Serving Residents of Northeast Kansas Since 1878

The Topeka Tiller

National Weather Service
Topeka, KS

Spring 2020 Volume 13, Issue 1

Inside this issue:

A Note from the Editor:

Hello everyone. In the midst of these challenging times, NWS Topeka feels honored to continue serving northeast Kansas by providing accurate forecast and weather information utilizing the latest research and technology. Protection of life and property is our mission, and while the pandemic poses challenges to us getting out into the community, we wanted you to know that we still have full-time staff working around-the-clock (24 hours per day, 7 days per week) to satisfy the mission. It is my hope that this edition of the Tiller provides you with some informative articles to read and some fun activities to try. From our family to yours, please stay healthy and safe this season, and know that we are still here watching the sky!
-Sarah Teefey

Local IWT Meeting of 2020

By Jenifer Prieto, Lead Meteorologist

On February 11th, Meteorologists from the National Weather Service (NWS) Topeka office met with core partners across northeast Kansas to discuss severe weather operations and best practices. Those in attendance included local and state emergency management, and Meteorologists from the Fort Riley Army base, WIBW, KSNT in Topeka as well as the Fox 4 station in Kansas city. Throughout the discussion, topics addressed included: the EF-4 tornado that impacted Lawrence, flash flooding across the entire northeast Kansas area, fire weather products and messaging, and methods of effective communication of imminent severe weather hazards.

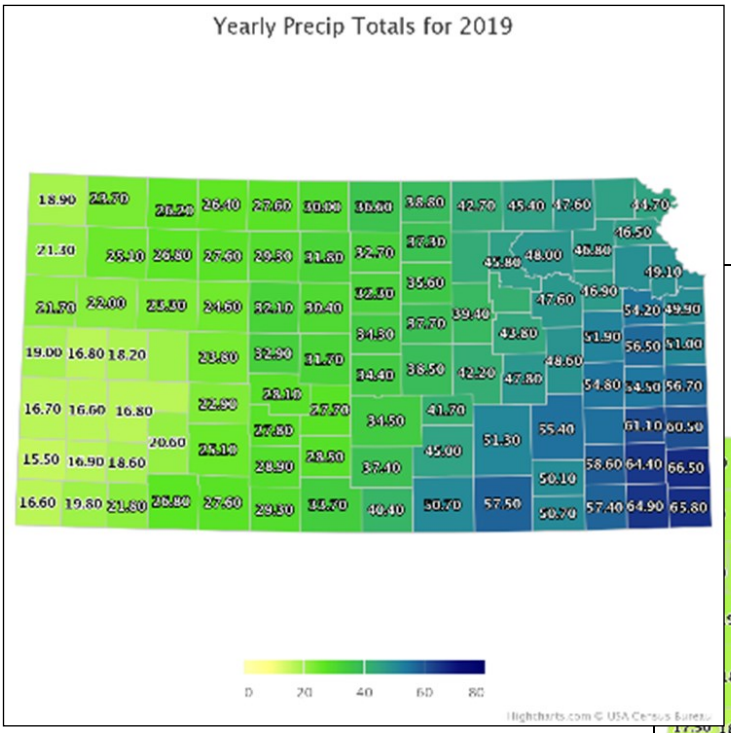
After a large group discussion and coming to agreements on how we (NWS) can improve our communications and services at the NWS Topeka office, the large group split into three smaller groups to dive deeper into specific topics on severe weather events from 2019 in terms of flow of communication during major events (multiple tornado and wind damage events, Flash Flooding throughout the area), content and layout of weather graphics and Situation Reports composed by the National Weather Service leading up to the event, and relaying storm reports on a timely basis throughout each event.

