ILLINOIS   Volume 1 Issue 2 - Summer 2010

Prairie State Precip

Inside this issue:

What's So Special About This Gauge?

A visit your local home improvement store will show that there are a variety of rain gauges available. The come in all sizes and a number of shapes. If measuring rain is so apparently simple, isn't one rain gauge as good as another? Simply, the answer is "no". Some garden gauges are more decorative than accurate. Scales are different and capacities are different. For example, you may have seen or used a wedge gauge. These aren't bad for small amounts of rain because of the enlarged scale on the low end, but they require significant "estimation" of amounts at the high end because of the coarse scale. Many weather enthusiasts use the electronic digital rain gauges that come with weather stations. These are great for determining when it rained, but can have large errors when rain is heavy or during cold weather. Studies have shown that the majority of automated rain gauges, when summed over several months or years, report less precipitation than actually fell by a significant amount - sometimes 25 percent or more.

The "official" rain gauge used by the National Weather Service is an eight-inch gauge. It has a capacity of two inches in the inner measuring tube and 20 inches overall. They are currently made of stainless steel, although some copper gauges are still in use. The four-inch plastic gauge we use for CoCoRaHS is a smaller version of the standard rain gauge, and measurements from it compare favorably with the standard NWS gauge. Tests conducted by the Colorado Climate Center indicate that the CoCoRaHS gauge has a collection efficiency of 101-105% compared to the standard NWS gauge. For climate data and research applications, as well as supporting the "NowCasting" goals of the National Weather Service, we require everyone to use the 4-inch diameter high capacity manual rain gauge.

The Standard Rain Gauge

- *Compares well with NWS official 8 inch gauge*
- *Four inch diameter, 11 inch capacity.*
- *All observers using the same rain gauge minimizes "instrument error"*

On the right is the 8-inch standard rain gauge used by the National Weather Service. On the right is a wedge gauge, often found in garden and hardware stores.

Getting the Gunk Out - Cleaning Your Rain Gauge

During the warm spring and summer months, in particular, the inner measuring tube of your rain gauge can accumulate dirt, bugs, bird droppings, and even an algae growth. Keeping the inner measuring tube clean makes it much easier to read the rain gauge, and it sure looks a lot better!

There a couple of ways to clean the tube. I first like to put a little household bleach in the tube (a couple of hundredths worth). That especially will help dissolve any algae (the green stuff). Use a soft bottle brush with a handle long enough to reach the bottom of the tube to clean out the bottom, and then rinse thoroughly. If you don't have a suitable bottle brush, take a double sheet of newspaper and roll it into a tight tube. Insert it to the bottom of the measuring tube and give it a few spins.

Remove the roll of newspaper, rinse, and you should have a sparkling clean inner measuring tube. If your outer tube needs cleaning, it is large enough to wash in a sink with any dishwashing detergent.

Rainstorms, CoCoRaHS, and Civil Engineering

By John M. Whitt, P.E., P.L.S., CFM

"But, to the rescue comes CoCoRaHS. On occasion I have been able to find CoCoRaHS information within blocks of a location that I am interested in with regard to drainage issues."

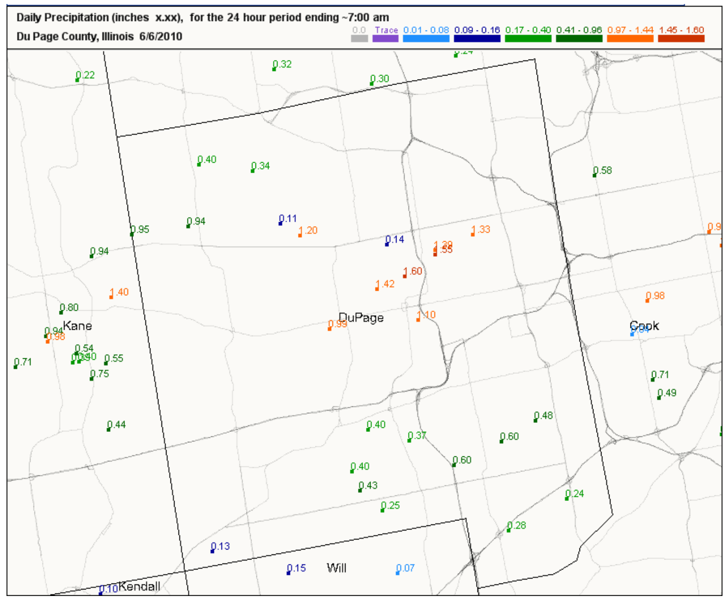
As a professional engineer, the CoCoRaHS network makes available to me a valuable source of data that I use in my job on a regular basis. Drainage-related issues, be it the design or analysis of stormwater infrastructure, evaluating modifications to riverine floodplains, or investigating flood damage claims for cause and origin, *are my bread-and-butter*. And, at the heart of this type of work is the need for information; accurate precipitation information. The National Weather Service (NWS), Midwest Regional Climate Center (MRCC), Illinois State Water Survey (ISWS), and other publicly recognized entities provide a wealth of information on severe rainstorm events. Unfortunately, however, these sources cannot alone provide the density of coverage of rainfall data that is helpful to have available when considering small local, or remotely isolated locations. From my experience, the CoCoRaHS network helps fill in the blanks and fill that need.

