Short Safety Subject

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Why Do Some Clouds Produce Lightning And Others Don't?

Lightning Is A Random, Chaotic And Dangerous Fact Of Nature.

At any given moment, there are 1,800 thunderstorms in progress somewhere on the earth. This amounts to 16 million storms each year! For as long as humans have watched the skies, lightning has fascinated and frightened them. Scientists that study lightning have a better understanding today of the process that produces lightning, but there is still more to learn about the role of solar flares that impact the upper atmosphere, the earth's electromagnetic field, and ice in storms. We know the cloud conditions necessary to produce lightning, but cannot forecast the location or time of the next stroke of lightning from a storm. There are lightning detection systems in the United States and they monitor an average of 25 million strokes of lightning from the cloud to ground every year!

Lightning has been seen in volcanic eruptions, extremely intense forest fires, surface nuclear detonations, heavy snowstorms, and in large hurricanes. However it is most often seen in individual thunderstorms. A thunderstorm forms in air that has three components: moisture, instability and something such as a cold front to cause the air to rise. Continued rising motions within the storm may build the cloud to a height of 35,000 to 60,000 feet (6 to 10 miles) above sea level. Temperatures higher in the atmosphere are much colder, and ice forms in the higher parts of the cloud.

Ice In The Cloud Is Critical To The Lightning Process.

The formation of ice in a cloud appears to be a very important element in the development of lightning and those storms that fail to produce quantities of ice may also fail to produce lightning. In a storm, the ice particles vary in size from small ice crystals to larger hailstones, but in the rising and sinking motions within the storm there are a lot of collisions between the particles. This causes a separation of electrical charges. Positively charged ice crystals rise to the top of the thunderstorm, and negatively charged ice particles and hailstones drop to the middle and lower parts of the storm. Enormous charge differences (electrical differential) develops.

How Lightning Develops Between The Cloud And The Ground.

A moving thunderstorm gathers another pool of positively charged particles along the ground that travel with the storm. As the differences in charges continue to increase, positively charged

particles rise up taller objects such as trees, houses, and telephone poles. Have you ever been under a storm and had your hair stand up? Yes, the particles also can move up you! This is one of nature's warning signs that says you are in the wrong place, and you may be a lightning target! The negatively charged area in the storm will send out a charge toward the ground called a stepped leader. It is invisible to the human eye, and moves in steps in less than a second toward the ground. When it gets close to the ground, it is attracted by all these positively charged objects, and a channel develops. You see the electrical transfer in this channel as lightning. There may be several return strokes of electricity within the established channel that you will see as flickering lightning.

Thunder.

The lightning channel heats rapidly to 30,000 degrees. The rapid expansion of heated air causes the thunder. Since light travels faster than sound in the atmosphere, the sound will be heard after the lightning. If you are ever in a storm when you see the lightning and hear the thunder at the same time, that lightning is in your neighborhood!

Negative Lightning And Positive Lightning.

Not all lightning forms in the negatively charged area low in the thunderstorm cloud. Some lightning originates in the cirrus anvil at the top of the thunderstorm. This area carries a large positive charge, and lightning from this area is called positive lightning. This type is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead or behind the thunderstorm. It can strike as far as 5 or 10 miles from the storm, in areas that most people do not consider to be a lightning risk area. The other problem with positive lightning is it typically has a longer duration, so fires are more easily ignited. Positive lightning usually carries a high peak electrical current, which increases the lightning risk to an individual.