NOAA 'Bout Weather

Welcome to the Spring 2013 Newsletter of the Blacksburg, VA Weather Forecast Office (WFO) of the National Weather Service (NWS)! In this issue we present a variety of information on weather, water and climate topics as well as information about our office. Submit comments, questions, or ideas for improvement to the newsletter editor.

A semi-annual publication of the National Weather Service Blacksburg WFO. Articles written and prepared by staff and guests.

Inside this Issue:

Weather Highlight:

Dense Fog at Fancy Gap leads to 96-car pileup on I-77: March 31, 2013

One of the more tragic weather related events in recent memory in this area occurred on the afternoon of March 31st, 2013 in dense fog along Interstate 77 in the Fancy Gap area of the Blue Ridge Mountains. A series of accidents, 18 in all, began around 1:15 PM near Fancy Gap and resulted in 3 fatalities and at least 25 injuries. Law enforcement officials reported that 96 vehicles were involved in accidents along approximately a 1-mile stretch of I-77. Visibility in the area was reported to be near zero at the time. The Fancy Gap area has a long history of multi-vehicle accidents including fatal pileups in 1977 and 2010. The area is known to be extremely fog-prone due to rapid changes in elevation along the escarpment of the Blue Ridge Mountains. The fog during the afternoon of March 31st was extremely localized to favored locations such as Fancy Gap as an area of low pressure was moving off the Carolina coast.

Scene at Fancy Gap pileup, March 31, 2013 (Photo: WXII-TV)

NOAA 'Bout Weather

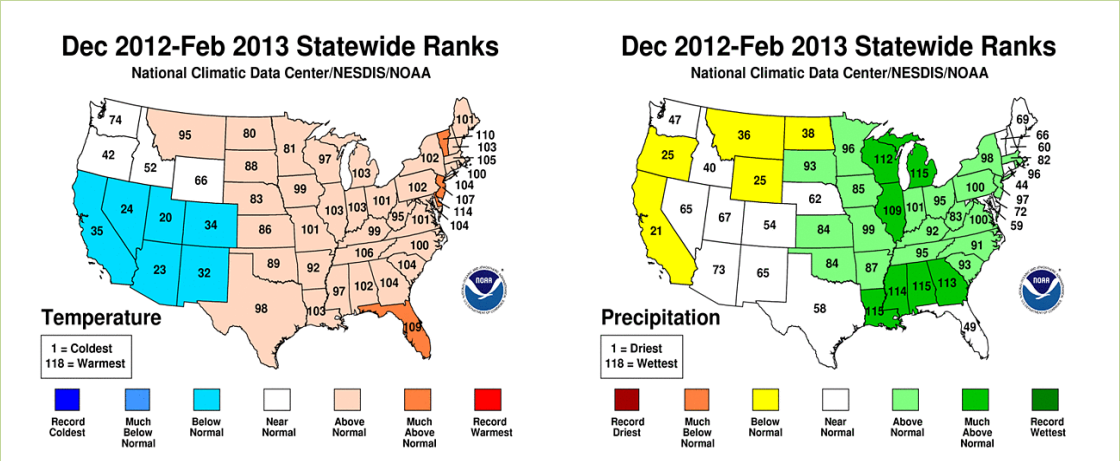
Climate Highlight: The winter of 2012-2013

Peter Corrigan, Service Hydrologist

The meteorological winter of 2012-2013 (December 1 – February 28) was again considerably warmer than the long-term averages, and just slightly cooler than last winter (2011-2012) which ranked among the warmest on record in much of our area. Table 1 below shows the average temperatures and departures from normal (1981-2010 climate normals) along with the rank in terms of warmth. Notice that some stations have considerably longer periods of record than others. At Bluefield, WV this was 2nd warmest winter after last year's record warmth. The figures below show statewide temperature and precipitation rankings (since 1895) across the entire U.S. showing the broad pattern of warmer and wetter than normal in the eastern half of the country over the entire 2012-2013 winter. Precipitation in the Blacksburg County Warning Area (CWA) was generally above average by about 1 to 3 inches due mainly to an extremely wet January. December was relatively dry, while March precipitation was near normal. Seasonal snowfall was generally below normal across the piedmont and foothills while the mountains were closer to normal.

