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The Topeka Tiller

National Weather Service
Topeka, KS

Fall 2020 Volume 13, Issue 2

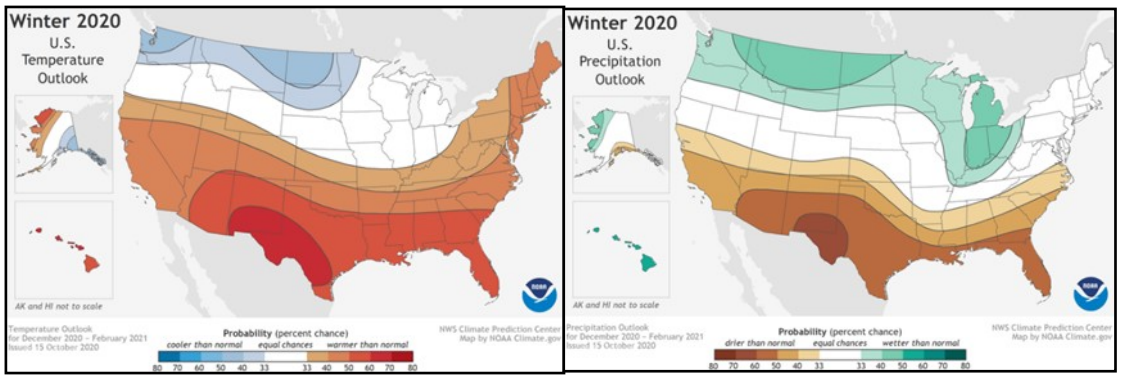
Inside this issue:

NOAA Official Winter Outlook

By Chad Omitt, Warning Coordination Meteorologist

NOAA's winter forecast for the U.S. favors warmer, drier conditions across the southern tier of the U.S. and colder, wetter conditions in the north, thanks in part to an ongoing La Nina. "With La Nina well established and expected to persist through the upcoming 2020 winter season, we anticipate the typical, cooler, wetter North, and warmer, drier South, as the most likely outcome of winter weather that the U.S. will experience this year," said Mike Halpert, deputy director of NOAA's Climate Prediction Center.

Here in Kansas, La Nina is just one factor that can influence our wintertime weather. In fact, when looking back at La Nina winters since the 1950s the data shows that some years were warmer than average and some colder than average. The same can be seen in the precipitation data which shows that some La Nina winters were drier than average while others were wetter.



We can see the uncertainty or low confidence in the outlook graphics, which use probabilities to try and convey the chances for certain conditions to prevail during the December through February period. In Kansas, odds slightly favor warmer and drier conditions across the southwest parts of the state with no meaningful signal either way for the rest of the state. Why the low confidence and uncertainty even when La Nina is present?

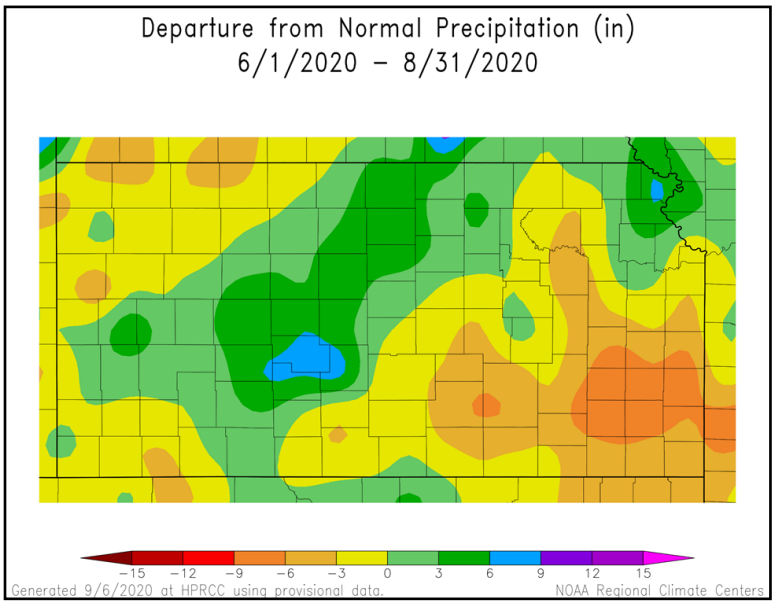
What makes long-term forecasting challenging is that other weather phenomena that are more difficult to forecast beyond about 2 weeks can influence the jet stream pattern and our weather across Kansas. What are those things? What's called the Madden Julian Oscillation, the Arctic Oscillation, and others can influence the storm track or jet stream position across North America. As mentioned, these "oscillations" are hard to forecast beyond about 2 weeks.

