The Science of Lightning

Lighting 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. 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.

Ice 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 in a storm. The collision of ice and water particles causes separation of the positive and negative electric charges in the particles. Positive charged ice particles tend to collect in the upper parts of the storm, with negative charged particles in the middle and lower parts of the storm. These opposite charges attract, thus "in-cloud" lightning is often produced.

Lightning to the Ground

As the negative particles gather at the bottom of the storm cloud, a pool of positively charged particles gather along the ground and travel with the storm. As the differences in charges increase, positively charged particles rise up taller objects such as trees, houses, and even people. If you are near a storm, and your hair stands on end, the particles are moving up you! The negative charged particles extend down from the cloud in "steps" and form a step leader. When it gets close enough to the ground or a tall object filled with positive particles, a channel is formed and an electrical transfer takes place. There can be several "strokes" which you see as flickering light. The channel heats to about 30,000 degrees Fahrenheit!. The rapid expansion of the heated air around the channel breaks the sound barrier, and you hear thunder.

One lightning stoke can generate between 100 million and 1 billion volts of electricity!

Number and rank of cloud-to-ground flashes by state 1997 - 2010

Flash Density Map: 1997 - 2010