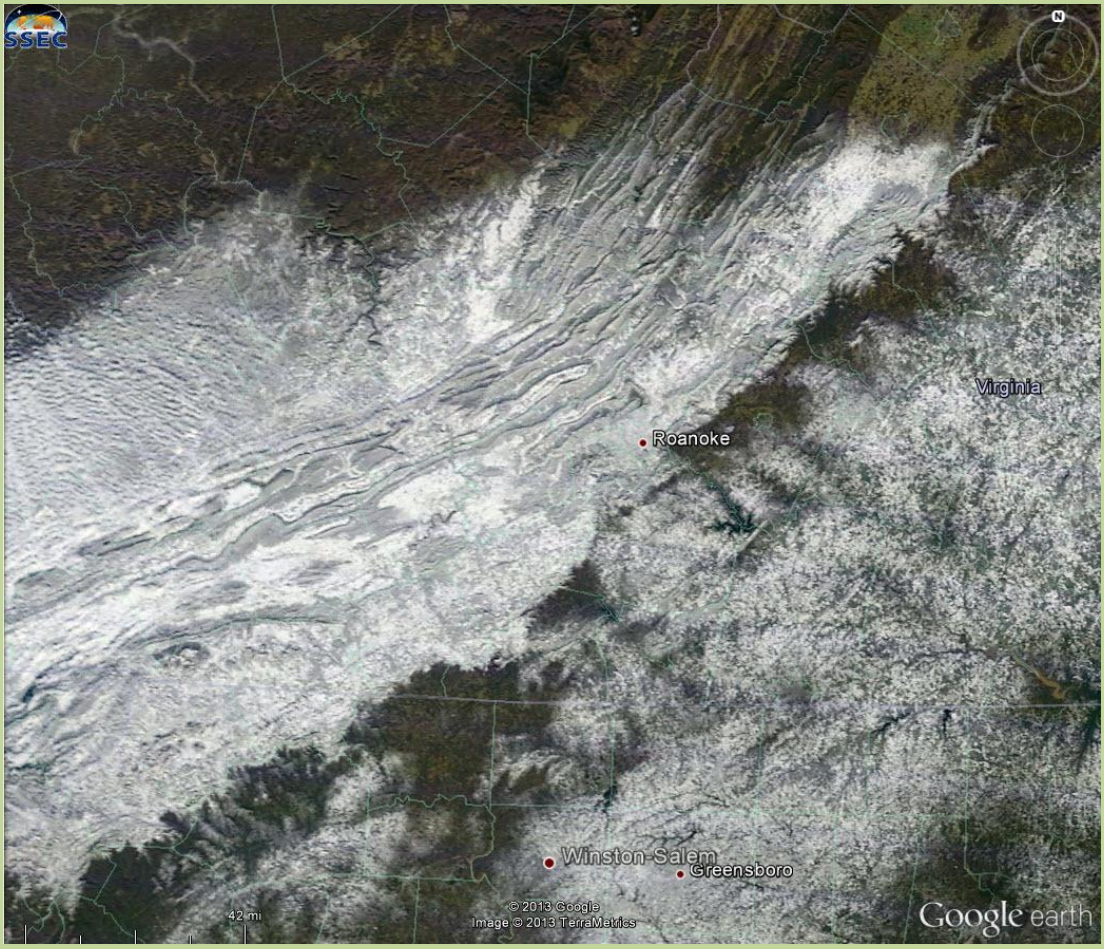
Table 1. Climatological Statistics for Winter 2012-2013 (Dec-Feb).