So bottom line…it's best to be prepared for a variety of winter weather this season. There will be wet periods and likely some dry periods too. Depending on the temperatures, that could translate into rain, sleet, snow, or the worst of all freezing rain.

Summer Summary 2020

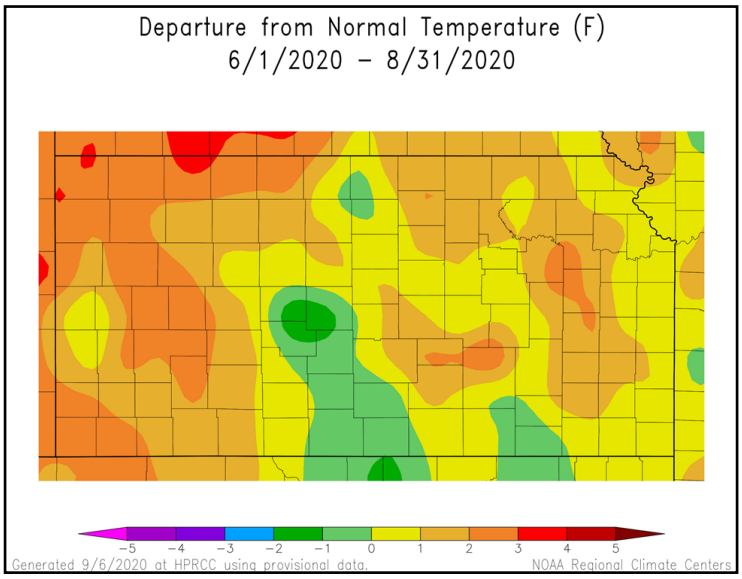
By Kyle Poage, Meteorologist

Summertime temperatures averaged to be slightly above normal across all of north-central, northeast, and east-central Kansas. Precipitation for much of the area was generally close to normal for the June through August period, save wetter areas in portions of north-central and northeast Kansas and dryer areas in east-central Kansas.



Prolonged periods of heat were rare, with the most persistent heat wave during mid-July when heat index values peaked from 103 to 112 degrees on July 17 and 18. The hot conditions were introduced rather early this season with heat indices in the upper 90s to around 105 on June 6, but heat of this magnitude did not return after early August.

Severe thunderstorm activity was also most prevalent early in the season, with only one event occurring after July 11. Wind gusts of 55 to 65 mph impacted locations from Republic and Cloud Counties southeast into Shawnee and Douglas Counties in the late evening of June 3 and again in the pre-dawn hours of June 5. The season's only tornado report was a brief touchdown in an open field in eastern Marshall County in the early evening of June 9. Hail up to the size of golf balls and wind gusts up to 70 mph impacted portions of Republic, Cloud, and Clay Counties on the evening of June 26. Sporadic wind damage was spread across much of the area in the pre-dawn hours of July 8. One of the most notable events of the season was the occurrence of very large hail in the early to mid-afternoon hours of July 11 from Pottawatomie and Wabaunsee Counties southeast into Coffey and Anderson Counties. Hail up to 4.5 inches in diameter was reported with many other instances of hail the size of golf balls and baseballs.



Flooding from the thunderstorm activity was largely limited to a five-week period from late June through late July. Although reports of flooding were only received from near Glasco and near Lawrence, rainfall amounts of around five inches were seen in portions of Cloud, Ottawa, Douglas, and Franklin Counties on June 26-27. Rainfall of nearly nine inches fell on July 20-21 near Reading with widespread amounts of around two inches from Jefferson County to Lyon County. July 29 and 30 saw multiple rounds of heavy rain with flooding in Marshall, Nemaha, Pottawatomie, Wabaunsee, Jefferson, Shawnee, and Douglas Counties. Vehicles were stranded in portions of Topeka on both of these days due to flash flooding. On the 30th in particular, 2.2 inches fell in one hour in Topeka while a 7.5-inch total amount fell near Ozawkie.

A Not-So-Nice Little Saturday: The July 11th Giant Hail Event

By Jenni Pittman, Science and Operations Officer

The morning of Saturday, July 11th started much like any Kansas summer morning – humid, warm, and outlooked with a potential for scattered thunderstorms later in the day. Within a few hours, however, it would become clear that one of these summer storms was anything but typical. By that evening, a supercell thunderstorm had spread a swath of golf ball to grapefruit-sized hail from north central Kansas into northern Oklahoma, shattering windshields and sending outdoor events into shelter across the state.

