Northern Exposure

National Weather Service
Grand Forks, ND

Fall 2008

Grand Forks, ND Sunset
Photo by Justin Turcotte

INSIDE THIS ISSUE

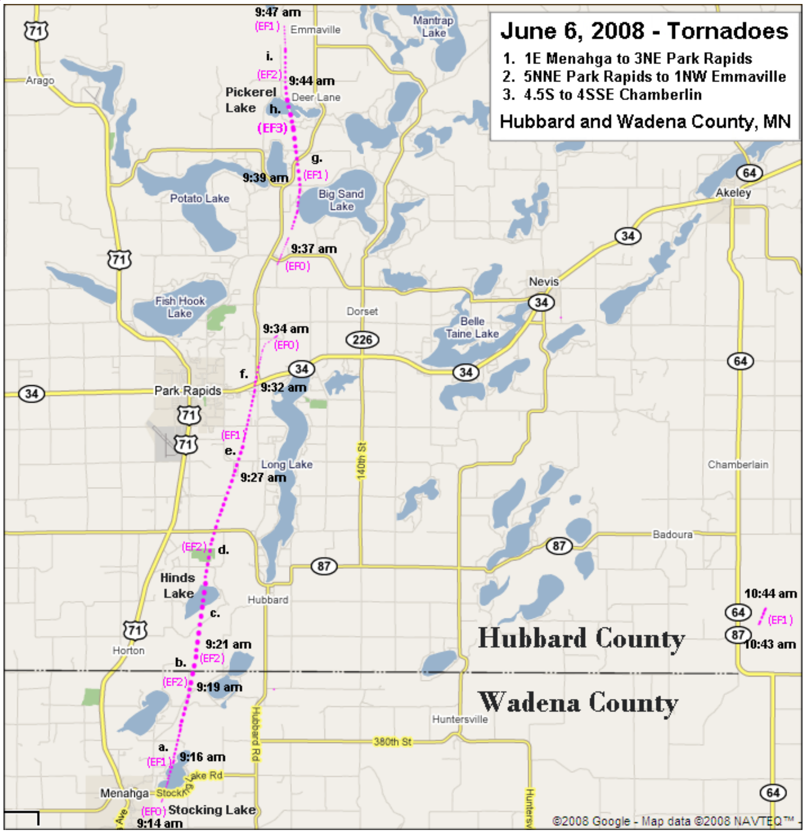
The June 6th Wadena/Hubbard County Mini-Supercell Tornadoes

by David Kellenbenz

Several tornadoes touched down in Wadena and Hubbard counties in central Minnesota during the morning of June 6, 2008 from 9:25 am until 10:23 am. The Pickerel Lake (about 7 miles north-northeast of Park Rapids) tornado, the strongest that day with a rating of EF3, had several long swaths of EF2 damage along its nearly continuous path around 21 miles. It was an uncommon case of tornadoes produced by mini-supercell

Tornado seen near Park Rapids, MN on June 6, 2008.

thunderstorms. Mini-supercells have radar characteristics similar to normal supercells with a rotating updraft, but are significantly smaller in height and width. The Grand Forks National Weather Service (NWS) had limited high resolution radar data on the storms due to their low



Tornado tracks of EF2 and EF3 tornadoes in Wadena and Hubbard Counties.

height and far distance to the KMVX Mayville, ND located Doppler radar. The lowest slice of the radar beam was only able to read the storms at a height of about 13,000 feet, and since the mini-supercells had tornadic rotation below this level, radar identification of these tornadoes was very difficult to near impossible. Also, while most significant tornadoes occur during the afternoon and evening hours, these morning tornadoes occurred during a climatological minimum in tornado occurrence. This made forecasting and warning operations challenging for the NWS office in Grand Forks.

The radar depiction of the tornadic mini-supercells was not very impressive. Little to no rotation was present (around 12,700 feet AGL). This indicates that most if not all of the rotation was below this level, and was not detected by the radar. The classic reflectivity signature, called a hook echo, was also non-existent, making warning operations for a tornadic event difficult if not impossible. The lack of quality radar data of the tornado made spotter reports vital to warning operations for this event. The radar is unable to resolve small, but sometimes intense, circulations in mini-supercells that are capable of producing significant tornadoes such as the Wadena and Hubbard county EF2 and EF3 tornadoes on the morning of June 6. Below are a few damage pictures of the tornado event. []

Aerial view of significant tree damage. Notice the tornado's relatively narrow path, making radar identification nearly impossible.

Home destroyed near Pickerel Lake.

Most EF3 tornadoes are usually detected by radar through velocity and reflectivity fields. This case illustrates the fact that not all significant tornadoes are observed by radar in the classic sense. Therefore, it is vital that the National Weather Service (NWS) train Skywarn Spotters to relay severe weather information, including tornadoes, large hail and high wind to our office during a severe weather event. If you are interested in becoming a Skywarn spotter, please feel free to contact our Warning Coordination Meteorologist Gregory at Gregory.Gust@noaa.gov or (701) 772-0720. []

Turkey barns destroyed near the Wadena/Hubbard County line.

Tornado viewed from 15 miles southeast of Rocklake, ND (July 7th, 2008)
Photo byRob MacDonald

"It was so cold I almost got married."
~Shelley Winters (American actress)

New Employees

Peter Rogers (General Forecaster)

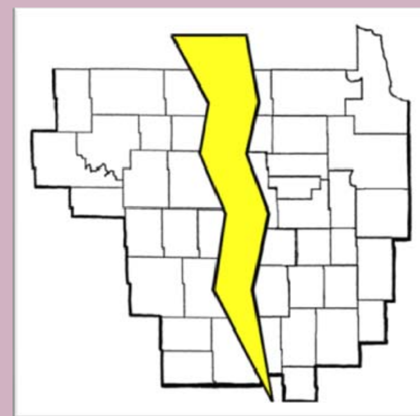
Born and raised in the Saint Paul area of the Twin Cities, Peter's interest in weather can be traced to his early childhood when thunderstorms scared him into the basement and blizzards cancelled school. Years later as a sophomore in high school, a tornado devastated his grandfather's hometown of Saint Peter, MN. After seeing first-hand the damage the tornado had caused and helping with the clean-up, Peter decided to pursue a college degree in meteorology with a desire to help people minimize the adverse impacts due to hazardous weather. Peter is a product of the University Of North Dakota John D. Odegard School Of Aerospace Sciences where he earned a B.S. of Science in Atmospheric Sciences in 2003. He then moved out west, attending Colorado State University in Fort Collins to complete his graduate work. While there, he worked with the 2004 North American Monsoon Experiment in Sinaloa Mexico, completing his M.S. Thesis in 2005.

Peter started his National Weather Service career as an Intern in Phoenix, AZ in 2006 – a natural transition considering his graduate school work. However, Peter and his wife, Elizabeth - also a native Minnesotan, disliked the desert heat and lack of four season. They also desired to be close to family in the Twin Cities. As such, Peter arrived as the newest General Forecaster at the NWS Grand Forks WFO in April 2008. "Elizabeth and I are excited to be in Grand Forks, returning to the Upper Midwest to enjoy all it has to offer, although I'm sure this winter will prove to be a rude awakening after being away for so many years," said Peter.