Climate Site	Average Temperature (Anomaly)	Rank (Warmest, year)	Period of Record	Total Precipitation (Anomaly)	Total Snowfall (Normal)
Bluefield	38.7 (+2.5)	2nd (40.2 , 2012)	1959-2013	10.84 (+2.27)	31.5 (25.3)
Blacksburg	35.9 (+2.8)	10th (39.0, 1956)	1952-2013	11.51 (+2.67)	17.0 (16.2)
Roanoke	41.8 (+3.5)	9th (46.5, 1931)	1912-2013	11.87 (+3.12)	9.3 (14.2)
Lynchburg	40.2 (+3.3)	25th (47.8, 1931)	1893-2013	10.28 (+0.97)	3.4 (10.2)
Danville	42.8 (+3.3)	3rd (45.7, 1949)	1948-2013	12.27 (+2.57)	1.7 (9.3)



Temperature Ranking **Precipitation Rankings**

There were numerous small to moderate snow events but no single large snowstorm affecting the entire CWA. Probably the most widespread snow of the winter was January 17-18 as a low pressure tracked out of the southeastern states to the Carolina coast. The system began with heavy rain which transitioned over to snow across the mountains first and later the piedmont. The heavy rains produced river flooding in the Dan basin leading to the unusual instance of Winter Storm and Flood Warnings out at the same time. The satellite image below shows the areal extent of the snow cover from this event. Amounts ranged from nothing in some foothills to over 1 foot in some mountain areas.



Visible Satellite showing snow cover, January 18, 2013.

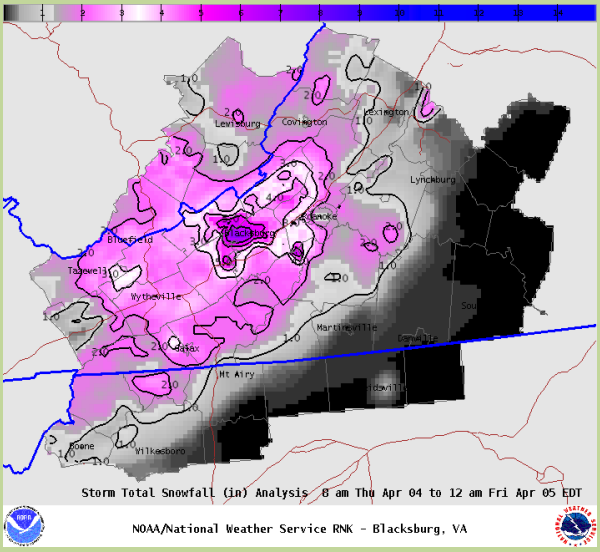
The most notable hydrologic event of winter 2012-2013 was the heavy rain and flooding that took place on January 30-31 as a cold front crossed the area and became stalled for several hours during the evening hours of the 30th. Widespread flash flooding in the mountains was reported especially in Watauga County where 3 to 6 inches of rain fell and several water rescues were needed. This was followed by river flooding in nearly all the basins of the CWA with several river forecast points reaching Major Flood Stage for the first time in several years. The worst was on the New River where numerous vehicles were submerged in a parking lot at Radford University and several AEP dams were damaged.

March 2013 – A Late Start to Spring

Despite March 1st marking the official end of "meteorological" winter, March 2013 was a chilly month with several significant winter weather events. This was a huge change from March 2012, a month that shattered high temperature records all over the eastern 2/3 of the U.S. At Blacksburg WFO the March 2012 average temperature was 51.6°F or 10.0 degrees above normal and was the highest March average on record (since 1952). In contrast, the March 2013 average was nearly 16 degrees cooler at 35.8°F or 5.8° below normal. This was the 4th coldest on record at Blacksburg, but not even close to March, 1960 which holds the record for March cold across the entire area. At Roanoke, with records dating back over 100 years (1912), March 2012 was also set a record while March 2013 came in at the 11th coolest (42.1°F). Several winter storms affected the area during March bringing variable amounts of snow, mixed precipitation and rainfall to the area. With near normal March precipitation (3.29" or 87% of the normal March amount of 3.77") there was enough to end all drought category designations on the weekly U.S. Drought Monitor for the CWA as of March 14, 2013. This was the first week since January 24, 2012 that not a single county in the CWA was shown in D0 (Abnormally Dry) or worse. The last lingering areas of D0 were in the upper James River basin (Bath, Alleghany and Rockbridge counties).

