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### ***Summer Thunderstorms May Become More Predictable***

BOULDER—Meteorologists have long known that summer thunderstorms and heavy rains are difficult to predict. They pop up quickly and disappear within a few short hours. But after looking at large numbers of radar images over four years, scientists at the National Center for Atmospheric Research (NCAR) have discovered a systematic pattern of rainfall across the continent, day after day. That knowledge should make the rainiest summer thunderstorms more predictable.

The analysis of 50,000 summertime radar images showed that the movement of blocks of enhanced rainfall from west to east, from the Rockies toward the Appalachians, is an identifiable pattern, even when traditional weather maps show none of the typical weather patterns, such as fronts or low pressure systems.

These eastward-moving blocks of enhanced thunderstorm activity still have individual storms popping up quickly and disappearing in a few hours, but it appears that the older storms actually give birth to new storms as the activity moves across the country. Thus, there is a much greater chance that a particular location will feel the effects of a thunderstorm when one of the activity areas is passing by, rather than either before or after it.

“Heavy rain from thunderstorms is hard to predict because these storms are mostly local, don’t last very long, and exhibit chaotic behavior in their evolution,” said Richard Carbone, lead author of a paper appearing in the July 1 issue of the American Meteorological Society’s *Journal of Atmospheric Science*. “But our work shows some clusters of storms actually spawn new clusters of storms. If we can follow this pattern, we may be able to greatly improve our predictions of where the new storms will develop.”

A senior scientist at NCAR, Carbone and his colleagues applied sophisticated computer processing techniques to vast quantities of data containing radar imagery of summer thunderstorms between 1997 and 2000. By compiling the images they found a distinct pattern of old storms generating new storms downstream.

“We can track the signal associated with afternoon thunderstorms in the west to new thunderstorms across the country more than 500 miles on a typical midsummer day” added Carbone. “Some of these storms or ‘episodes’ last up to two days and 1,500 miles, even though ordinary thunderstorms last about an hour and organized groups of thunderstorms three to ten hours. You could say, for example, that yesterday’s storms in Colorado have a lot to do with the likelihood of storms in Chicago today—and watch out on the East Coast tomorrow!”

Mountains and storm-created “waviness” in the atmosphere are mostly responsible for starting weather systems on their way across the country. But what links some of the thunderstorms together is still a mystery, said Carbone.

“We haven’t discovered the ‘silver bullet’ yet—what ties these sequences of storms together—but we’ve got some ideas,” said Carbone. Ongoing research by Carbone and his collaborators includes looking

more deeply into how these episodes of enhanced thunderstorm activity form and what controls the speed at which they propagate across the central United States. If the underlying mechanisms can be brought to light, that information can be used to improve forecasts of thunderstorm activity in the summer months.

Carbone's thunderstorm research was funded primarily by the U.S. Weather Research Program. NCAR ([www.ncar.ucar.edu](http://www.ncar.ucar.edu)) is a national research laboratory managed by a consortium of 66 universities offering Ph.D.s in the atmospheric and related sciences. NCAR's primary sponsor is the National Science Foundation. The AMS (<http://www.ametsoc.org/ams>) is the nation's leading professional society for scientists in the atmospheric and related sciences.

**Note to Editors:** PDF or faxed copies of the paper are available to journalists from Stephanie Kenitzer, AMS press office (425-432-2192) or [kenitzer@dc.ametsoc.org](mailto:kenitzer@dc.ametsoc.org).

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