2020 Shareholders Report

Volume 2

National Weather Service
Austin/San Antonio

At the National Weather Service (NWS), we know our top priority is you, our customer base in our 33 county area of responsibility in South Central Texas. We strive to provide top quality forecast and warning services with the goal to meet our stakeholders needs. As part of that effort, we are excited to present this second volume of the National Weather Service – Austin/San Antonio Shareholders Report to further augment our service to you by highlighting weather-related topics and events of interest. You will find a variety of topics in this second volume that are informative and of interest including recent additions to our staff. We continue to welcome your feedback for future volumes of our Shareholders Report.

- Joe Arellano, Meteorologist In Charge

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Supplemental Upper Air Soundings

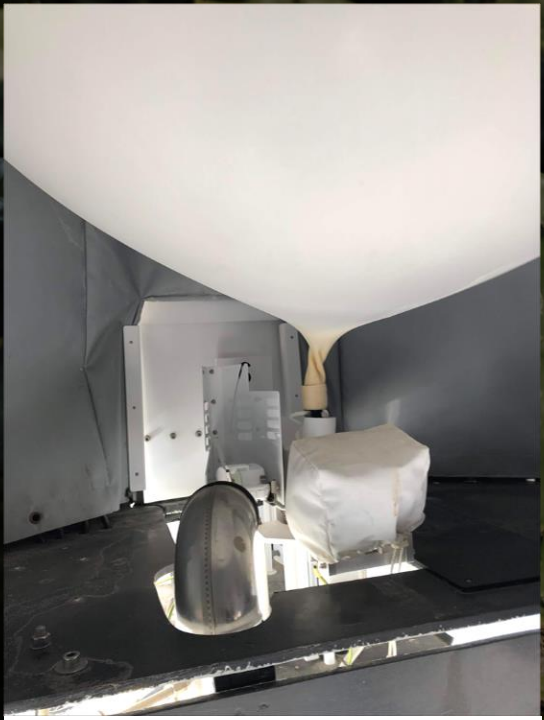
By: Ethan Williams, Meteorologist

We routinely launch weather balloons twice a day around 00Z and 12Z (Zulu time; or around 5-6 am and 5-6 pm local time) to gather data from the ground up to nearly 100,000 feet. In addition to these regular launches, our Automated Radiosonde Observing System (AROS) in Del Rio can make additional launches during active weather. Examples include when the National Hurricane Center (NHC) or the Storm Prediction Center (SPC) request additional data to help forecast tropical cyclones or severe thunderstorms.

These "supplemental" soundings are usually requested for 06Z and 18Z, (around 11 am-Noon and 11 pm-Midnight) and along with the regular soundings, help our models *initialize* well, which is to say it gives us the most up-to-date snapshot of the atmosphere. This helps lead to more accurate model forecasts. For example, this data can influence the forecast track of a hurricane or raise concern of a large hail threat. In addition, our forecasters can literally watch the data coming in as the balloons rise, tipping us off to changes in instability or moisture that help us better predict and issue warnings for severe thunderstorms, tornadoes, and flash floods.

Even though the AROS system is automated and it's easy to schedule the additional launches, it takes a team effort to maintain the capability. For example, instead of two routine flights per day, the supplemental soundings add two more (totaling 4 per day), which exhausts the balloons, instruments, and hydrogen gas faster, such that our electronics staff have to make replenishment trips more often (or plan to fill the stocks in advance, like when a hurricane is still days away from the Texas Coast).

A full loading tray inside the AROS



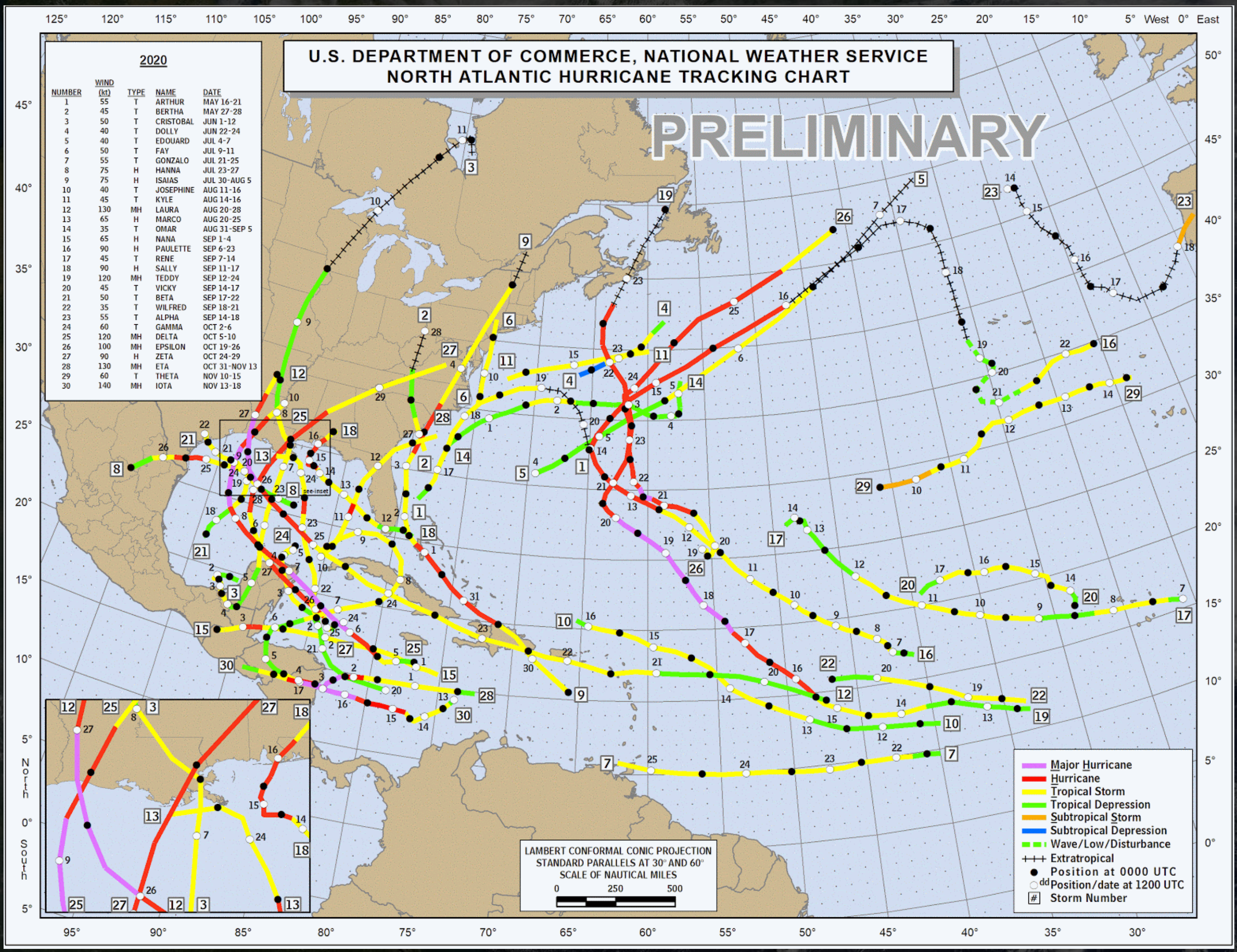
Balloon being inflated in the launch vessel

