DallasNews.com
The Dallas Morning News
January 5, 2004





# Archive

Search Tips | Terms/Conditions | Obituary Archive

Hot cities spawn storms
Space-based radar confirms that summer rainfall levels are higher downwind

**By SARAH GOFORTH Staff Writer**
Published July 8, 2002
**Click here** to go back to results.

If you can't stand the heat, get out of the city. But be warned, scientists say: If you head downwind, take an umbrella.

NASA researchers have confirmed that summer rainfall levels are higher downwind of major cities than in upwind regions or in the cities themselves. Using the world's first space-based rain radar, the researchers found that summer rainfall rates northeast of Dallas, for example, were 32 percent higher than in the upwind region west of the city.
Scientists have studied the ways cities change climate patterns for decades and have known for almost as long about the rain-generating effects of so-called "urban heat islands." Now, using the radar system aboard NASA's Tropical Rainfall Measuring Mission satellite, researchers can monitor rainfall patterns on a global scale, over long periods of time.
In recent years, scientists have used ground radar and computer simulations to examine how the extra heat from Atlanta and St. Louis shapes weather systems. Such techniques are limited in range and sensitivity, though. The TRMM satellite can detect and measure rainfall patterns over a swath of land around the Earth's entire midsection. The satellite's scope ranges as far north as the central United States and about as far south as mid-Argentina.
J. Marshall Shepherd and his colleagues at NASA's Goddard Space Flight Center in Greenbelt, Md., found that when combined with sophisticated computer models, the satellite's latest data demonstrate a clear "heat island effect" around all of the cities the researchers examined. The team's findings, which appear in the July issue of the Journal of Applied Meteorology, also provide NASA's first comprehensive look at how local rainfall patterns are shaped by the Dallas heat island.
Urban heat islands are so named because metropolitan areas such as Dallas are hotter than outlying regions. Buildings, roads and other artificial surfaces retain heat, which builds to create an overall warming of the city. Cars and air conditioners compound the problem, producing smog and more heat. Heat islands can be up to 10 degrees Fahrenheit warmer than surrounding suburbs, which usually have fewer dark surfaces and are cooled by tree shade.
"Critics have suggested in the past that the urban heat island effects that were measured in cities like Atlanta and St. Louis were isolated events," Dr. Shepherd says. "We know now that the phenomenon isn't isolated. ... Human influence can actually change the natural water cycle system."
TRMM was launched in 1997 as a joint U.S.-Japanese venture to advance the understanding of global energy and water cycles. Over the next three years, the NASA group monitored rainfall around six U.S. cities: Dallas, Waco, Austin and San Antonio; Atlanta; and Montgomery, Ala.
The researchers chose cities with few geographical elements likely to affect rainfall patterns, such as mountains or large bodies of water. Texas' Interstate 35 corridor was ideal for the study, Dr. Shepherd says, because it threads through a string of cities, is fairly flat, and is not bordered by major lakes or rivers.
Since heat island effects are most pronounced during warmer times of year, the researchers measured rainfall during the summer months only. For the six cities studied, the average three-year summer rainfall rates were 28.4 percent higher downwind of the cities than upwind.
Thomas Bell, a senior scientist at Goddard, says these effects were larger than he expected. And since the satellite's observations are measured consistently over long periods of time, Dr. Bell says, "it gives you data in a clean way, that you're never confident about with ground-based observations."
Scientists don't completely understand how the rain patterns around these sweltering cities

develop. But, Dr. Shepherd says, there are two probable causes. One is that warm city air tends to rise. As cooler streams rush in to replace it, convective clouds - the kind that typically produce intense rain, often in the form of thunderstorms - form from the warm air above.

Another possibility is that congregations of tall buildings may disturb natural air streams in a way that produces more clouds. When two wind currents collide in a city's center, they rise like the front ends of two trains crashing into each other. These air streams may create new clouds or enhance existing ones, Dr. Shepherd says. As they are pushed away from the city by prevailing winds, the clouds often release rain in their wake.

The U.N. Population Fund has estimated that by 2025, 80 percent of the world's people will live in cities. Scientists hope that future TRMM projects will help them understand and scrutinize the climate-altering effects of other world cities - particularly in areas where ground-based technologies are sparse and data have not been collected. The hope is that the information gleaned from satellites such as the TRMM will help urban planners and agriculturists use land wisely, and that climate experts will be better able to predict weather patterns.

"This particular satellite has been extraordinarily successful," Dr. Bell says. "It might be that when the government begins to understand the level of the [heat island] effect, they might say, 'Well, maybe we should plant more trees, as well as build more highways.' "

E-mail sgoforth@dallasnews.com