This severe weather event began Saturday around 11:00 AM CDT, when bubbling cumulus clouds near the Kansas-Nebraska border began growing in height, developing into several isolated thunderstorms prior to noon. The focus for these storms' initial development was a slow-moving cold front, but as the storms grew, they shifted away from the front and trekked south-southeast at about 30 mph. Shortly after 12:30 PM, the first severe thunderstorm warning of the day was issued for far northeast Kansas including Seneca, Sabetha, and Hiawatha; however, the newly formed thunderstorm 40 miles to its southwest would soon become the dominant supercell of this event. This new cell initially over northern Pottawatomie County escalated in strength rapidly, producing baseball-sized hail in Westmoreland less than an hour after its first lightning strike was detected.

The prolific giant hail producing storm continued south-southeast for hours, producing greater than baseball-sized hail near Dover, Waverly, Harris, Altoona, and Thayer. Storm spotters sent in dozens of photos of the massive, spiky hail, and described the storm as "eventful" and a "crazy day" in their summaries. Additional photos showed numerous vehicle windshields damaged or destroyed by the hail, though fortunately, no injuries were reported. In total, 49 reports of severe (diameter ≥ 1 inch) hail were received across eastern Kansas in association with this event.

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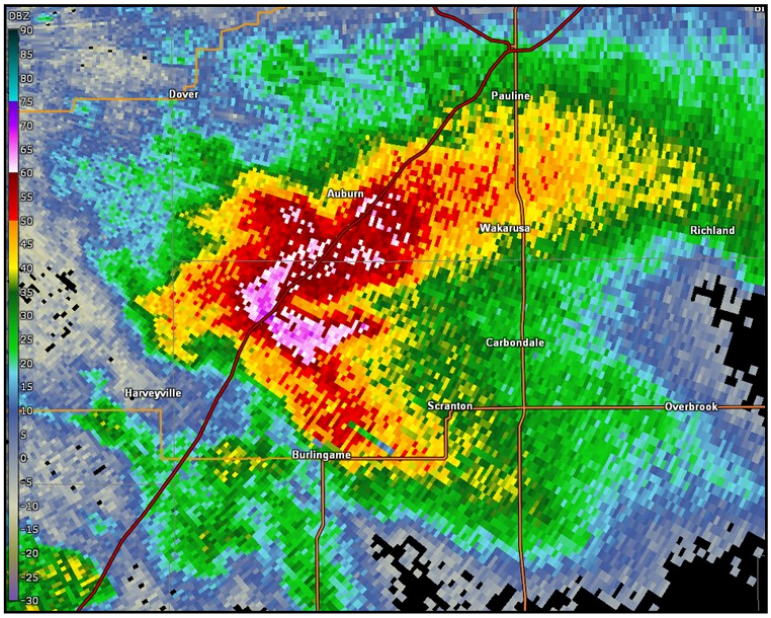

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Winter Weather Travel Safety and Preparedness

By Chad Omitt, Warning Coordination Meteorologist

Living in Kansas you may think that severe t-storms and tornadoes pose the greatest risk to your safety from Kansas weather. However, the greatest risk to your safety actually comes from driving in snow and ice during the winter season. We're not talking about the traditional blanket of heavy snow that you can see. The true road ice hazard is subtle and due to light snow or freezing drizzle, these are events that suffer from a lack of obvious visual cues and public awareness (see image above right). It is these conditions that cause the biggest percentage of deaths and injuries and it doesn't take much to make roads icy enough for you to lose control!

Although numbers are largely underreported, here in Kansas at least 15 people lose their lives each year in automobile accidents where ice and snow plays a role and that number may be much higher. So what can you do to lower your risk when driving on ice and snow?

1. **Know what to expect on your trip and plan accordingly.** If you know you need to travel through especially bad wintery conditions, be sure to check the weather forecast along your trip by visiting www.weather.gov. Visit Kansas Dept. of Transportation website to access information about your road conditions including webcams.

2. **Pay attention, slow down, and relax.** This is the most important rule to driving in bad conditions of any kind. And we're not just talking about speed — you want to do everything more slowly and more lightly than you normally would. Hitting your gas pedal, slamming your brakes, or cranking your wheel too quickly is a surefire way to lose traction on an icy or wet road. At the same time you cannot be distracted by a smartphone for any reason when driving let alone when trying to drive in ice or snow…pay attention to the road!