From practice, when requested by a client to investigate why or how a residence flooded, or what were the conditions that existed at the time of a drainage-related transportation infrastructure failure, researching all of the available sources of precipitation data is near the top of the list. Certainly, rainfall information from public sources is primary because of the manner of data collection and record keeping, and consequently its recognized quality and authoritative status. Additionally, publicly acquired data in many instances can provide information as to the time distribution of a storm event with precipitation readings to the hour, quarter-hour, or less. Unfortunately, the recording stations for this data may be miles away from where the house flooded or the bridge failed. But, to the rescue comes CoCoRaHS. On occasion I have been able to find CoCoRaHS information within blocks of a location that I am interested in with regard to drainage issues. This valuable volunteer-gathered information can then be used to supplement the more distant public data to create a clearer picture of a local condition. Further, under certain circumstances I have found it to be reasonable to apply the time distribution of a storm event, as recorded from a public source, to the precipitation

Rainstorms, CoCoRaHS, and Civil Engineering

data available on the CoCoRaHS network. The use of all of these clues together help me in forming a professional opinion based on fact, and *within reasonable engineering certainty*, as to why a flood damage situation occurred so to assist attorneys and insurance companies in resolving claims.

John Whitt is a Senior Project Manager with Rempe-Sharpe Consulting Engineers in Geneva and is CoCoRaHS IL-DP-74.



The density of CoCoRaHS reports paints a much more detailed picture of rainfall when combined with the "official" reports. In DuPage and Kane Counties combined, there are only 7 active NWS Coop Stations, plus the DuPage County Airport and Aurora Airport. On this map there are 26 reports in DuPage County and 24 in Kane County (not all are visible).

Dual-Polarimetric Doppler Radar Coming to Northern Illinois in January 2011

By Mark Ratzer, Senior Forecaster, National Weather Service, Romeoville

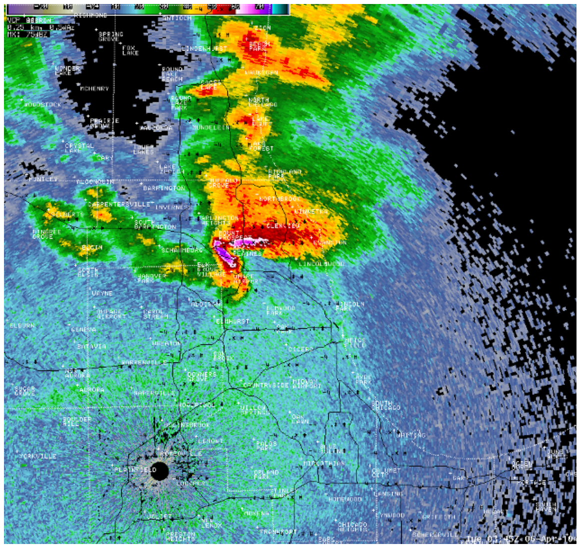
Dual-polarization of the WSR-88D is expected to result in several improvements to the data coming from the radar

The National Weather Service Chicago Forecast Office has been selected as one of the test sites for the new dual-polarimetric upgrade to the WSR-88D Doppler radar, beginning in January 2011. Dual-polarization of the WSR-88D is expected to result in several improvements to the data coming from the radar, including better estimation of rain and snowfall rates, the ability to discriminate rain from hail, and the identification of different precipitation types in winter storms. Dual-polarization should also provide better tools for delineating ground clutter from actual meteorological targets, which will also help to provide better rainfall estimation.

