

NADP Precipitation Samples Track 2004 U.S. Dust Storm

Karen Harlin, Scott Dossett, Tracy Dombek, and John Ingrum
 Central Analytical Laboratory
 National Atmospheric Deposition Program
 Illinois State Water Survey
 Champaign, Illinois, 61820, USA

OVERVIEW

In late February 2004, a strong storm moved across the U.S. from the Southwest. The storm generated a large dust cloud that was tracked using hourly nation-wide NEXRAD composites. Calcium levels in NADP- National Trends Network (NTN) precipitation samples obtained for that period tracked well with the path of the storm. A rain sample collected at the Illinois State Water Survey on February 20th also contained a large amount of fine brown dust from this storm as it crossed central Illinois. Electron micrographs of the particulate material in this sample were performed and revealed a bimodal size distribution of 1-2 µm and 15-20 µm particles. In addition to the regular analyses that the CAL performs, these samples were also analyzed for cadmium, chromium, cobalt, copper, iron, manganese, nickel, strontium, vanadium and zinc by Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES). NTN protocol was followed and samples were filtered (0.45 µm) prior to analysis but were not acidified. All of the samples had traces of copper, most had traces of manganese, zinc, and strontium and some had traces of iron. A strong correlation was apparent between pH and the amount of copper and iron found in the samples.

The authors thank Pam Bedient for her expertise in poster preparation, Roger Claybrooke for preparing calcium storm maps, and CAL staff for their assistance.

URGENT - WEATHER MESSAGE
 NATIONAL WEATHER SERVICE EL PASO TX
 320 PM MST WED FEB 18 2004

...STRONG WINDS AND BLOWING DUST TO DEVELOP THURSDAY ACROSS SOUTHERN NEW MEXICO AND FAR WEST TEXAS... A PACIFIC FRONTAL SYSTEM WILL MOVE ACROSS THE AREA THURSDAY... INCREASING WINDS AND PRODUCING SOME BLOWING DUST.

URGENT - WEATHER MESSAGE
 NATIONAL WEATHER SERVICE MIDLAND/ODESSA TX
 422 AM CST THU FEB 19 2004

...A SIGNIFICANT HIGH WIND EVENT IS EXPECTED OVER SOUTHEAST NEW MEXICO AND MOST OF WEST TEXAS TODAY WITH THE POSSIBILITY OF BLOWING DUST...
A STRONG UPPER LEVEL STORM SYSTEM THAT WAS LOCATED OVER ARIZONA EARLY THIS MORNING WILL QUICKLY MOVE EAST...AND WILL PASS OVER THE TEXAS PANHANDLE THIS AFTERNOON. THIS FEATURE WILL RESULT IN VERY HIGH WINDS IN THE GUADALUPE AND DAVIS MOUNTAINS.
AREAS OF BLOWING DUST MAY ALSO REDUCE VISIBILITIES TO LESS THAN ONE MILE.

From: Springfield Journal Register 2/21/04
LOCAL / STATE
Texas Dust Falls in Illinois Rain

By Abby Rosen and Peter (reprinted by Scott Dossett)
 Friday's rain was supposed to help ease away the silt and sludge of water. Instead, it added to the mess, dropping a layer of dirt all the way from Texas.

It was a classic case of one state dumping on another.

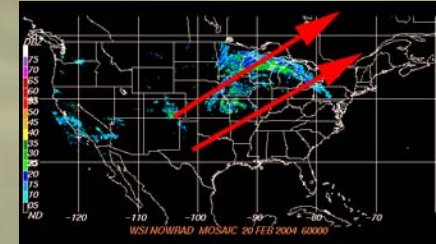
Meteorologist James Auten, with the National Weather Service in Lincoln (IL) said Thursday dust storm in Texas was most likely to blame. "They had really strong winds" he said of Texas. "And the dust is fine enough it could be lifted into the atmosphere and carried northeast into this area."

Auten said the phenomenon of dust traveling hundreds of miles is unusual, but when the conditions are right—dry, very windy and with a strong (weather) system—it is possible.

"We got a lot of wind Friday," Auten said. "And the dust was 4000 to 5000 feet above the surface, which helped it make it all the way here."
 "Dirt on the lighter colored cars looked like mud!"

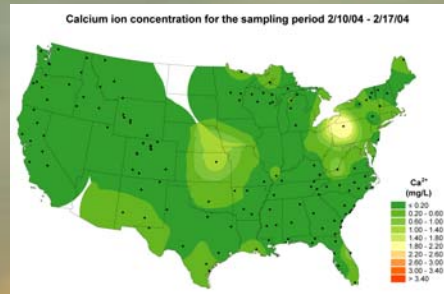
The dust storm was no minor inconvenience in Texas where it contributed to as many as 30 vehicles crashing Thursday on U.S. 84 between Southland and Post.

Pat Jacobs didn't know what to make of the brown splatters all over her car, but she knew it would mean good business for her employer, Sparkling Clean Car Wash, 3001 Landwehr Blvd.