A Rare April Snowstorm

Hopes of spring were briefly frosted in early April as the area was visited by one last winter 'surprise' snowstorm on April 4th. The storm brought one of the largest April snowfalls in recent memory with anywhere from 1 to 6 inches of snow centered on the Blacksburg area of the New River Valley (see map below). The area of low pressure responsible for the snow took a near perfect track for snow but initial forecast thinking was that it was too warm for much snow to stick on the ground. However the intense rates of snowfall were able to cool the thermal profile enough to overcome the warm ground and cause accumulating snow.

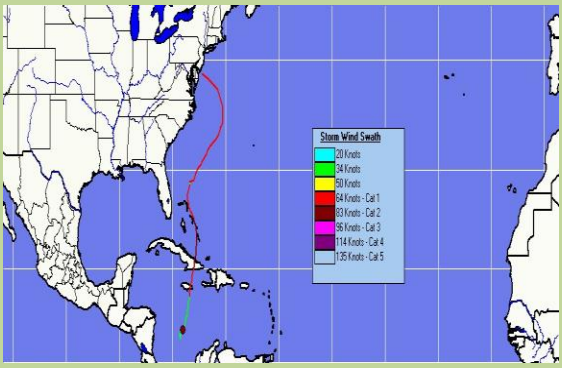


Snowfall map of the April 4th, 2013 Storm

Unique Hurricane Sandy Ends 2012 Atlantic Hurricane Season: Will 2013 Be As Busy?

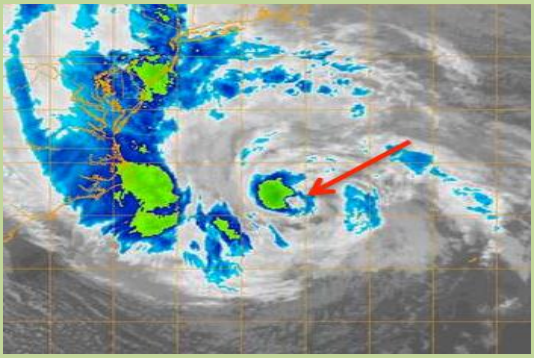
Jim Hudgins, Senior Forecaster

The 2012 Atlantic hurricane season ended in late October with one of the strongest storms to ever affect the Eastern Seaboard as Sandy (see map below) a former category 3 hurricane, made landfall along the coast of New Jersey. Sandy was quite different from 'normal' tropical storms in that it was transitioning from a purely tropical warm-core storm to a hybrid extratropical cyclone. It is not that unusual for a tropical storm to shift from warm-core to cold-core, but additional elements combined to enhance the strength of Sandy. Such cases of warm to cold core transition are not unprecedented, and this mechanism was part of what led to the so-called "Perfect Storm" of October, 1991.



Track of Sandy October 22-29, 2012

The satellite picture (below) about a day before Sandy hit New Jersey shows a thin eyewall (red arrow) with the inner core of the hurricane, while the rest of the storm resembled more of a cold core extratropical low. With Sandy it appears that all these factors contributed to it becoming a super storm, possessing very strong winds near the core as well as in bands far from the center. In addition, moisture from what were once rain bands within the core of the hurricane became intermingled with very cold air for late October to turn precipitation to inland heavy snow. Across the local area, this expansive system caused wind gusts from 50 to 70 mph over the mountains and snowfall of one to two feet across the upslope areas from the NC mountains to Greenbrier County, WV.



GOES-13 image of Sandy (courtesy NRL)

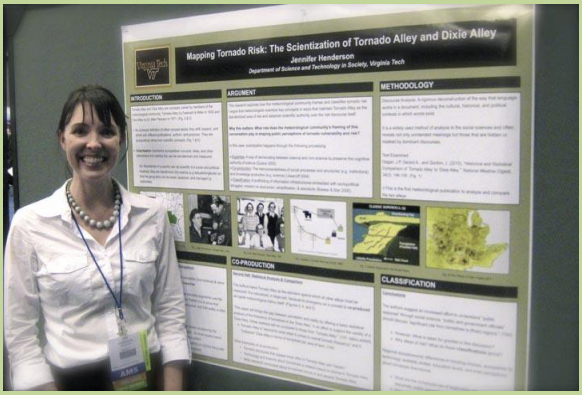
The outlook for the upcoming 2013 Atlantic hurricane season remains inconclusive at this time as official forecasts have not yet resumed. Several factors hold the key to the forecast: These include already above normal Atlantic sea surface temperatures that are forecast to remain quite warm, a possible favorable upper air pattern over the western Atlantic during the late summer, and lack of a Pacific El Nino pattern until later in the year. Later updates will reflect the impact of these features upon the number of named storms that may occur during this year. The names for the 2013 season that runs June 1-November 30th include: Andrea, Barry, Chantal, Dorian, Erin, Fernand, Gabrielle, Humberto, Ingrid, Jerry, Karen, Lorenzo, Melissa, Nestor, Olga, Pablo, Rebekah, Sebastien, Tanya, Van and Wendy.