The WSR-88D radar at the NWS Forecast Office in Romeoville.

So what exactly is this "dual-polarization"? To answer this, we should perhaps first look briefly at how weather radar works. Radar (**Ra**dio **D**etection **a**nd **R**anging) works by sending out a brief pulse of radio signal, and waiting for a portion of that signal to be reflected back to the antenna. The larger or more reflective the target, the greater the portion of pulse energy is returned to the radar. The distance from the radar to the target is then calculated simply from the amount

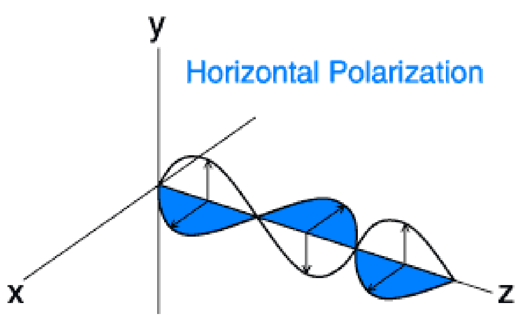
Dual-Doppler Radar



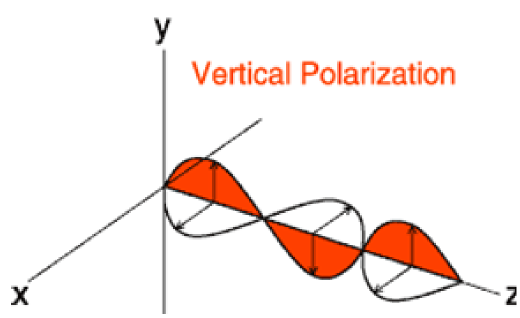
A reflectivity image of storms over northern Cook and southern Lake Counties.

of time that lapses from the initiation of the pulse, to the detection of the return signal. In simplest terms, the radar reflectivity you see on a radar image is simply the "reflected" pulse energy that is received by the radar.

Any radio wave, such as a microwave pulse sent by a weather radar, is a series of oscillating electromagnetic fields. If we could see them, they would look like this:



Horizontally polarized electromagnetic wave.



Vertically polarized electromagnetic wave.

...using dual-polarized radar, we can actually distinguish hail from liquid drops

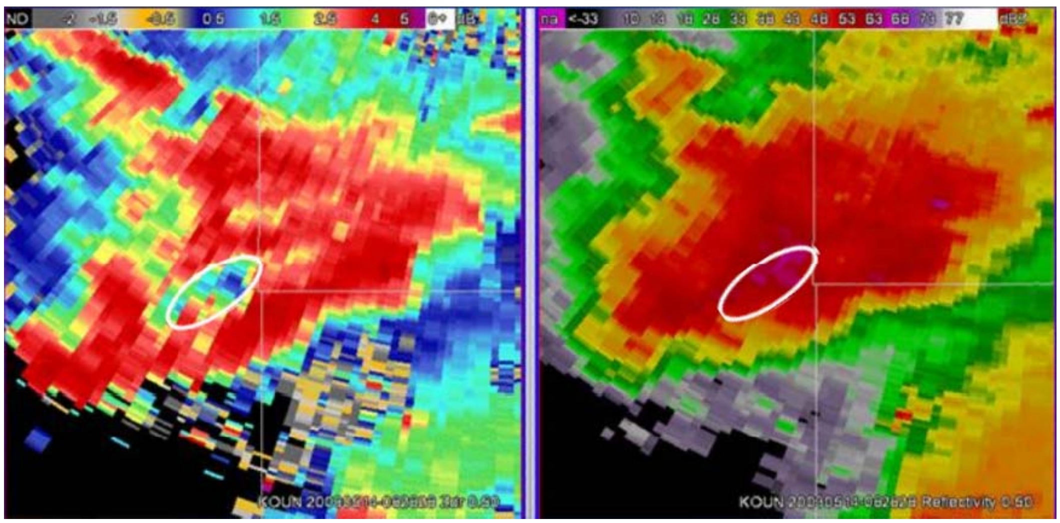
Most weather radars, the WSR-88D included, measure the reflected power returned only from the radar's horizontal pulse. Polarimetric radars, on the other hand, measure the reflected power returned from both the horizontal and vertical pulses. This is commonly done by alternating between horizontal and vertical polarization with each successive microwave pulse. This is where the term "dual-polarization" comes from.

