NORTHEASTERN STORM BUSTER

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Evan L. Heller, Editor/Publisher
Steve DiRienzo, WCM/Contributor
Ingrid Amberger, Webmistress

FEATURES

DEPARTMENTS

THE MAY 22nd 2014 TORNADO

Thomas A. Wasula
Meteorologist, NWS Albany NY

The National Weather Service in Albany conducted a damage survey on May 23rd, confirming a significant EF3 tornado that occurred on May 22, 2014 in eastern New York. The tornado occurred in Schenectady and Albany Counties during the mid-afternoon. A long-path tornado touched down at 3:33 p.m. EDT northwest of the town of Duanesburg, and east of Braman Corners, in northwestern Schenectady County (**Figure 1**). There was some tree damage, and a roof was torn off of a shed. This tornado continued to the south-southeast for 7 miles across Schenectady County before ending in northwestern Albany County, at the intersection of Crow Hill and Bozenkill Roads, in the Town of Knox, at 3:55 p.m. EDT. The tornado had a narrow path at the beginning of its track in the northwestern reaches of the Town of Duanesburg. Trees were snapped and uprooted in different directions near the intersection of Route 30 and Duanesburg Churches Road (**Figure 2**). Some trees also fell into a pool, and there was shingle and roof damage to homes, as the tornado tracked southeast towards U.S. Route 20 and State Route 126.

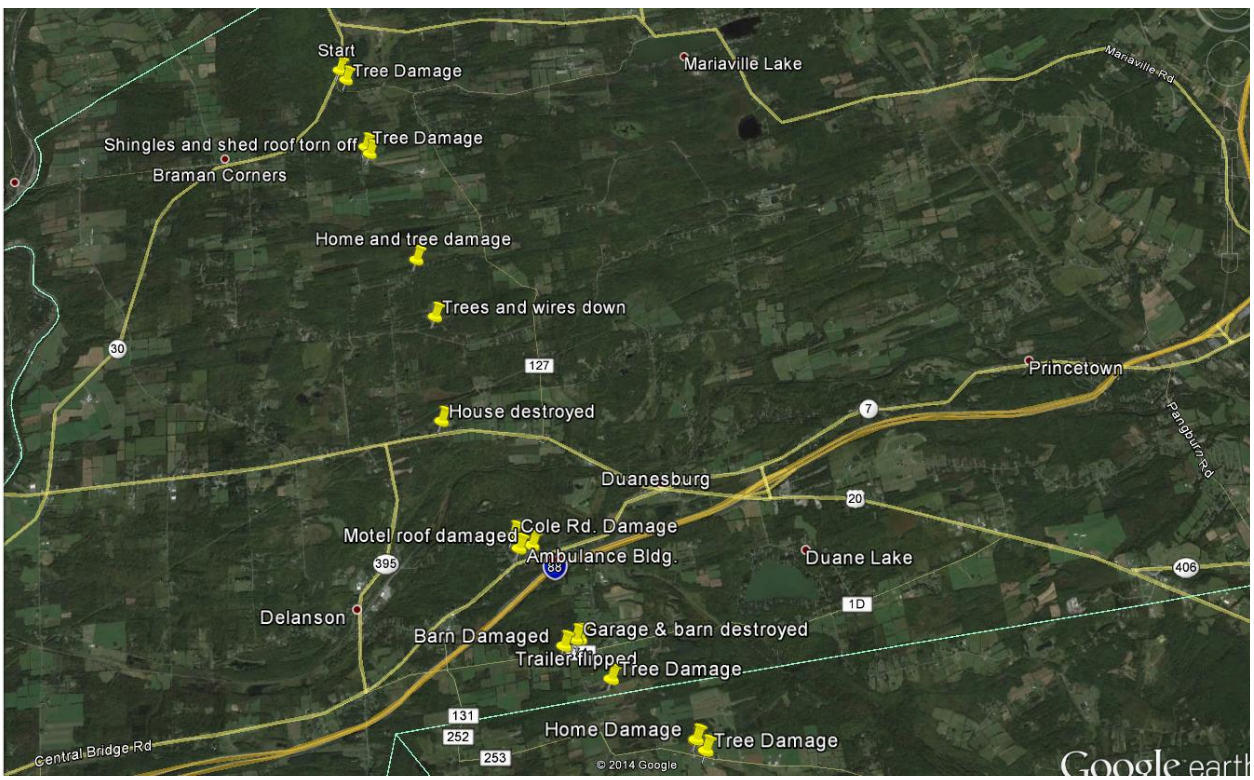


Figure 1: Tornado track based on the NWS at Albany damage survey. The tornado crossed NY Routes 7 and 20, as well as Interstate 88.

Figure 2: Tree damage at the starting point of the tornado near the intersection of NYS Route 30 and Duanesburg and Churches Road. The initial damage was rated EF0, with snapped and uprooted trees *(NWS at Albany photograph)*.

The tornado was most intense, in terms of the damage to a home along Route 20, in the Town of Duanesburg. Its path width was around a quarter mile at times. A well-built home was almost completely destroyed by winds of around 140 mph **(Figure 3**). The home was left with only one wall standing. There were no injuries or fatalities as the owner was not home at the time it occurred (between 3:45 p.m. and 3:50 p.m. EDT). The pets of the household were also found to be safe after the destruction. A motel and an ambulance station sustained some roof damage as the tornado pressed on further to the south, crossing State Route 7 and Interstate 88 around 3:50 p.m. EDT. Two tractor trailers tipped over on Interstate 88 around 350 p.m. EDT. Fortunately, the drivers did not sustain any injuries. At 3:51 p.m. EDT, a well-defined hook echo was on the Albany (KENX) radar (**Figure 4**), with a tornadic debris signature on its associated dual-polarization Correlation Coefficient product. The extremely low values of correlation coefficient indicated that siding, shingles, insulation, leaves and other debris were being lofted into the air. The tornado diminished around 3:55 p.m. EDT in extreme northern Albany County, in the Town of Knox. Significant EF0-EF1 tree damage occurred in its path, with additional sheds and barns destroyed, and roof damage to homes. Also, some campers and cars were damaged or overturned.

Figure 3: A home situated along State Route 20 in the Town of Duanesburg, almost completely destroyed. Only one wall remained standing after the tornado *(NWS at Albany image)*.

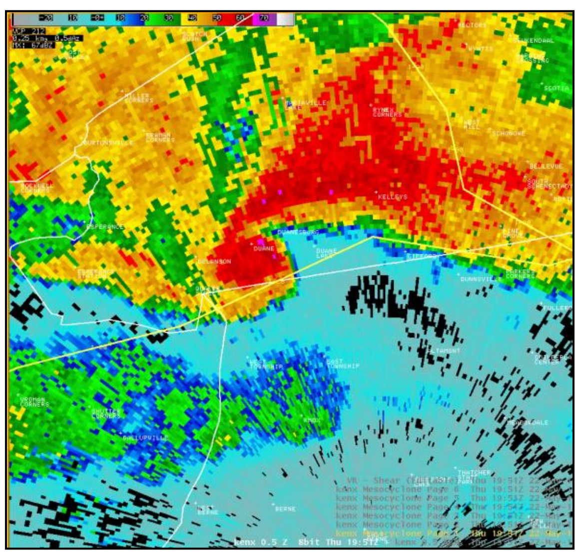


Figure 4: The KENX radar 0.5° Base Reflectivity image at 3:51 p.m. EDT showing the hook echo moving across Duanesburg and Delanson in Schenectady County. The corresponding Dual Pol Correlation Coefficient product (not shown) at this time indicated a tornadic debris signature, with siding, insulation, shingles and other debris lofted into the air.