Social Scientist Conducts Research at WFO RNK

Jen Henderson, Ph. D. Student, VT

Jen Henderson has been fascinated by severe weather since she saw a waterspout over the Great Salt Lake in her native Utah when she was 12 years old. Instead of becoming a meteorologist, a field she didn't really consider until she was in graduate school, she focused on an M.F.A. in creative nonfiction, which led her to write her thesis, in part, on storm chasing and Dr. Theodore Fujita's work with tornadoes. For several years, she taught creative writing and studied meteorology as a hobby. Then, in 2011, on the heels of the Super outbreak of tornadoes in April, which devastated several communities in the Southeast, she decided to return to graduate school for a Ph.D. Her career goal is to work with the meteorological community as a social scientist to understand the complexities of the warning process.

As a Ph.D. student in Science and Technology Studies (STS) at Virginia Tech, Jen is part of an interdisciplinary community of historians, sociologists, and philosophers who study the impact of science and technology on society and vice versa. Her particular interest within STS lies at the intersection of meteorological science and society, specifically severe weather warnings. While her dissertation work is still in its early stages—she's only in her second year of a five-year program—Jen hopes to map the weather warning process, from the ways that technology shapes how forecasters work to how their messages get disseminated to different publics. To help her understand more about the forecasting processes performed at the National Weather Service, Jen has been conducting ethnographic work at the Blacksburg forecast office since late October of 2012. Each week, she visits different shifts to learn what forecasters do both by watching them work and asking a lot of questions along the way. Thus far, she has learned a lot about this fascinating work! She's come to see the importance of conveying both uncertainty and confidence in forecasts, the difficulty of doing so, and the value of skill and expertise in interpreting the vast amount of data collected by the National Weather Service each day. Perhaps most importantly, she's developed a great deal of respect for just how difficult forecasting the weather can be and how much forecasters care about getting it right.



In May of this year, she'll extend her research to include novice meteorologists from Virginia Tech as they practice what they've learned in the classroom by forecasting supercells on the Great Plains. And in June, she'll join an interdisciplinary group of researchers at Colorado State focused on extreme precipitation, flood warnings, and societal aspects of forecasting. You can find out more about Jen's work by visiting her website: http://www.jenhenderson.com

Latest News in Social Media

Chris Fisher, Meteorological Intern

Some exciting things have been happening in the world of social media here at the Blacksburg office. In early February, our Facebook page went over the 3,000 "likes" mark. Since October alone, over 1,500 people have "liked" the page. As would be expected, our page traffic continues to increase each time there is active weather in the area, as people seek out the latest weather information and provide reports. Interaction with the public and media through Facebook has become an integral part of our verification process during winter storms, and we hope to continue that momentum into the convective season this year. The public, media, and trained weather spotters are encouraged to post reports and photographs to our Facebook page during severe weather events. In addition to current weather events, our page often posts educational information, SKYWARN schedules, and information on outreach events. Our office Facebook page can be found by searching "US National Weather Service Blacksburg," or https://www.facebook.com/US.NationalWeatherService.Blacksburg.gov

During the fall of 2012, the Blacksburg Twitter page was launched. In just a few short months, over 700 people are following us. Twitter has given our office an additional social media platform to disseminate information, gather reports, and interact with the public and media in our county warning area. You can stay in contact with us on Twitter by searching @NWSBlacksburg or directly by going to: https://twitter.com/NWSBlacksburg

The social media team also needs your help with an interactive project. The PING project (Precipitation Identification Near the Ground) is a collaboration between the NSSL (National Severe Storms Laboratory) and the University of Oklahoma. The basic idea of the project is simple. The NSSL collects radar data and compares it with precipitation reports on the ground. All you have to do is tell us what kind of precipitation is falling at your location. This will help develop and improve new radar techniques for determining what type of precipitation is falling where. There are a couple ways you can get involved. First is the website: http://www.nssl.noaa.gov/projects/ping/. The second way to report is through the mPING app available for free on all Android and iphone devices.

