?