The AROS system from the outside

Recap of the Record Breaking 2020 Atlantic Hurricane Season

By: Jason Runyen, Lead Meteorologist

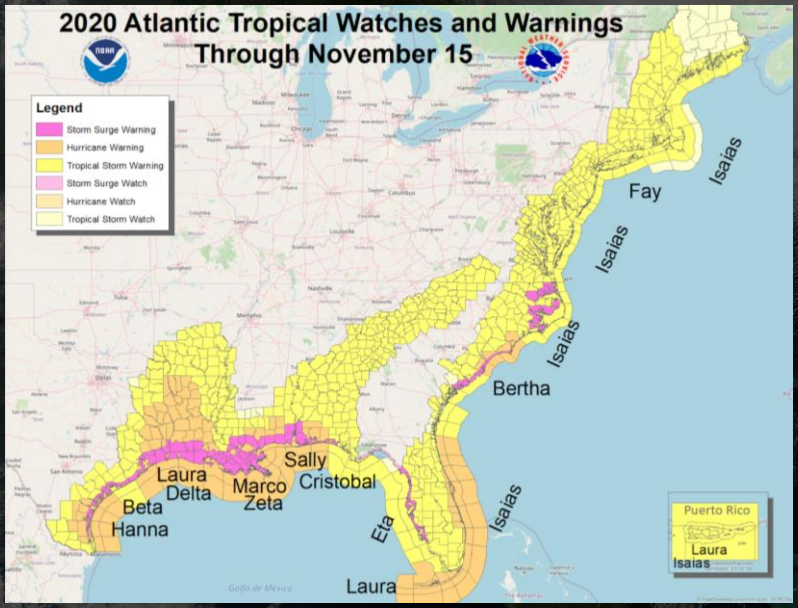
To say the 2020 Atlantic Basin hurricane season was active is an understatement. Thirty named storms occurred in 2020, breaking the previous record of 28 storms set in 2005. Official records date to 1851. Out of these 30 named storms, 12 struck the U.S. The previous record for landfalls in the U.S. during a single season was nine set in 1916. Bertha, Cristobal, Fay, Hanna, Isaias, Laura, Marco, Sally, Beta, Delta, Zeta, and Eta all made landfall along the U.S. coast.



The 2020 season began early when Arthur formed on May 16. The extremely active season quickly went through the predetermined list of 21 names, ending with Wilfred on September 18. Then for only the second time in history, the Greek alphabet was used for the remainder of the season, extending through the 9th name in the list, Iota.

According to Phil Klotzbach, Ph.D, Research Scientist in the Department of Atmospheric Science at Colorado State University, accumulated Cyclone Energy generated in the Gulf of Mexico during the 2020 Atlantic hurricane season was the 2nd-most since 1950, trailing only the 2005 season. Accumulated Cyclone Energy is a metric accounting for intensity and duration of storms. During 2020, 10 of the tropical cyclones experienced rapid intensification, tied with the 1995 season for the most.