The estimated maximum wind speeds produced by the Schenectady-Albany County tornado were 140 mph based on the damage it inflicted. This classified it as a solid EF3, confirmed by the near-complete destruction of the Duanesburg home. Most of the damage, however, was in the EF0-EF1 category, with numerous homes, barns, vehicles, trees and wires damaged. The operational Enhanced Fujita Scale is a set of wind **estimates** based on damage. This tornadic damage scale (which used to be the Fujita Scale) was put into effect February 1, 2007 by a team of meteorologists and engineers. The EF scale ranges from 0 to 5 and has estimated 3-second wind gust ranges in miles per hour (mph). An EF0 has wind gusts of 65-85 mph; an EF1, 86-110 mph. An EF2 has estimated 3-second wind gusts of 111-135 mph, while an EF3 has gusts of 136-165 mph. The estimates of the damaging gusts are based on the subjective judgment of the survey team on 8 levels of damage to 28 structural and vegetation indicators. More information on the EF scale and the transition from the Fujita Scale can be found at the following website:
http://www.ncdc.noaa.gov/oa/satellite/satelliteseye/educational/fujita.html

The Albany forecast area averages two to three tornado events each year, based on a tornado climatology spanning from 1950 to 2010. The Schenectady-Albany County tornado was the first EF3 tornado in the Capital Region since the F3 tornado of May 31, 1998 that struck Mechanicville in Saratoga County. This was a high-end F3 tornado, with winds of up to 200 mph that caused over $70 million in damage and 68 injuries **(Figure 5).** The total path length of this tornado was 31 miles as it moved across southeastern Saratoga County into northern Rensselaer and Bennington Counties in the Albany forecast area**.** Schenectady County has had 3 tornadoes in the past four years! Only last year, a significant tornado struck Schenectady County on May 29th. Its long path length of 13 miles started in extreme eastern Montgomery County near the town of Florida, and moved eastward across most of Schenectady County, producing EF2 damage in Mariaville. It was up to a mile wide at times. Yet another tornado touched down in Montgomery and Schenectady counties, in Cranesville and West Glenville, on September 4, 2011. This was a significant EF1 tornado that was nearly a half mile wide at times. The May 22nd tornado was only the fifth one to strike Schenectady County since January 1, 1950! One tornado occurred on August 21, 1971, when an F0 hit part of Schenectady County. It's interesting to note that the only other documented Schenectady County tornado occurred on June 24, 1960. This significant F3 touched down just east of the city of Schenectady, and moved northeast nearly 11 miles into southeastern Saratoga County, where it dissipated south of Round Lake. Nine injuries and approximately $25 million in damage resulted from this long-track tornado that hit the Greater Capital Region. The path length of the May 29, 2013 EF2 tornado was very comparable to that of the historic June 24th one. Albany County has now had 8 tornadoes since 1950. The most memorable was the long-track EF4 tornado of July 10, 1989 that moved through Montgomery, Schoharie, Albany and Greene Counties.

Figure 5: F3 damage from the Mechanicville Tornado of May 31, 1998 (NWS at Albany photograph).

Tornado safety must be emphasized when events like May 22 arise. Fortunately, no one was killed or injured. Many people in the Duanesburg and Delanson areas stated that they heard the tornado warning 10 to 20 minutes in advance. The best option in terms of tornado safety is to get into a basement under sturdy protection, and to stay away from windows. If a household does not have a basement, then go to the lowest floor in a center room, which is usually a bathroom. In a mobile home, try to get out quickly and find a nearby storm shelter. There is no real safe option when caught inside a car in a tornadic situation. It is emphasized to avoid seeking shelter under a bridge; people have lost their lives trying to hide under bridges. If outdoors, when a tornado is nearby, it is suggested you lie flat against the ground, protecting the back of your head with your arms from potential flying debris. Remember…"When thunder roars, get indoors!"

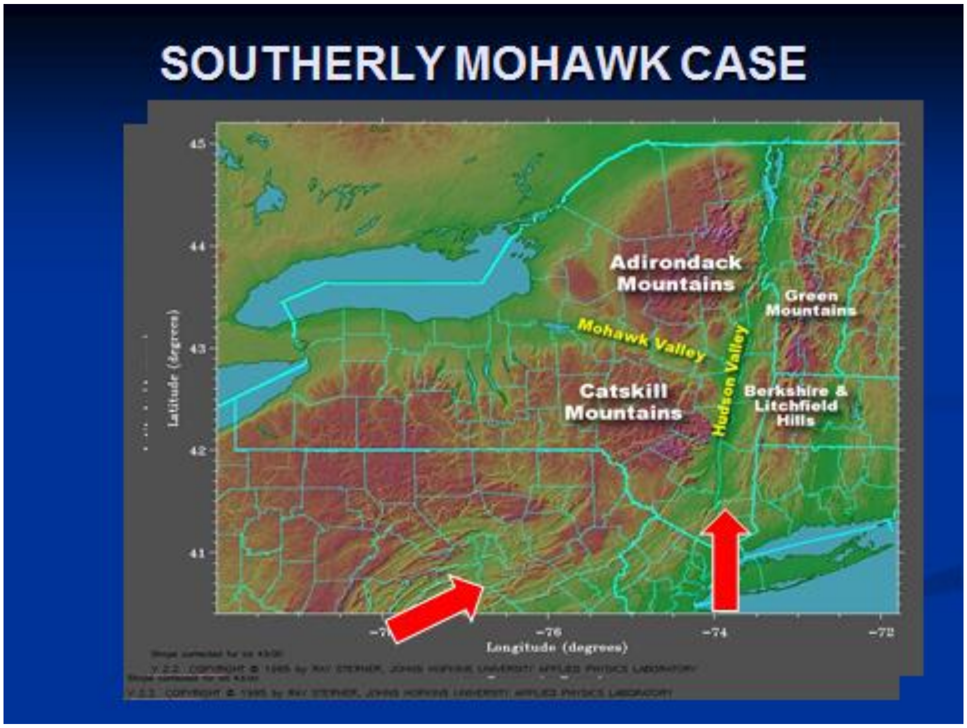
SOUTHERN MOHAWK-HUDSON CONVERGENCE

Hugh Johnson
Meteorologist, NWS Albany, NY

It's been long known that valleys can have a local effect on weather. We have seen this with our Mohawk and Hudson Valleys. The surface wind in the Mohawk Valley is often skewed to a westerly flow that lines up with the valley. In the Hudson Valley, which runs north to south, a southwesterly flow through it is often channeled in a more southerly direction.

Myself and a number of SUNY Albany students have conducted research over a nearly ten-year span which has revealed that, during the warm months, a southwesterly surface wind well ahead of an oncoming cold front will become more westerly down the

Mohawk Valley, and more southerly up the Hudson Valley. These two valleys converge in the Capital District. If these winds are accompanied by moist unstable air in the absence of any apparently strong synoptic forcing, single cell thunderstorms can suddenly erupt in the Capital District with little warning. Since this phenomenon always occurs in the vicinity of Albany International Airport, aviation traffic can be severely impacted. Refer to the figure below.



This phenomenon, which has been coined Southern Mohawk-Hudson Convergence (SMHC), takes place an average of a couple of times a year, mainly during the summer months. If a lone thunderstorm can form and contain the right amount of shear and instability, it could become severe.

One scenario occurred on June 22, 2008. A storm "popped" just to the west of Albany International Airport. A lone cell developed and quickly transformed into a supercell, and a tornado warning was issued. While no tornado occurred, the cell produced large hail and some spotty wind damage. Another storm, possibly the result of SMHC, developed on July 21, 2010 and became briefly severe. Yet another formed on July 23, 2012.

SMHC does not occur often, so it's important to continue research into when and why it does. Initially, the local studies have had to rely on surface winds from the ASOS at Utica, nearly 90 miles west of Albany, to represent the mean surface flow down the

Mohawk Valley. In 2009, however, the ASOS at Utica was moved to Rome Griffiss Air Force Base, so now the measurements are even further away from Albany.

In the near future, there should be additional surface observations available for this continued research, thanks to current weather monitors along the New York State Thruway throughout the Mohawk Valley that will be available to the National Service. That additional data could help further explain why SMHC only occasionally takes place.

A special "thanks" goes out to all the SUNY Albany students who have assisted with this project.

NOAA'S 2014 HURRICANE OUTLOOK

Kevin S. Lipton
Meteorologist, NWS Albany, NY

On May 22, 2014, NOAA's Climate Prediction Center issued the 2014 hurricane outlook for the Atlantic Basin, which includes the Caribbean Sea and Gulf of Mexico, and they expect a "normal to below normal" season. A "normal" hurricane season in the Atlantic Basin spawns 12 named storms (either tropical storms or hurricanes), 6 of which are hurricanes, with 3 of them attaining "major" status (category 3 or higher on the Saffir-Simpson Scale of hurricane intensity). The Climate Prediction Center's forecast indicates the number of named storms to range anywhere from 8 to 13 for 2014, with the expectation for 3 to 6 of them to reach hurricane status, 1 to 2 reaching major status (Figure 1). For reference, the 2013 Atlantic hurricane season witnessed a near-normal season overall, with 13 named storms, 2 of which were hurricanes. Neither of these hurricanes reached major status, which was below normal.

