Southernmost Weather Reporter

National Weather Service
Weather Forecast Office
Key West, FL

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National Weather Service • Key West, FL

Welcome to the January 2021 Edition!

Shortly after the last edition of the *Southernmost Weather Reporter* was published (March 2020), the COVID-19 pandemic completely transformed everyday life within a few months of the beginning of the 2020 Atlantic Hurricane Season. At your Florida Keys National Weather Service (NWS), we quickly implemented measures to ensure the health and safety of our team and to maintain operational readiness for executing our mission of delivering weather, water, and climate data, information, and knowledge in support of decisions and actions protecting lives and livelihoods in the Florida Keys and across the adjacent coastal waters. We implemented mandatory telework for certain positions and shifts, moved computer workstations to facilitate greater physical separation of mission-essential staff, established guidelines for wearing facial coverings, maintaining physical distancing, and increased hygiene, cleanliness, and disinfection protocols. We suspended public tours and in-person outreach, educational, and coordination visits, and transitioned to virtual meetings. We are grateful for the expertise and guidance from the dedicated career officers and scientists with the U.S. Public Health Service, Centers for Disease Control and Prevention, National Institutes of Health, and Monroe County Health Department.

The 2020 Atlantic Hurricane Season was expected to be busy, and it delivered, with record-breaking numbers. Despite being threatened several times by tropical storms and hurricanes between July and November, the Florida Keys escaped any hurricane impacts. Nevertheless, Florida Keys NWS staff were very busy as tropical cyclones Isaias, Laura, Sally, Delta, and Eta all threatened the Florida Keys during their evolutions. Our team sprang into action with each threat, releasing extra weather balloons, updating our followers on social media, providing quality marine weather forecasts to the maritime community, producing web graphics highlighting threats and potential impacts, and providing e-mail briefings and telephone consultations to core partners. The 2020 hurricane season is over, and as we turn the corner, from 2020 into 2021, I would like to extend best wishes to all for a happy and healthy new year!

Sincerely,

Kennard “Chip” Kasper
Meteorologist-in-Charge
NOAA/Florida Keys National Weather Service

JANUARY 2021
INSIDE THIS EDITION:

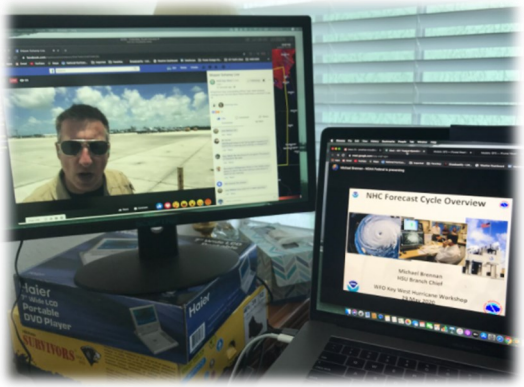
Long-Duration Impact-Based Decision Support During the Covid-19 Pandemic in Monroe County

By: Jon Rizzo

When you think of the local emergency response to a pandemic, images of emergency managers and first responders meeting frequently with public health and safety subject matter experts come to mind. However, did you know that a team of local meteorologists was among them?

That's right! Your Florida Keys National Weather Service (NWS) rapidly responded with its all-hazards support approach to the growing information needs of Monroe County Emergency Management and first responders once the Emergency Operations Center (EOC) became established in mid-March 2020. As the EOC established a rigorous schedule of planning and tactical meetings, in my role as Warning Coordination Meteorologist at the Florida Keys NWS, I was present virtually to develop a plan for long-term response as well as identify short-term hazardous weather vulnerabilities. As medical knowledge concerning the pandemic grew, challenges emerged as health safety guidance and directives concerning social distancing, personal protective equipment and teleconferencing technology were set by each of the responding stakeholders and subject matter experts' agencies.

Early in the response, weather information needed for response personnel working and storing protective equipment under temporary structures resulted in briefings and a supporting Weather Impact Matrix product. The Weather Impact Matrix, originally used by the Florida Keys NWS to provide first responders with a hazardous weather outlook during the week-long Fantasy Fest festivities in Key West, was adapted with modified thresholds coordinated through the Monroe County Covid-19 Response's Safety Officer.



Telework setup early during the Covid-19 pandemic. Here, multi-tasking, attending a briefing provided by Naval Air Station Key West Capt. Sohaney while also participating in our office's annual tropical season workshop.