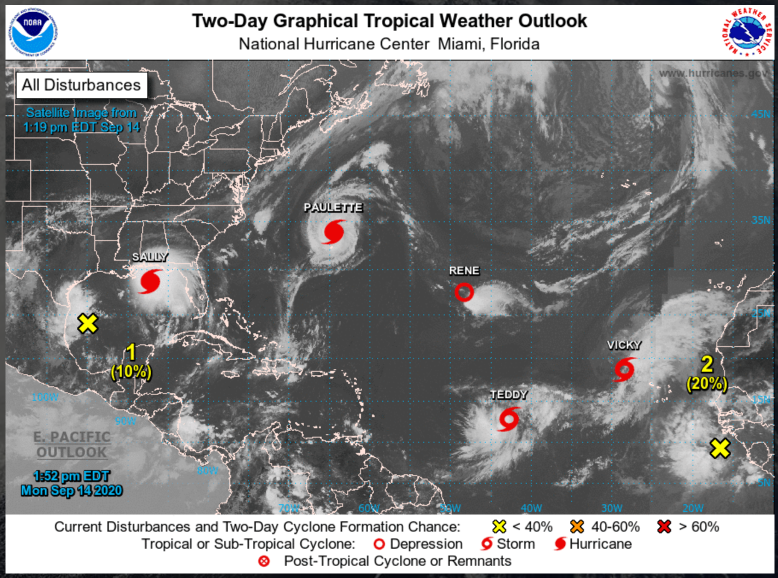
Of the 12 landfalling named systems this year, eight of them made landfall along the Gulf of Mexico coast, and of those five of them struck Louisiana. The entire coastline of the U.S. from Texas to Maine was at one time under some type of watch or warning from a tropical system. In fact, coastal areas of Louisiana alone spent over 19 days under some form of watch or warning from tropical systems. The most powerful of them was Major Hurricane Laura, which brought devastating impacts to southwest Louisiana, including Lake Charles. Laura was the strongest continental U.S. hurricane landfall of 2020 in terms of wind speed, with maximum sustained winds of 150 mph, and is now tied with the 1856 hurricane as the strongest tropical cyclone to make landfall in Louisiana. Laura caused at least $16 billion in damage and 77 deaths.



Texas saw two landfalling systems. Hurricane Hanna made landfall along Padre Island with 90 mph winds on July 25th, producing wind and surge damage.

Estimated economic losses at this time are estimated to be just under $1 billion from Hanna. Tropical Storm Beta made landfall late on September 21st along Matagorda Island with 45 mph winds.

The 2020 hurricane season also brought impacts to other areas of the Atlantic. Two Category 4 hurricanes struck the coast of Nicaragua in November just days apart. According to Phil Kotzbach, Hurricane Iota was the strongest November hurricane on record to make landfall in Nicaragua, with maximum sustained winds of 155 mph winds, surpassing the previous record set by Hurricane Eta (140 mph) just 13 days earlier in 2020. Prior to landfall, Iota achieved 160 mph maximum sustained winds. Iota is the latest known Category 5 to form on record (Nov 16) in the Atlantic Basin and only the second Category 5 recorded in the month of November. In Europe, Subtropical Storm Alpha made landfall in Portugal. This was the first ever recorded occurrence for that country and only the third known to have made landfall in continental Europe.



September was quite active in the Atlantic basin, with 10 of the 30 named storms occurring during the month. Wilfred, Alpha, and Beta all formed on September 18th. Only one other time in recorded history (1893) have three storms formed on the same day. On September 14th and 15th there were five named systems occurring in the Atlantic Basin at the same time. Three named storms formed in November, tying the 1931, 1961, 2001 and 2005 seasons for the most named storms during the month of November.

Continued on page 7……..

NWS Weather Forecast Office Backup Program: Ensuring the Warnings Never Stop

By: Aaron Treadway, Lead Meteorologist

Protecting lives and property is the primary mission of the National Weather Service (NWS). While each NWS Weather Forecast Office (WFO) issues many different kinds of forecasts and products, the main tool for communicating risk to lives and property is the issuance of our NWS warnings, watches, and advisories. But what happens when a WFO is threatened by a tornado, a blizzard knocks out power for an extended period, or a hurricane damages communication lines? No matter what natural or man-made disasters may occur, the NWS ensures continuity of operations with each WFO being backup up by one to three other WFOs. Backup WFOs can assume warning and forecast responsibility at a moment's notice if a WFO loses communications or the building is threatened. This ensures there is never a gap in watches, warnings, advisories, and other services.

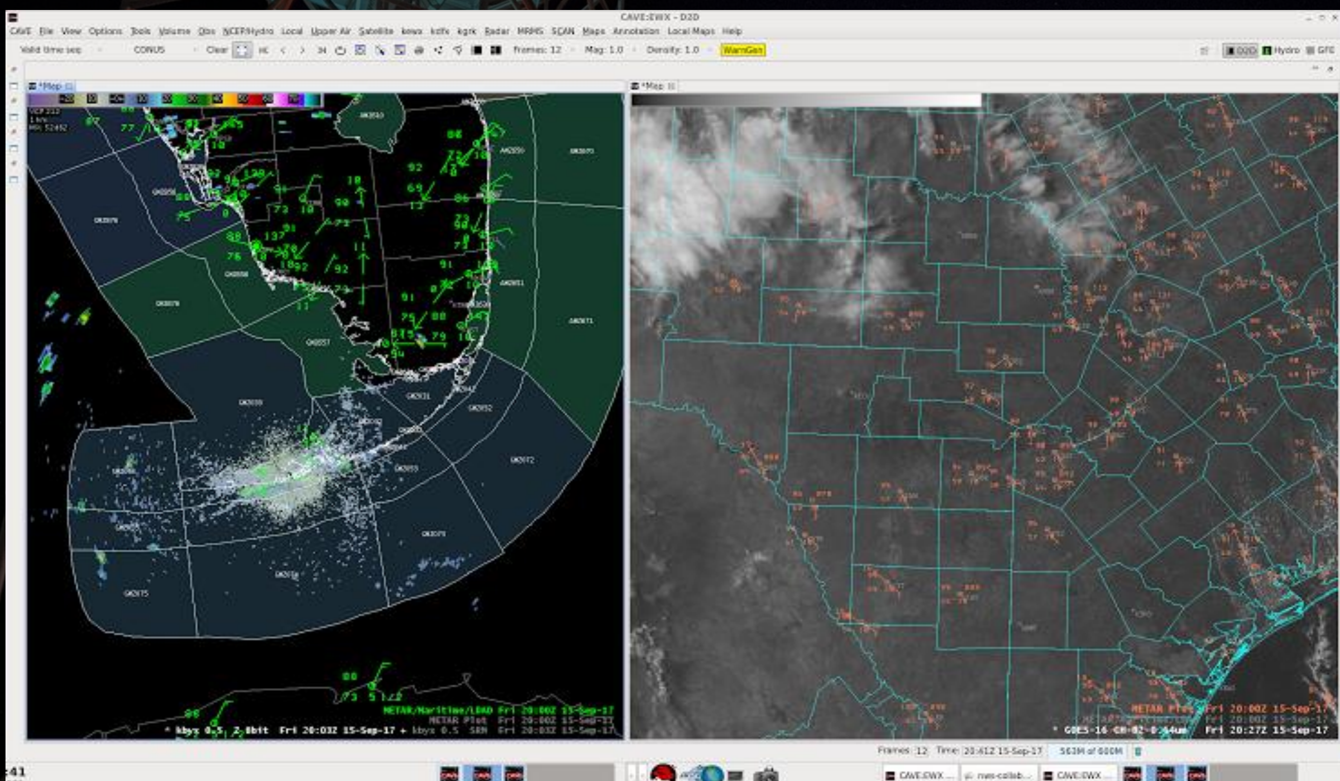
WFO Austin/San Antonio is backed up by three other WFOs. The primary backup is WFO Corpus Christi, secondary is WFO Brownsville, and the tertiary is WFO Miami. While Corpus Christi and Brownsville are nearby, the tertiary backup of Miami was purposely selected to be on the opposite side of the Gulf of Mexico. If a big event, like a hurricane or a large communication outage occurs, there should be at least one backup WFO unaffected. We conduct backup drills with these sister WFOs multiple times a year to be prepared for any short or long-term backup. Below are three unique situations involving backup operations at our office.