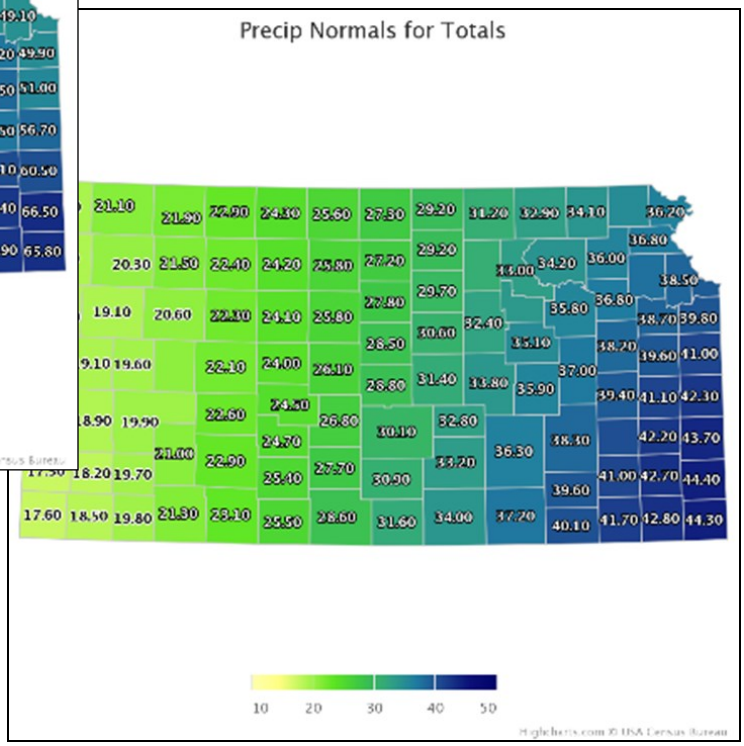
All parties found many useful takeaways, highlighting best practices on sharing severe weather reports via multiple communication platforms, but also an overall agreement that the Lawrence EF-4 tornado event was well coordinated and communicated leading up to and during the event. It has been over 10 years since a violent tornado (EF-4) came close to impacting a highly populated area, so to see the NWS and our core partners' training, skills, and coordination come into fruition led to an overall stronger partnership and deeper trust in working together to inform our customers, the public and to protect lives and property.

From Floods to Fire

By Bryan Baerg, Meteorologist

The 2019 fire season was quite benign across all of eastern Kansas. This was of course due to an abnormally wet year, with some portions of eastern Kansas receiving in excess of 60 inches of rain (see figures below). The plethora of soil moisture led to rapid vegetation growth throughout the warm season of 2019. As the 2019-2020 winter came (and hopefully leaves soon), this left massive fuel loads of dormant grasses from 2019. Several strong storm systems progressed across the Southern Plains throughout March and early April. Unfortunately, this upper level storm track typically yields little in the way of precipitation across the NWS Topeka forecast area. What this weather does yield however, is a dry and windy pattern with periodic warm-ups. The combination of warmth, wind, and a large supply of dormant grasses resulted in critical fire danger conditions on several occasions this spring. Fortunately, our forecast area has evaded significant fires that resulted in major loss of property. The vast amounts of soil and subsoil moisture has allowed for rapid growth and green-up of native grasses across the region, which for the time being has tempered any potential for critical fire weather conditions. Meteorologists will have to monitor the threat for a secondary fire season later in spring due to the unusual outbreak of sub-freezing temperatures the region received throughout mid-April.