Several ideas are on the horizon for this upcoming spring, including a Facebook and/or Twitter Q&A session, trivia and photo contests. We are always looking for feedback from our users to help enhance NWS Blacksburg's social media experience.

Collaboration with Virginia Tech and NC State Meteorology programs

Steve Keighton, Science Operations Officer

In the newsletter last spring we reported on the new Virginia Tech Meteorology Program within the Department of Geography. We are excited about the level of involvement that we've had with faculty and students during this first school year with the new undergraduate major, and wanted to share with you some of these collaborative activities.

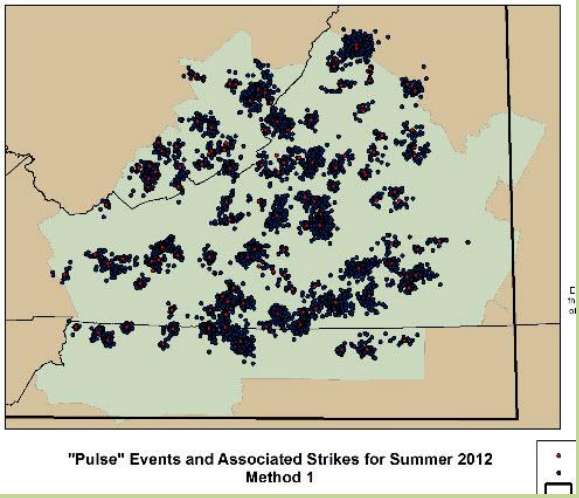
Providing experiences for students

Providing interested meteorology students with opportunities to experience various aspects of operational meteorology inside a National Weather Service office is probably the most significant contribution we can make toward the program, and it ultimately benefits us as well for those students who choose careers in the NWS. We have provided about a dozen students some volunteer opportunities to help collect reports to verify warnings, and a handful of these volunteers have also spend additional time helping with data collection and/or analysis for local research projects. In both the Fall semester and the current Spring semester, we have offered a 3-credit internship course for three students at a time, where they spend several hours per week in the NWS learning about various aspects of our operations, and even get a little hands-on experience helping with data collection, preparing forecasts, or practicing issuing warnings on a weather event simulator. Last Fall the three students got a tour of the Doppler radar site in Floyd County. We currently also have plans to offer a 1-credit forecasting practicum course next Fall which will focus on how to best use computer-based forecast guidance given common limitation and biases in these models, especially in the Appalachian region. This short course will take advantage of real-time events each week as much as possible to share our local knowledge of how and where to best improve upon computer-based forecast information.

New collaborative research opportunities

With the new program, VT faculty and students in the Geography Department are considering more research opportunities related to meteorology, both at the undergraduate and graduate level, and we have been involved in guiding and developing a couple of these in the last year, as well as supporting others with data. In one case, a collaborative effort supporting a Master's candidate research project has recently been formerly funded through a Cooperative Program for Operational Meteorology Education and Training (COMET) grant, specifically through the "GOES-R" program which is established to prepare for data sets available on the next versions of weather satellites. This specific collaborative study will be primarily examining the use of total lightning data (both in cloud as well as cloud-to-ground) activity in weak shear or "pulse" thunderstorms in the Appalachian region, which are a common yet challenging mode of severe storms in this area. Total lightning data, which will be available from the new GOES satellites a few years from now, is also recently available to NWS offices through a contract from Earth Networks Inc. This will be the first summer season where forecasters at

the NWS in Blacksburg will be able to evaluate any total lightning data in real time, while Virginia Tech will work with archived data and studying algorithm-based performance as it relates to detection of potential severe pulse storms.