Possible shelter in place due to a tornado impacting WFO Austin/San Antonio:

On the morning of October 30, 2015, an EF-2 tornado passed close to our office. As the staff on duty tracked the tornado rotation on radar approaching the office, they gave WFO Corpus Christi a heads up that we may need to shelter-in-place in our breakroom (which is designed to double as concrete-reinforced storm shelter). The tornado missed our office, and we were able to maintain warning and forecast operations throughout the event. Unfortunately, the tornado impacted homes nearby in Geronimo. During the damage survey, we noted our New Braunfels KEWX radome (marking the location of our office) just beyond one of the damaged homes (see photo).

The first implementation of quaternary (4th level) backup:

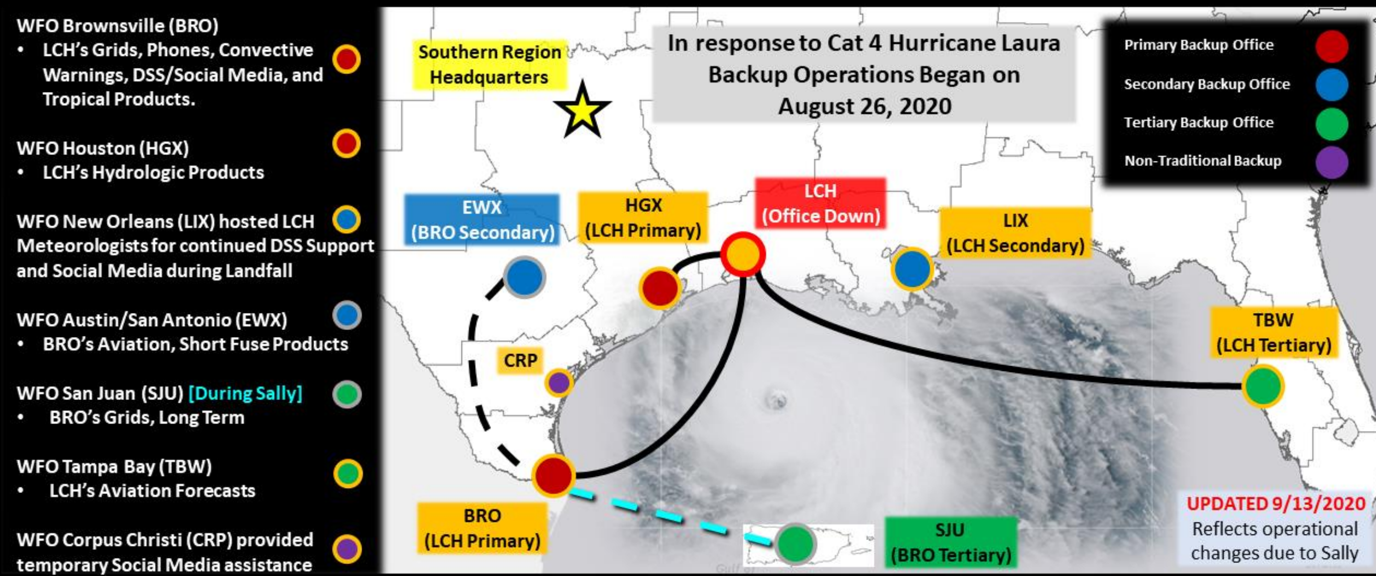
In September 2017, Major Hurricane Irma was moving across the northern Caribbean, and was forecast to travel up the Florida peninsula and affect several WFOs. Since the Florida WFOs are primary and secondary backups for each other, it was likely they would be affected at the same time and have difficulty backing up each other. NWS Southern Region Headquarters solved this problem by arranging for quaternary (4th-order) backup. Four Florida WFOs were paired with other WFOs farther away, including our pairing with WFO Key West. In the short time before landfall, we prepared communication plans, configured hardware and software, familiarized ourselves with their forecast area (the Florida Keys), and organized staffing to handle both our operations and WFO Key West's. At 7 am on Sunday, September 10, Irma passed over the Keys with 91 to 120 mph winds. Despite losing commercial power, WFO Key West continued to operate on generator power, but communications began to fail. We assumed full warning and forecast responsibility for their area by mid-afternoon. We ended up covering WFO Key West's operations for the next six days, while they provided support for recovery and clean-up efforts in the Keys. The image below shows our computer system configured for both WFO Key West (left) and us (right).