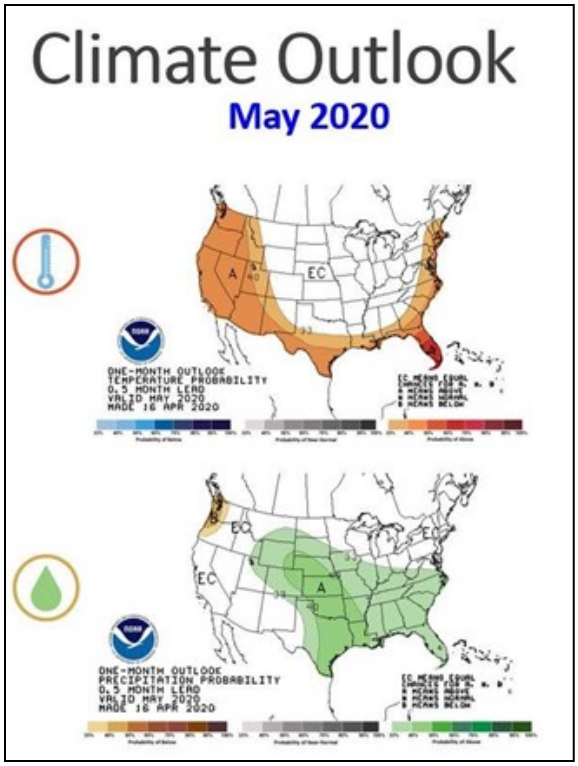




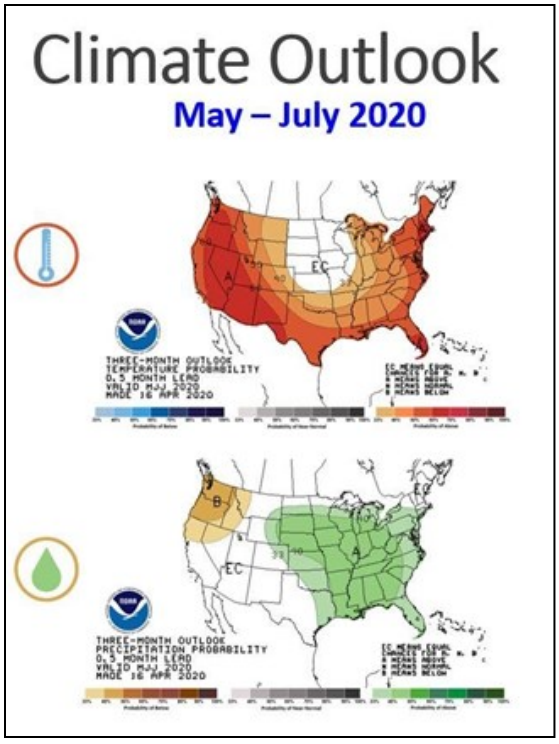
Spring 2020 Weather Outlook for Northeast Kansas

By Chad Omitt, Warning Coordination Meteorologist

In May 2019, many areas of Kansas experienced record wet conditions and flooding, which has many asking what this year has in store. Unfortunately, if you don't like rain, you won't like the most recent long range forecast for the area. The image below shows the latest temperature and rainfall forecast for May. It shows that odds favor wetter than average conditions across much of the central Plains this May. There's less confidence in what the temperatures will look like, but chances are if we are wetter than average, our temperatures will remain around average or may actually be cooler than average IF we are wet again this May.



Now, it is important to know that we are not forecasting another record wet year, but based on the expected weather patterns, we do expect that this May could be wetter than average. What is average for May? Typically, here in north central and northeast Kansas we receive between 4 and 5 inches of rain during the month of May. In addition, if we expect more rain in May, we also know that this could bring the risk for severe storms including tornadoes to the area. That shouldn't be surprising though since our typical peak for severe weather including tornadoes is May into June across the area. Through the middle of April, the Jetstream has kept the bulk of the severe weather to our southeast, however, as we progress into May, it will shift north, so be prepared!



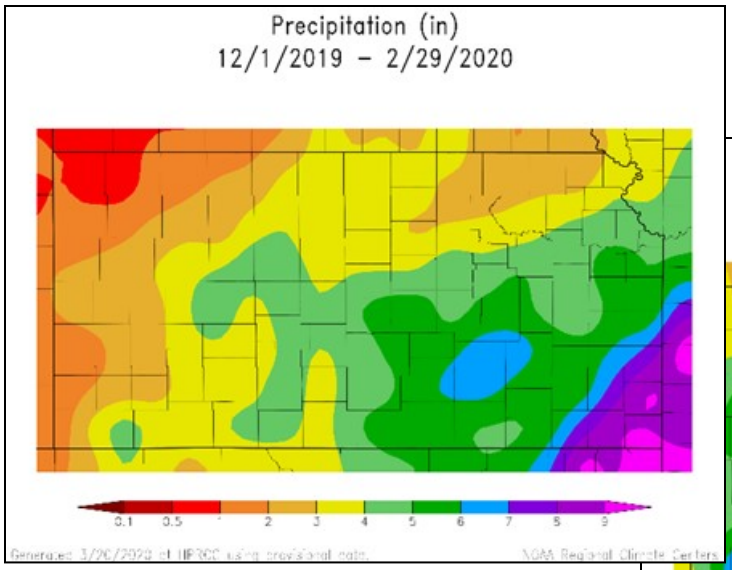
What's the latest thinking on the longer term, say over the next few months? The latest long range forecast through June is below. As you can see, it looks similar to the May forecast with odds favoring wetter than average conditions with no meaningful signal for warmer or cooler temperatures. Ultimately, we shall see what the weather will bring over the next few months, however, it does appear that the storm track/weather pattern that has set up over the country so far this spring could support a more active pattern, meaning more rain and more severe storms across the region as we head through May and June.