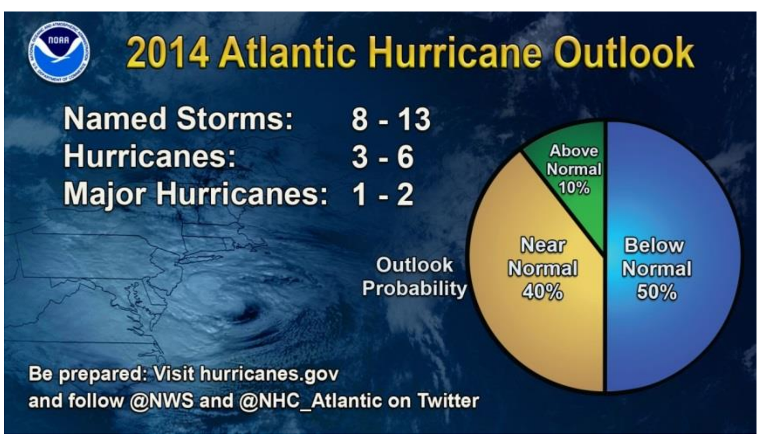


Figure 1. The official 2014 Atlantic Hurricane Outlook, issued by NOAA's Climate Prediction Center on May 22, 2014. The pie graph on the right gives the overall probabilities favoring a below-normal, normal, or above-normal season for 2014 . *Image courtesy of NOAA.*

The premise for this year's forecast is heavily dependent on three main factors. The first and biggest involves the expectation for El Niño to develop in the eastern Pacific Ocean. El Niño refers to the presence of abnormally warm sea surface temperatures across the eastern and central Pacific Ocean. What do Pacific Ocean water temperatures have to do with hurricanes in the Atlantic Ocean? Well, typical conditions across the tropical Pacific Ocean involve warmer water across the far western Pacific Ocean along with associated thunderstorm development, while the waters in the eastern tropical Pacific normally remain relatively cool, with limited thunderstorm activity. The opposite is true when an El Niño is present – the warmer waters and associated thunderstorm development shifts much further eastward in the Pacific Ocean. When this occurs, winds within the upper levels of the atmosphere strengthen across the eastern Pacific Ocean, and these strong upper-level winds stretch even as far as across the tropical Atlantic Ocean. They tend to rip apart thunderstorms over the Atlantic Ocean, limiting the potential for these to organize into tropical cyclones. Therefore, when an El Niño is present, overall tropical cyclone activity is usually less than normal in the Atlantic Basin. Most current indicators, such as recent water temperatures, wind patterns and computer forecast projections of these fields over the next several months strongly suggest that an El Niño is developing, and that it should strengthen over the upcoming summer months. Assuming this occurs, conditions should favor upper-level winds becoming stronger than normal across the tropical Atlantic Ocean, therefore limiting the overall number of tropical cyclones that may develop this season. Of course, should the El Niño fail to form, or if it develops more slowly than is currently expected, then it is possible that the overall number of tropical cyclones for 2014 will trend towards the higher side of the 2014 forecast range.

The second main factor infused into this season's forecast includes the presence of slightly cooler than normal water temperatures which were present in the mid- to late-spring season across the eastern tropical Atlantic Ocean, off the west coast of Africa, as shown in Figure 2, where the seedlings to eventual tropical cyclones traverse during the season. Tropical cyclones need warm ocean temperatures to gather strength – normally, water temperatures above 80^0 Fahrenheit (F). The initial atmospheric disturbances that can eventually transform into tropical cyclones pass across this region of the tropical Atlantic Ocean on their long journey toward the western Atlantic Ocean. If water temperatures reach or exceed 80^0 F, these initial disturbances can organize and develop a circulation, potentially reaching tropical storm or even hurricane strength. The unusually cool sea surface temperatures in this region, also known as the Main Development Region for Atlantic tropical cyclones, develop from abnormally strong and persistent surface winds blowing from east to west along the northwest coast of Africa. When these easterly winds strengthen or persist, they force the water currents to move away from the African coast, allowing cooler water from well below the ocean surface to move upward – a process known as upwelling. The fact that these water temperatures are already running a bit below normal, and are forecast to remain slightly below normal throughout the summer months, is a limiting factor for expected Atlantic tropical cyclone development this year.

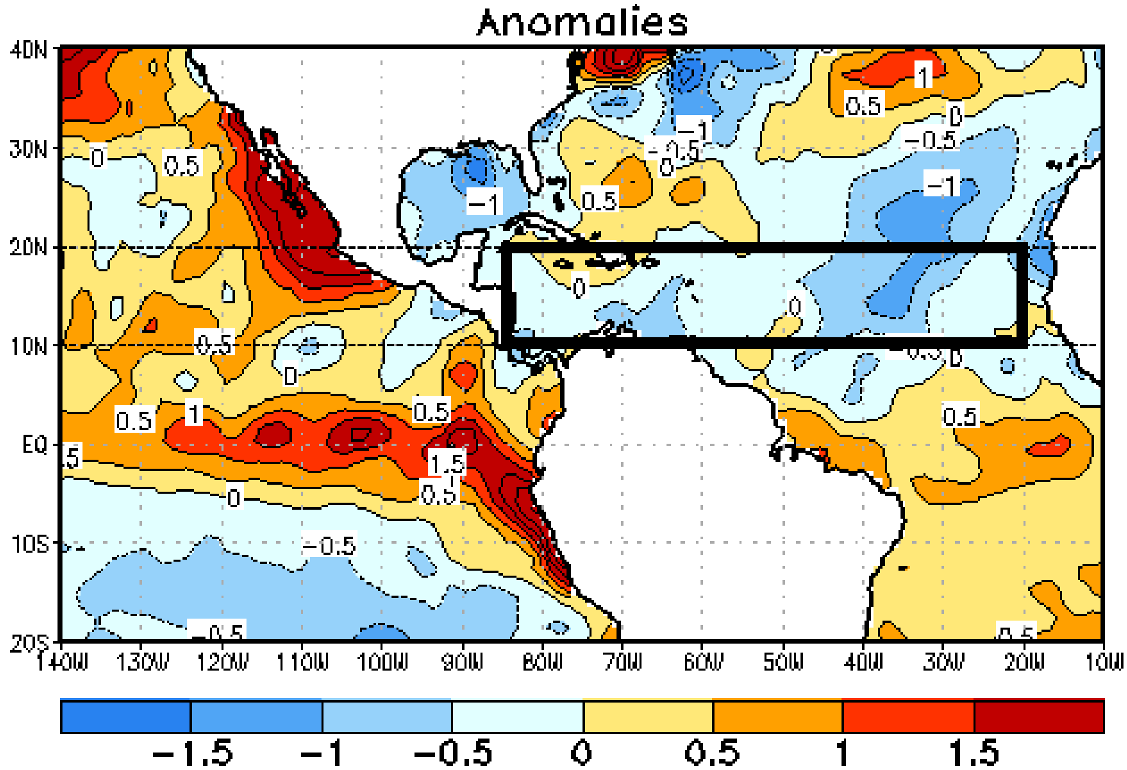


Figure 2. Anomalies of weekly-averaged sea surface temperatures (degrees Celsius) in the Atlantic Ocean, centered on June 4 2014. The black rectangle denotes the Main Development Region, where Atlantic tropical cyclones are most likely to develop. The white and blue colors denote cooler sea surface temperatures compared to normal, which would potentially limit tropical cyclone development within the tropical Atlantic Ocean. *Image from NOAA's Climate Prediction Center/NCEP.*

There is one additional factor included in the forecast that actually favors tropical cyclone development in the Atlantic Basin – an active African monsoon season - a trend which has been present since 1995. This enhanced African monsoon activity is believed to be part of a longer-term active cycle – and has been associated with more active Atlantic hurricane seasons. However, the other two factors outweigh this one; so, when combined, the overall outlook is for a near- to below-normal Atlantic tropical cyclone season in terms of overall numbers.

It should be noted that in May 2013, NOAA's Climate Prediction Center forecasted an above normal season for the Atlantic Basin, with a prediction of 13-20 named storms, 7-11 reaching hurricane strength, and 3-6 of these attaining major hurricane status. As noted above, the actual result was 13 named storms, 2 being hurricanes, neither of which reached major status – overall, lower than the 2013 forecast ranges.

So – the official forecast for the 2014 Atlantic hurricane season issued by NOAA's Climate Prediction Center favors a normal to below-normal season, based on these three main factors. Of course, any changes to these factors could easily alter this year's outcome. The Climate Prediction Center will issue an updated forecast in August 2014, taking into account these and other factors, and adjusting the forecast accordingly.