Soon afterward, a more immediate life-safety information evolved once the Monroe County resident and worker access checkpoints were established on U.S. Highway 1 and Card Sound Roads. A 24-hour direct notification service on critical weather hazards and warnings to the Monroe County Sheriff's Office supervisors was provided, as the Florida Keys NWS' dedicated operational meteorologists in Key West stood the watch for hazardous weather. The checkpoints, consisting of shade tents, law enforcement, fire rescue, and public works crews, faced several hazards, including one severe thunderstorm with wind gusts approaching 60 mph and hail. The notification enabled the checkpoint commands to make immediate life-safety decisions to halt activities and seek shelter in their vehicles until dangerous weather passed. The notification service was expanded temporarily to include the Monroe County Public Works department, storing and distributing protective gear until a more substantial enclosed facility could be readied for storage. The combination of real-time weather monitoring, short-term hazardous weather warning and notification, and my role as WCM for planning formed the meteorological support network for Monroe County and Florida Keys municipalities to continue their pandemic response safely and efficiently.

(Continued on page 3)

Long-Duration Impact-Based Decision Support During the Covid-19 Pandemic in Monroe County (continued)

Even as the need for 24-hour notification faded with the discontinuation of the checkpoints, the continuing response into the summer months meant a new concern: A forecast active hurricane season. Coordination began with tropical cyclone briefings as well as review of service delivery to the Monroe County and municipal emergency management agencies. The Weather Impact Matrix was expanded to include tropical weather outlook information.

While the Monroe County Covid-19 response evolved into longer planning periods, the Florida Keys NWS transitioned the Weather Impact Matrix to support the Monroe County Health Department for Covid-19 testing events.

The continuing Monroe County response to the pandemic led to improvements in the Florida Keys NWS' ability to support our core partners remotely. A variety of collaborative teleconferencing and meeting tools, including those operated by both the NWS and Monroe County, have enabled your local NWS office to share and store briefings as references. The practice of countywide stakeholder meetings, led by the Monroe County Emergency Management, led to direct communication with all levels of the response and media. And, partnerships strengthened at the Monroe County Public Information Officer Roundtable in late 2019 and the NWS Florida Keys' Integrated Warning Team Workshop in January 2020 resulted in direct collaboration and instant "chat" contact with public information officers representing a large number of agencies and departments serving the Florida Keys. These strong relationships led to more frequent and robust service delivery for incidents outside the pandemic, including for Tropical Cyclones Laura and Eta.

So, when you learn about local first responders and your local emergency managers ramping up during a long-term non-weather situation, you know local subject matter experts are ready to provide scientific guidance and support. Among them is a whole team of NWS meteorologists, based right here at home in the Florida Keys, standing the hazardous weather watch and at the ready for long-duration support to help our partners protect life and property.

2020 Florida Keys National Weather Service Staff Changes

By: Bryce Tyner

In 2020, there were several staff changes at the Florida Keys National Weather Service:

- Stephen Chesser accepted a position as a Meteorologist at the Central Weather Service Unit in Miami, Florida. He completed his tenure at the Florida Keys National Weather Service in July 2020.
- Katherine Lenninger accepted a position as a Meteorologist at the National Weather Service Office in Houston, TX. She completed her tenure here in October 2020.
- Mark Webb accepted the Information Technology Officer position in July 2020.
- Justin McReynolds and Keren Rosado-Vazquez started their new roles as Meteorologists in October and November 2020, respectively.
- Dan Milner, Electronic Systems Analyst, retired at the end of 2020. Dan completed 38 years of federal service, including 12 years with the United States Air Force and over 25 years with the National Weather Service.

We wish the best to those moving on to new opportunities. For those joining the Florida Keys National Weather Service, we embrace you with a warm welcome!