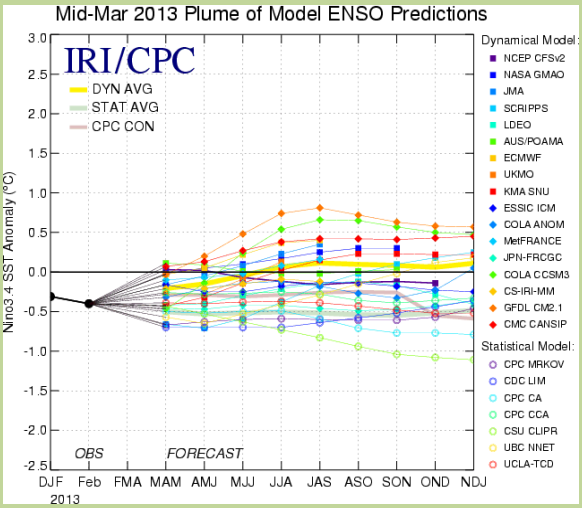
A side component of this study will also examine satellite-based cloud-top cooling or convective initiation products for pulse storms in these same environments. Previously, most of the research with the convective initiation satellite products and total lightning studies has been focused on organized storms in stronger shear environments, and also removed from any appreciable terrain influences. So we're excited about what we might learn together with Virginia Tech over the coming year on how we can best utilize these new data sets for improving severe weather detection and warnings on these kinds of storms. We'll be that much better prepared to use similar new data sets coming with the next generation of satellites.

In addition to collaboration with Virginia Tech, we continue to be involved with formal collaborative research efforts lead by NC State University. The latest Collaborative Science, Research, and Training (CSTAR) projects between NCSU and nearby NWS offices that we are specifically involved with include the distribution of rainfall in land falling tropical systems, and improving understanding of environments tornadic and significant severe storms that develop in high shear but low instability environments. These tend to be smaller and shallower than most tornadic storms studied heavily in the Plains states (which develop in both high shear and high instability), but are a very common kind of tornado-producing scenario here in the Southeast U.S. This NCSU CSTAR project is attempting to help forecasters better recognize the environments and often subtle radar signatures that can lead to quick tornado development. We have participated by identifying several events from our area, and conducting detailed analysis of the radar characteristics of these events, while other participating offices are looking at quite a few other events as well. Students from NCSU are developing relational databases between environments and reports, and general relationships between reports and specific radar-based shear thresholds and trends, as well as modes of convection. Both the high-shear, low-instability study, and the tropical rainfall distribution study which we have also contributed toward, should wrap up by the end of this summer.