Amanda Homann (SCEP)

As one of the few North Dakota natives in the office, Amanda Homann's interest in weather was sparked back in elementary school. During a special presentation early in elementary school, Amanda was more fascinated in the weather and television stories "Too Tall" Tom Szymanski had to offer than his impressive height like many of the other young students. Then a few years later, fellow meteorologist and family member "Uncle Al" also gave a presentation at Amanda's elementary school on the formation of clouds and their many types. However, once Amanda moved on to middle school and into high school, there were fewer educational experiences that focused on meteorology. Amanda began her post-secondary education at Lake Region State College in Devils Lake pursuing a future career as a high school math teacher. After transferring to the University of North Dakota, Uncle Al's influence and the fact that she was beginning to dislike math more and more each semester, Amanda finally started her studies in meteorology. After receiving a B.S. in Atmospheric Sciences in the spring of 2007, Amanda was accepted as a student employee at the NWS office in Grand Forks. Amanda continues her employment at the office part time while working towards her M.S. in Atmospheric Sciences from UND. After graduation, Amanda hopes to continue her NWS career as an intern at another Midwest office.

Did You Know?



The National Weather Service (NWS) has over 120 forecast offices across the United States and its territories. Each office has its own county warning area (CWA) to issue the only official forecasts, watches, and warnings. The Grand Forks office's CWA, above graphic, covers the northwestern quarter of Minnesota and the eastern third of North Dakota. Our office shares borders with the Bismarck, Aberdeen, Minneapolis, and Duluth NWS offices.

The Grand Forks NWS is responsible for all official weather forecasts, watches, and warnings across the CWA.

"One need only think of the weather, in which case the prediction for even a few days ahead is impossible."

~Albert Einstein

Tornado near Frazee, MN (July 11th, 2008)
Photo by Bill Doms

"A change in the weather is sufficient to recreate the world and ourselves."
~Marcel Proust
(French Novelist)

Chauncy Schultz (SCEP)

"Everyone tried scaring me with talk of how cold it would be getting that winter, but even western North Dakota gets chilly," reflected Chauncy Schultz on his arrival in Grand Forks. "Then I learned that *here* 'cold' meant the mercury would stay below zero for a week or more at a time." Chauncy quickly settled into a new school and a new National Weather Service office in August 2005, when he started working on an Atmospheric Sciences degree at the University of North Dakota. Growing up in the small, western North Dakota town of New Salem provided many opportunities for Chauncy to view severe storms and blizzards while growing up. "I actually saw my first tornado when I was just nine - from the seat of my bike. That might have been what really hooked me." He also grew up hearing stories of storms that his dad saw weather spotting with the town's volunteer fire department, which helped him decide that he wanted to forecast the weather as early as third grade. "I actually thought about a different career once or twice," recalled Chauncy, "but after working with the NWS in Bismarck between my sophomore and junior years in high school, I knew there was nothing else in the world I'd rather do."

Two more summers of work with the office helped Chauncy land year-round student employment with the NWS by the time he started at UND. This means spending summers working at the Bismarck office, and the colder months here in Grand Forks. "People joke that I'm merely on loan from one office to another, " Chauncy commented. "But I get to learn meteorology from two absolutely great groups of people - what could be better?" Chauncy is still fascinated by severe thunderstorms and tornadoes, which is where he focuses his studies and research. His exposure to firefighting stuck with him, though, and he even started volunteering on his town's department at age 16. The connection between wildfires and weather was quickly made, and ever since Chauncy has spent much of his time working with the NWS fire weather program in North Dakota. After graduating next year, he hopes to make a career out of his NWS experience. And as for the winter chill? "Well, what nobody told me right away was how great hockey season is where it stays this cold. I'll take it!" joked Chauncy.

Geoffrey Grochocinski (Intern Meteorologist)

A newcomer from Chicago, Geoffrey Grochocinski quickly made a new home at the National Weather Service (NWS) and in Grand Forks after arriving last November (2007). Like many young meteorologists these days, Geoff had a long time desire to be the TV weatherman. "I think the passion started with my vague childhood memory of awe and fright during the famously devastating F5 tornado that hit my nearby suburb of Plainfield in August 1990," he speculates. Geoff had a whirlwind tour of various fields within the private meteorology sector during and after attending Iowa State University. A stint at a television studio revealed his disinterest for a life in front of the camera, but it opened up new opportunities. Chesapeake Energy Corporation in Chicago took Geoff on for the summer after graduation (2006) to provide energy, agricultural, and hurricane forecasts. "It was a challenging and really rewarding opportunity in a hip suite overlooking the Chicago River", Geoff explains. "My coworkers were great, and the job was so close to home. Essentially, they gave me a few months to live the high life. It was as if NASA had me prepare as a one-time backup astronaut, but I had to hand back in my suit before launch because the mission no longer needed the backup." The temporary gig led to a forecaster/consultant position at DTN/ Meteorlogix in suburban Minneapolis where he worked for nearly a year.

All along, though, Geoff held a dream to work for the NWS, and jumped on an opening at the relatively nearby office in Grand Forks. With some luck, Geoff was given the chance to live his dream and is determined to prevent a friend's prophecy from stealing this golden opportunity. "My recent nomadic lifestyle was overanalyzed" Geoff scoffs. "This friend drew a line from Chicago through Minneapolis to Grand Forks, extrapolated the line into Canada, and determined that I'd magically be employed with Environment Canada in Saskatoon, Saskatchewan come 2009. I told the friend they'd have to drag me across the border." The office's magic 8 ball, though, doesn't offer any consolation as it reads "Signs point to yes". He'll just have to keep his fingers crossed. []

Cold-core tornado west of Grand Forks, ND (June 9th, 2008) Photo by Justin Turcotte

"The East Wind, an interloper in the dominions of Westerly weather, is an impassive-faced tyrant with a sharp poniard held behind his back for a treacherous stab."

~Joseph Conrad (Novelist)

Up, Up, and Away!

by Chauncy Schultz

A weather balloon.

