THE
ATMOSPHERICRESERVOIR
Examining the Atmosphere and Atmospheric Resource Management

Learning About Lightning

By Mark D. Schneider

North Dakota State Water Commission employees are often found presenting water topics at schools and festivals across the state. The Atmospheric Resource Board division usually teaches about thunder, lightning, and hail and both children and teachers always learn something; especially about lightning. A student with long, straight hair is asked to participate in a lightning experiment by standing in front of the class. A balloon, representing a developing thunderstorm that has many different forms of water particles inside it, is then rubbed back and forth in the student's hair. The student's head serves as the earth in the experiment and when enough static electricity is produced between "thunderstorm" and "earth," the child's hair stands straight up when the balloon is lifted away. So, lightning is a powerful form of static electricity that is generated by opposite electrical charges between clouds and the earth.

Next in the classroom presentation is an "auction-style" class participation activity where all the students stand up and someone in the front row begins with a guess about how hot the average lightning bolt is in degrees Fahrenheit. Guesses usually begin around 200 to 300 degrees and then that student is asked to sit down so the next student can guess. This continues for quite a while until temperatures approach 54,000 degrees Fahrenheit and both kids and teachers are amazed by how hot lightning is. In fact, lightning is about five times hotter than the surface of the sun.

When asked which occurs first, thunder or lightning, even teachers are sometimes stumped by this question. Students and teachers who answer that lightning comes first are asked to pat themselves on the back for being correct and then discussion occurs about why this is true. The extremely hot lightning heats the air surrounding it very quickly and this air expands so rapidly that it breaks the speed of sound and creates a sonic boom known as thunder.

Knowing the speed of light and sound, a safety tip about judging one's distance from lightning can be calculated: every five seconds between seeing lightning and hearing its associated thunder equals one mile. Kids are told that this is a helpful tool, but that they should also go inside any time they can hear thunder or see lightning. This is because lightning can strike 10 to 15 miles ahead of a thunderstorm due to the "anvil" of high clouds that stretch out in front of it.

Myths about lightning are usually dispelled such as:

"The rubber from your tires keeps you safe from lightning inside of your car or truck." In reality, the frame of your vehicle acts as a "shell" around you, providing a pathway for the electrical charge.

"Lightning never strikes the same place twice." A thunderstorm can produce more than one lightning bolt striking the same location. The Empire State Building in New York City, for example, is struck by lightning 20 to 25 times per year!

"Bolts of lightning always originate in thunderstorm clouds and then move downward towards the Earth." Meteorologists call this lightning "cloud to ground" lightning, but in reality it's actually quite common for channels of electricity to originate at the Earth's surface and then move upward through the air until they connect with downward channels of charge from clouds. When the two channels or feeders meet, a pathway for the flow of electricity is created and lightning occurs.

Atmospheric Resource Board | North Dakota State Water Commission | 900 East Boulevard, Bismarck, ND 58505
(701) 328-2788 | http://swc.nd.gov

ND Weather Modification Association | PO Box 2599 | Bismarck, ND 58502 | (701) 223-4232