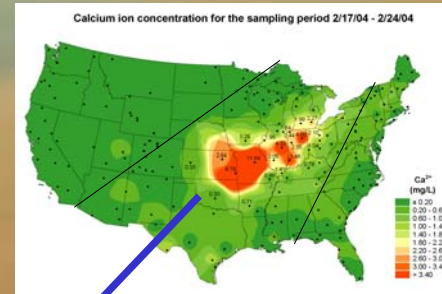


Hourly NEXRAD summaries for the period 19 to 21 February clearly show a strong, large thunderstorm system starting to deliver precipitation to the panhandle of Texas. It then establishes a path toward the central Mississippi Valley (continually delivering precipitation) and then curving slightly more easterly on line with the St. Lawrence seaway. See also the PC slide show below.

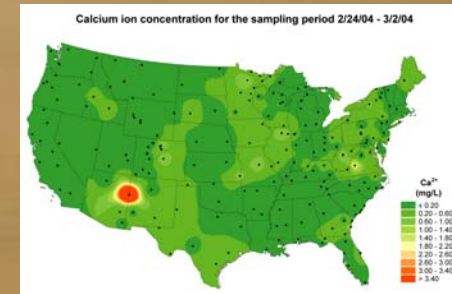
Week Preceding Storm



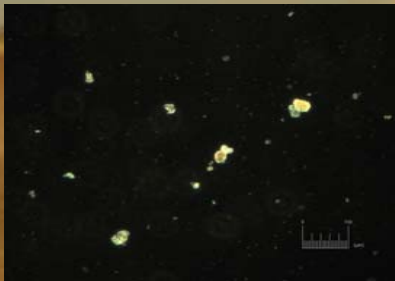
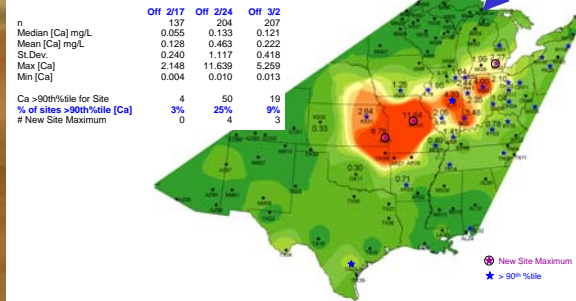
Week of Storm



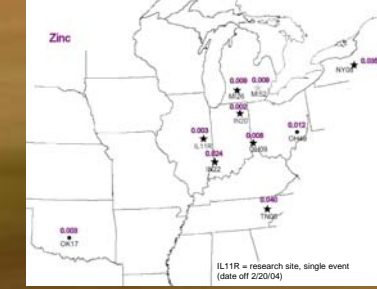
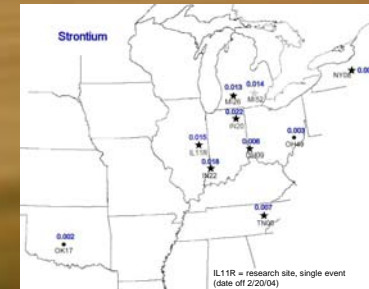
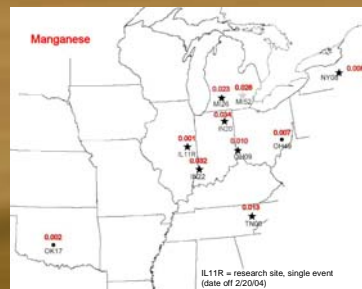
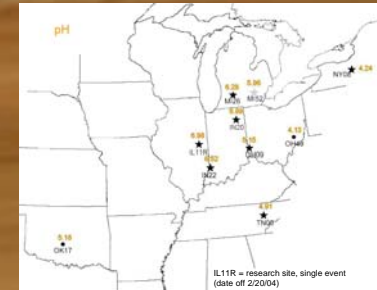
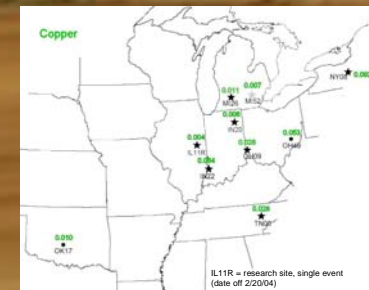
Week After Storm



Calcium values preceding, during, and after storm



Unfiltered samples of the precipitation event were analyzed using a Zeiss Axiovert 100 inverted research-grade microscope configured to perform fluorescence microscopy as well as differential-interference contrast fluorescence microscopy. Results seem to indicate a bi-modal distribution of material size. Many small particles were seen in the 1-5 µ range and smaller numbers of well defined 20-60µ particles. It is assumed these are condensation nuclei and soil material respectively. This true color image shows the brown dust color noted in news reporting of this event.



- Common Items and their respective particle sizes:**
- Postage Stamp, 1 inch high: 25,400 microns
 - Eye of a Needle: 1,230 microns
 - Human Hair: 40 to 300 microns
 - Oil Smoke: 0.03 to 1 micron
 - Fertilizer: 10 to 1000 microns
 - Tobacco Smoke: 0.01 to 1 microns
 - Coal Dust: 1 to 100 microns
 - Beach Sand: 100 to 2000 microns
 - Mold Spores: 10 to 30 microns
 - Pollens: 10 to 1000 microns
 - Typical Atmospheric Dust: 0.001 to 30 microns