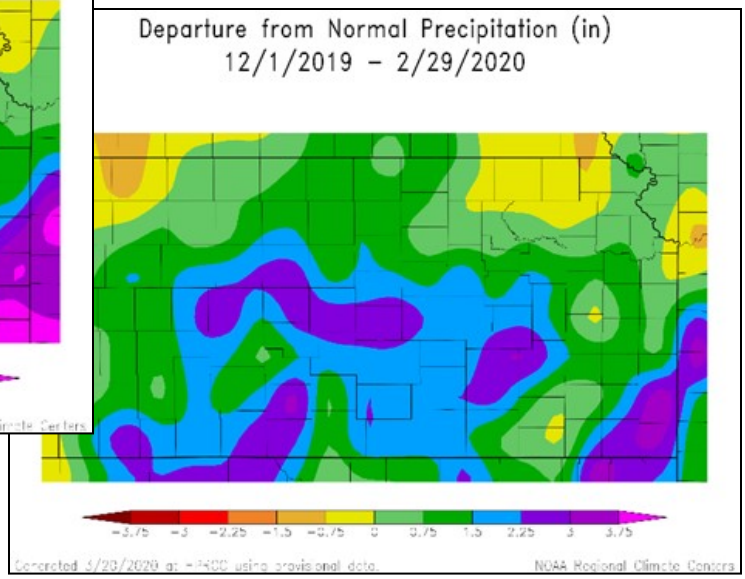
Winter Season 2019-2020 Review

By Kyle Poage, Meteorologist

In a general sense, winter conditions for north-central, northeast, and east-central Kansas were mild though wetter than normal. Temperatures for the season averaged to be around three degrees above normal for the entire area.

For Topeka, where 133 years of data are on record, this was the thirteenth-warmest winter (December through February), with an average temperature of 35.4 degrees which is 3.4 degrees above normal. The highest temperature during the season of 72 degrees on February 2 tied the record high for that day. The lowest temperature was one degree -- only sixteen winters on record had a warmer coldest temperature. The 4.69” of precipitation in Topeka over the winter was the 28th-wettest winter on record, 1.16” above the normal amount of 3.53 inches. Record amounts of precipitation fell on three days -- 1.85” on December 28, 0.75” on January 10, and 0.42” on January 17. Only 9.9” of snow fell during the winter, which is in the bottom-third of winter snowfall totals on record and nearly five inches below the normal amount of 14.6 inches.





For Concordia, where 135 years of weather records exist, this winter tied for the eighth-warmest winter on record with an average temperature of 34.9 degrees, or 4.5 degrees above normal. As with Topeka, the highest temperature occurred on February 2 with record-breaking heat that day as well at 71 degrees. The coldest temperature was five degrees, with only four winters on record having a warmer coldest temperature. The coldest high temperature for any day this past winter was 22 degrees on January 20. Only two winters before had more mild coldest days -- the winter of 1999-2000 with 26 degrees and the winter of 2011-2012 at 23 degrees. The 3.33” of precipitation that fell was the 23rd-highest winter total on record, 1.11” above normal. Over a third of this total accumulated on December 28 when 1.33” was measured, setting a record for the day. The 7.3” total winter snowfall amount was just over half of the normal amounts of 14.2 inches.