Backup Teamwork on a Regional Scale For a Busy Hurricane Season:

The 2020 Atlantic Hurricane Season was a record setter for activity. In late August, Major Hurricane Laura was moving towards the middle Louisiana Coast. The National Hurricane Center forecast "catastrophic" storm surge, and WFO Lake Charles was directly in the path of the storm, so the decision was made to evacuate their staff. This was the first time a WFO was evacuated due to an impending hurricane. WFO Lake Charles' products and services were maintained by splitting them up between their backup WFOs at Brownsville, Houston, and Tampa Bay Area. To help further balance the workload, we backed up all of WFO Brownsville's services for 36 hours, and then maintained airport forecasts and short term warning services for the next 21 days, until WFO Brownsville resumed full operations ahead of Tropical Storm Beta's landfall on the Texas coast. Additional split backup operations took place two other times this season: (1) ahead of Hurricane Sally's landfall on the middle Gulf Coast in mid-September, and (2) ahead of Tropical Storm Beta's landfall along the Texas coast in late September. The sharing of warning and forecast duties among several WFOs, in lieu of just one WFO handling backup duties for days on end, helps alleviate stress and balance workload.

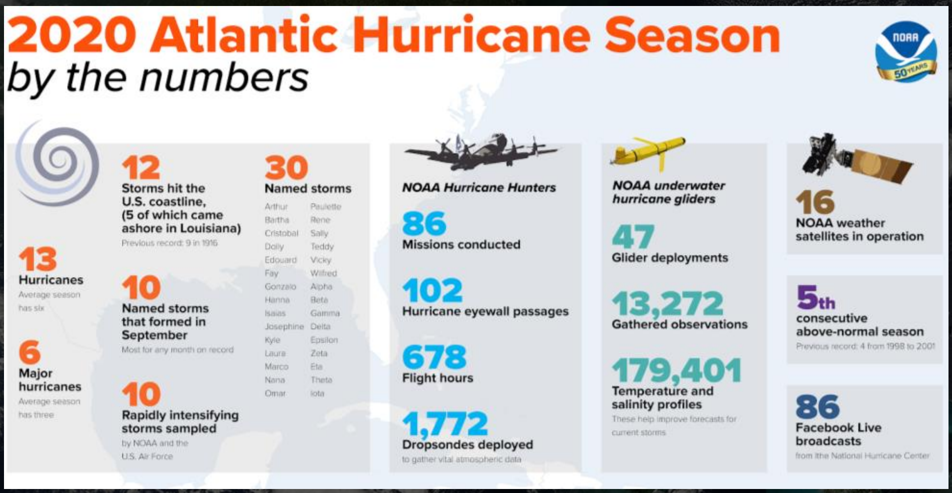
NWS SR Service Backup Operations and Teamwork for WFO Lake Charles



This teamwork within the NWS happens behind the scenes frequently, and ensures that National Weather Service products continue to be issued in a timely and accurate manner, while staff from impacted offices are kept safe from hazardous weather themselves and given time for recovery and clean-up efforts. The NWS backup program is designed this way with the goal of maintaining our ability to protect lives and property for the citizens of South Central Texas and across the country.

2020 Atlantic Hurricane Season (continued from page 4)

This is the fifth consecutive year with an above-normal Atlantic hurricane season, with 18 above-normal seasons out of the past 26. This increased hurricane activity is attributed to the warm phase of the Atlantic Multi-Decadal Oscillation (AMO), which began in 1995, and has favored more, stronger, and longer-lasting storms since that time. Such active eras for Atlantic hurricanes have historically lasted about 25 to 40 years. An average season has 12 named storms, six hurricanes, and three major hurricanes.

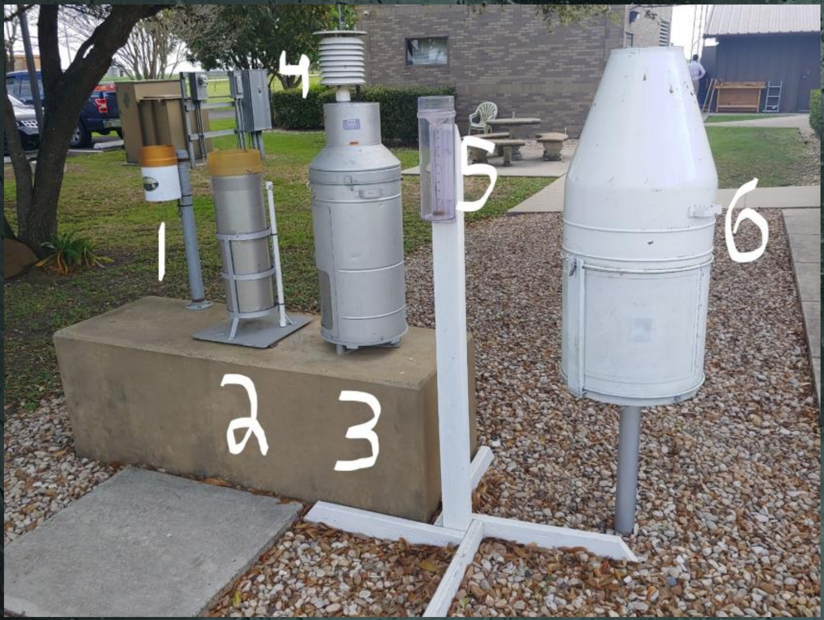


"As we correctly predicted, an interrelated set of atmospheric and oceanic conditions linked to the warm AMO were again present this year. These included warmer-than-average Atlantic sea surface temperatures and a stronger west African monsoon, along with much weaker vertical wind shear and wind patterns coming off of Africa that were more favorable for storm development. These conditions, combined with La Niña, helped make this record-breaking, extremely active hurricane season possible," said Gerry Bell, Ph.D, lead seasonal hurricane forecaster at NOAA's Climate Prediction Center.