THE SUMMER WIND

Evan L. Heller
Meteorologist, NWS Albany, NY

Ol' Blue-Eyes sang about it. The summer wind has a different meaning to different people, depending upon where they live in the world. That's because there are numerous special localized winds that occur worldwide, and many are either unique to, or are at least a significant part of, the summer season. They are produced as the result of the effects of various combinations of meteorological, geographical and topographical features coming together. We will discuss a few of the more common and important of these summer winds.

'Foehn wind' is a general term referring to any of the worldwide local 'katabatic winds'…those that are adiabatically heated upon their journey down the lee sides of mountain slopes due to compression from increasing air pressure. The chinook is a very common North American example of a Foehn wind. It is a very common wind on the Lee Side of the Rockies, where the cold, moist air warms and dries adiabatically upon descent; but it is a wind most common during late winter and spring. There are some Foehn winds that occur in summertime as well. In the United States, perhaps the best-known example is the 'Santa Ana winds'. Though most common in fall and winter, these can be hot and extremely dry east to southeasterly downsloping winds in spring and early summer as well, that originate from high pressure in the Great Basin and upper Mojave Desert regions of the southwest, and heat upon descent as they channel down the valleys and canyons, and through the major mountain passes all the way to the southern California coast as far south as the northern Baja of Mexico (Figure 1). They are notorious for creating very hot conditions that dry out crops and vegetation, and cause major wildfires. Despite the heat associated with them, with surface temperatures often well exceeding 100 degrees Fahrenheit, the downsloping effect is actually only a small contributor. Most of the heating of this usually already warm desert air is attributable to compressional heating, as the wind gets "squeezed" through the mountain passes and valleys.

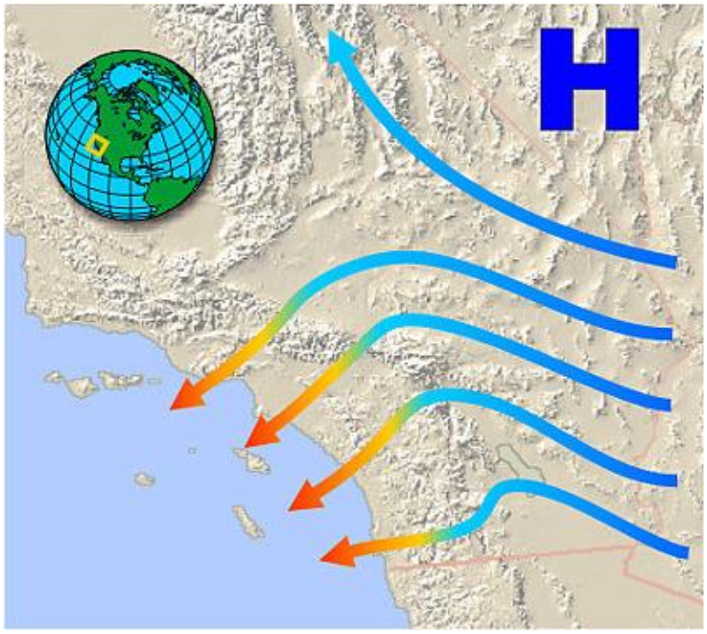


Figure 1. Schematic of the Santa Ana winds, with high pressure centered over the Great Basin/Mojave Desert regions of southern Nevada. *Image courtesy of* ***NOAA.***

A lesser-known Foehn wind is something known as 'The Brookings Effect', a local wind with the same characteristics as the Santa Ana Wind, and affecting the southern coast of Oregon. More well-known, however, and also with similar characteristics to the Santa Ana, is a local wind that frequents Santa Barbara, California. Known as a 'sundowner', this is a northerly wind heated on its journey south off the slopes of the Santa Ynez Mountains that lie just to the north, parallelling the east-west-oriented coast of Santa Barbara County. They occur with high pressure situated just north of the area. They tend to precede the Santa Ana winds by a day or two due to the typical slow eastward progression of the area of high pressure to the interior plateau and Great Basin, which triggers the Santa Ana winds further south.

Gradient winds are another type of wind phenomena, usually even more typical of the summer months. A good example of this is the 'Washoe Zephyr'. 'Zephyr' is a Greek term meaning *gentle west wind*. This wind provides some relief from the extreme heat that can occur across western Nevada in the summertime, and is the result of the daytime heating of the Great Basin causing a localized area of low pressure to form, and thus a pressure gradient, which, in turn, induces a wind flow that pulls cooler air down from the High Sierras of California. So, despite a wind flow off the mountains, this is not really a downslope wind as the air in the High Sierras tends to be already quite dry under high pressure when the Washoe Zephyr occurs, so the air arrives over western Nevada cooler than if it were introduced through downsloping.

Another example of a gradient wind, in an even more localized sense, is the 'Coromuel'. This is a sea-breeze-like south to southwest wind that affects only the La Paz region of Baja California Sur's east coast. This is because it's the only east coast area of Baja California Sur where a south to southwest wind is not obstructed by a mountain chain. The Coromuel is formed as the air over the peninsula is heated, creating low pressure, and a temperature gradient between the land and the Pacific Ocean off the west coast of the peninsula. This, in turn, results in a pressure gradient which induces a cool wind to blow northeastward from off the Pacific coast, across the peninsula to the east coast of the southernmost portion of the Baja.

Sea breezes are yet another type of gradient wind. In the U.S., sea breezes (Figure 2), while more common and more profound in the spring, can occur anytime through the summer months as well…especially in the northeast. The mechanism is roughly the same as for the Coromuel. Land heats up, a low forms, and cool southerly winds pull cooler air in off the colder ocean surface of the Atlantic. These are broader sea-breezes, though, as there are no mountains on Long Island or in New Jersey or southern New England which would suppress the sea breeze front from pressing well inland. In similar fashion, particularly along the shores of the Great Lakes, lake breeze fronts are common, mainly during late spring and early summer. These tend to be much more localized, and usually don't extend inland more than a few miles. Even so, it is not unusual to see a temperature variation on both sides of a lake breeze boundary of as much as 35 degrees Fahrenheit…particularly during the early part of the season. I've observed this much variation myself in conjunction with Lake Erie in northwest Ohio. Sometimes, low-topped thunderstorms will form along lake breeze and sea breeze fronts due to the convergence of the winds and the contrasts in air masses. Lake breezes sometimes develop in association with even smaller lakes…those such as Lake George and Lake Champlain; but because these are small lakes, the breezes tend to be less frequent and less pronounced, and occur more in spring because by mid-summer, lake temperatures are no longer so cool as to create that big of a contrast with the temperature over the land.

Figure 2. Radar Depiction of a sea breeze front along the coasts of Northern Florida and southern Georgia. Sea breeze fronts strengthen and move inland during the day, and weaken and retreat in the evening. *Image courtesy of **NWS Jacksonville, FL.***

Desert winds are also important summer winds, although they can occur throughout the year in the deserts of North Africa and Asia. We mention them here because they are hottest and most oppressive during the summer months. The 'sirocco' is a broad term encompassing a number of localized desert winds that are the result of an area of low pressure tracking east across the Meditteranean or far northern Africa. The sirocco is a moderately hot, usually semi-humid, and often dusty, mainly southerly, desert wind when it makes its landfall somewhere along the Mediterranean coast of Europe. The sirocco picks up moisture from the Mediterranean Sea on its journey there. Depending on the precise geographical location, some siroccos can wind up arriving drier and hotter than others. It is mostly dependent on the distance over water the wind must travel before making landfall on the other side. Obviously, the greater distance this initially hot and dry wind travels over water, the cooler and moister it will become. In different countries, this wind goes by different names. In Spain, it is known as a 'leveche'; in the Canary Islands, it is 'la calima'; in Malta, 'xiokk', and; in the slovak nations, it goes by the name 'jugo'.

The hot, dry desert winds that affect North Africa and the Arabian Peninsula cause the world's major dust storms. Sometimes satellite imagery picks up large swaths of dust leaving North Africa and travelling across the Atlantic Ocean (Figure 3). Dust from African dust storms has been found deposited in great quantities as far away as South America! The desert winds also go by different names in different countries; for example, in Morocco, they are known as the 'chergui'; in Libya, the 'ghibli'; and from Egypt to Saudi Arabia, the 'khamsin'. The 'simoom' is a very hot, dry and suffocating dust-laden wind that affects mainly the Sahara Desert, Syria, Jordan, Israel and the Arabian Peninsula. It is the wind most responsible for the changing landscape of the vast desert sand dunes. It is quite strong, but brief, rarely lasting more than 20 minutes. In North America, southwestern U.S. deserts such as the Mojave and the Sonora also produce sandstorms that change the landscape, but because they are much smaller than the deserts of North Africa and the Arabian peninsula, this occurs to a much smaller extent.