Naval Air Station Key West "Civilian in the Spotlight": Jon Rizzo

By: Chip Kasper

On February 6, 2020, Capt.Mark Sohaney, Commanding Officer, Naval Air Station (NAS) Key West, visited the Florida Keys National Weather Service to recognize Warning Coordination Meteorologist, Jon Rizzo, as "Civilian in the Spotlight". Jon was recognized for his meteorological knowledge, local expertise, and excellent briefing skills in support of the emergency management and command staff of NAS Key West during the approach of Hurricane Dorian in September 2019. NAS Key West's national security mission supports operational and readiness requirements for Department of Defense, Department of Homeland Security, National Guard units, other federal agencies, and allied forces. NAS Key West is the U.S. Navy's premier training facility for tactical aviation squadrons. Local aerial ranges enable aviators to engage in training maneuvers within minutes of takeoff. The station is equipped with a sophisticated tactical combat training system, which tracks and records combat aerial maneuvers. In addition, NAS Key West is the host facility for numerous tenant activities, including the Joint Interagency Task Force-South and the U.S. Army Special Forces Underwater Operations School. Congratulations, Jon, on this recognition!

Capt. Mark Sohaney, Commanding Officer of NAS Key West, presents Warning Coordination Meteorologist, Jon Rizzo, with the award for "Civilian in the Spotlight".

Getting to Know the New Staff: Sofia de Solo

What were you doing before joining the team at the Florida Keys National Weather Service (NWS)?

I received my acceptance to the Pathways program during my first year of graduate school at Mississippi State University, where I was beginning my research on rapidly weakening tropical cyclones. Prior to joining the team at the Florida Keys National Weather Service, I have interned with the Air Force Hurricane Hunters, the Environmental Modeling Center, and the Hurricane Research Division.

Where do you see yourself in ten years?

In 10 years I wish to have established a well-respected career within the National Weather Service from a sunny and warm location. This includes being fairly involved in outreach and diversity programs. I, one-day, would like to fly regularly into hurricanes with either the NOAA or Air Force Hurricane Hunters. The timeline of that goal is still uncertain but I hope to have a better idea by then! With an established career, I also hope to dive deeper into my non-meteorological passions. I see myself owning a boat and maybe pursuing a side job in sports journalism.

What do you like to do in your free time?

I love to be near the water! I love boating, fishing, sitting on the beach, kayaking, and catching sunrises/sunsets. I am also a bigtime baseball fan and spend much of my time at Marlins Park. During baseball off-season, I enjoy playing some slow pitch softball, myself.

Getting to Know the New Staff: Lexia Williams

What were you doing before joining the team at the Florida Keys National Weather Service (NWS)?

Before joining the Florida Keys National Weather Service, I was working on completing my masters degree in Natural Hazards and Catastrophes at the University of Miami while completing my thesis "Statistical Analysis of Wind and Pressure Fluctuations for Hurricane Matthew (2016), Hurricane Irma (2017), and Hurricane Dorian (2019)" and working in the service industry in Asheville, North Carolina. I was also active in research at my previous internship at the State Climate Office of North Carolina, where I also had the opportunity to present several research projects at both national and school-based conferences.

Where do you see yourself in ten years?

In ten years, I hope to still be working for the Florida Keys National Weather Service, as Key West quickly has become my home. I hope to begin building relationships with my local community members and core partners while becoming more active in educational outreach and in the various programs that the office has to offer. If I happen to no longer be at this office, I would like to still be working for the organization at another National Weather Service office or working for the National Hurricane Center in Miami, as tropical meteorology has been a passion of mine for as long as I can remember. Aside from my career goals, I hope to obtain my own personal goals by having a family of my own that will also support me and my dreams.

What do you like to do in your free time?

In my free time, I enjoy getting out and exploring the various views that the Florida Keys have to offer while taking my camera out and capturing memories. I also enjoy spending a good portion of my free time either in the water or at the beach. When I am not exploring or in the water, I like to spend time with my close friends, whether that involves movie nights, trying the many restaurants that the islands have to offer, or making dinners of our own.

Peripheral Impacts of Tropical Cyclones in the Florida Keys

By: Sandy Delgado

It is a natural reaction to worry more about tropical cyclones that are forecast to make landfall in the Florida Keys than those that are expected to give a glancing blow to the island chain. After all, it is in the core of hurricanes where you find the strongest winds and most damaging storm surge. Regardless, the peripheral impacts of tropical cyclones should not be taken lightly. This past hurricane season, a few tropical cyclones passed close enough to the Florida Keys to cause important impacts, including the very heavy rainfall produced by what would eventually become Hurricane Sally as it passed to the north.