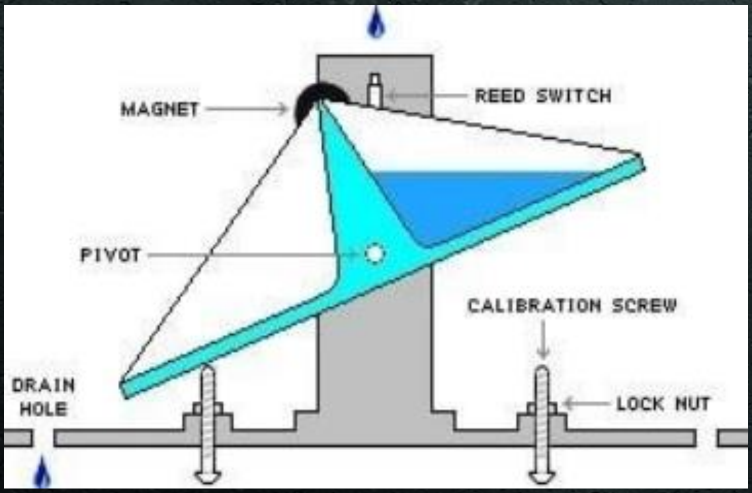
Everything You Ever Wanted To Know (and More!) About Rain Gages

By: Keith White, Meteorologist

Let's talk rain gages! This picture is from outside our office. We show these gages (for display only) when we give office tours, but for a good portion of 2020 we were unable to do that, so I'm bringing the tour to you and going into excruciating detail for those that want to learn more about measuring rainfall!



Gage #1 is a "Tipping Bucket" gage, and it's our most commonly used *near-real time automated* rainfall measurement device. The gold top portion is a funnel that drips down into a little triangular "bucket" that tips over and empties once it's reached a set amount. After tipping, a second "bucket" faces up, which repeats the process and tips back when full (see the schematic below.)



With each tip, the rainfall amount increases, and the data is logged and sent via satellite or in rare cases telephone modem. Unfortunately, these gages are notorious for under-reporting rainfall amounts in heavy rainfall rates, because rainwater that falls in during the split second the bucket is mid-tip isn't counted. Another disadvantage is that the funnels can sometimes get clogged by spiderwebs, leaves, and bird excrement. But, since these gages typically report at least each hour, they are the most useful data we get in the middle of flash flooding events to help verify our radar estimated rainfall.

The second gage is just a simple, manually read standard 8 inch rain gage. These gages are used at many NWS Cooperative Observer sites around the country. Although you'd think it's called that because of its capacity, it actually holds up to 20" of rain. The name comes from the diameter of the mouth, which funnels the rain into a thinner tube within the bucket (see image 3). The inner tube holds 2", and when it overflows the rest goes into the outer bucket. At a set schedule, usually once per day or every 6 hours, someone then measures the amount of rain with a special ruler, and can refill the inner tube from the overflow until all the rain has been measured. In snowier locales, the funnel and inner cylinder are removed in the winter, and the snow that falls in the bucket is melted down to give a snow to liquid ratio, which can vary from as wet as 5:1 to as dry as 50+:1 depending on the nature of the snow.

Gage #3 is a Universal Precipitation Gage (UPG). These gages are no longer widely used and have since been replaced largely by PLUVIO gages which I will not discuss here. UPGs work very similarly to gage #6. We'll get back to that in a moment.

First, let's see how many of you have a keen eye and recognize that gage #4 isn't a rain gage at all, rather a "bee-hive" enclosure for a thermistor that measures temperature! These devices are used for our nationwide Cooperative Observer program and are part of what's called an MMTS or Maximum Minimum Temperature System.

Many of you are familiar with the 5th gage, as it's the standard rain gage used by tens of thousands of CoCoRaHS (Community Collaborative Rain, Hail, and Snow network) observers across the nation. These are also known as "four inch" rain gages because of the diameter of the funnel top, but actually have a capacity of 11". Their operation is exactly the same as the standard 8" gage, except they don't require a ruler because it's built-in to the inner tube, which holds 1" before overflowing into the larger bucket. If you look closely at the post it is mounted on, you can see the top is beveled such that the flat surface faces away from the gage. This is to prevent "splash-in error" where rainwater that wouldn't have landed in the funnel bounces in off of other surfaces. If you're interested in becoming a citizen scientist and observing rain at your location, you can learn more and sign up at https://www.cocorahs.org/.

Lastly, the large white enclosure labeled #6 is a Fischer-Porter gage. The large opening at the top allows the precipitation to funnel into a 20" capacity bucket and the rainfall amount is determined by *weight.* In northern states, each fall the gages are serviced, emptied, cleaned and calibrated, and antifreeze is added to the bucket.

The main advantage of this gage is that it also measures liquid equivalent for snow that falls in and melts due to the antifreeze. The large enclosure also helps to prevent loss due to evaporation contaminating the data. The data logger is powered by a small solar panel and back-up battery, and data are recorded in 15 minute increments. However, they typically are only transmitted via SD card once per month. These gages are often located in more remote locations and can be difficult to reach. Wireless data transmission is often impossible, thus this data is used more for climatological purposes than real-time forecasting. If located in a very wet area, these gages sometimes need to be serviced or emptied 3 or more times per year.