3. **If you start sliding, turn slightly into the skid and pump your brakes.** Once you're already sliding, your tires have lost traction with the road. It seems counterintuitive, but in order to avoid a spinout you need to turn slightly into the skid, slowly let off the gas, and start pumping the brakes — or let your anti-lock brakes do the work for you. Yanking the wheel in the other direction and locking the brakes will stop your tires from turning, but you'll lose all hope of regaining traction with the road surface.

4. **Know when to quit.** Sometimes road conditions are simply too dangerous to drive in. If you can't see or you keep losing control, pull over. Never push your luck if you're unsure. It's not worth it to drive if you're jeopardizing yourself, your passengers, or other drivers on the road.

Even the smartest and safest drivers get into accidents. That's why it's crucial to be prepared for the possibility of any kind of collision or accident that could leave you and your passengers stranded on the side of a cold and possibly dangerous road. The first step is to build an emergency kit and place it in the trunk of your car.

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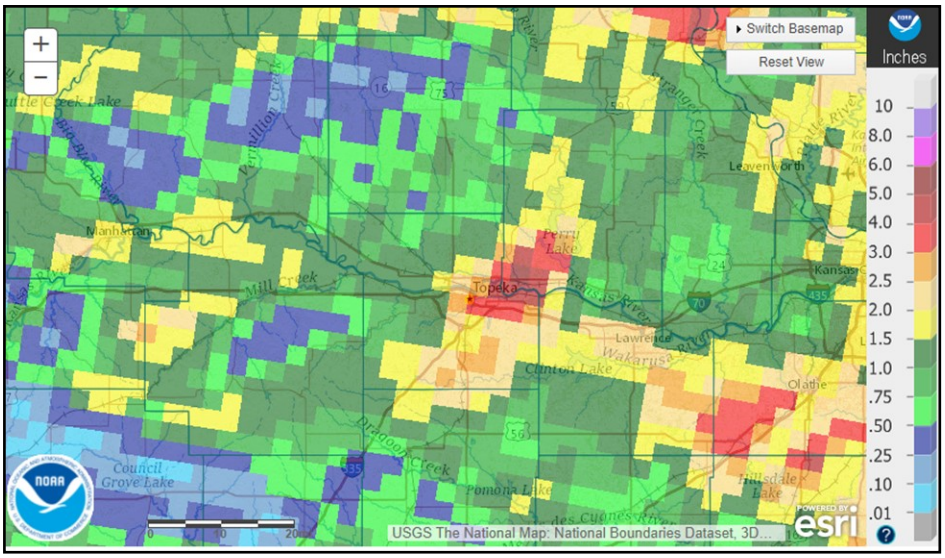
Topeka Flash Flood Event - July 2020

By Brandon Drake, Meteorologist

Around midday on 30 July 2020, a weak upper-level disturbance – along with lower-level and surface frontal features – combined with a tropical (i.e. very wet / moist) airmass to enhance rainfall rates as a slow-moving storm propagated along the front yielding very efficient and torrential rainfall. All told, over 5 inches of rain fell in approximately less than one hour over the city of Topeka. Much of this fell on or near the headwaters of the Shunganunga Creek that runs through the city. In fact, this storm prompted a flash flood warning to be issued for the Topeka metro area for several hours as well as flood warnings for the Shunganunga Creek at Gage Blvd, which reached a level of 19.29 feet in moderate flood stage. The previous record was 15.53 feet. As flood waters rose extremely fast, some homes and businesses became threatened and the city drainage systems quickly reached capacity. This was a case that happened during the best possible time – during daylight – but highlighted how quickly flash flooding can occur and how dangerous it can become. Several motorists became stranded as cars were either partially submerged or totally submerged. Some water rescues were performed by the fire department and fortunately no lives were lost. Flooding of the creek temporarily caused Gage Blvd to be closed as well as some other locations and intersections. However, no evacuations of physical structures were needed.



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The Importance of the Skew-T Log-P Diagram in Winter

By Chelsea Picha, Meteorologist

The skew-T log-P diagram is a valuable tool meteorologists use to evaluate the condition of the atmosphere above a certain location. As discussed in the spring 2020 edition of this newsletter, temperature is plotted along the horizontal axis and is skewed to the right moving upward on the graph. The vertical axis is used to plot air pressure and decreases logarithmically moving upward on the graph. This is how we get the name "skew-T log-P." Temperature (represented by the red line in the example images) and dew point (represented by the blue line) can tell us a great deal about the current or future state of the atmosphere. Observations are usually obtained by soundings in the form of radiosondes attached to weather balloons. Model soundings can be used outside of observation times and at other locations.