Another important desert phenomena is a fairly common wind known as the 'haboob'. The haboob derived its name from Arabic as they are strong and frequent in the African Sahara, and in the Saudi peninsula, Iraq and Kuwait. It is a desert dust storm that is the result of desert sands being sucked up with the surface inflow into developing thunderstorms, and then exiting in all directions through the thunderstorm downbursts after the storms reach their peak intensity. They occur more or less worldwide, even in the western U.S., and are frequently observed as walls of sand overtaking a region (Figure 4).

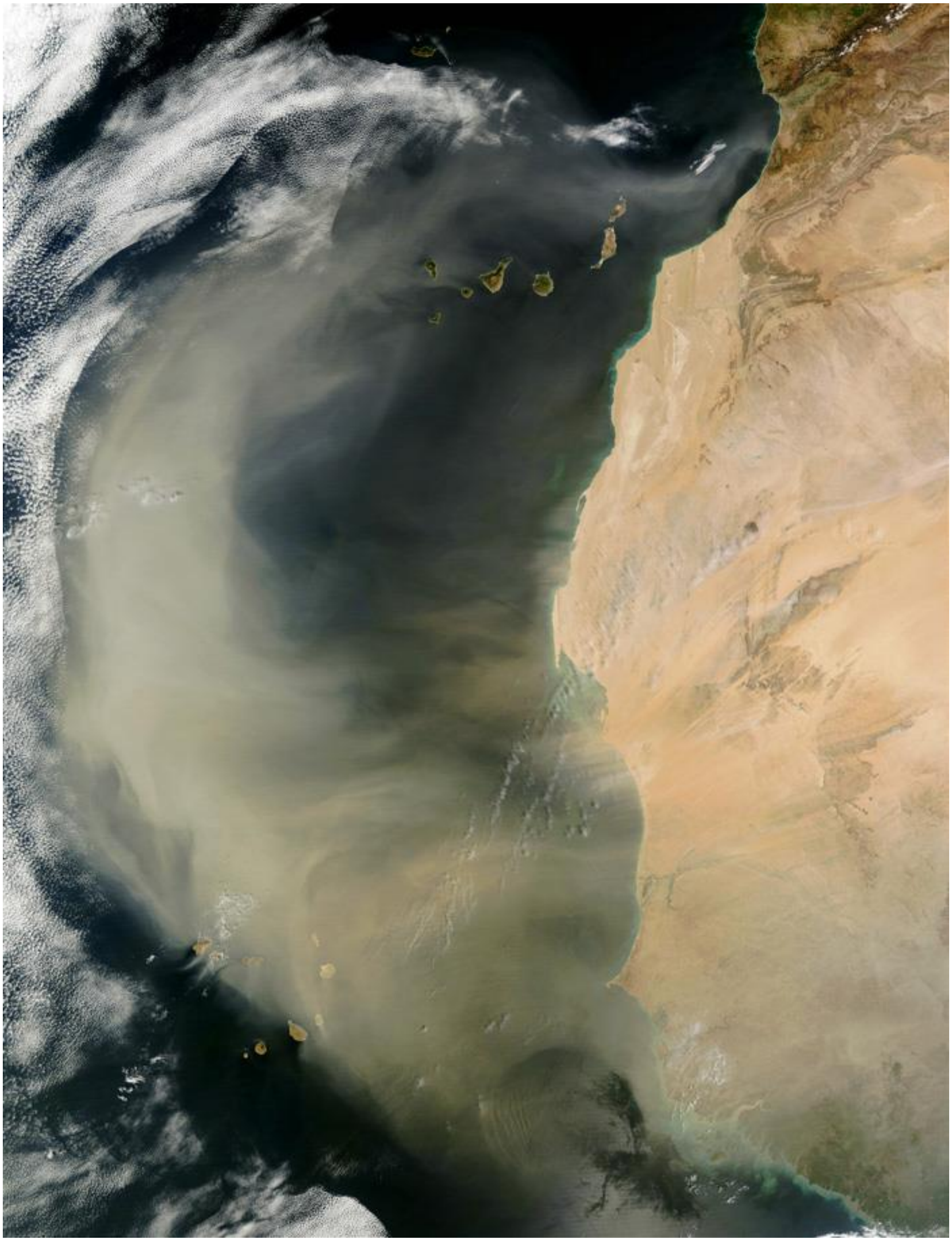


Figure 3. Vast amounts of Saharan dust can be seen being carried off of Africa out over the North Atlantic, as captured by the MODIS instrument aboard NASA's Terra satellite on March 2, 2003. *Image courtesy of* ***NASA.***

Figure 4. A haboob approaches NOAA's National Weather Service forecast office in Phoenix on August 11, 2012. *Image courtesy of NWS Phoenix, AZ.*

Even in the southern hemisphere, Australia has its share of desert-influenced localized summer winds. For example, the 'brickfielder' is a strong, hot and dusty northwest wind from the interior desert that affects Victoria and New South Wales in the summertime, and the 'Fremantle Doctor' is a cooling afternoon sea breeze affecting southwest coastal sections of Western Australia.

This is but a small sampling of the world's many 'summer winds'.

HEAT INDEX AND DEW POINT

Brian Montgomery
Senior Meteorologist, NWS Albany, NY

The American Meteorological Society (AMS) defines 'dew point' as the temperature to which a given air parcel must be cooled at constant pressure and constant water vapor content in order for saturation to occur. The dew point is related to relative humidity in that a high relative humidity indicates that the dew point temperature is close to the current air temperature. A relative humidity of 100% indicates that the dew point is equal to the current temperature, and that the air is maximally saturated with water. When the

NWS issues heat advisories or Excess Heat Warnings, we are utilizing the combination of temperature and dew point to calculate relative humidity, and obtain the Heat Index.

NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution   Extreme Caution   Danger   Extreme Danger

Credit: http://nws.noaa.gov/os/heat/index.shtml

For us to understand dew point, it is important to look at the climatology of this unique meteorological measurement. We have taken all of the observations from Albany International Airport (ALB) from 1980-2013, and performed a preliminary "dew point climatology" that we wanted to share with you. As for extremes, a maximum dew point of 79 degrees was achieved on June 16 1981, July 18 1982, July 11 1984, August 14 1988 and July 27 1997. The lowest was -36 degrees on December 25 1980. More work is needed, including expanding this climatology to other locations within our service area.