For all of these gages, rainfall is recorded to the nearest hundredth of an inch. It's also important that they be sited correctly to reduce measurement error. This means they must be installed level, and ideally should be located at least twice as far from any obstructions like buildings and trees as they are tall. In developed areas at least as far away as the height of the obstruction will suffice. The top of the gage should be 2-5 feet above the ground, closer to 5' in developed areas and 2' in wide open spaces. Metal spikes can be used to prevent birds from sitting on the edges of the funnel. In some cases, wind screens are used to help reduce the effects of turbulence near the gage and increase gage catch. However even for these "in situ" measurements, it is acknowledged that under some meteorological conditions the true rainfall amounts may not be accurately captured by the gage. For example, studies by Jones (1969) showed that the weighing rain gages with sloping shoulders below the orifice collected 2 to 6 percent less rain than the 8" Standard Rain gauge which has straight outer sides. The slope of the Universal's shoulder can induce upward wind currents that may carry away some of the raindrops. Larger errors occur with snowfall.

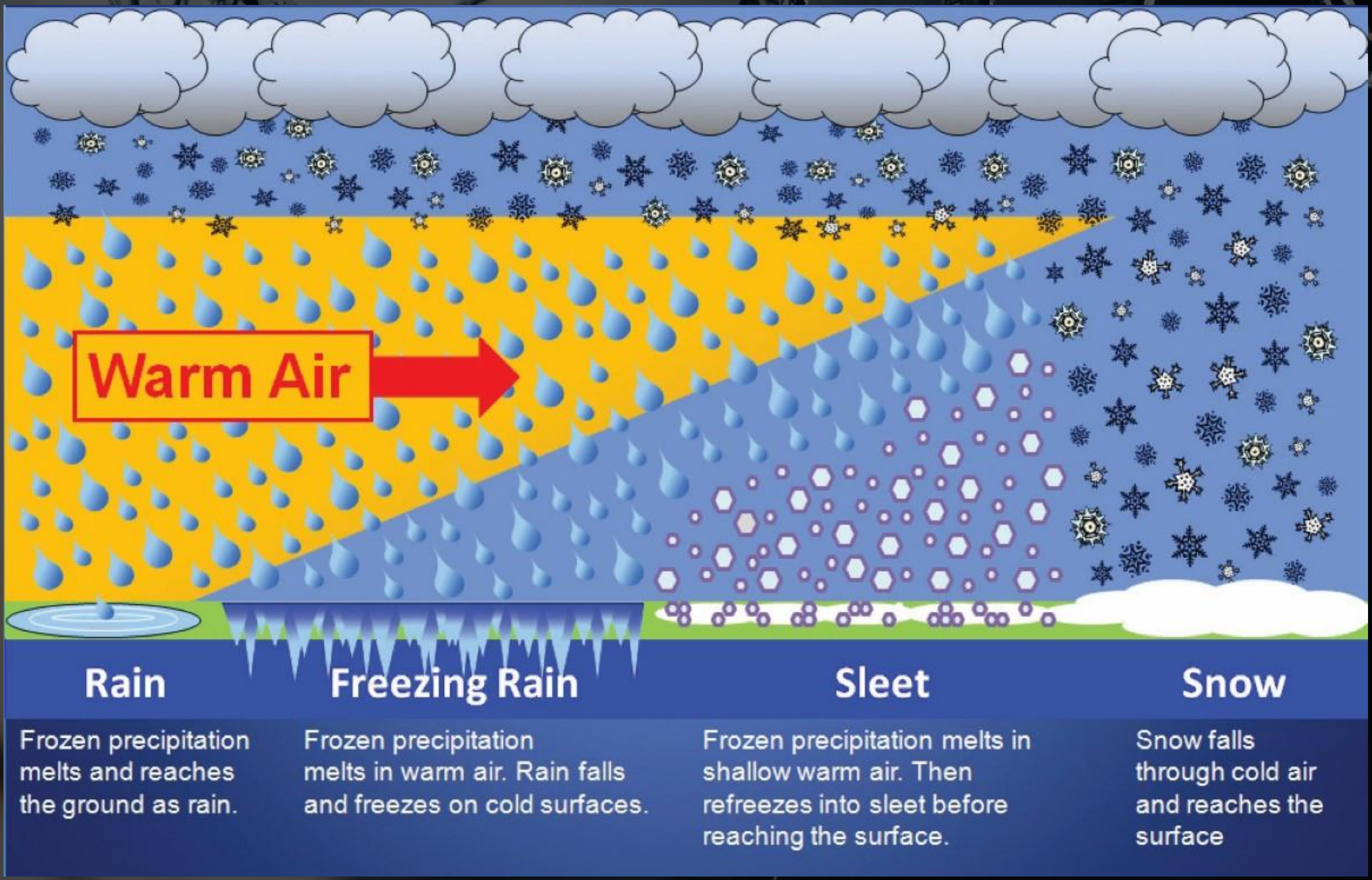
I hope you've enjoyed learning about measuring rainfall. In our next issue, we'll discuss remotely sensed rainfall estimation from radar and satellite data!

Science Corner: Forecasting Wintry Precipitation

By: Nick Hampshire, Lead Meteorologist

Have you ever wondered why forecasting a precipitation type during a cold winter outbreak can be tricky? The easy answer is unlike a warm day where there can only be one type of precipitation, in winter we can see 4 possible types of precipitation! The precipitation type that occurs during the winter can be highly dependent on any warm air that could be in place either at the surface or even a separate layer of warm air higher in the atmosphere. What can be even more problematic, is that for snow crystals to form, there needs to be the right conditions where the column of air between -10C and -20C is nearly saturated. If this portion of the atmosphere is not saturated, snow is not likely to occur, and instead freezing drizzle or rain would be most likely.

