

Oklahoma Tornado Sets Wind Record

Tornado-chasing scientists in Oklahoma last week measured wind speeds of 318 miles per hour, the highest ever documented on Earth. These radar observations, which still must be verified, also captured the birth of a tornado and will help researchers unravel the conditions that spawn such killer storms.

"It's really fascinating watching this tornado come together. That was the first time we were positioned so well with the radar to get these data," says Joshua Wurman, an atmospheric scientist at the University of Oklahoma in Norman. Wurman and his team used two Doppler radars mounted on separate trucks to study the tornadoes that ravaged the Oklahoma City area on May 3.

The Doppler radars, cousins of police radar guns, gauge wind speed by shooting pulses of microwaves that reflect off rain, dust, and other objects in the air (SN: 6/22/96, p. 388). The new wind speed measurement by one of Wurman's radars shatters the previous record of 286 mph, taken during a 1991 tornado by atmospheric scientist Howard B. Bluestein of the University of Oklahoma. He had used a more primitive Doppler radar.

"If this measurement holds up, it will be a remarkable thing," says Joseph H. Golden, a research meteorologist with the National Oceanic and Atmospheric Administration in Silver Spring, Md. He cautions, though, that "everybody has to be careful until people have a chance to sift through these data."

The Doppler radars measure winds more than 65 feet above the ground, making it difficult to compare these data with the Fujita scale, used to assess tornado damage to houses and other objects on the ground, says Wurman. The

strongest documented tornadoes, designated F-5, carry frame houses considerable distances, send automobiles flying, and strip the bark off trees.

The late Tetsuya Theodore Fujita, who designed the scale, estimated that F-5 tornadoes have wind speeds of 261 to 318 mph just above the surface. Meteorologists, however, consider these numbers only rough guides. "The F scale has never been well calibrated, particularly at the F-4 and F-5 damage categories," says Golden.

Last week's record winds will help scientists probe the speed limits of the atmosphere, where friction and other forces put the brakes on flowing air, says Wurman. "There have always been questions about how high wind speeds could get."

Before recording the top wind speed, Wurman's team captured the birth of this violent tornado, which eventually passed through Oklahoma City. The researchers observed the storm for 8 minutes before the tornado's birth and then documented the first 6 minutes of its life.

Tornadoes develop when winds high above the ground flow at a different speed than winds near the surface, causing the air to roll along a horizontal axis, like the wheels of a car. If a thunderstorm is brewing at the same time, updrafts and downdrafts can tilt the rolling winds so that they spin around a vertical axis, setting a broad region of the storm slowly rotating. Meteorologists call such a storm a mesocyclone.

"What's not well understood is how the mesocyclone then spawns a tornado," says Wurman.

The data collected last week are expected to shed some light on that process and others, as different teams analyze their gigabytes of measurements. Bluestein and his coworkers studied some of the same Oklahoma storms using a Doppler radar with much higher resolution, designed by Andrew L. Pazmany of the University of Massachusetts at Amherst. "These are the highest-resolution images anyone's ever gotten inside a tornado," says Bluestein.

—R. Monastersky

Depression, sadness yield brain link

Major depression includes not only feelings of intense sadness and despair but also a wandering, indecisive train of thought. Distinct brain areas involved in emotion and attention together foster both depression and ordinary bouts of sadness, according to a new study.

Specific changes in these neural regions accompany recovery from major depression, whether achieved with an antidepressant drug or placebo pills, says a team of neuroscientists led by Helen S. Mayberg of the Rotman Research Institute in Toronto.

"The negative influence of depressed mood on attention is probably due to functional connections between these two brain regions," Mayberg says. "Successful treatment, including placebo use, alters those connections."

Mayberg's group first took positron emission tomography (PET) scans of eight women resting and after recalling a sad personal experience. The PET scans measured blood-flow changes in their brains, an indirect sign of boosts or drops in brain-cell activity. None of the women or their family members had been diagnosed with mood disorders.

In a second trial, the researchers took PET scans of eight men before and after successful treatment for major depression. Over 6 weeks, four men had improved after taking the antidepressant

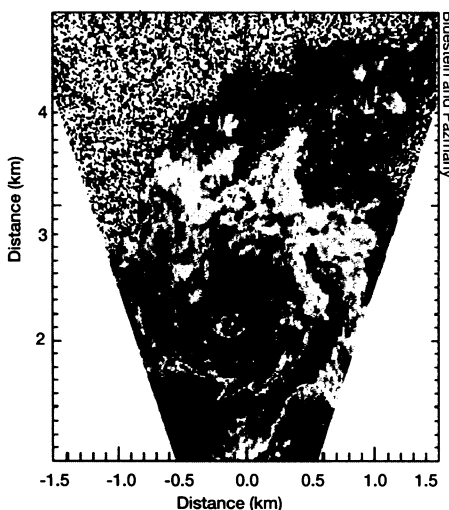
drug fluoxetine (Prozac); the rest had rallied in response to pills that they thought might be antidepressants but that contained no active ingredients.

When the women recalled sad experiences, blood-flow surged in a pair of the inner brain structures that regulate emotional responses and declined in two parts of the brain's outer layer previously linked to attention, the team reports in the May AMERICAN JOURNAL OF PSYCHIATRY. The men who had recovered from depression showed unusually high activity in the two attention areas and low activity in the emotion areas.

Before recovery, however, the depressed men had exhibited marked overactivity in only one of the two emotion-related areas characteristic of brief sadness in the women. Further research will examine more closely the processes that occur during depression, Mayberg says.

The findings suggest that a brain circuit incorporating emotion and attention "offers a plausible converging point" for antidepressant effects of drugs and psychotherapy, remark psychiatrist Charles B. Nemeroff of Emory University School of Medicine in Atlanta and his coworkers in an accompanying editorial.

Researchers haven't yet explored brain function in the substantial minority of depressed people who don't benefit from treatment, Mayberg adds.—B. Bower



Doppler radar picture of one of the Oklahoma tornadoes on May 3.