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2020 Tornado Safety

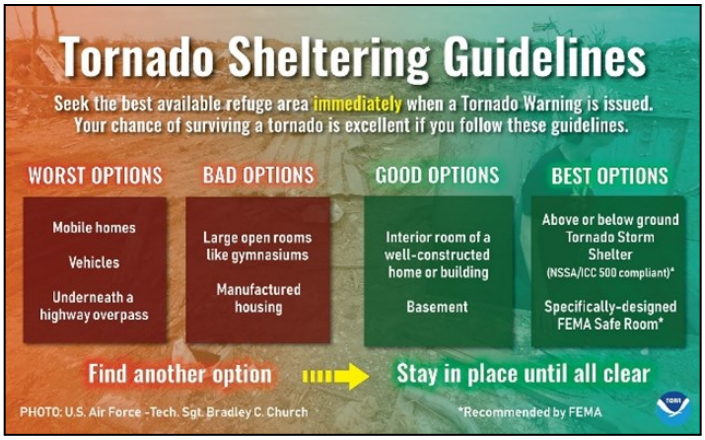
By Daniel Reese, Meteorologist

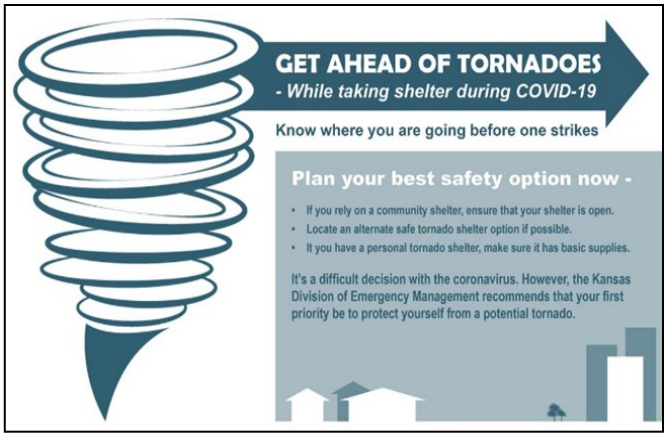
It's spring in northeast Kansas, and of course that means severe weather season is here. Even though this spring has obviously been different than most, severe weather awareness and preparation are as important as ever. So let's take some time to refresh your tornado safety plans, and while we're at it, we can see if there are any minor adjustments that can be made to add social distancing to your plans.

Same as always, the first step to severe weather safety involves having ways to receive the warning. You should have at least two different ways to receive a warning, including one that will continue to function even if your power goes out. Consider methods that you can receive at any time or any place. Two good methods are Wireless Emergency Alerts (WEAs) and a weather radio. There are lots of great ways to get weather alerts on your phone, but WEAs are one of the simplest. When a warning is issued, cell towers in the warned area will automatically broadcast the alert out. Any mobile device in the area will then get the alert, provided you haven't turned off WEAs on your device. So as long as you have your phone on you and are in an area with coverage, you can quickly receive any warning that is issued. But what if it's at night, and your phone is turned off or on silent? In that case, a weather radio is a great tool. When a warning is issued, a weather radio will give off a certain attention grabbing tone, and then will read off information about the warning. For events where you are sleeping or otherwise caught off guard, a weather radio can be a life-saver.

Once you receive a warning, then what do you do? Your decision will depend on where you are and what you're doing, so it's important to be ready for several different scenarios. Particularly on days when severe weather is forecast and a tornado watch is issued, have a plan in place for where you'll be later in the day and what you should do. If you are outside, in a car, or in a mobile home, you will want to leave those spots and find a permanent structure. Remember, most deaths in tornadoes occur from flying debris, so put as many walls between you and the storm as possible. The best options are an above or below ground storm shelter or FEMA designed safe room, but basements or even an interior room will typically provide good shelter in a tornado.

Now how are things different this year? For the most part, things won't be that different. The two paragraphs above will apply just as much as they do every year. What may be different is if you typically need to go to a community tornado shelter during tornado warnings. The decision on whether community shelters will remain open will be made at the discretion of local officials, so call your local officials well ahead of time to make sure they will be open. If necessary, come up with an alternate sheltering option. Assuming you do need to go to a community shelter, it might seem like a tricky situation to decide between social distancing and sheltering together from a tornado. However the Kansas Division of Emergency Management and the National Weather Service recommend that protecting yourself from a potential tornado should be your first priority. Take shelter first, and then if possible, practice good social distancing and other COVID-19 mitigation tactics. As always, having a proper plan in place can pay off big when severe weather comes.