Assuming the atmosphere would support snow formation aloft in the clouds, meteorologists then take a “top-down” approach when looking at the atmosphere to determine what precipitation type would ultimately occur once the hydrometeor reaches the surface. The graphic below shows how this works quite well. Once the snow develops in the upper levels and begins to fall, it will melt if it encounters any portion of the atmosphere where the temperature is above freezing. If the air remains above freezing all the way to the surface, the precipitation type would be rain. If the air remains above freezing most of the way down, but the air at the surface is below freezing, liquid rain will reach the ground but then freeze to surfaces on contact. This is known as freezing rain. If the layer of above freezing temperatures is shallow and below it, there is a large layer of temperatures back below freezing, the snow will melt into rain droplets when it encounters the warm air, but then would refreeze into ice pellets before reaching the ground. This is known as sleet. Lastly, if snow develops and the entire column of air remains below freezing, the snow flakes will make it to the surface to the delight of all the children in South-Central Texas!



Employee Milestones

CONGRATS ON TEN YEARS!

We want to congratulate Aaron Treadway on recently attaining ten years of service with the Federal Government as part of the National Weather Service. Aaron grew up in Central Texas, and despite being afraid of thunderstorms as a kid, developed an interest in meteorology from a young age. His high school calculus teacher, who happened to be a Texas Longhorn, suggested he check out the University of Oklahoma Meteorology program once he graduated from Bastrop High School. While pursuing his Bachelor of Science in Meteorology at OU, Aaron accepted a “Student Career Experience Program” position at the New Braunfels NWS office (EWX). He began his federal service in 2010, serving on staff during summer and winter breaks. When he graduated from OU in 2013, Aaron started work full time at EWX as a Meteorologist Intern. He has also served as a General Forecaster and now is a Lead Forecaster. His focus areas at the office include radar meteorology, flash flood forecasting and communication, and NWS backup operations. Aaron has furthered his education by obtaining a Master of Science in Emergency Management, and he assists the WCM and Decision Support Team in cooperating with Emergency Managers by conducting tabletop exercises, participating in briefings, and partnering in the StormReady program.

WELCOME NWS TRANSFER MATT!

Matt Brady transferred to Austin/San Antonio this fall from the NWS office in Brownsville, Texas, where he spent the past four years. In Brownsville, he helped to run several different teams and program areas; including tropical weather, radar, and decision support services. Matt worked several impactful weather events during his time in Brownsville; including major flooding events, periodic severe weather and Hurricane Hanna. Additionally, he was part of the Brownsville team that helped to provide critical backup operations for the Lake Charles NWS office during and after the landfall of Category 4 Hurricane Laura.

Matt’s passion for weather grew while growing up in Central Florida, monitoring the daily summertime thunderstorms along the sea breeze boundaries and the frequent approach and/or impact of tropical cyclones. However, one of the most vivid memories from Central Florida was sadly the impact of a deadly tornado outbreak in February of 1998. Matt took his strong passion for weather to Florida State University (FSU) where he excelled academically and garnered strong leadership skills by taking an officer position on an award winning local American Meteorological Society and National Weather Association chapter. After graduation from FSU, Matt began his career as an Operational Meteorologist providing decision support with a private company in the state of Maryland for over 3 years. Matt looks forward to many years of dedicated service to the communities of South-Central Texas.

WELCOME NEW HIRE MACK!

Mack Morris came to the National Weather Service this fall after working as an Aviation Meteorologist/Flight Planning Specialist for World Fuel Services in Webster, Texas. Mack worked with clients to assemble flight and weather packages that assist in trip support. He analyzed, interpreted, and evaluated meteorological data to provide pilots and customers with the best possible flight plan.

Prior to his work in the general aviation industry, Mack worked as a Broadcast Meteorologist at KBTX-TV in Bryan, Texas from 2016-2018 where he performed a variety of responsibilities, including on-air broadcasts, forecasting, community outreach, weather-related stories in the field, social media, as well as shooting and editing video for newscasts. Additionally, Mack worked at KFDA-TV in Amarillo, Texas from 2013-2016 as the weekend meteorologist, where he worked several winter storms in the field and also assisted with storm chasing during severe weather events.

Mack is an AMS Certified Broadcast Meteorologist, which is a designation sought as a mark of professional distinction and recognition in the industry. Mack worked several high-impact events as a Broadcast Meteorologist, including the Amarillo hail storm of May 28, 2013, the Panhandle tornado outbreak of November 16-18, 2015, the May 26, 2016 Bryan, Texas tornado, and Hurricane Harvey coverage in late August 2017.

Mack earned his Bachelor of Science degree in Meteorology from Valparaiso University in 2012 and was a member of the Cross Country and Track & Field teams for 4 years. Mack is excited to be working for the National Weather Service and is looking forward to getting to know the people of the area.

WHAT ARE WEATHER READY NATION AMBASSADORS?

Local community leaders who partner with the National Weather Service to help play a vital role in promoting weather safety information. Communities can become better informed and prepared in the face of hazardous weather.

AMBASSADOR™ WRN WEATHER-READY NATION

What Do Our Weather-Ready Nation Ambassadors do?

- ✓ Promote Weather-Ready Nation messages and themes to your stakeholders
- ✓ Engage with NOAA personnel on potential collaboration opportunities
- ✓ Share their success stories of preparedness and resiliency
- ✓ Serve as an example by educating employees on workplace preparedness

We need your help! Become a force multiplier!
More information available at: www.weather.gov/WRN/Ambassadors

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