



How does lightning form and how do we detect it?

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Lightning is essentially a giant spark that occurs either within a cloud or between the cloud and the ground. The charge and lightning develops because of tiny collisions between ice particles within the cloud. This happens millions of times per second and as these charge particles then spread apart within the cloud larger regions of charge develop and when this charge gets large enough a lightning strike occurs. When the lightning connects with the ground it starts off as what is called a step leader which is a channel that grows or steps from the base of the cloud towards the ground and as it steps towards the ground, when it finally connects a full channel is created and what is called the return stroke occurs which is the lightning flash that you see.

People refer to lightning flashes and lightning strikes and they have their own defined meanings in terms of lightning terminology. A lightning flash is what you can see but it might be made up of several lightning strokes which are individual pulses of current separated up hundredths of a second. A single lightning flash might be made up of a number of strokes or pulses of current. A lightning strike is essentially a cloud to ground lightning stroke where it strikes the ground which is where the term comes from.

Positive lightning occurs when the positively charged upper part of the cloud connects to the ground as a lightning strike opposed to the negatively charged part in the base of the cloud. When positive lightning strikes it has to go around the negatively charged part of the bottom of the cloud and so the lightning channel extends around the outside of the cloud. This kind of lightning strike is generally more powerful and because it can strike away from the cloud it can lead to what is known as a 'bolt from the blue'.

Thunderstorms develop when the atmosphere is said to be unstable. That means that it's warm air underneath much colder air and the warm air wants to rise up through the atmosphere in the same way that warm moist air rises from a kettle when it's boiling. This generally occurs in the summer when there's lots of warm air around and plenty of heat and moisture, but less commonly it can occur in Winter and this does lead to what's known as thunder snow when thunderstorms occur when it's snowing.

When lightning strikes it sends out pulses of radio waves and these can be used to detect lightning strokes. You can either use triangulation to work out the direction the lightning strike came from and locate lightning in that way or you can use the arrival time of the radio wave at a number of very spread out stations. We use a technique called multilateration. The Met Office lightning detection network uses later case where we have sensors dotted around Europe and use the arrival time differences between the radio waves arriving at each station to locate the lightning strike.