

How Twisters Get Their Spin

Source: <http://sci.tech-archive.net/Archive/sci.physics/2009-01/msg00263.html>

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 - *Date:* Mon, 05 Jan 2009 23:34:41 GMT
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<http://sciencenow.sciencemag.org/cgi/content/full/2009/105/2>

By Phil Berardelli

ScienceNOW Daily News

5 January 2009

Researchers using high-resolution computer simulations have discovered that the size of raindrops or hailstones inside a storm cloud influences whether that cloud will spark a severe thunderstorm or spawn an even more destructive tornado. The findings could lead to a better understanding of these fierce storms, although scientists are a long way from controlling or preventing them.

Tornadoes touch down about 800 times each year in the United States, causing hundreds of deaths and billions of dollars in property damage. After studying the storms for years, including chasing them down in instrument-laden vehicles, researchers have learned that twisters spin into being when warm, humid air gathers ahead of a cold front—commonly known as a dryline. They've also suspected for some time that the size of water droplets inside a cloud has something to do with twister creation. But until now, no one had been able to track the droplets to determine how they unleash such a powerful force.

Taking advantage of more powerful supercomputers, two meteorologists at the University of Oklahoma, Norman, may have accomplished precisely that task. Nathan Snook and Ming Xue ran simulations using six varieties of potential tornado fodder: large hailstones, small hailstones, large raindrops, small raindrops, large hailstones and raindrops in combination, and small hailstones and raindrops. In the 20 December issue of *Geophysical Research Letters*, the researchers report that the formation of a supercell—the type of storm cloud from which tornadoes emerge—is highly sensitive to the size of the water droplets. With large enough droplets, the surrounding air begins to take on the familiar cyclonic pattern. That's because larger varieties resist evaporation, which cools less air beneath the storm. That warmer air in turn permits the storm to connect the low-level air, in which the cyclonic pattern forms, to the updraft that provides the sucking force of the tornado. Small droplets, by contrast, tend to evaporate in droves, losing their energy before falling lightly to earth.

It's a "solid piece of work" that is based "on some very sophisticated simulations," says meteorologist William Cotton of Colorado State University in Fort Collins. The research shows that smaller raindrops increase evaporation, "which in turn decreases the chance of tornado formation." Such knowledge might someday help scientists to curb tornado formation, Cotton adds, but because the storms are "affected by many things in addition to raindrop size and rainfall rates, it would be tough to determine when it could be effective."