THE
ATMOSPHERICRESERVOIR
Examining the Atmosphere and Atmospheric Resource Management

"How To Make A Thunderstorm"

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Photo by Dave Hubberts.

The expression "cooking up a storm" is relevant to North Dakota thunderstorms because warm, moist, rising air serves as the main ingredient for their development. When water is boiled, steam rises upward much like the water vapor within a cumulus cloud. Our sun is the heat source for rising thermals of air and when our Earth's surface is heated unequally due to either differences in topography or *albedo* (the measure of a surface's reflectivity), air in the lower atmosphere begins to mix. This can trigger enough rising air to begin the formation of thunderstorms. Other triggers for thunderstorm development include frontal boundaries where air is converging together and warm air is lifted.

In the *cumulus stage* of thunderstorm development, air cools and water vapor condenses into clouds as it rises. Cloud droplets evaporate into the drier air surrounding the cumulus cloud, moistening the air and allowing successive updrafts to condense water vapor at higher levels. As cumulus clouds continue to grow, so do the water droplets and ice particles within them.

The *mature stage* of a thunderstorm is reached when both updrafts and downdrafts are occurring. Ice particles within the column of rising air become heavy enough to begin falling as precipitation. Most of these particles melt as they fall into warmer air below and become rain. The combination of water and ice particle movement within mature thunderstorms creates strong charges that are released as static electricity or what we commonly know as lightning. Lightning, which can exceed temperatures of 50,000 degrees Fahrenheit, heats the surrounding air expanding it outward in all directions faster than the speed of sound, creating thunder.

When widespread downdrafts occur in a thunderstorm and start to overtake its updrafts, the *dissipating stage* begins. Downdrafts deprive the thunderstorm of warm, moist air, which is the "fuel" source necessary to sustain cloud droplet development. The lower cloud bases of the dissipating thunderstorm then begin to evaporate with precipitation no longer reaching the ground.

When additional thunderstorms develop next to a dissipating storm, they're likely a result of its downdraft or outflow of cool, dense air. This air provides a lifting mechanism for warm, moist air in the nearby atmosphere and the whole thunderstorm formation process is repeated.

Not all thunderstorms are short-lived or have vertically oriented downdrafts that result in rapid dissipation. A *supercell* thunderstorm for example has a tilted, rotating updraft that allows precipitation to fall outside of the main updraft. *Squall-line* thunderstorms form along frontal boundaries and maintain themselves by continually "feeding" off of the warm, moist air that they're moving into. Both supercell and squall-line thunderstorms can last for many hours and are often associated with severe weather including strong winds, hail, and tornadoes.

Now that you're familiar with how thunderstorms develop, see if you can observe one "cooking" up in your backyard this summer!

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