Did you know that even in today's age of high-tech computers, radars, and satellites, a simple balloon is one of the most important elements in making a weather forecast? The latex balloons are sent up simultaneously all around the world twice every day, with a small instrument called a radiosonde attached to them by a length of string. The radiosonde, which is smaller than a milk carton, measures temperature, relative humidity, and wind speed and direction every second and transmits a GPS signal back to earth, where a computer display is used to quality control the data. Thanks to hydrogen gas in the balloon, the instrument is carried upward at an average of 1,000 feet per minute until the balloon pops, which is often more than 100,000 feet (that's almost 20 miles!) above the earth. A parachute brings the balloon and instrument back to the ground, where the radiosondes are sometimes found and sent back to the NWS, which then reuses them. During the two hours it takes the balloon to rise, it expands from six to almost twenty feet in diameter, and can be carried away more than 150 miles from where it is launched by strong jet stream winds. There are around 900 places in the world that launch the balloons , including sites at Bismarck, Aberdeen, International Falls, and Minneapolis, where they are sent up at 6 a.m. and 6 p.m. CDT (Noon local time at London, England). The NWS in Grand Forks does not launch balloons, as the sites are all spaced a half-state or more away, partly because each launch costs well over $100. However, the forecasters in Grand Forks use the data from the radiosondes to predict everything from today's high temperature, to the chance of rain next Tuesday, or even the risk of tornadoes this evening. What, you may ask, can today's balloons tell us about the weather as many as seven days from now? The answer lies in supercomputers that model the atmosphere, which forecasters interpret when they prepare their prognostications. The models need to know what is happening right now (the "initial" conditions) before they can run complex mathematical equations to calculate what will happen in the future. The best way for the models to get this vital information is from the balloon launches made all around the world - 365 days a year, rain or shine.

A radiosonde.

"Each of us makes his own weather, determines the color of the skies in the emotional universe which he inhabits."

~Fulton J. Sheen (American Bishop)

New TAF Service Begins at Regional Airports

by Peter Rogers

On May 20 at 0000 UTC (May 19 at 1900 LT), the National Weather Service Grand Forks, ND Weather Forecast Office (WFO) began issuing Terminal Aerodrome Forecasts (TAFs) for Devils Lake Regional Airport (KDVL) in eastern North Dakota and Thief River Falls Regional Airport (KTFV) in northwest Minnesota. The Grand Forks WFO also issues TAFs for three other airports, including Grand Forks International Airport (KGFK), Hector International Airport (KFAR), and Bemidji Regional Airport (KBJI). A TAF is a 24-hour surface wind, visibility, precipitation, cloud cover, cloud base height, and low-level wind shear forecast for an area within five miles of the airport's terminal. TAFs are widely used by commercial airlines, general aviators, and military operators for safety and flight planning purposes. "With Mesaba Airlines already flying regional jets to Devils Lake and Thief River Falls, and the University of North Dakota (UND) Aerospace Flight Operations using both airfields for training purposes, adding TAFs for these sites was the next logical step to improve our aviation services," said Dan Riddle, Grand Forks WFO Aviation Program Leader. The new TAFs at KDVL and KTFV will also benefit numerous general aviators, such as private pilots and crop dusters, and other private companies, including the Digi-Key Corporation, UPS, and FedEx.

Grand Forks NWS Aviation Program Leader, Dan Riddle, talks with Bemidji Airport Manager, Harold Van Leeuwen, at the base of the KBJI Automated Weather Observing System (AWOS).

In addition to starting new TAF service, Dan Riddle and Assistant Aviation Program Leader, Peter Rogers, visited the five airfields in the Grand Forks WFO County Warning Area (CWA) in July and August. During each visit, Dan and Peter met with Federal Aviation Administration (FAA) officials, local airport managers, and numerous private aviation customers as a means to foster relationships with the local and regional aviation community. They also toured the facilities, runways, and grounds at each airport to improve their understanding of any local issues that might help Grand Forks WFO forecasters improve the accuracy and customer use of each TAF. "Having the ability to get out of the forecast office and meet our customers is a great way for us to build long-lasting relationships, and to make sure we are meeting the needs of those who use our products and services most often," said Peter. []

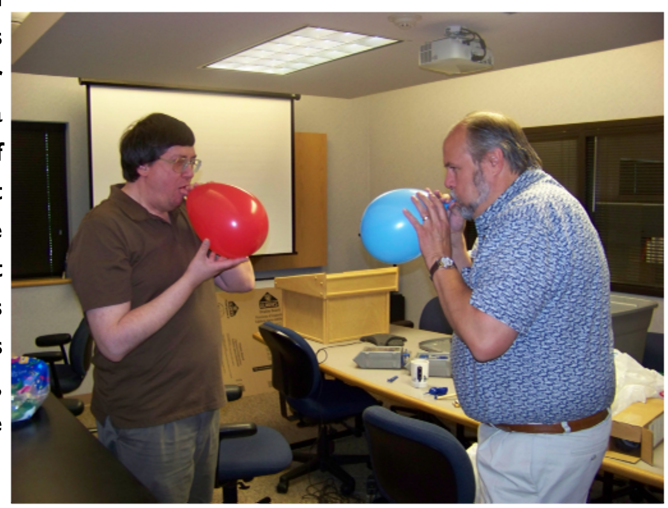
Kids in the Park

by Amanda Homann and Geoffrey Grochocinski

Kids and meteorologists agree — balloons are cool! Forecaster Peter Rogers (left) and Intern Meteorologist Geoff Grochocinski (right) teach buoyancy.

The staff at the Grand Forks NWS office not only issue severe weather warnings and daily forecasts, but are also involved in education activities across the area. The Grand Forks Park District invited the National Weather Service to provide fun and educational activities for local kids this past July as a part of their summer lunch "Kids in the Park" program. Several NWS employees took up the offer, and the activities were held at Lake Agassiz Park near the School of the Blind and at University Park.

Warning Coordination Meteorologist (WCM) Greg Gust and SCEP student Amanda Homann provided the first round of activities. The two gave a presentation on weather observations, showed the kids how to take temperature measurements with a thermometer, and taught about wet-temperature using sling psychrometers. Forecaster Peter Rogers and Intern Meteorologist Geoffrey Grochocinski provided lessons on buoyancy with the use of helium and balloons on the second occasion. The kids had a blast filling the balloons with helium, but even more fun for the next activity. Peter and Geoff also assembled a rain gauge reading game by having the kids throw and pop their water balloons over the gauge. The kids not only got a chance to practice their aim, but whenever they missed, they usually got to see the meteorologist holding the popping board get all wet! "In a blink of an eye, we went from just finishing the contest to having ten kids chasing me with an arsenal of water balloons," Geoff recalls. "Let me tell you, it was loads of fun, but still alarming when these young tikes were insistent upon hitting me in the face." Amanda returned for the third occasion with Forecaster Peter Speicher. They taught the kids weather safety tips and how to protect themselves and their families. Several different cardboard cutouts depicting a variety of weather situations were used to give examples of various incidents when precautions should be taken. A giant cardboard cutout of the sun was shown to stress the importance of the use of sunscreen and how to prevent heat exhaustion. Next, cutouts of several different kinds of clouds were used to explain the difference between "good" clouds and "bad" clouds. The kids were taught about hail, tornadoes, and lightning and learned where the safest place to be is during these events in their homes.