Below are the monthly average values

	January	February	March	April	May	June	July	August	September	October	November	December
1980	14.1	9.1	20.5	35.7	45.6	51.5	59.5	60.7	49.7	35.2	24.9	10.4
1981	4.0	25.3	22.3	32.9	45.6	54.5	59.4	58.2	49.6	35.1	26.9	19.3
1982	4.8	12.8	20.4	25.6	44.6	53.7	58.7	55.1	53.3	41.2	34.3	25.5
1983	14.2	16.9	27.5	35.4	45.9	57.2	62.3	63.3	54.3	42.5	31.7	16.7
1984	11.3	24.5	15.8	35.5	43.7	57.4	62.3	64.3	51.4	46.5	31.7	28.1
1985	12.6	18.0	21.3	35.0	45.7	52.6	59.9	59.3	56.0	42.3	34.8	18.5
1986	16.3	16.1	25.5	36.6	49.3	54.2	62.8	59.8	53.4	42.6	30.7	24.8
1987	16.3	11.8	27.1	39.7	47.0	58.6	63.2	57.0	53.9	38.0	30.3	23.6
1988	11.6	16.0	22.3	34.1	47.5	49.3	63.6	63.5	51.8	38.3	32.6	16.7
1989	16.9	14.7	20.3	29.2	48.5	58.6	61.1	59.7	53.5	42.5	28.0	4.8
1990	24.8	18.9	24.1	35.1	43.2	56.4	61.2	61.3	52.4	44.1	31.2	24.5
1991	14.5	19.6	26.0	35.8	50.1	55.4	59.4	61.4	50.6	43.2	30.3	21.7
1992	16.2	17.7	19.6	29.6	43.4	55.0	59.5	58.9	53.1	38.0	32.1	21.9
1993	19.2	7.8	21.4	34.8	45.4	54.5	60.9	62.4	53.9	39.5	30.2	19.8
1994	3.9	9.1	23.4	32.6	41.9	57.3	64.5	59.4	52.3	39.7	31.8	24.5
1995	24.8	12.7	30.2	30.7	45.9	54.0	62.6	59.1	50.3	45.8	28.8	16.4
1996	13.8	15.8	17.1	32.9	43.4	59.0	60.0	62.2	57.0	43.3	28.5	29.5
1997	14.7	21.5	23.4	30.5	39.6	55.5	59.6	59.8	54.6	41.6	31.0	23.5
1998	23.0	23.2	30.2	36.8	51.7	57.2	61.3	61.6	54.9	43.6	34.2	26.1
1999	17.4	20.0	21.4	30.8	45.7	56.9	62.9	59.0	56.5	40.2	34.3	22.3
2000	11.0	18.8	27.9	34.6	49.4	57.4	59.0	60.8	53.6	42.1	31.6	15.2
2001	18.6	17.8	22.1	31.0	46.2	58.2	57.0	62.9	53.4	40.5	35.5	26.8
2002	22.8	20.5	25.1	36.1	42.0	56.7	60.6	61.3	56.6	40.5	31.7	20.2
2003	9.4	11.9	23.3	30.2	46.0	56.6	61.2	64.1	56.3	40.9	34.2	21.3
2004	5.6	15.7	29.6	34.2	50.9	53.8	62.5	61.8	56.1	43.4	32.1	20.2
2005	12.7	17.5	21.7	32.0	41.1	61.3	62.9	62.9	55.8	44.9	32.3	19.4
2006	24.5	16.2	21.1	32.9	47.0	58.2	63.6	59.1	53.1	39.7	36.9	27.0
2007	18.8	8.3	19.9	30.9	42.5	56.0	59.5	59.4	53.6	48.2	28.3	20.5
2008	18.5	18.9	20.5	33.2	40.4	59.2	62.5	58.4	54.9	39.7	31.5	21.1
2009	9.8	16.6	21.4	31.8	44.6	54.9	58.8	61.6	51.6	39.7	34.9	18.1
2010	16.2	19.3	27.9	35.8	47.7	57.9	62.8	59.8	54.0	41.6	30.2	18.1
2011	13.8	13.9	22.0	35.8	50.5	56.3	62.1	61.8	58.7	43.5	35.3	26.5
2012	19.5	21.2	31.0	31.0	51.7	55.8	61.2	60.8	53.1	46.0	27.3	26.7
2013	17.6	16.5	22.0	30.4	46.2	57.2	64.9	58.6	51.6	42.8	25.4	19.8

These are the maximum values observed within the month (highlighted are monthly highest)

	January	February	March	April	May	June	July	August	September	October	November	December
1980	53	37	52	55	69	71	77	76	76	64	48	53
1981	41	58	56	61	70	79	75	70	70	61	51	39
1982	44	41	51	59	66	72	79	73	72	64	65	61
1983	46	49	56	61	67	74	78	76	75	71	55	46
1984	37	46	40	62	68	74	79	77	70	65	56	57
1985	48	50	59	62	67	69	74	76	75	67	61	48
1986	46	35	58	58	68	73	75	74	72	70	58	42
1987	41	35	61	58	71	71	76	73	70	55	59	47
1988	38	49	54	57	65	71	73	79	70	65	59	42
1989	40	46	58	56	70	73	76	75	73	65	61	36
1990	48	53	62	67	60	69	74	72	69	69	60	59
1991	39	45	59	62	72	73	75	72	74	66	54	53
1992	50	43	53	60	62	72	73	71	71	64	58	48
1993	55	33	48	58	63	72	75	74	76	61	60	44
1994	45	42	39	63	62	76	77	73	70	59	62	51
1995	61	37	56	59	71	71	76	76	68	67	61	37
1996	56	49	49	60	69	72	74	74	70	61	65	55
1997	50	56	56	59	60	77	79	73	72	64	58	38
1998	52	41	59	64	77	72	78	78	70	63	52	53
1999	53	53	52	49	66	77	77	74	72	61	61	52
2000	54	47	54	59	72	74	71	75	74	61	50	55
2001	37	43	34	59	63	73	76	74	72	62	61	60
2002	43	50	56	64	70	72	74	74	72	70	63	50
2003	38	39	58	52	61	73	74	75	72	62	60	52
2004	45	39	56	59	70	72	74	75	75	59	59	55
2005	55	43	41	55	61	74	76	75	72	68	59	40
2006	53	49	54	55	68	71	75	77	67	63	63	56
2007	59	32	50	57	66	71	72	75	71	68	52	48
2008	52	52	41	58	67	73	73	68	74	60	61	53
2009	32	46	49	59	64	68	72	75	69	62	54	54
2010	53	35	50	57	69	72	75	74	71	71	50	55
2011	42	39	48	65	67	73	75	74	73	65	59	55
2012	45	43	56	59	72	72	74	75	72	66	55	51
2013	54	36	50	60	69	72	75	73	77	66	61	50

These are the minimum values observed within the month (highlighted are monthly lowest)

	January	February	March	April	May	June	July	August	September	October	November	December
1980	-15	-23	-21	7	14	27	38	40	25	12	9	-36
1981	-26	-15	-3	5	23	37	41	37	22	16	9	-10
1982	-27	-13	-12	-1	22	39	42	30	34	22	6	-7
1983	-23	-20	5	12	24	33	42	48	33	18	14	-23
1984	-28	-16	-17	8	26	36	48	46	26	20	13	0
1985	-15	-9	-5	6	16	35	41	45	32	17	15	-9
1986	-15	-6	-11	16	15	32	41	34	33	20	1	-3
1987	-17	-19	-8	6	21	34	43	36	29	15	-6	-14
1988	-25	-7	-9	12	24	30	44	40	29	19	16	-21
1989	-14	-10	-23	-1	32	39	46	41	28	27	-2	-19
1990	2	-14	-6	6	14	34	44	48	29	18	9	-10
1991	-15	-13	-1	10	22	38	43	49	25	19	11	-5
1992	-12	-14	-5	-1	16	37	42	45	28	22	15	-6
1993	-13	-21	-13	13	28	34	46	46	27	12	1	-15
1994	-30	-17	1	13	15	31	46	44	31	17	1	-8
1995	-5	-23	-1	-2	12	34	46	42	31	21	9	-2
1996	-22	-14	-5	6	23	32	48	48	30	20	6	-4
1997	-18	-3	0	-1	20	39	44	44	35	25	10	0
1998	-10	-4	-2	20	34	33	49	42	29	27	22	-6
1999	-17	-9	-3	12	21	30	48	39	35	23	12	-4
2000	-20	-8	3	10	18	40	42	45	28	19	5	-8
2001	-2	-7	1	12	15	35	38	35	37	5	12	8
2002	-1	-2	-3	3	21	36	39	44	39	17	4	-9
2003	-17	-22	-15	0	18	38	47	40	39	21	2	-1
2004	-24	-16	-3	5	18	39	44	48	39	21	11	-15
2005	-20	-4	-9	8	20	44	48	49	31	25	0	-3
2006	-8	-11	-5	15	11	40	48	41	35	21	20	-3
2007	-12	-14	-18	0	11	34	40	41	36	22	8	-5
2008	-10	-7	-4	6	17	43	48	44	38	21	4	-9
2009	-11	-7	-4	11	21	24	42	45	35	22	22	-8
2010	-16	0	0	15	20	37	45	43	38	22	6	2
2011	-19	-9	-7	9	24	28	42	49	36	24	20	6
2012	-9	-4	1	6	25	45	45	43	36	19	8	9
2013	-9	-7	0	1	21	31	47	41	35	17	-1	-8

2013-14 ARCTIC SEA ICE EXTENT

George J. Maglaras
Senior Meteorologist, NWS Albany, NY

Trends in Arctic sea ice extent are frequently used as a measure of climate change, especially the summer minimum extent. While changes in weather patterns and ocean currents from one season to the next can cause large variations from year to year, a multi-year trend of increasing sea ice extent is seen as evidence of a cooling climate, while a trend of decreasing sea ice extent is taken as evidence of a warming climate. This article will present the latest maximum Arctic sea ice extent statistics for this past winter, as provided by the National Snow and Ice Data Center. Although winter ice extent variations over the past decade have not been as dramatic as summer ice extent variations, the maximum winter ice extent can provide clues as to what will occur in the summer.

Arctic sea ice extent is defined as an area of sea water where ice covers 15 percent or more of that area. Thus, for any square mile of sea water to be included in the ice extent total, at least 15 percent of that square mile must be covered with ice.