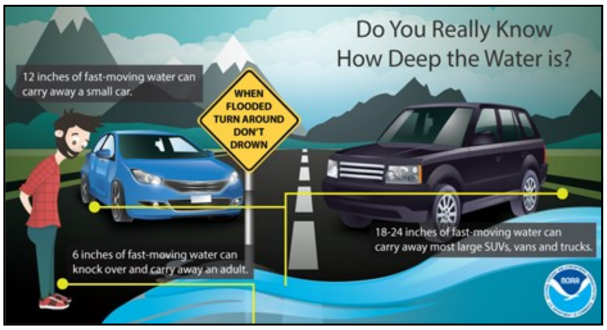
Staying Safe While Enjoying the Outdoors

By Matt Flanagan, Meteorologist

Now that warmer weather is here, more people will be indulging in outdoor activities, whether that be playing at the park, hiking, swimming, boating, etc. While enjoying the outdoors, it is important to remain weather aware as severe weather such as lightning, hail, strong winds, tornadoes, and flash floods could dampen your plans and threaten your safety. In order to ensure you are safe when outdoors, follow these guidelines:

- Have a plan in place for each severe weather hazard in case your activities are impacted, and know where you safe place is.
- Be cognizant of what weather is expected before departing.
- Build an emergency kit for your car including batteries, blankets, flashlights, cell phone charger, and a first aid kit.
- Have multiple ways to receive weather information while outdoors, such as:
    - Wireless Emergency Alerts or another way to receive warnings on your mobile device,
    - Battery operated NOAA weather radio or other radio, and/or
    - Outdoor sirens.

If you are outdoors during any of these hazards, here are some ways to protect yourself:



Flash Floods: Use caution when going to flood-prone areas and stay informed on the possibility of heavy rain. If flash flooding does occur, never drive through flooded roadways or around barricades as the water may be deeper than it appears and can hide hazards such as washed out roads. It only takes a few feet of water to float a vehicle. Remember, Turn Around, Don't Drown!

Lightning and Severe Thunderstorms: If you hear thunder, you are likely within striking distance of lightning. When thunder roars, go indoors! There is no safe place outside when thunderstorms are in the area. If there are no buildings around, the next best place to shelter from lightning is in your car. If thunderstorms are producing strong winds and/or large hail, your car may not be a safe option. Find the nearest sturdy building and take shelter there.

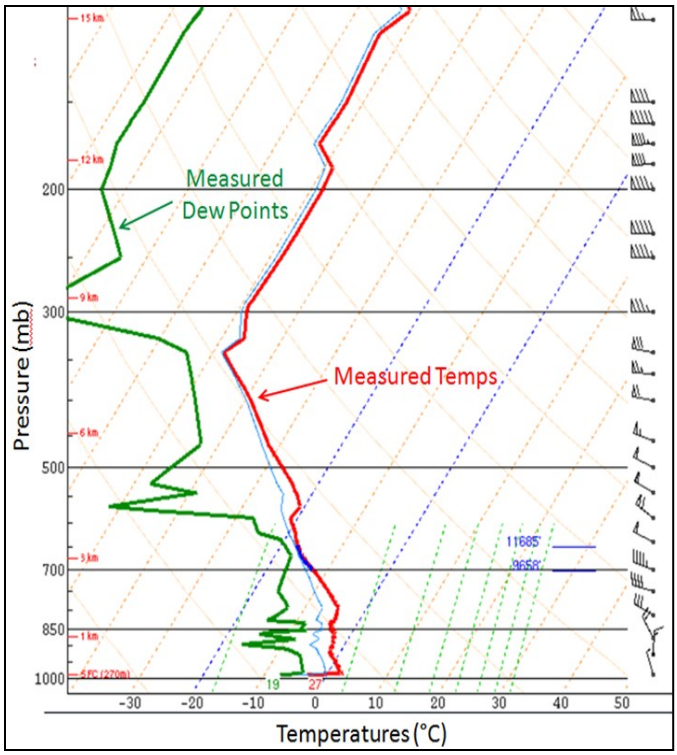
Tornadoes: If you are outside during a tornado, you must act fast to seek shelter in the closest building. Being in a vehicle during a tornado is not safe. The best course of action is to drive to the closest shelter, which means knowing where the shelter is ahead of time. If you are unable to make it to a shelter, either get down in your car and cover your head or abandon your car and seek shelter in a low lying area such as a ditch or ravine.