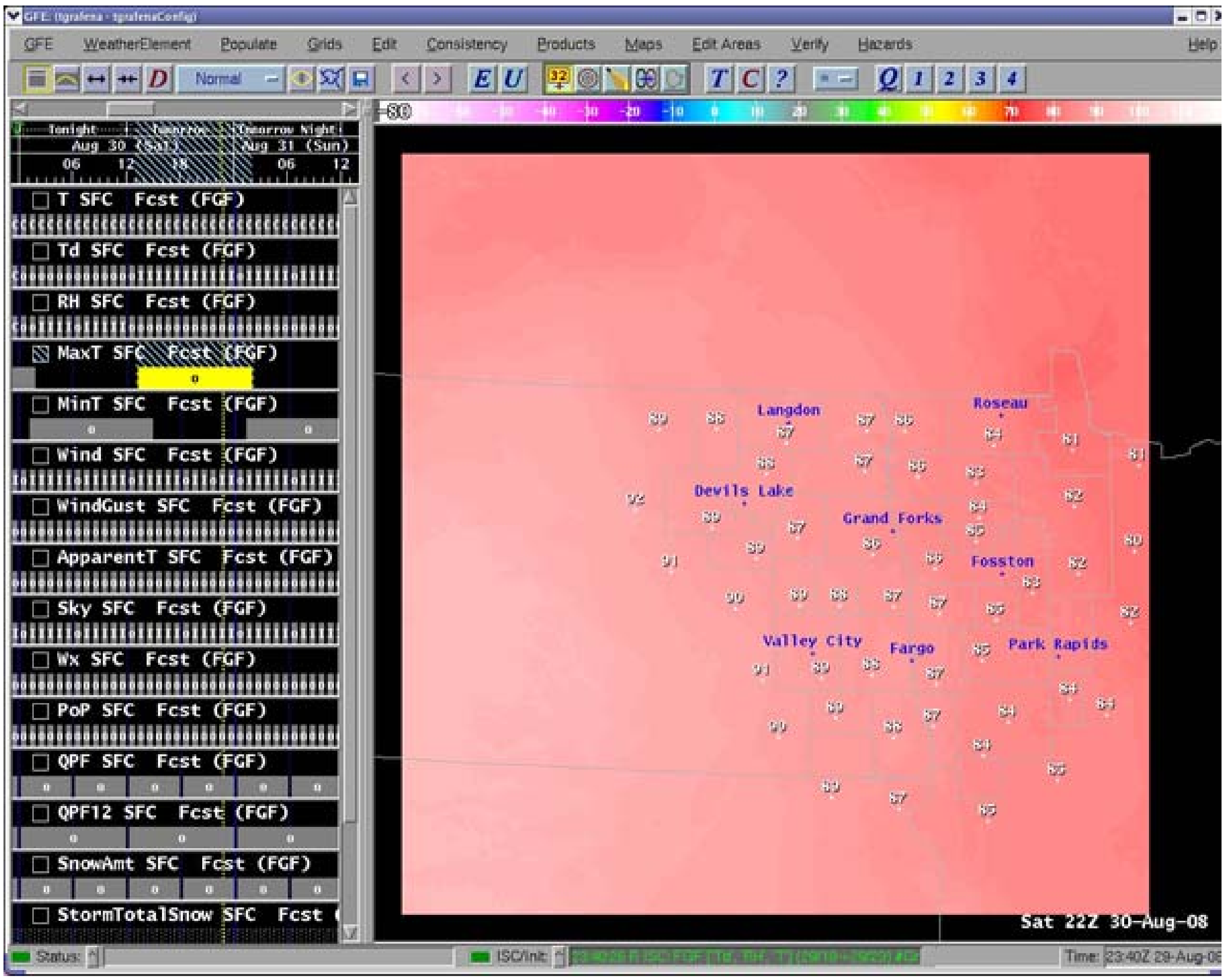
Science Operations Officer Brad Bramer (left) and Warning Coordination Meteorologist Greg Gust (right) prove managers are full of hot air!

The Grand Forks NWS staff would like to thank Brie Siefken and the Grand Forks Park District for inviting us to take part in the "Kids in the Park" program. We hope to be given the chance to provide more activities next summer!

Recipe for a Forecast

by Tommy Grafenauer

Forecasters at the National Weather Service (NWS) are using the interactive forecast preparation system (IFPS) to create graphical forecasts. The graphics that are created make up the digital forecast database. Text products are then generated from these graphical products. The database is then shared, or transmitted, to the National Digital Forecast Database (NDFD). The NDFD contains a seamless mosaic of digital forecasts from all NWS field offices. This database is made available to all customers and partners to meet their needs for faster access to accurate, easier to understand information. Customers and partners may use this information to create a wide range of textual, graphical, and gridded products.



The graphical forecast editor (GFE) displaying maximum temperature.

Graphical products are created by drawing in the graphical forecast editor (GFE). Much of the forecast preparation involves this program. Forecasters can load model data, or manually adjust the images in order to depict the weather that they expect. The following forecast elements are created by the NWS in Grand Forks: Maximum Temperature, Minimum Temperature, Hourly Temperature, Dew Point, Relative Humidity, Wind, Wind Gust, Apparent Temperature, Sky Cover, Weather, Probability of Precipitation, Amount of Precipitation, Amount of Snowfall, Haines Index, Lightning Activity Level, Mixing Height, Transport Winds, Minimum Relative Humidity, Maximum Relative Humidity, and even more.

The forecasters have many "smart tools" available at their disposal to help create the graphics. These smart tools use information available in the grids created by the forecaster, as well as model data. Specific functions are performed by each smart tool to help with the forecast process. A few examples are listed:

Model Blend: This tool will blend two or more model databases. If one model is predicting a temperature of 70F and another is predicting a temperature of 60F, equally blending the two will result in a temperature of 65F.