In late August, Tropical Storm Laura passed about 200 miles south of the Lower Keys near the southern coast of Cuba on a westward track toward the Gulf of Mexico. Outer rainbands moved across the Florida Keys, bringing spells of heavy rain, tropical-storm-force wind gusts, and rough seas. The highest wind gust was measured at our office in Key West, 69 mph! Only minor damage was reported across the island chain. A strong high pressure system over the western Atlantic kept Laura south of the Florida Keys, but it also caused a tight pressure gradient across the island chain. This pattern resulted in persistent strong, to near-gale breezes (25-38 mph) across the Florida Keys. .

In 2008, Hurricane Gustav crossed western Cuba, passing well southwest of the Lower Keys. Gustav still was able to produce wind gusts to tropical storm intensity in the Lower and Middle Keys. However, Sand Key, about 8 miles southeast of Key West, reported sustained winds of 56 mph and wind gusts to 74 mph. About two weeks later, Hurricane Ike passed at about the same distance from the Keys as Gustav with similar wind impacts.

Ike did bring another danger associated with the outer rainbands of tropical cyclones: tornadoes. Two tornadoes impacted the Florida Keys. Similarly, Hurricane Mitch in 1998 produced two tornadoes when it passed over 100 miles north of the island chain. Back in 1972, Hurricane Agnes passed over 250 miles west of Key West. The outer rainbands produced a few tornadoes that impacted the island chain. Unfortunately, the tornadoes occurred at night and around 40 people sustained injuries in Big Coppitt Key.

In summary, it is very important to be prepared and vigilant even when the tropical cyclone is not expected to make landfall in the Florida Keys.

Tree damage due to a 69 mph wind gust observed at the Florida Keys National Weather Service office on August 24, 2020.

Getting to Know the New Staff: Mark Webb

What were you doing before joining the team at the Florida Keys National Weather Service (NWS)?

Before joining the team at the National Weather Service here in Key West, I served as an Information Technology Analyst for the U.S. Army and Department of Defense at Fort Knox, Kentucky. I had the privilege of serving the Army Human Resources Command, which maintained over 150 applications running on over 1500 servers that kept the Army Human Resources operation running smoothly. We also built and maintained the Goarmy.com website on premises.

Where do you see yourself in ten years?

Finally getting on board with NOAA and the National Weather Service has been a dream of mine for many years, and having made it to the Florida Keys, I don't see myself going anywhere in the near future. Being in the beautiful Florida Keys makes that statement even more likely to come to fruition. In one word, "here", the answer is here.

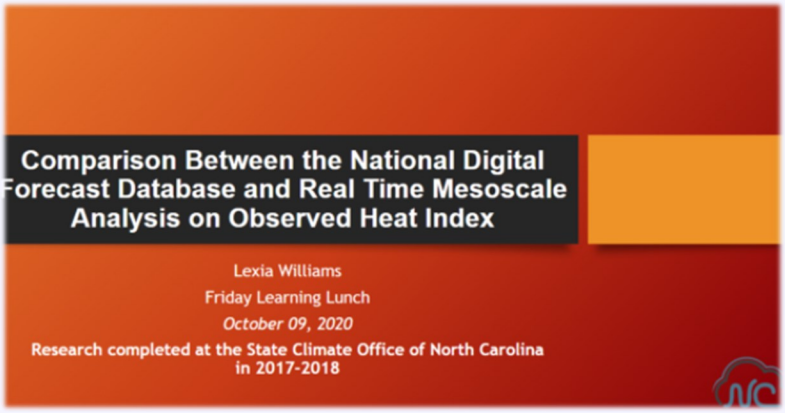
What do you like to do in your free time?

The last few years have seen my interest change. I have become an avid scuba diver, one of the primary factors of wanting to move to the Keys. If I'm not diving, I'm working on my project boat (endless) or talking to one of my grandchildren on Messenger. Other than that, I'm learning a new computer skill (yes, that's a hobby) or playing a video game (you're never too old).