Comparing the power returns from the horizontal and vertical pulses allows us to determine many things about the nature of the target. For example, large rain drops tend to flatten as they fall, taking on the shape of a hamburger bun. Because of this shape, the reflected energy in the horizontal phase of the radar pulse will be greater than that in the vertical. Smaller drops don't flatten as much, though still exhibit a slightly greater reflection in the horizontal phase. Hail stones on the other hand, tend to tumble as they fall. This results in an overall average spherical cross section which reflects equally in the horizontal and vertical phases. Thus by comparing the differential reflectivity using dual-polarized radar, we can actually distinguish hail from liquid drops, and can make some inferences about the sizes of droplets in an area of precipitation. Without getting too complicated, we can also use a statistical correlation coefficient between the

Dual-Doppler Radar

reflected vertical and horizontal power returns. High correlations tend to indicate areas of similar type and size particles. Lower correlations tend to indicate a wider size spectrum, with correlation values less than about 0.85 suggesting non-meteorological targets. This should allow the more efficient removal of significant ground clutter, such as some of the new wind farms, from radar data sets.

The following images show Differential Reflectivity (left) with regular Reflectivity (right). Note the area circled in white. The right image shows dark red and purple colors, indicative of highly reflective (>60 dB) returns within a thunderstorm. From reflectivity alone, we can't tell if this is rain or hail. Looking at the Differential Reflectivity on the left, however, we note very low values (near zero), which suggest these highly reflective targets have a nearly spherical cross section. This indicates that we are probably looking at a hail core within the updraft of the storm.



Differential Reflectivity (left), Reflectivity (right). Note white circled area with low differential reflectivity, but high reflectivity .

With the current WSR-88D, the highly reflective hail core in this example would be included in computing radar estimated rainfall amounts. This would result in an over-estimated rainfall amount from this storm. Using the dual-polarized radar, an algorithm can be used to recognize the high reflectivity as hail, and can remove this data from rainfall rate and accumulation estimation, yielding more accurate estimates.

This is just one example of how the dual-polarized upgrade to the WSR-88D will provide improved radar data. Other improvements will likely include determining mixed precipitation types in winter storms, and locating areas of icing for aviation concerns. Identification of non-meteorological returns, or clutter, will also be improved, allowing better filtering of this clutter from processed data.

The dual-polarization upgrade to the Chicago/Romeoville WSR-88D is scheduled to take place in January 2011. The radar will be taken out of service for a 10-14 day period for the work to be completed.

Other improvements will likely include determining mixed precipitation types in winter storms, and locating areas of icing for aviation concerns.

Jim Morrill, Cook County Coordinator

We turn the coordinator spotlight in this issue on Jim Morrill, the local coordinator for Cook County. For some time Jim split Cook County duties, taking responsibility for the northern half of the county, but has since assumed responsibility for all of the county. Jim lives in Elk Grove Village and is station IL-CK-63.

Jim is also a dedicated snowfall observer during the winter.

"The part I enjoy about the program is the data. I'm a computer guy so I like data. "

How did you find out about CoCoRaHS and when did you get started?

"I found out about CoCoRaHS through an article in the Chicago Tribune. I had been measuring precipitation long before I joined CoCoRaHS so I thought this would be a great way for someone to use my data. I signed up in March of 2007 and may have missed only one or two days since."

What about the program do you enjoy the most?

"The part I enjoy about the program is the data. I'm a computer guy so I like data. Each day I look back through my reports and look for any trends such as warming, cooling, rainfall and drought. I also go back and compare the data from previous years to see where things stand this year compared to past years. It is always interesting to review the precipitation maps as well to see exactly where the storm came through compared to what was reported at the "official" reporting stations. I am amazed how a few miles or even less can make a huge difference in precipitation totals. "

Why did you decide to volunteer as coordinator?

"Tim Halbach, who at the time was with the NWS Romeoville office, sent out an email asking if anyone was interested in being a volunteer for Cook County and if so to explain why. Apparently my explanation was good since I was chosen to be the northern Cook County coordinator. However, as time progressed I became coordinator for all of Cook County. That has been very educational since precipitation amounts vary greatly from one part of the county to the next."

Tell us a little more about yourself .