The maximum Arctic sea ice extent during the 2013-14 winter season was reached on March 21, 2014, and was about 12 days later than the average date of the maximum extent. The maximum ice extent on that day was 5.76 million square miles, which was 282,000 square miles below the 1979 to 2010 average, and which was the fifth-lowest extent since the satellite record began in 1979.

There was a significant increase in multi-year ice (ice that has been in the Arctic for two or more continuous years) during the 2013-2014 winter season when compared to the 2012-2013 winter season. During the 2013-2014 winter season, multi-year ice made up 43% of the ice pack and covered 1,220,000 square miles. This compares to only 30% of the ice pack being multi-year ice during the 2012-2013 winter season, and which covered only 869,000 square miles.

Multi-year ice is usually thicker and more difficult to melt than ice that just formed during the previous winter. As a result, the amount of multi-year ice is a major factor in how much ice survives the summer melt season. The higher amount of multi-year ice this year could result in a minimum ice extent this summer that is higher than it has been for the past several years. However, other important factors, such as the summer weather patterns and ocean currents, will also affect ice loss during this summer, and will determine what the minimum ice extent will be.

SPRING 2014: NOT AS COLD AS IT SEEMED

Evan L. Heller
Climatologist, NWS Albany, NY

Yes, the spring season started out cold…and even with a very close to normal April, it still seemed that it was too cold for it to be normal. Perhaps that was because it was a pretty cold winter that simply seemed to drag on into spring. In reality, the climatological Spring of 2014 was only 2 degrees below normal (Table 1). March was, by far, the most below normal of the three months of the season. In spite of this, the only daily records for that month were three for Daily Maximum Wind Speed (Table 3a). In contrast, April, despite being so normal, actually scored the season's only daily temperature records…a Daily High Minimum and a Daily High Mean, both occurring on the 14^{th} (Table 3b). In addition, there was a Daily Snowfall record in April, on the 15^{th}, when 2.4" fell, nudging aside a 109-year-old record. There were also two more records for Daily Maximum Wind Speed. May was slightly above normal, and the month produced no records of any kind.

The last consequential snow event of the season occurred from the 12^{th} to the 13^{th} of March, when 5.5" fell in Albany (Table 3a). The last flakes of snow were observed on April 16^{th}, with the last freeze of the season happening just 9 days later (Table 2b). The total snowfall in Albany for the spring months was 8.3", roughly 1/3 less than normal, with the March total of just 5.9" being the sole reason for the shortfall (Table 1).

It follows suit that precipitation was also short of normal for the season. The 7.77" total received was 2.22" short of the 9.99" normal for Albany, and it was pretty evenly spread out over the 3-month period. It's interesting to note that no single calendar day recorded as much as an inch of precipitation (Table 2a). Rain fell on nearly two-thirds of the days of spring, with measureable precipitation on 39 days. The last date with sleet was April 15th, with the first audible thunder occurring just 2 days prior (Table 4b). The windiest date fell right in between these two dates, but the peak wind gust occurred on March 26th (Table 4a).

STATS

	MAR	APR	MAY	SEASON
Average High Temperature/Departure from Normal	37.0°/-7.4°	59.5°/+1.2°	71.3°/+1.9°	55.9°/-1.5°
Average Low Temperature/Departure from Normal	18.5°/-7.2°	35.3°/-2.0°	48.7°/+1.6°	34.2°/-2.5°
Mean Temperature/ Departure From Normal	**27.7°/-7.3°**	**47.4°/-0.4°**	**60.0°/+1.7°**	**45.0°/-2.0°**
High Daily Mean Temperature/Date	44.5°/29th	70.5°/14th	74.5°/27th	
Low Daily Mean Temperature /Date	12.0°/4th	34.0°/16th	49.0°/4th	
Highest Temperature reading/Date	53°/29th	79°/13th	87°/27th	
Lowest Temperature reading/Date	1°/1st & 4th	26°/16th & 17th	34°/7th	
Lowest Maximum Temperature reading/Date	19°/3rd	42°/16th	53°/4th	
Highest Minimum Temperature reading/Date	36°/29th	63°/14th	62°/10th, 15th & 27th	
Total Precipitation/Departure from Normal	**2.72"/-0.49"**	**2.44"/-0.73"**	**2.61"/+1.00"**	**7.77"/-2.22"**
Total Snowfall/Departure from Normal	**5.9"/-4.3"**	**2.4"/+0.1"**	**0.0"/-0.1"**	**8.3"/-4.3"**
Maximum Precipitation/Date	0.66"/30th	0.72"/15th	0.90"/16th	
Maximum Snowfall/Date	4.8"/13th	2.4"/15th	0.0"/-	

Table 1

NORMALS, OBSERVED DAYS & DATES

NORMALS & OBS. DAYS	MAR	APR	MAY	SEASON
NORMALS				
High	44.4°	58.3°	69.4°	57.4°
Low	25.7°	37.3°	47.1°	36.7°
Mean	**35.0°**	**47.8°**	**58.3°**	**47.0°**
Precipitation	**3.21"**	**3.17"**	**3.61"**	**9.99"**
Snow	**10.2"**	**2.3"**	**0.1"**	**12.6"**
OBS TEMP. DAYS				
High 90° or above	0	0	0	0/92
Low 70° or above	0	0	0	0/92
High 32° or below	10	0	0	10/92
Low 32° or below	27	14	0	41/92
Low 0° or below	0	0	0	0/92
OBS. PRECIP DAYS				
Days T+	20	16	23	59/92/64%
Days 0.01"+	7	13	15	35/92/38%
Days 0.10"+	5	7	8	20/92/22%
Days 0.25"+	4	3	3	10/92/11%
Days 0.50"+	3	1	1	5/92/5%
Days 1.00"+	0	0	0	0/92/0%

Table 2a

NOTABLE TEMP, PRECIP & SNOW DATES	MAR	APR	MAY
Last Snowfall	-	16th (T)	-
Last Freeze	-	25th (30°)	-

Table 2b

RECORDS

ELEMENT	MARCH	
Daily Maximum Wind Speed Value/Direction/Date | Previous Record/Direction/Year	41 mph/NW/13th	40 mph/N/1993
Daily Maximum Wind Speed Value/Direction/Date | Previous Record/Direction/Year	44 mph/W/22nd	41 mph/NW/2009
Daily Maximum Wind Speed Value/Direction/Date | Previous Record/Direction/Year	46 mph/NE/26th	43 mph/W/1990
Minor Snow Event (4.5+") Amount/Date(s) | Remarks	5.5"/12th-13th	-

Table 3a

ELEMENT	APRIL	
Daily High Minimum Temperature Value/Date | Previous Record/Year	63°/14th	55°/1941
Daily High Mean Temperature Value/Date | Previous Record/Year	71.0°/14th	68.0°/1938
Daily Maximum Wind Speed Value/Direction/Date | Previous Record/Direction/Year	44 mph/S/14th	40 mph/W/1999
Daily Maximum Snowfall Value/ Date | Previous Record/Year	2.4"/15th	2.0"/1905
Daily Maximum Wind Speed Value/Direction/Date | Previous Record/Direction/Year	38 mph/W/15th (tie)	38/NW/1995

Table 3b

ELEMENT	MAY	
none	none	None

Table 3c

ELEMENT	SPRING	
none	none	none

Table 3d

MISCELLANEOUS
MARCH

Average Wind Speed/Departure from Normal	9.8 mph/+0.2 mph
Peak Wind/Direction/Date	46 mph/NW/26th
Windiest Day Average Value/Date	17.6 mph/26th
Calmest Day Average Value/Date	2.7 mph/4th
# Clear Days	3
# Partly Cloudy Days	20
# Cloudy Days	8
Dense Fog Dates (code 2)	None
Thunder Dates (code 3)	None
Sleet Dates (code 4)	12th, 19th, 27th & 28th
Hail Dates (code 5)	None
Freezing Rain Dates (code 6)	12th

Table 4a

APRIL

Average Wind Speed/Departure from Normal	9.7 mph/+0.4 mph
Peak Wind/Direction/Date	44 mph/S/14th
Windiest Day Average Value/Date	18.0 mph/14th
Calmest Day Average Value/Date	3.7 mph/1st
# Clear Days	3
# Partly Cloudy Days	15
# Cloudy Days	12
Dense Fog Dates (code 2)	11th, 12th & 15th
Thunder Dates (code 3)	13th
Sleet Dates (code 4)	15th
Hail Dates (code 5)	None
Freezing Rain Dates (code 6)	None

