THE
ATMOSPHERICRESERVOIR
Examining the Atmosphere and Atmospheric Resource Management

THUNDERSTRUCK

By Mark D. Schneider

North Dakota's thunderstorm season has returned and most of us could use a brief refresher. Warm, moist, rising air in the lower atmosphere is needed to condense into clouds that make up the ***cumulus stage*** of thunderstorm development. When you're boiling water at home, the steam rises upward much like the water vapor within a cumulus cloud. Our sun serves as 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. Frontal boundaries where air is converging together can also serve as triggers for thunderstorms and begin lifting the air. Once water vapor has condensed into clouds, the cloud droplets can evaporate into the drier, surrounding air and moisten it. This allows the successive updrafts to condense water vapor at higher levels of the atmosphere. As cumulus clouds continue to grow, so do the water droplets and ice particles within them.

Greg Gust, Warning Coordination Meteorologist (WCM) for the Fargo-Grand Forks National Weather Service (NWS) Forecast Office makes the point that, "the faster you can lift warm, moist air and the deeper the layer of the atmosphere you can lift it through, the bigger the storms."

A thunderstorm reaches its ***mature stage*** 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; what is commonly known 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.

John Paul Martin, WCM for the Bismarck NWS Forecast Office reminds us that, "regardless of where we are in the life cycle of a thunderstorm or what type or how intense it is, every thunderstorm is potentially life-threatening due to lightning."

Photo of a developing thunderstorm by Herb Ballou.

When widespread downdrafts occur within a thunderstorm and begin overtaking 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. If 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.

Regardless of the type of thunderstorms you observe this season, keep a safe distance away and hope for plentiful growing season rains!

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