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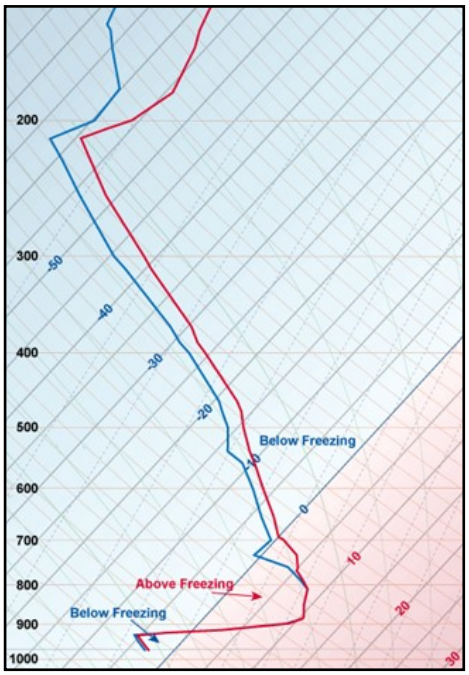
In the spring edition, we discussed how this diagram is used to draw conclusions about the atmosphere's stability and wind shear in the context of thunderstorms. While this can be a useful application year-round, in winter the skew-T log-P diagram is most frequently used to forecast precipitation type. This is determined by looking at both temperature and dew point, but we'll focus on temperature first. In a typical "snow" sounding, unsurprisingly, the entire temperature profile is below freezing (0°C), as shown in Figure 1 on the left.

However, things get more complicated when any part of the temperature profile is near or above freezing, and especially when the near-surface temperatures become colder. This is what introduces the possibility of sleet, freezing rain, or a mixture of these along with snow. When these mixed precipitation types are involved, there is a layer of air above freezing in the lower levels of the atmosphere, which is often referred to as a "warm nose." Below that warm air, there is usually another layer of colder air at the surface that is below freezing, oftentimes referred to as the refreezing or sub-freezing layer. Whether we tend to see more freezing rain or more sleet compared to other precipitation types depends on the depth of these layers as well as how warm or cold temperatures get within them. Generally speaking, a classic "freezing rain" sounding tends to have a deep and large warm nose with a shallow refreezing layer (Figure 2, right). This is because the warm nose must be sufficiently deep and warm enough to completely melt the snowflakes into liquid as they fall through the atmosphere. In this situation, the sub-freezing air at the surface isn't cold or deep enough to refreeze the water droplets, but it is cold enough for them to freeze on contact with the ground.



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Article continues on page 9...

A Not-So-Nice Little Saturday: The July 11th Hail Event (Continued…)

Of these 49 reports, the largest hailstone from this event had a measured diameter of 4.5 inches. While this doesn't quite compare to the Kansas state record of 7.75 inches in diameter, it is certainly unusual for this large of hail to be observed. The July 11th, 2020 event marks only the fourth July event in history where 4-inch diameter (softball-sized) or larger hail has been recorded in the NWS Topeka County Warning Area (CWA). Across the state, less than one half of a percent of all historical hail reports measure 4.5 inches in diameter or greater.

Hail up to the size of baseballs were also reported in the Topeka CWA earlier in the year on the morning of May 4th, but overall, the severe weather season has been a little less active than normal, with only 166 severe thunderstorm warnings issued through the end of September (average annually is 217). For its rarity this year and in history, and for the damaged caused, this certainly was a storm to remember by all those impacted.

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Winter Weather Travel Safety and Preparedness (Continued…)

Inside, you will want to include common car safety items like jumper cables, a flashlight, and a roadside visibility kit of either reflectors or flares. If you are stranded, a small shovel and bag of sand are must-haves. At right is a list of possible items you may want to have in your vehicle.

Points to remember:

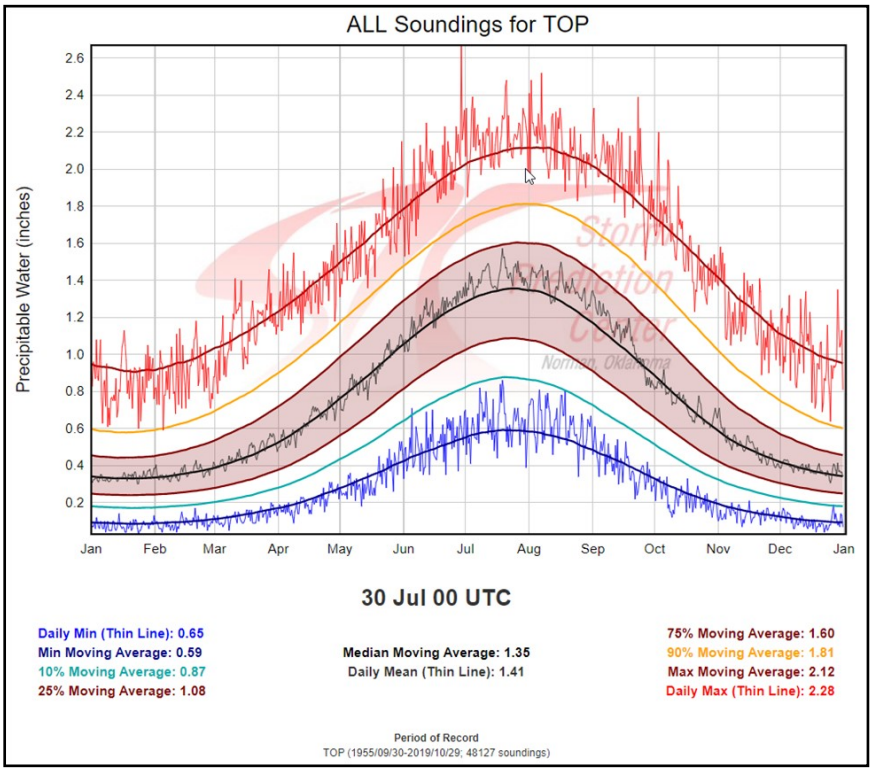
- Wear your seat belt! Even though wearing your seat belt should already be a no-brainer at all times, during the winter it's even more critical. An alarming number of road ice fatalities occur with minor accidents where the vehicle occupants were not wearing seat belts.
- Take it slow! *You don't have the skill to drive at normal speeds on icy roads.* High speeds make it easy to lose control on ice and snow. Slowing down to below 45mph when icy roads are a threat is one of the best ways to avoid an accident.
- Pay attention! Put your mobile device away and focus on the road with both hands on the steering wheel!

By remembering these few important points we hope that you can help keep yourself, your family, and fellow drivers safe this winter season.

Topeka Flash Flood Event - July 2020 (Continued…)

Leading up to the event, the month of July had already been wet for the Topeka area with 8 inches of precipitation month-to-date, which was 3.59 inches above normal for the month of July. With saturated soils and the heaviest rainfall occurring over the urban areas, the hydrological recipe was in place for a flash flooding situation to unfold quickly. A few key meteorological factors that play a role into worsening a situation like this include: highly efficient rainfall rates, a slow-moving system, and substantial moisture (150% of normal moisture for this day) with what is known as deep moist convection – causing rapid air ascent – taking place.

All of these ingredients were present on this day along with the added factor of the urban landscape – namely a lot of concrete and areas making it hard for 5 inches of rain within one hour to flow away and disperse out from one focused area. A sample of the storm characteristics can be seen on the radar image. This shows a textbook view of what a heavy rain producing storm will look like when viewing it from the WSR-88D perspective.



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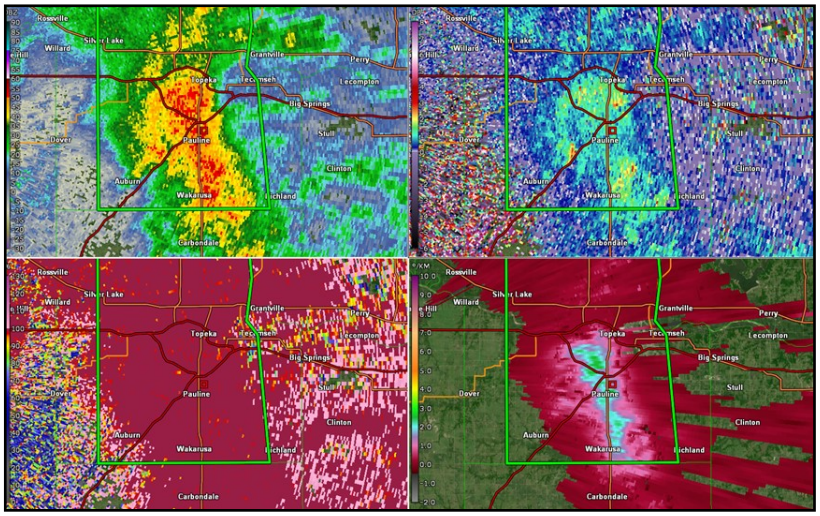
While we are constantly assessing the evolving situations in cases like this, it is important for readers of this newsletter to know that we value your reports to a very large extent. In cases like this, leveraging social media – particularly Twitter – and using #kswx or mentioning @NWSTopeka can help us make quicker and more accurate decisions. We welcome your reports and thank you in advance for these. This situation serves a very recent and powerful reminder that when heavy rain begins falling, always be ready to take necessary safety precautions and have a plan in place when you are in flood prone areas and remain vigilant. And always remember TURN AROUND, DON'T DROWN!