"I was actually born in Virginia, moved to North Carolina, and eventually to the northwest suburbs of Chicago when I was a little kid. We stopped in Indianapolis while moving up here from North Carolina. When I got out of the car and slipped on ice. I remember by Dad saying something to the effect of "That's ice, get used to it" and since then the weather has interested me. I have been studying and observing the weather since the late 1970's when we had the blizzards of '78 and '79 followed by the very cold winters of the early '80s when we could actually play ice hockey outside. I currently work for one on the largest retailers in the country as a Lead Systems Engineer in the Information Technology department. I am also a member of the Elk Grove Village Community Emergency Response Team (CERT) and a member of the Elk Grove Village Health and Community Services Board. I have been married to my wife Terry since 1993 and we have three children which are growing up way too fast. Jessica is 15, Katie who is 13, and my son Michael who is 11. All three join me in watching storms roll in and they also share my passion for observing the weather. My wife, however, is still coming along, especially during severe weather events!"

Community Collaborative Rain, Hail, and Snow Network

www.cocorahs.org

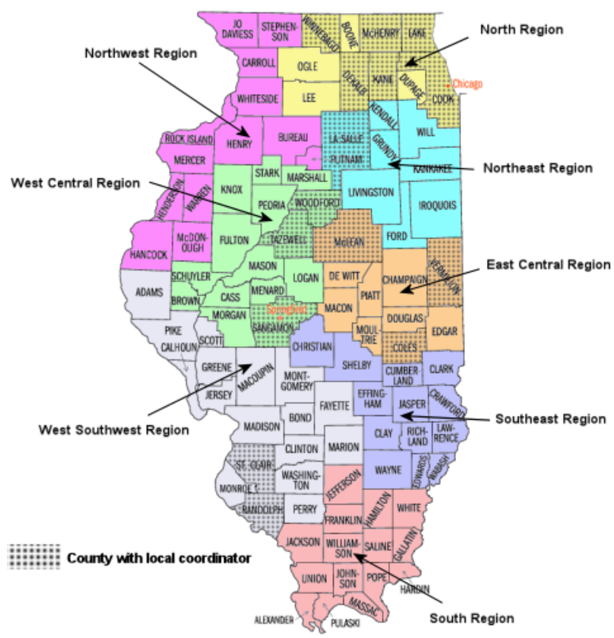
Illinois web page
http://www.cocorahs.org/state.aspx?state=il

"Because Every Drop Counts!"

Illinois State Coordinator

Steve Hilberg
hberg@illinois.edu

Illinois CoCoRaHS Regions



Region	Coordinator
Northwest	Andy Ervin Andy.Ervin@noaa.gov
North	Bill Nelson William.Nelson@noaa.gov
Northeast	Bill Morris William.Morris@noaa.gov
West Central	Bill Ousley Billy.Ousley@noaa.gov
East Central	Steve Hilberg hberg@illinois.edu
West Southwest	Jim Angel Jimangel@illinois.edu
Southeast	Darrin Hansing Darrin.Hansing@noaa.gov
South	Deanna Lindstrom Deanna.Lindstrom@noaa.gov

Local County Coordinators

County	Coordinator
Brown	Tim Gross Tim.Gross@noaa.gov
Champaign	Steve Hilberg hberg@illinois.edu
Cook	Jim Morrill jmorrill2@comcast.net
Coles	Cameron Craig cdcraig@eiu.edu
DeKalb	Walker Ashley washley@niu.edu
Douglas	Mike Timlin mtimlin@illiois.edu
Kane	Jon Snurka jon@robynhode.com
	Craig Hayward aronmore@sbcglobal.net
Knox	Tim Gross Tim.Gross@noaa.gov
Lake	Richard Mathis rlmath@yahoo.com
LaSalle	Patricia Rod pmend12@verizon.net

County	Coordinator
McLean	Jerry Swartz jjj.swartz@verizon.net
McDonough	Tim Gross Tim.Gross@noaa.gov
McHenry	Mary Moltmann moltmannm@aol.com
Randolph	Scott Rubach scottrubach2@msn.com
Sangamon	Casey Mayfield caseymayfield@comcast.net
Schuyler	Tim Gross Tim.Gross@noaa.gov
St. Clair	Curtis Williams faxplus@swbell.net
Tazewell	Amanda Wertz amandawertz86@gmail.com
Warren	Tim Gross Tim.Gross@noaa.gov
Winnebago	Mike Lager lucky13lager@yahoo.com
Woodford	Jim Copes jcopes@mtco.com