Florida Keys NWS Begins "Learning Lunch" Series

By: Chip Kasper

The National Weather Service (NWS) is a science agency that depends on its experts to convey relevant knowledge to partners and the general public for the purpose of protecting lives and property. As such, the NWS is a "learning organization" where continuous learning and improvement is necessary to keep up with the growing need by partners for weather intelligence. The arrival of several new staffers at the Florida Keys NWS in the middle of the COVID-19 pandemic inspired the creation of a weekly "Learning Lunch", an informal virtual forum where our staff routinely meet to exchange ideas, share knowledge, and learn from each other. Fifteen learning lunches have been held so far in 2020, with presentation formats including short seminars, science project updates, core partner overviews, diversity and inclusion presentations, and informal discussions. The learning lunches are about an hour in duration, and include time for questions, answers, and discussion. Notes are taken, shared with the entire staff (including those not present), and archived. In 2021, we plan to expand the range of topics to include both colleagues in the weather enterprise and core partners. If you are interested in being a guest presenter, please contact Chip Kasper at kennard.kasper@noaa.gov.



Florida Keys NWS Meteorologist Lexia Williams presents her research working with the State Climate Office of North Carolina as part of the Friday "Learning Lunch" program.

Wet May 2020

By: Sandy Delgado

It is not unusual to have a rainy month of May in the Florida Keys. After all, the month typically marks the beginning of the rainy season. Furthermore, it is not unusual for the heavy rain to be caused by a tropical or subtropical cyclone. In 2018, for example, rains from Subtropical Storm Alberto allowed Key West to have the wettest May since climate records began in 1871. In 2020, two disturbances affected the island chain and brought record rainfall, especially to the Middle Keys and parts of South Florida. Both disturbances would later develop into the season's first tropical cyclones, Arthur and Bertha, off the southeast coast of the United States.

On May 10th, a weak cold front that was the predecessor for Subtropical Storm Alberto moved across the Florida Keys, bringing showers and thunderstorms to the island chain. The cold front commenced the rainy season after a very dry winter. The airport in Marathon received 2.81 inches of rain on May 10th, not only shattering the daily record of 0.69 inches but making it the 10th wettest day in May. The weak front continued southward, stalling over the Bahamas and Cuba. However, on May 13th, showers and thunderstorms began to increase over western Cuba and moved slowly northward into the Florida Straits, affecting the Florida Keys. Very heavy rains affected the Florida Keys on May 14th. On that day, the Marathon airport received 5.76 inches of rain, not only obliterating the previous daily record of 1.20 inches, but it also made May 14th the 2nd wettest May day ever.

Another frontal boundary, the origins for Tropical Storm Bertha, moved across the Florida Keys on May 19th. Showers and thunderstorms increased in the Western Caribbean Sea over the next couple of days and gradually lifted northward on May 22nd and 23rd, affecting the Florida Keys. The storm activity became more prominent on May 24th, extending from the eastern Gulf of Mexico to the Bahamas, causing heavy rains in southern Florida and the island chain. Marathon airport received 3.45 inches of rain on that day, surpassing the previous record of 2.30 inches set in 2001. On May 25th, heavy rains affected the Middle and Upper Keys, with some locations receiving 5 to 10 inches.

The disturbances that affected the Florida Keys resulted in the wettest May on record for much of the island chain. The heaviest precipitation occurred in the Middle Keys, with some reporting stations recording over 20 inches of rain. Marathon International Airport received 15.66 inches of rain, 3.35 inches above normal, and surpassed the monthly record of 15.47 inches set in 1968. In the Upper Keys, most islands received 10 to 15 inches of rain, with isolated spots reporting higher amounts. Similarly, 10 to 15 inches were recorded in the eastern Lower Keys. In the rest of the Lower Keys, rainfall amounts of 4 to 10 inches were more common.

Station – *Station Type* period of record	Rainfall	Departure	Rank
Dry Tortugas National Park – *COOP*$_{1951}$	2.42	+0.85	16th *Wettest*
Key West, WFO – *NWS*$_{2008}$	3.26	N/A	6th *Driest*
Key West 0.5 SW – *CoCoRaHS #24*	3.64	N/A	N/A
Key West International Airport – *ASOS*$_{1871}$	4.18	+1.18	44th *Wettest*
Key West 1.3 ENE – *CoCoRaHS #16*	4.32	N/A	N/A
Cudjoe Key 0.9 SSW – *CoCoRaHS #6*	10.74	N/A	N/A
Cudjoe Key – Citizen Observer$_{2004}$	8.25	N/A	N/A
Bahia Honda State Park – *COOP*$_{2001}$	12.82	+9.74	*Wettest*
Florida Keys Marathon Airport – *ASOS*$_{1951}$	15.66	+12.31	*Wettest*
Marathon 6.8 ENE – *CoCoRaHS #23*	17.35	N/A	N/A
Curry Hammock State Park – *COOP*$_{2001}$	15.16	+11.64	*Wettest*
Islamorada 7.8 SW – *CoCoRaHS #8*	16.69	N/A	N/A
Tavernier – *COOP*$_{1936}$	14.48	+10.97	N/A
Key Largo 6.2 NE – *CoCoRaHS #25*	12.74	N/A	N/A
John Pennekamp State Park – *COOP*$_{2001}$	13.91	+10.01	3rd *Wettest*