The best way to stay safe while enjoying the outdoors is to be prepared and to stay weather aware. Having a plan for any severe weather hazard will mitigate your risk and protect you and your family.

The Importance of the Stew-T Log-P Diagram

By Sarah Teefey, Meteorologist

The Skew-T Log-P diagram is a valuable, multifaceted tool used by meteorologists to assess the state of the atmosphere above a given location. The name of this diagram can be explained by looking at the graph itself (see figure below). Temperature is plotted along the horizontal axis and is skewed to the right moving upward on the graph. Pressure is plotted along the vertical axis and increases logarithmically (non-linearly). Hence, "Skew-T, Log P". Data plotted on the graph, such as temperature and moisture, are measured by atmospheric soundings, usually in the form of radiosondes attached to weather balloons.



During the convective seasons of spring and summer, meteorologists use this diagram to analyze the vertical temperature profile of the atmosphere. That knowledge can then be used to draw conclusions about atmospheric stability. Stability is determined by examining how quickly temperature cools with height in a measured atmosphere. It is important to note here that the rate at which temperature changes with height is called a lapse rate. In order to determine stability, the environmental (measured) lapse rate is compared to an established lapse rate of unsaturated and saturated air. Unsaturated air that rises from the surface (theoretically without interaction from surrounding air) would generally cool at a rate of approximately 5.5 degrees Fahrenheit per 1000 feet. This is called the dry adiabatic lapse rate. For saturated air, the adiabatic lapse rate is lower and varies, but is generally around 3.3 degrees Fahrenheit per 1000 feet.

If, for example, the environmental lapse rate is **less** than the dry and moist adiabatic lapse rates, the atmosphere is stable and air near the surface would tend to stay in place as opposed to rising. If, on the other hand, the environmental lapse rate is **greater** than the moist and dry adiabatic lapse rates, the atmosphere would be considered unstable and air would rise freely on its own. This helps meteorologists determine if air will have a natural tendency to rise, which could promote the development of thunderstorms if other conditions, such air moisture availability, are present. The strength of potential thunderstorms can also be estimated based on the amount of instability that exists. Further, inversions, or areas where the environmental temperature actually **increases** with height, can also be identified on this diagram. Inversions act to "cap" the atmosphere, making it more difficult for air to continue rising.

In conjunction with a stability analysis, the Skew-T Log-P contains other data used to help determine severity potential of thunderstorms in a favorable environment. The amount of wind shear, which is the change of wind direction and/or speed with height, can be determined by looking at wind barbs. The combination of large amounts of instability, wind shear and low level moisture, all of which can be seen on a Skew-T diagram, often lead to severe weather outbreaks. For these reasons, and many more, the Skew-T Log-P provides a wealth of information from a single source that is useful year-round in varied seasonal air masses.

More detailed information about the Skew-T Log-P diagram can be found at the following link: https://www.weather.gov/jetstream/skewt.

At-Home Weather Experiments

By Chelsea Picha, Meteorologist

Looking for some new and fun activities to try at home? Here are a couple of ideas of hands-on experiments if you or your family would like to learn more about the weather and how it works. They are quick and easy to do, and the supplies are likely things you already have in your household!

Making fog:

For this experiment you will need a glass jar, bag of ice, matches, and food coloring. To make it happen, first fill the jar about halfway with hot water and add food coloring. Then light a match and hold it over the jar opening. After a few seconds, drop the match into the jar and quickly put the bag of ice over the top of the jar. What do you see?

There should be a cloud forming inside the jar. So how does this happen? The warm water heats the layer of air that it touches, and some of the water evaporates into the air to form water vapor. That warm air consisting of water vapor then rises and cools as it comes into contact with the air cooled by the ice. When water molecules cool, they slow down and stick together more easily. The smoke particles from lighting the match then act as nuclei for water molecules to collect on. This is how condensation occurs. The connection to weather: As the atmosphere cools, water vapor suspended in the air condenses into water droplets around nuclei such as dust particles, ash, pollutants, and sea salt.