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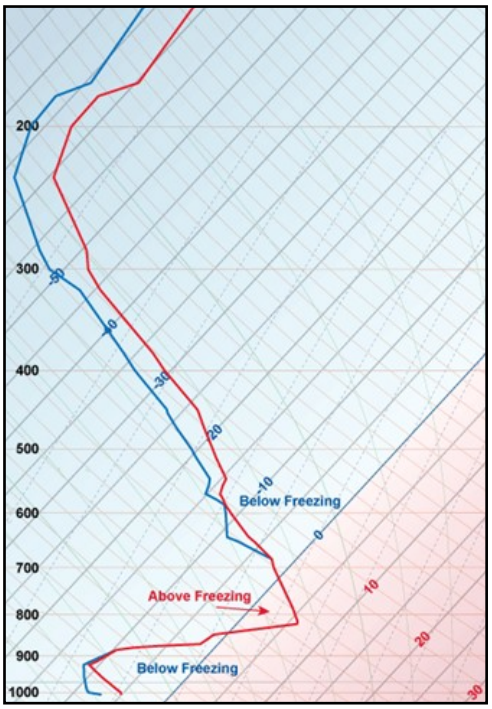
The Importance of the Skew-T Log-P Diagram in Winter (Continued…)

On the other hand, a typical “sleet” sounding usually has a smaller warm nose with a deeper and colder sub-freezing layer at the surface (Figure 3). This results in enough warm air to at least partially melt snowflakes as they fall, but in this case the sub-freezing air is sufficiently cold and deep to refreeze water droplets into ice pellets. The images shown here are more “textbook” examples, but usually there tends to be a mix of sleet and snow rather than only sleet, or there can sometimes be a mixture of multiple precipitation types. This turns especially complicated when the forecast temperature profile is near freezing at the surface or in the low levels, because sometimes all it takes is a difference of a degree or two to completely change the precipitation type. No two winter events are the same so based on this alone, it is easy to see how complex it can get while forecasting precipitation type!



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Now to add another layer of complexity to this, moisture is another important variable to consider when forecasting winter precipitation type, which is where dew point comes into play. When the dew point and temperature are very close together, the air is considered saturated, which typically shows where clouds are present in the vertical profile. In order to get ice crystals in a cloud, the cloud generally needs to be around -10°C or colder. If the air is too dry at these temperatures aloft but is saturated closer to the surface, it is possible to get freezing rain or drizzle even when surface temperatures are well below freezing, because there are no ice particles forming higher up in the atmosphere. Another way to think about this is by looking at temperatures between -18 and -12°C, which is the dendritic growth zone. If the air is saturated in this layer, then ice crystals or dendrites can efficiently grow and aggregate as they fall to the ground. However, if it is too dry we typically do not have ice forming in the cloud.

As you can see, the skew-T log-P has many of its own uses for winter forecasting in addition to other applications year-round. With this in mind, it is an essential source that provides an abundance of information in one place, which is why it is so frequently used among meteorologists.

More information about skew-T log-P diagrams can be found at the following link: https://www.weather.gov/jetstream/skewt. Samples and their explanations can be found by clicking “next” at the bottom of the page, or by simply clicking this link: https://www.weather.gov/jetstream/skewt_samples.

COOP Corner Fall 2020

By Shawn Byrne, Observing Program Leader

Hi all! Well, the COVID-19 pandemic continues to affect the Cooperative Program, and will likely continue into the spring. I plan on calling all of you soon to see if you need anything, and how you are doing. If you need any supplies, do not hesitate to ask! We are allowed to stop by if there is an emergency regarding the equipment, but we are still not able to interact with anyone.

Summer started out rather wet, but by August, the ground really began to dry out. We were only a day or so away from having one of the driest Augusts on record.

Length of Service Awards will have to be mailed this year. It is unfortunate because it's one of the best aspects about the program. Getting a chance to honor all of you for your dedicated years of service is a wonderful honor! I will have to recognize each of you here the best we can.