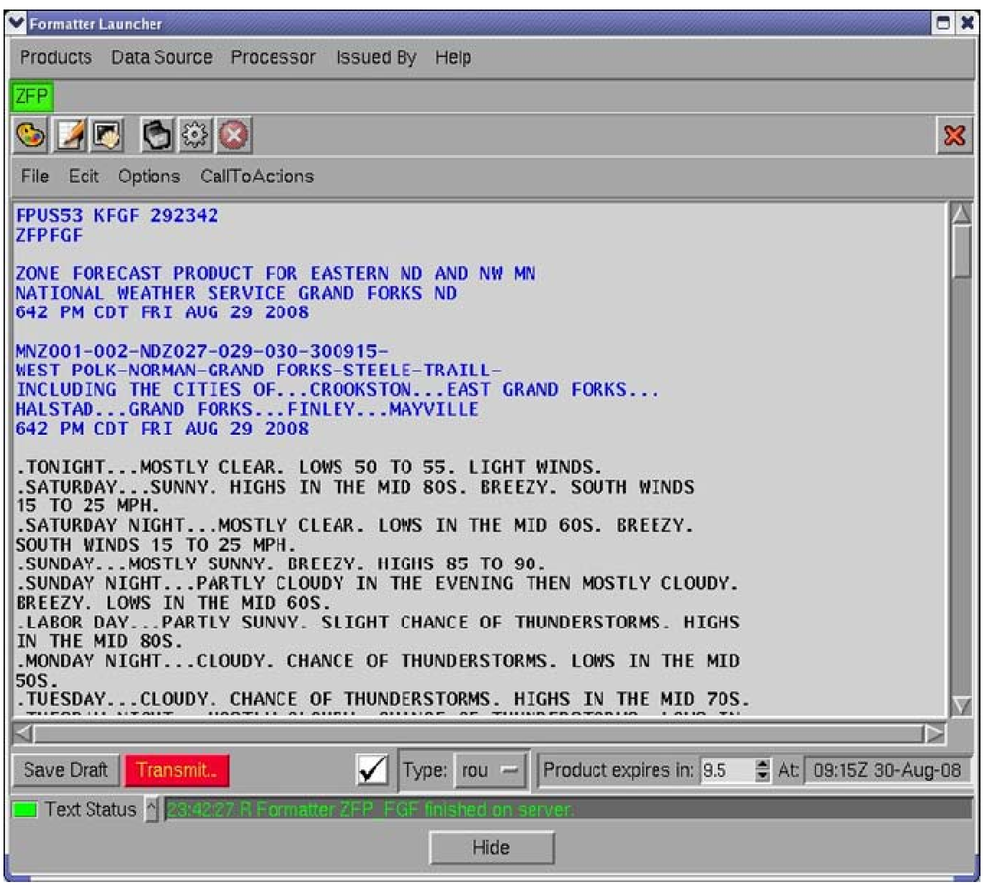
RH Tool: This tool will calculate the relative humidity from data in the Temperature and Dew Point grids.

Apparent Temperature Tool: A tool to calculate the apparent temperature (wind chill or heat index) based upon data in the Temperature, Dew point, and Wind grids.

Sky Tool: A handy tool to calculate the expected percentage of sky (cloud) cover. The user is able to input their model of choice, as well as the layer in the atmosphere they are expecting cloud cover, and the tool will populate the grid with the appropriate information.

Snow Amount Tool: This tool calculates the expected snow amount based upon data available in the Amount of Precipitation grid. The user is able to input the expected ratio of liquid water to snow. The tool does the appropriate mathematics and outputs the expected snow amount. The tool also looks at the Weather grid, and if no snow is forecast it will set the snow amount to zero.

Once the graphical portion of the forecast is complete, it is time to generate text products. These text products are generated with a program called the GFE text formatter. This formatter takes information from the database and automatically compiles text products. No typing is required, which makes generating these products fast and easy. This allows the forecaster to spend more time on analyzing and predicting the weather.

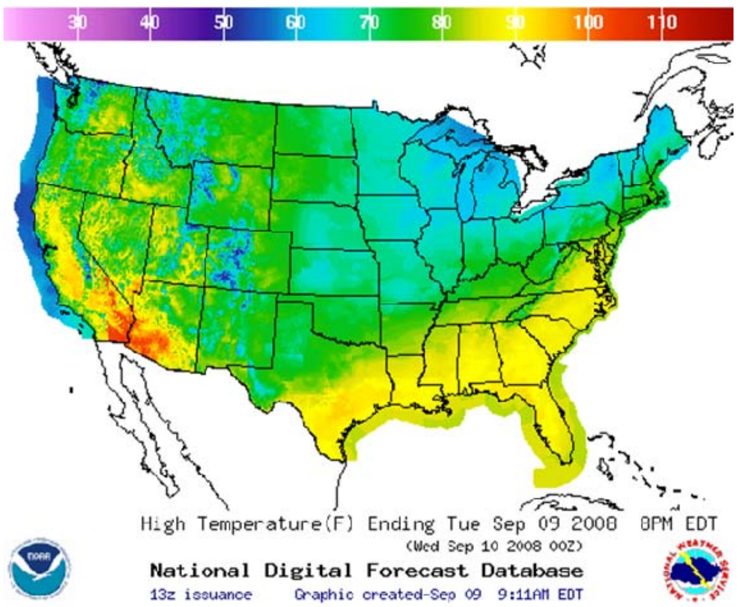


A graphical display of the GFE text formatter.

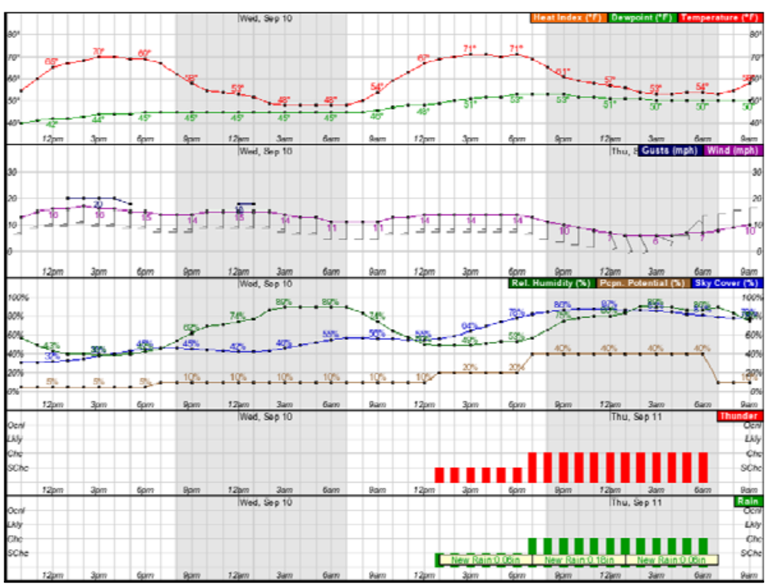
In addition, the Grand Forks, ND National Weather Service website (http://www.crh.noaa.gov/fgf/) provides a number of useful programs which access the digital database. One such program is located in the menu on the left hand side under the 'forecasts' section, named 'Interactive'. This program allows the user to create an hourly weather graph or digital/ tabular graph. []

For further information:

- The NDFD: http://weather.gov/ndfd
- Graphical NDFD: http://weather.gov/forecasts/graphical
- NDFD Digital Data: http://weather.gov/ndfd/technical.htm



An example Maximum Temperature NDFD grid.



An example hourly weather graph.