May rainfall (inches) from Florida Keys observing locations.

2020 Hurricane Season: A Year of Records

By: Sandy Delgado

The 2020 Hurricane Season goes into the record books as one of the most active ever recorded in the Atlantic basin. In total, there were 30 named storms of which 13 became hurricanes and 6 major hurricanes. Five major hurricanes reached at least Category Four intensity. In comparison, an average hurricane season sees around 12 named storms, 6 hurricanes, and 3 major hurricanes. The active nature of the hurricane season did not come as a surprise, as all pre-season forecasts were calling for an active or hyperactive hurricane season. In May, NOAA predicted 13-19 named storms, 6-10 hurricanes, and 3-6 major hurricanes.

These forecasts were based on the indication that either neutral or La Nina conditions would be present through the hurricane season, which makes the equatorial waters of the Pacific Ocean cooler than normal. The lack of an El Niño typically means less wind shear across the tropical Atlantic Ocean and more favorable conditions for tropical cyclone development. Water temperatures in the tropical Atlantic basin were also above normal and the environmental pressures below normal. These factors are typically a recipe for a very active hurricane season.

Some statistics from the historic 2020 Atlantic hurricane season (courtesy: NOAA).

The Southeast Untied States had 12 landfalling tropical cyclones, eclipsing the 1916 record of 9. Most of the U.S. impacts occurred along the Gulf Coast. The most significant was Hurricane Laura, which made landfall in southwest Louisiana in late August with maximum sustained winds of 150 mph, a powerful Category Four storm. Laura was the most intense hurricane to make landfall in Louisiana since 1856. Hanna, Isaias, Sally, Delta and Zeta were also hurricanes when they made landfall. Sally's slow movement across south Florida brought very heavy rainfall as the system slowed down to a crawl as it approached the Alabama and NW Florida coasts. Zeta made landfall in southeastern Louisiana as a strengthening Category 2 hurricane, despite the storm moving over cooler shelf waters. Zeta moved over New Orleans, and the National Weather Service office in Slidell was actually able to release a rare weather balloon inside the eye of the hurricane. Zeta was a quick-moving hurricane, which largely limited its impact.

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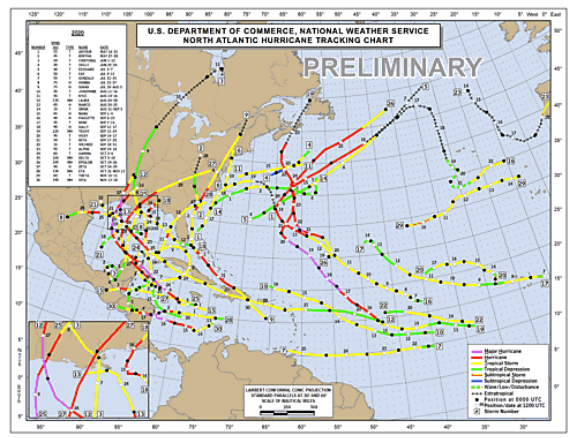
2020 Hurricane Season: A Year of Records (continued)

The Florida Keys were spared of significant impacts despite the number of tropical cyclones that impacted the Gulf of Mexico and western Caribbean Sea. The Island Chain experienced peripheral impacts from a few tropical cyclones, including Isaias, Laura, and Sally. Eta was the only system to make landfall in the Keys, occurring in Lower Matecumbe Key on November 9th with maximum sustained winds of 65 mph. Eta had a large eye visible on radar, but the southern side was quite weak, and most of the weather was on the north side. There was some damage reported in Key Largo, especially to trees.



Tracks of all tropical cyclones in 2020 (courtesy: National Hurricane Center).

