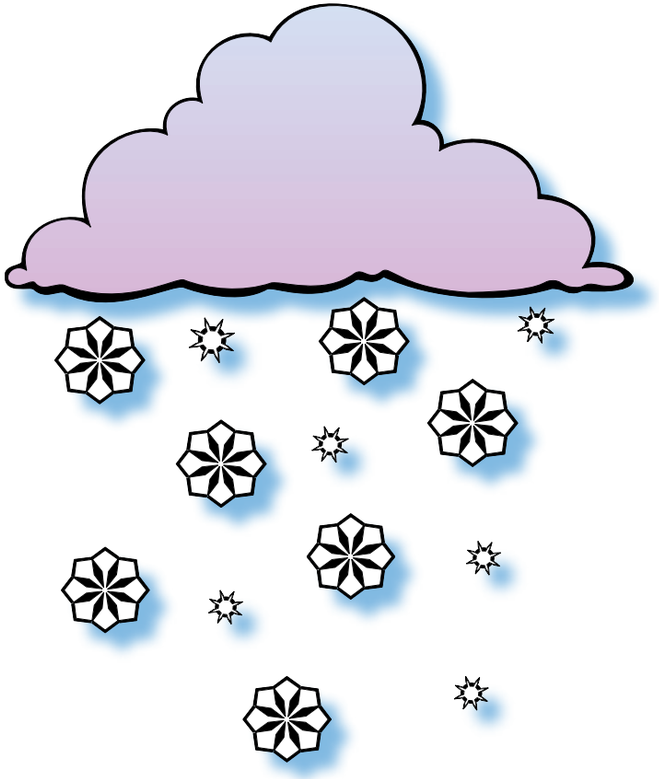
FROZEN AND FREEZING PRECIPITATION IN SOUTH CAROLINA



South Carolina frequently experiences what local meteorologists have dubbed a "mixed bag of wintry precipitation," which includes precipitation in the form of snow, sleet, freezing rain, and rain. Snow and sleet are considered frozen precipitation while freezing rain is, of course, freezing precipitation. Temperature change with height in the atmosphere ultimately determines the observed surface weather conditions.

Within the cloud where precipitation formation begins, ice crystals develop and grow until they become heavy enough to fall to the earth. If the temperature remains near or below freezing from the cloud to the ground, then snow is observed. Snow indicates a very deep and cold air mass is over your location (1). If sleet reaches the ground, the snowflake partially melted on its way down as it passed through a layer of above-freezing temperatures aloft. Near the surface, temperatures were below freezing over a deep enough layer to refreeze the melted snowflake into an ice pellet or sleet (2). In the case of freezing rain, the cold air at the surface is not deep enough to freeze the water droplet before it reaches the ground (3). Instead, the water freezes on contact with surfaces such as cars, trees, and power lines and forms a glaze. Rain occurs when the temperatures below the cloud are above freezing all the way to the earth's surface.

So, what causes the temperature to change with height?

In the troposphere, the lowest portion of the atmosphere where almost all weather occurs, temperature naturally decreases with height at a rate of roughly 10° F per kilometer. However, certain processes take place that can alter the standard vertical profile.

In South Carolina, the most common cause of mixed precipitation during the winter months is a phenomenon known as cold air damming or CAD. Northeast winds bring cold air south from eastern Canada across New England. As the cold, dense air approaches the Appalachian Mountains from the east, the air is forced southward when it is unable to cross over the terrain barrier. This forms a wedge of cold, dry air along the eastern seaboard reaching as far south as southern Georgia and northern Florida at times. As the wedge moves south, it displaces the warm air at the surface and lifts it up and over the top of the arctic air mass as a "warm nose." The warm air aloft needed to melt snowflakes into sleet, freezing rain, and rain is now available.

Since the CAD is indeed sloped like a wedge, various depths of cold air can exist over a very short horizontal distance. In South Carolina, the climatologically favored region for snow during a cold air damming event is along and north of Interstate 85 in the Upstate. Sleet generally falls south of this line across the southern Upstate while freezing rain is favored in the northern Midlands from Newberry County to Chesterfield and Lancaster counties along the North Carolina-South Carolina border. Thus, over a distance of less than 150 miles from Greenville to Columbia, all the major winter-time precipitation types can occur simultaneously.

Although South Carolina is protected from arctic outbreaks moving into the United States from central Canada on northwest winds, the menagerie of snow, sleet, freezing rain, and rain still remains a threat when cold air damming engulfs the eastern slopes of the Appalachian Mountains.

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