Article continues on page 9...

Winter Season 2019-2020 Review (Continued…)

Wintry conditions were rather long-lived again on January 11 and 12 for some portions of the area. Freezing rain, including some thunderstorms, developed across the area in the afternoon of the 11th and continued into the early portions of the 12th in much of east-central Kansas while changing over to snow. Accumulations of freezing rain ranged from just a trace to near one quarter of an inch in southern and eastern locations. Wind gusts of 30 to 40 miles per hour were also common with this event.

Ice accumulations from freezing rain ranged from around a tenth of an inch to around a third of an inch from the pre-dawn hours through the middle of the day on January 17.

Two light snow events took place fairly close together on January 22 and 23 with a break of several hours to about half a day with total snowfall amounts of a few inches resulting.

Light to moderate snow overspread much of northeast and east-central Kansas in the daytime hours of February 12 with accounts commonly in the two- to four-inch range. Winds throughout the bulk of the event were very light but picked up from the north as the snow ended that evening. Cold air brought in by these north winds produced the most brutal temperatures of the season with mercury readings near to a few degrees below zero and wind chills around ten degrees below zero for the late night and early morning hours of February 13 and 14.

At-Home Weather Experiments (Continued…)

Making a tornado:

This experiment can be done in two ways. The first method requires two 2-liter bottles and a bottle connector (or duct tape and a metal washer). Fill one of the bottles about two-thirds of the way with water, and then attach the connector followed by the other bottle. If you don't have a connector, an alternative is to put a metal washer between the bottles to make the hole smaller, and then attach them tightly with duct tape to ensure no water leaks out. Once the bottles are attached, flip the apparatus upside down and spin the top in a circular motion as fast as possible. A vortex should form inside, very similar to a tornado! To add the effect of "debris," you can also add glitter, dish soap, beads, kidney beans, or any other small objects you may have in your home. Even small toy cars or trains will work! The second way to do this is to simply use one bottle or a tall glass jar. It may take some practice to get the vortex to form properly, especially using only one bottle. I have found the results to be better with the two bottles, and that using one bottle requires more vigorous swirling.

So what causes the vortex? The rotating water induces a centrifugal force, which attempts to throw the fluid to the outside of the system. The removal of fluid at the vortex center then creates low pressure, which induces a pressure gradient force that directly opposes the centrifugal force. The fluid is said to be in cyclostrophic balance as a result of these counteracting forces.

These are just two of many experiments that can be done, but plenty of online resources are available if you are looking for more ways to learn about the weather from home. Some of these can be found on https://www.weather.gov/learning. This provides links to fun and interactive sites about meteorology and weather safety for all ages – games are included as well!

COOP Corner Spring 2020

By Shawn Byrne, Observing Program Leader

Hi all! Well, we survived a relatively mild winter for the 2019. Most stations reported above normal precipitation for the winter season, but below normal snowfall. No station recorded a 5 inch snowfall or greater this entire winter, which was in obvious contrast to the previous winter season. I know last year was an exhausting one for you all, and we greatly appreciate you hanging in there and providing the data to us! So, that brings us to Spring. It's that time of year again to dust off your funnels and inner measuring tubes for the summer season. If it looks like snow in the forecast though, don't hesitate to remove the funnel and tube and bring them back inside until it warms back up.

This year, site visits may be a bit delayed due to the ongoing COVID-19 pandemic. If you have any issues, please let me know and I will try to get you serviced as soon as possible. If you need any equipment, I will send that to you as soon as possible as well. I do look forward to seeing you all soon!

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Severe Weather Spotting Card :

Weather to Report:

Hail (report any size)

Strong Wind Gusts (58+ MPH)

Any notable wind damage to trees, homes, businesses

Funnel Cloud/Rotating Wall Cloud or Tornado

What to Include in your Report:

Your Name and/or Call Sign (Spotter Number)

Your Location

Time and Date of Event

Location and Duration of Event

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