Length of Service Awards for 2020…

40 Years of Service

Frank Nelson of White City, KS

20 Years of Service

Von and Kim Kramer of Longford, KS

Jim Yarrow of Wakefield, KS

Jerry Swanson of Scandia, KS

Gary L. Robinson of Miller, KS

15 Years of Service

Rebecca Wassom of Wamego, KS

Lisa Keith of Emporia, KS

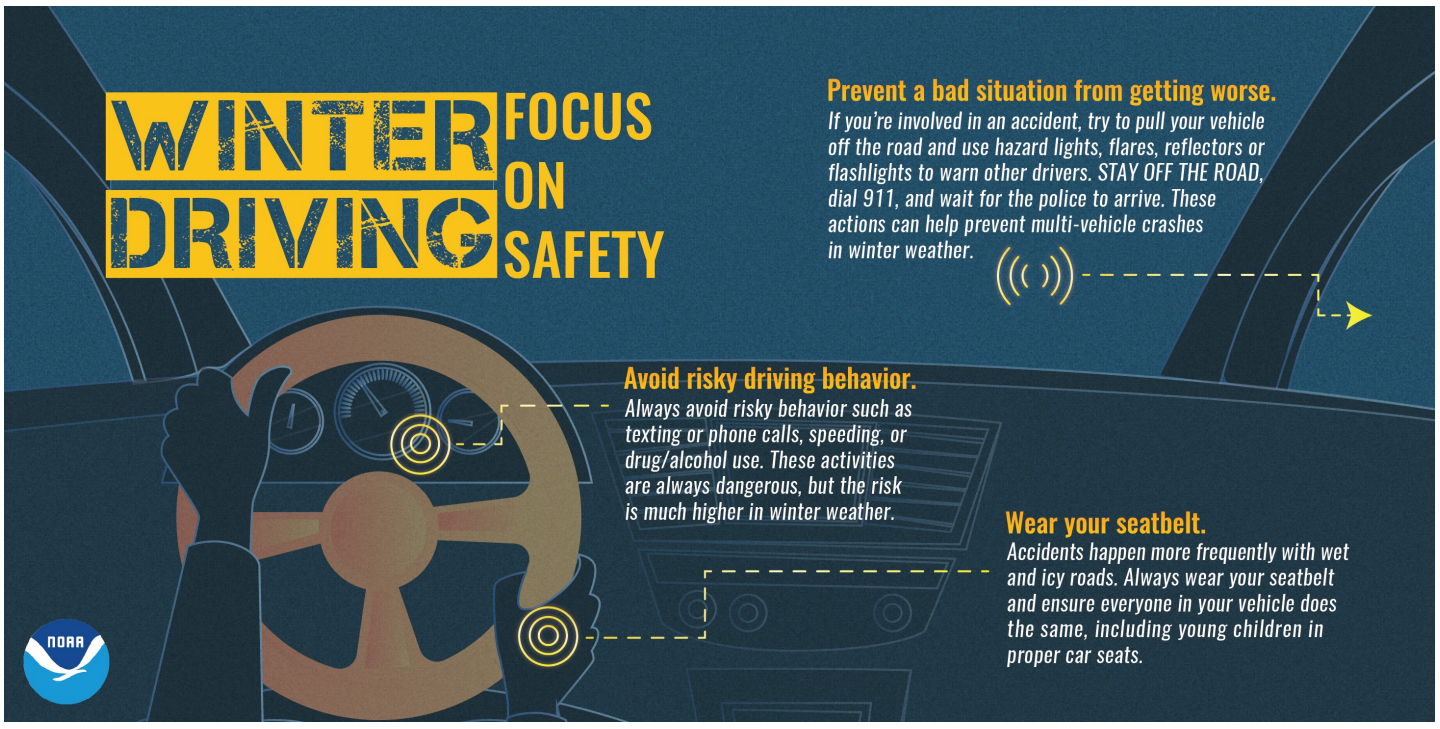
10 Years of Service

Mike Gilland of Osage City, KS

Dave Crawford of Blue Rapids, KS

Thank you all for your dedication and service!

As we enter fall, please make sure to bring your rain gauge funnels and inner measuring tubes indoors. Leaving them outside will cause the inner tubes to crack due to the ice, and the funnels are not large enough or deep enough to catch the snow properly. If you need any help with snow measurement, please don't hesitate to call the office at **1-800-432-3929** and we would be happy to help! Have a good and safe holiday season, everyone!



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