A thunderstorm's hail shaft viewed from the Grand Forks National Weather Service office (June 21st, 2008)

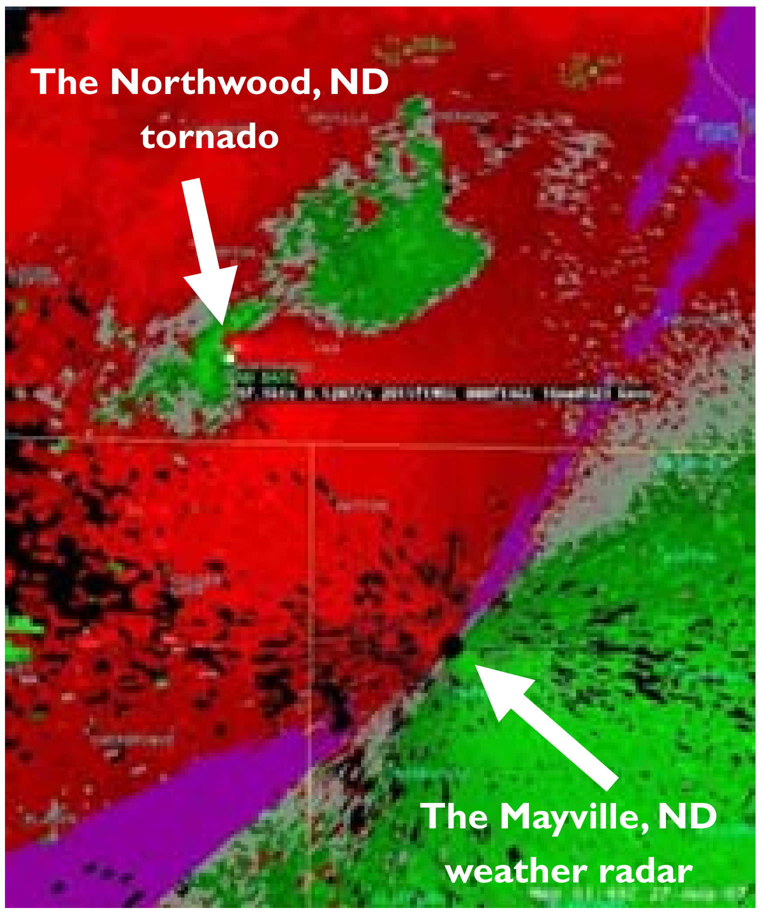
Mahnomen, MN area funnel cloud (July 24th, 2008)

Mayville Weather Radar gets an Upgrade

by Ben Read

The WSR-88D (Weather Surveillance Radar, 1988 Doppler) located in Mayville, ND had its Klystron tube replaced on September 9th. At three feet tall, this tube is a major component and is considered the heart of the radar's transmitter system. The Klystron was last replaced in 2001, and their lifespan is usually five to seven years.

In our radar, the Klystron amplifier, along with some other components in the transmitter, take a "raw" 8.32 microsecond burst of radio waves at 10 milliwatts power and amplifies the burst to 700 kilowatts (that's 0.01 watts to 700,000 watts)! To put this in perspective, the average cellular telephone power output is about 100 milliwatts, a home microwave oven averages 750 to 1500 watts, and a radio station about 50 kilowatts. The transmitter will "fire" at least 322 times per second, up to 1282 times per second. This is called the Pulse Repetition Frequency, or PRF. In between pulse transmissions, the radar is "listening" for return echoes.



A display of "storm relative motion" during the Northwood, ND tornado of August 26th, 2007.

The Klystron has six "cavities" that can be tuned, or adjusted, for size. The final goal of tuning is to achieve "resonance", or the point at which the tube is most efficient. This is quite similar to blowing air across the top of a glass bottle and hearing a sound. The larger the bottle is, the lower the tone.

The Klystron tube is an excellent amplifier for meteorological radars because it is extremely stable in frequency. Doppler radars measure the frequency shift from precipitation echoes, and can then derive the actual speed and direction, toward or away, the precipitation is travelling. To the right is the "storm relative motion" display of the Northwood, ND tornado event of August 26, 2007. The tornado is clearly evident in the center of the picture, the red showing motion away from the radar, and the green showing motion toward the radar. The close proximity of the bright red and bright green highlight the tornado's strong rotation. []

Heavy rains from August 11th and 12th, 2008 flooded the underpass under Highway 75 near Kent, MN.

"Autumn is a second spring when every leaf is a flower."
~Albert Camus
(French author)

Modeling the Weather

by Jim Kaiser

Today's forecasts have come a long way from those of 30 years ago. The computer age has changed the way science and technology fields operate and meteorology is no exception. Arguably one of the biggest advances in forecasting has been numerical weather prediction. These predictions are calculations of how various measurements of the atmosphere such as temperature, wind direction and speed, pressure and moisture or humidity will change over specific amount of time. This 'modeling' of the atmosphere is a great tool to help the forecaster visualize how the atmosphere will change and the effects these changes may have on the forecast. There are models that focus on atmospheric winds on a global scale, to ones that depict the various wind fields in tornadic thunderstorms.

Weather models need atmospheric data to start their simulations. The more complete the data is at the start of the model 'run', the better the simulation will be. Some models use thousands of data points from across the globe! These data points are gathered as surface observations on land and sea via buoys and through upper air data in weather balloons and satellites. The more accurate the data the better the simulation will be so there are quality control measures taken as the data becomes available. Converting data into a format the model can use is another step before any calculations are made. This step is called data assimilation. Data assimilation is a complex process as observation locations and model formats don't necessarily 'line up'.

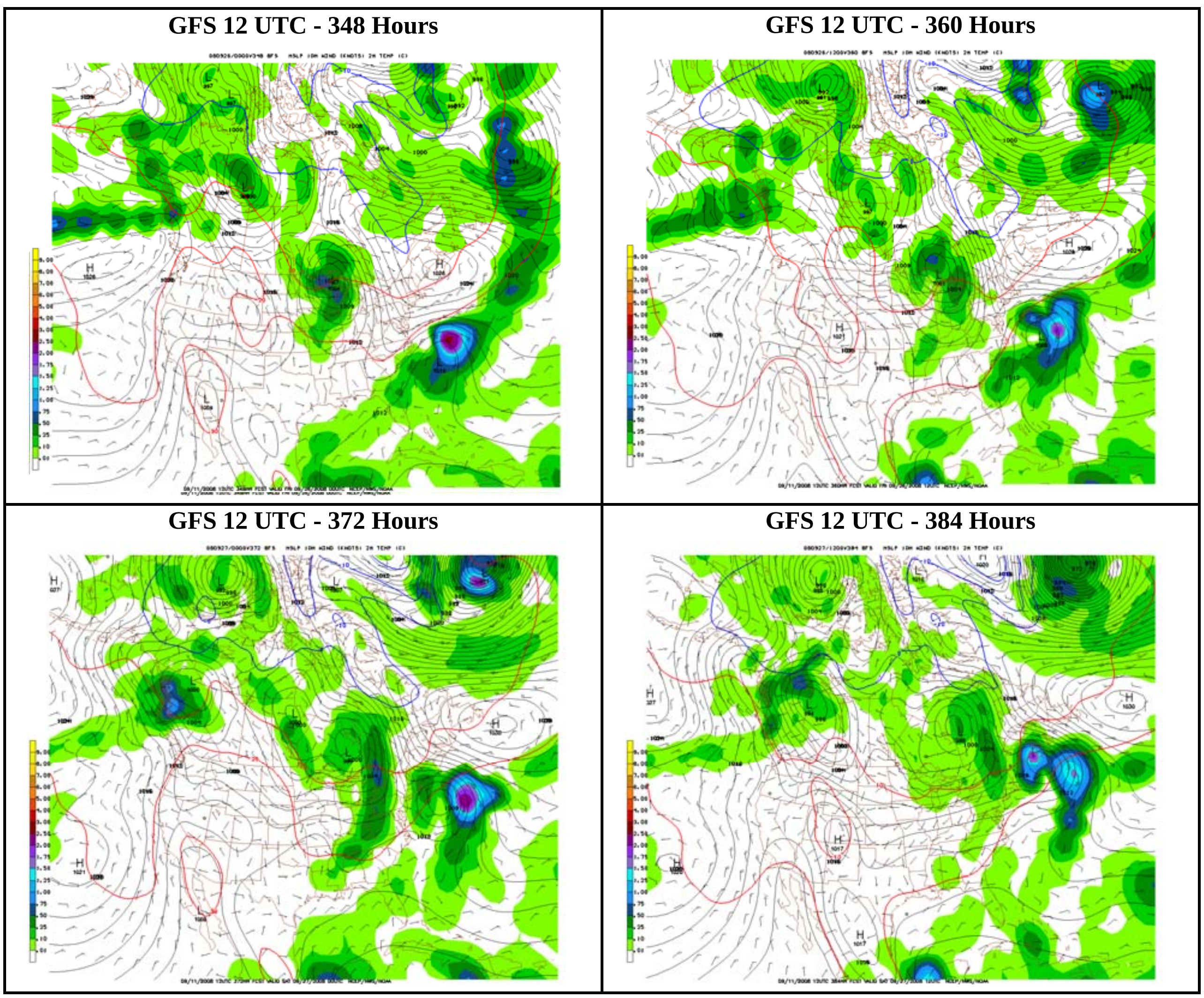
All models of the atmosphere are based upon the same set of numerical equations that solve changing atmospheric variables. Since the atmosphere is so complex, there are different approximations and assumptions made in the application of these equations. These differences lead to different models. The example below is just part of one equation that examines how temperature variations cause rising and sinking motions in the atmosphere.