Summer 2013 Outlook

Peter Corrigan, Service Hydrologist

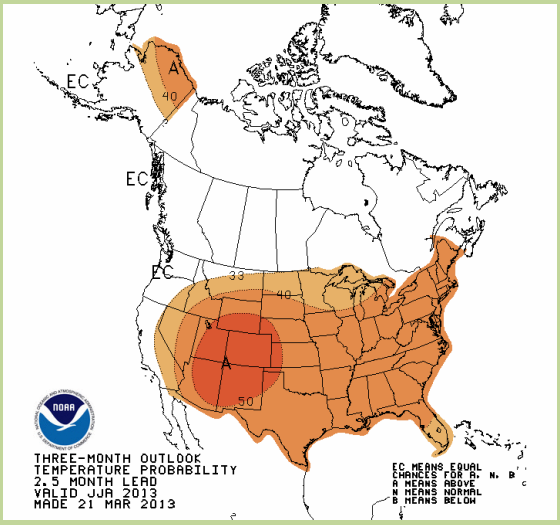
Even as we emerge from a winter that seemed longer than usual due to a very cool March, questions have begun as to the type of summer we will have. Summer in this discussion is confined to the period from June 1-August 31, often called 'meteorological summer'. If persistence is an indicator it will be warmer than normal again this summer. The last three summers have all seen periods with some of the warmest temperatures ever recorded in much of our area. Roanoke, with records dating back to 1912, had its hottest July on record in 2011 at 80.2°F only to break that record in 2012 at 80.8°F. The overall summer of 2012 was not as extreme owing to a relatively cool August but the summer 2011 was the warmest on record at Roanoke with 78.2°F and that followed 2010 which had just set the new record for the warmest summer at 78.0°F. But will summer of 2013 make it four years in a row for record breaking heat? The answer unfortunately, is not at all clear. The skill in long-range weather forecasting is not very high and this is especially true in summer with its weaker atmospheric flow patterns. One of the more useful tools in long-range forecasting is the evolution and status of the El Niño/Southern Oscillation (ENSO). El Niño is the periodic (about every 3 to 5 years) warming of the central and east-central equatorial Pacific Ocean waters and represents the warm phase of the ENSO cycle. Its counterpart is La Niña, which refers to cooling of ocean temperatures in the same Pacific Ocean waters. La Niña represents the cool phase of the ENSO cycle. This cycle can exert a profound effect on weather patterns around the globe and a strong ENSO signal can be a strong predictor of future weather. On the other hand the lack of a strong ENSO signal may offer little if any predictive power. The strength of ENSO is measured at the NWS Climate Prediction Center by the Oceanic-Niño Index (ONI). Persisting values of ONI at or above +0.5 qualify as El Niño, while values below -0.5 or below qualify as La Niña. The last three summers as mentioned above were very warm but how did they compare to the ENSO index? Summer 2010 was during a moderate La Niña (ONI -0.9) while both 2011 and 2012 were considered 'neutral' with ONI values between -0.5 and +0.5. The current status of ENSO at this writing (April 5, 2013) is in the neutral range and is forecast by the CPC to remain neutral through the summer of 2013. The Figure below shows a series of ENSO forecasts from various dynamic and statistical models, with 0.0 representing neutral ENSO conditions.



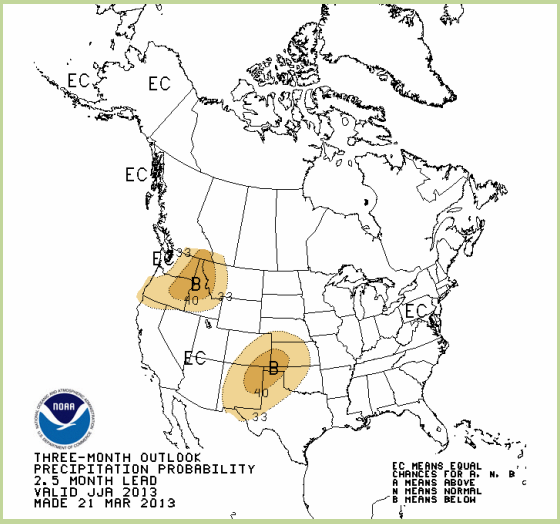
ENSO Forecast Plumes – through late 2013

Does a neutral ENSO presage a warmer than normal summer? The last two summers could support that notion and it could be one inferred from the latest set of seasonal forecasts from the CPC. The 2.5 month long-lead outlooks for

June-July-August (see Figures below) show an enhanced probability for warmer than normal temperatures in our forecast area and most of the continental U.S. Precipitation, generally even more difficult to predict than temperature, shows equal chances for above, below or normal precipitation. It bears stating however that these forecasts are based on other factors besides ENSO, including statistical and physical climate models, soil moisture and persistence.



Summer 2013 – Temperature Outlook



Summer 2013 – Precipitation Outlook

Severe Weather Season is Here!

As we head into spring and summer remember to stay safe and be prepared for storms: The link below provides a wealth of information on safety in all types of weather.

http://www.weather.gov/safety

Report Severe Weather!

Trained spotters or the public should report the following to the NWS via Social Media (Twitter/Facebook) or SKYWARN: 1-800-221-2856

- Tornadoes or funnel clouds
- Wind Damage, such as structural damage or trees/power lines down.
- Measured or estimated wind gusts of 50 MPH or greater
- Hail of any size
- Water flowing over a road
- Creeks or streams leaving their banks

While in-person SKYWARN training is soon over, for free online SKYWARN training check out this link!

http://www.erh.noaa.gov/rnk