Table 4b

MAY

Average Wind Speed/Departure from Normal	7.4 mph/-0.6 mph
Peak Wind/Direction/Date	41 mph/W/4th
Windiest Day Average Value/Date	14.5 mph/4th
Calmest Day Average Value/Date	2.7 mph/7th
# Clear Days	1
# Partly Cloudy Days	23
# Cloudy Days	7
Dense Fog Dates (code 2)	None
Thunder Dates (code 3)	9th, 14th, 22nd & 30th
Sleet Dates (code 4)	None
Hail Dates (code 5)	None
Freezing Rain Dates (code 6)	None

Table 4c

WEATHER *ESSENTIALS*

With Kevin S. Lipton

WEATHER ESSENTIALS: ON THE "FRONT" LINE

Kevin S. Lipton
Meteorologist, NWS Albany, NY

In the last edition of Weather Essentials, we discussed air masses, and reviewed the different types. We also mentioned that a boundary known as a "front" separates the different characteristics of air masses. Fronts come in 4 types, as shown in Figure 1. They are classified by which type of air mass replaces the other. For instance, if a cold, dry air mass (Continental Polar) is replacing a warm, humid air mass (Maritime Tropical), then it is a "cold front". In this instance, the cold front represents the leading edge of the colder air mass replacing the warmer one. The different lines used to represent the different types of fronts on weather maps are also shown in Figure 1. The triangles or semi-circles attached to these lines indicate the direction in which the fronts are moving. We will describe these frontal types in more detail below.

Contrary to a cold front, a "warm front" represents the leading edge of a warmer air mass replacing a colder one. Usually, the air on the warm side of the boundary also tends to be more humid. Warm and humid air is lighter and less dense than cool and dry air. If we look at a side profile of a warm front (Figure 2), we can see how the warm, moist air (green arrow) tends to slide upward and over the cooler and drier air ahead of the warm front (peach color), typically at a fairly gradual slope relative to the ground. Thus, the weather changes associated with a warm front tend to be gradual. Typically, as a warm front approaches, clouds gradually increase and lower, and a period of steady precipitation then ensues. As the warm front draws near, in addition to the steady precipitation, fog may develop as the increasingly warmer and more humid air begins to come in contact with the cooler, denser air closer to the ground. Once the warm front passes, the air turns warmer and more humid, the steady precipitation tapers off, and breaks in the cloud cover may develop.

As previously stated, a cold front represents a cooler air mass replacing a warmer one. Usually, the air on the cool side of the boundary is also drier. Taking a look at a side profile of a cold front (Figure 3), note that the cooler, drier air (blue arrow) tends to be heavier and denser than the warmer and more humid air ahead of the cold front (green), forcing the cooler air to undercut the warmer air. The slope at which this occurs tends to be steeper relative to the ground compared to a warm front, and therefore tends to produce weather changes that are more abrupt. Typically, a band of showery precipitation develops along or just ahead of the cold front. Sometimes the precipitation can be intense, and may also be accompanied by thunderstorms. When the cold front passes, the temperature falls, sometimes quite rapidly, and the air tends to become drier. The showery precipitation usually ends, and skies eventually clear.

Sometimes, a cold front, which generally moves faster than a warm front, may actually overtake a warm front. As this occurs, it becomes what is known as an "occluded front". There are two types of occlusion - warm and cold: in a cold occlusion, the air mass overtaking the warm front is cooler than the cool air ahead of the warm front, and plows under both air masses; in a warm occlusion, the air mass overtaking the warm front is not as cool as the cold air ahead of the warm front, and rides over the colder air mass while undercutting and lifting the warmer air mass. The type of weather typically associated with an occluded front tends to be a hybrid mix of that of a warm front and a cold front; usually a period of steady precipitation, possibly becoming more showery and intense, followed by decreasing precipitation and clouds. Occluded fronts are rather common in our forecast area as cold fronts often approach from the west rather rapidly while, at the same time, warm fronts move very slowly across the Western Mohawk Valley or Catskills. Oftentimes the incoming cold front overtakes the slower moving warm front, and thereby becomes an occluded front.

Finally, the fourth type of front is known as a "stationary front". This type of front occurs when the different air masses on each side are not moving much, and therefore one air mass is not replacing the other. The weather associated with a stationary front often varies. It is possible that on the warm side of the front, showery precipitation may occur; while on the cold side of the front, precipitation may tend to be more steady and stratiform.

Now that you know a little about fronts, we shall explore the concepts of high and low pressure systems in our next edition of Weather Essentials.

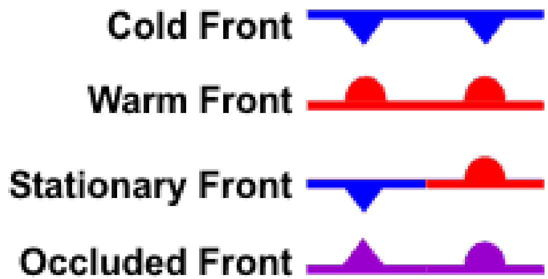


Figure 1. The 4 different types of fronts as typically represented on weather maps. *From NWS Jetstream.*

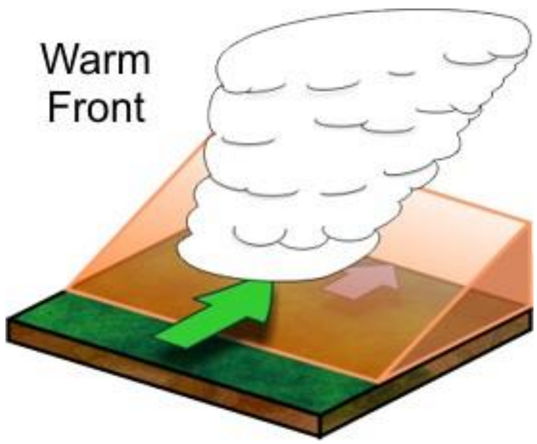


Figure 2. Side profile of a warm front. The green arrow indicates warmer, more humid and less dense air rising up and over the cooler, drier and denser air closer to the ground (peach). *From NWS Jetstream.*

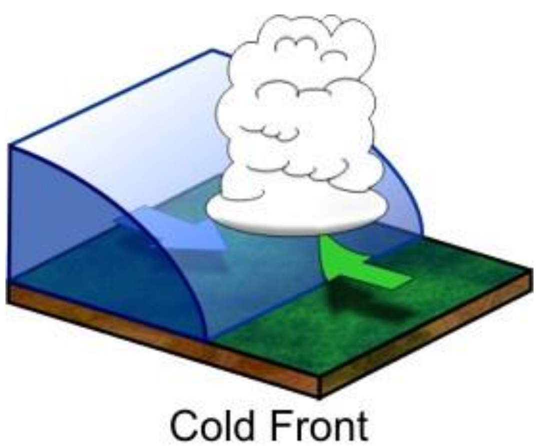


Figure 3. Side profile of a cold front. The blue arrow indicates the cooler, drier and denser air overtaking a warmer, more humid and less dense air mass (green). *From NWS Jetstream.*

From the Editor's Desk

This is one of the biggest editions of Northeastern StormBuster in recent memory. We have 8 information-packed articles, including our regulars: the seasonal climate summary, and; Weather Essentials. Perhaps the most significant weather event in recent years was the May 22nd, 2014 tornado, so we open with in-depth coverage on that. Then we go into other summertime themes, addressing the subjects of thunderstorms, hurricanes and summertime winds. Keeping with the summer themes, we segué into less violent summer events: heat indices, and; summer sea ice. Then we round out the Features section with the spring climate wrap-up. Lastly, we provide an educational lesson about weather fronts. This is sure to be great reading…hope you enjoy...and have a wonderful summer!

WCM Words

Steve DiRienzo
Warning Coordination Meteorologist, NWS Albany

Summer officially begins on June 21, 2014 at 6:51 AM. However, hazardous summer weather usually occurs before the official arrival of summer. Many years, the last week of May and the first week of June are active with severe weather. The tornado on May 22, 2014, and the three tornadoes on May 29, 2013 are two recent examples.

Another summer weather hazard is lightning. Lightning is deadly, and all thunderstorms contain lightning. If you are close enough to a storm to hear thunder, you can be struck by lightning. Lightning Safety awareness week is June 22-28, 2014. Please share lightning safety information found at http://www.lightningsafety.noaa.gov/. And remember, When Thunder Roars…Go Indoors!

Here at the National Weather Service, we strive to be the source of unbiased, reliable and consistent weather information. We're here to answer your weather and water questions 24 hours a day, 7 days a week. If you have concerns, please call us. If you have comments on StormBuster, or any of the operations of the National Weather Service, please let me know at Stephen.Dirienzo@noaa.gov. Have a great summer!