$$\left(\nabla_p^2 + \frac{f_0^2}{\sigma}\frac{\partial^2}{\partial p^2}\right)\omega = \left(\frac{R}{\sigma p}\right)\left[-\nabla_p^2\left(-\vec{\mathbf{v}}_g \cdot \nabla_p T\right)\right]$$

These points are called grid points. A grid point is where the model solves these equations. The closer the grid points are together, the more calculations that need to be done. So, as computer processing has become faster, model grid points have become closer together or at a higher resolution. This has allowed the models to resolve some atmospheric phenomena that were missed with lower resolution simulations. Model simulations are very computationally intensive considering each has hundreds of these equations and they need to be calculated for each grid point at each time step until the end of the forecast cycle.

One example is the Global Forecast System (GFS) model. It has a grid spacing of 0.5° by 0.5° long/lat and 64 vertical layers with a time step of 7.5 minutes through 384 hours. On a good day, one with no technical issues, it takes a supercomputer 2 to 3 hours to run the GFS model simulation!

The last and final step is to convert the simulation into a graphical representation of the solutions of the equations. Once this occurs the forecaster can now use the model to help in producing a forecast. Forecasters will typically compare different model runs to see if they are producing similar solutions. If they are, then the forecaster will have more confidence that the models are handling the situation well, and thus aide the meteorologist with a forecast. []



Example output of precipitation and surface pressure output from a GFS model run.

The Winter 2008/2009 Outlook

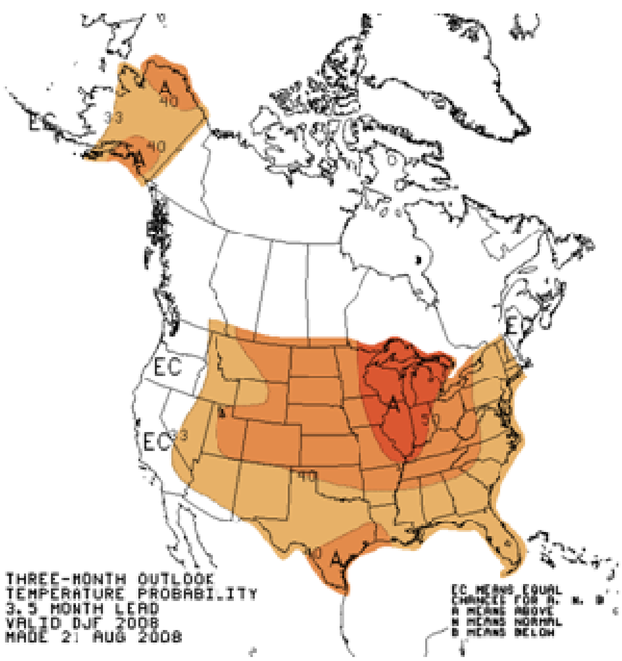
by Mark Ewens

One of the most popular questions we are asked is "What will it do this winter?" Weather affects all aspects of our lives, from how to budget for heating or cooling our homes, what to wear to work or play, is it safe to travel to Grandma's house – on and on. Your NOAA's National Weather Service (NWS) is tasked with producing weather forecasts to help you make those, and many more, decisions.

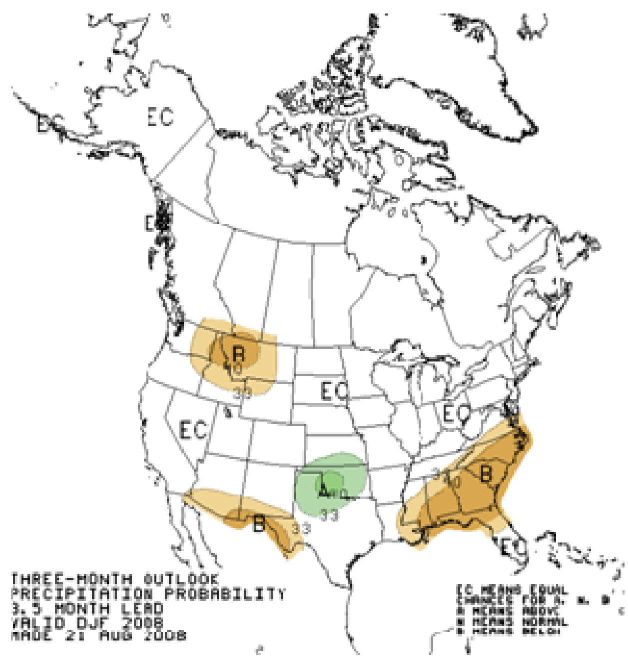
The Climate Prediction Center (CPC) in Silver Spring Maryland is the primary forecast entity for the national long range weather and climate forecasts. They use a relatively broad range of terms to describe the overall climate across regions, or multiple state areas, of the country. The CPC also offers a "down scaled" outlook that helps to fine tune the national outlook.

Local NWS offices are involved in research to define those climate outlooks even further, down to the state or local level. We use many of the same tools and techniques that the CPC uses but refine the outlooks for the local variability of the 'weather'. Also, the CPC uses a probabilistic approach that is, framing the outlooks in terms such as "It will likely be warmer or likely be drier" than average. The Grand Forks Office of the NWS offers a refined outlook, based on a more complete historical data set.

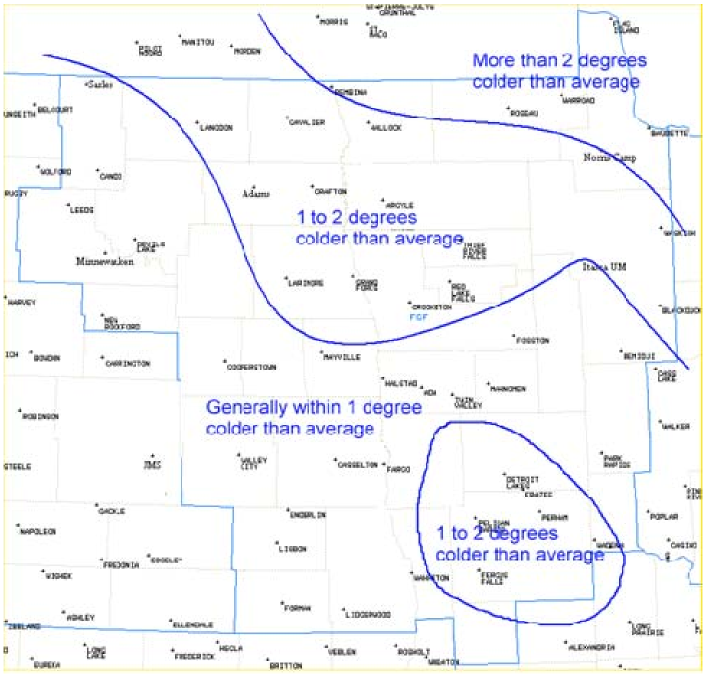
Below are the CPC outlooks for the upcoming winter season, defined as December 2008 through February 2009. Note that the outlooks broadly paint a large area of the country as having warmer than average temperatures. The image on the left is the temperature outlook, and the image on the right is the precipitation outlook. Notice almost the entire country is expected to have a higher likelihood of warmer than normal temperatures this winter versus normal, or colder than normal. In the precipitation outlook, only a small part of the southern plains is expected to have a higher than average chance of a wet winter.



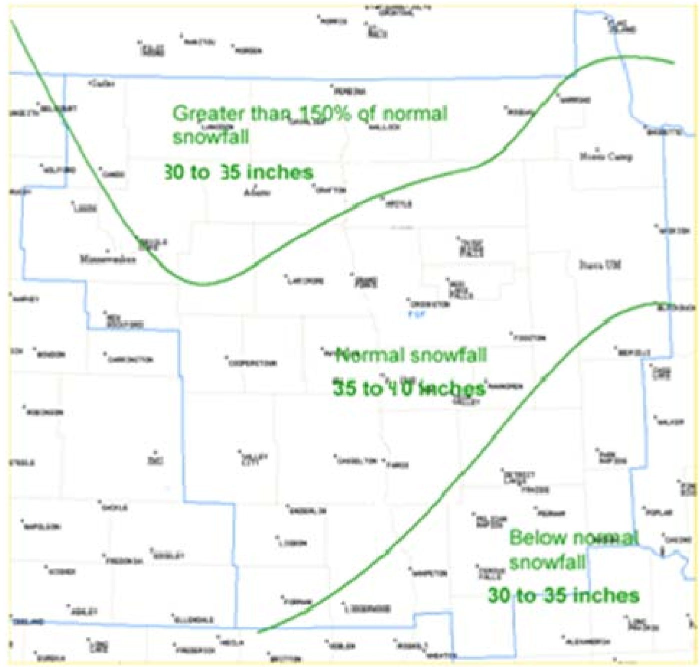
This winter's temperature outlook.



This winter's precipitation outlook.



This graphic represents the expected average departure from normal temperatures for the period December 2008 to February 2009.



This graphic represents the expected snowfall departure for the core winter season December 2008 to February 2009.

The NWS Grand Forks outlooks are listed above. By using a variety of techniques, as well as much more data than the CPC, we have refined the outlook to be a bit different.

The graphic on the left represents the expected temperature patterns, and the one on the right expected snowfall patterns. Based on local studies, anticipated patterns of the jet stream and primary track of surface storms, the overall temperatures this winter will be very close to, but a bit below normal. Snowfall is expected to be higher near the international border and in the Devils Lake basin, with lower amounts in the Minnesota lakes country.

This product is made available experimentally to demonstrate evolving capabilities within the Climate Realm. This is not intended to replace the official outlook, forecasts or warnings. Always refer to the latest outlooks and products from the Climate Prediction Center for the official products.

Whatever the final outcome of the weather this winter, it will have a significant impact on the way we live, our economy and well being. That is the primary task of your NOAA's National Weather Service, to produce the highest quality forecast, watches and warnings in service to the public.

CPC Outlooks are available at the web site below:
http://www.cpc.ncep.noaa.gov/products/predictions/90day/

And remember to check the NWS Grand Forks web site for updated local forecasts, outlooks, watches and warnings. []

4-H

by Pete Speicher

Meteorologist Pete Speicher teaches 4-Hers how to use a psychrometer.

The National Weather Service office has had an active summer with its education and outreach program, supporting several events in the Grand Forks community. In July, we participated in the Grand Forks County 4-H Day Camp held at Turtle River State Park. Meteorologists from the weather service office demonstrated how to take weather observations. The demonstration included observing the sky, taking the temperature and dew point, measuring and estimating the wind's direction and speed, and measuring rainfall using several different types of rain gauges.

4-Hers from local clubs and the air base received hands-on experience using a sling psychrometer to measure the air's temperature and dew point. The psychrometer is an instrument containing two thermometers, one which is wrapped with a tiny gauze pad. The wet bulb temperature, which is used to calculate the dew point, is determined using the "wet" side of the psychrometer (the side with the moist gauze pad). When the 4-Hers sling the instrument in circles, the water in the pad evaporates, cooling the "wet" bulb of the thermometer. The instrument is slung until the temperature stops falling, or remains the same for two consecutive "spins" taken approximately two minutes apart.

4-Hers also sprayed water into an electronic rain gauge until one-hundredth of an inch of "rain" was received. This "tipping bucket" type instrument holds a small cup which holds approximately one-hundredth of an inch of water. When the cup is all the way full, it "tips", dumping the water while automatically adding one "tick" to a digital counter (each tick, of course, represents a hundredth of an inch of rain). The counter is used to measure hourly or six-hourly rainfall accumulations.

The National Weather Service is working with the North Dakota 4-H program to add "weather" as a project offered to 4-Hers. We hope the first level course will be ready for Clover Buds in 2009. The National Weather Service plans to help 4-H by coordinating and providing judges, field trips, and project leaders to the local county programs. The 4-H Day Camp was the first step in building this partnership. □

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A Walsh County (ND) Supercell
Photo by Justin Turcotte

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