Statistics of the 2020 Hurricane Season:

- 30 named storms was the most ever recorded, surpassing the 28 named storms that occurred in 2005
- Twelve tropical cyclones made landfall in the United States, breaking the record of nine set in 1916
- Five named storms formed in July, tying the record of five set in 2005
- Ten named storms formed in September, breaking the record of eight set in 2002, 2007, and 2010
- Alpha became the first recorded named storm to make landfall in Portugal
- Four major hurricanes developed after October 1st; the previous record was two in 2005
- Eta and Iota became major hurricanes in November, the first recorded occurrence
- Iota became a Category Five hurricane in November, only the second time a Category Five hurricane has been recorded in November
- Iota was also the latest recorded Category Five hurricane on record
- Ten tropical cyclones underwent rapid intensification (increase in maximum sustained winds of at least 30 knots in 24 hours), tying the record set in 1995

Florida Keys NWS Team Wins National Ocean Service Peer Recognition Rafting Award

By: Chris Rothwell

The National Ocean Service (NOS) selected Daniel Milner (Electric Systems Analyst), Martin Rieman (Electronics Technician), Chris Rothwell (Lead Meteorologist), and Chip Kasper (Meteorologist-in-Charge) of the Florida Keys National Weather Service (NWS) for the 2020 NOS Peer Recognition Rafting Award. This award recognizes coordination among NOS offices and provides NOS employees the opportunity to express their appreciation to another NOS or NOAA colleague who has helped them in some way. Their NOS Peer Recognition Rafting Award was preceded by a NOAA Employees and Team Member of the Month Award in June of 2020.

The Florida Keys NWS routinely works with several NOAA line offices in support of the common mission. In this case, the team collaborated with the NOS to assist them in safely replacing a mission-essential sea surface temperature sensor at the NOAA/National Water Level Observation Network station at Key West Harbor in the midst of the Covid-19 pandemic and government-wide travel restrictions.

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Florida Keys NWS Team Wins National Ocean Service Peer Recognition Rafting Award (continued)

Electronics Technician, Martin Rieman, aids in the repair of the sea surface temperature sensor for Key West Harbor.

The important environmental monitoring sensor at the Key West station failed at the end of March 2020. Chris Rothwell consulted with Field Engineering Technician Jack Marshall (NOS/Center for Operational Oceanographic Products and Services/Field Operations Division in Gulf Breeze, Florida), to identify a course of action to quickly and efficiently replace the sensor. This course of action returned the critical data feed, which NOAA scientists and partners use for a variety of purposes, including environmental monitoring, validating satellite-derived measurements, and provision of marine impact-based decision support services to emergency managers, water resource managers, and other federal, state, and local partners. After receiving the new sensor via express shipping and arranging for site access from NOS/Florida Keys National Marine Sanctuary staff, Rothwell joined Milner and Rieman at the Key West Harbor station, which is only a short distance away from the Florida Keys NWS forecast office. Mindful of safe physical distancing, the NWS team of Rothwell, Milner, and Rieman (on site) and NOS Affiliate Jack Marshall (via telephone) executed Marshall's thorough instructions, removing the old sensor from the cable conduit, and installing a replacement sensor to precision depth in only two hours. On May 8, 2020, the SST data feed at Key West Harbor (one of the oldest stations in the network) was fully restored.

This award represents a unique way to recognize the tremendous work the Florida Keys NWS team has done in support of the NOS and NOAA mission.

Florida Keys NWS Attends Partners Workshop at the Tropical Analysis and Forecast Branch

By: Chris Rothwell

Nearly three-dozen participated in the 2020 Marine Partners Workshop at TAFB.

Early in March of 2020, as Marine Program leader at the Florida Keys National Weather Service (NWS), I attended a marine partner workshop at the Tropical Analysis and Forecast Branch (TAFB) located at the National Hurricane Center (NHC). Senior operations managers from Carnival, Royal Caribbean, Norwegian, Crowley Marine, Tote Maritime, Foss Maritime, and others, in conjunction with representatives from Weather Forecast Office (WFO) Miami, WFO Key West, TAFB, NHC, Ocean Prediction Center, Port Meteorological Officers, and United States Coast Guard District 7, met to discuss operational products and decision support deficiencies across the NWS enterprise. One of several items of note, I observed how the larger ship companies rarely use the 10 meter, 2-minute average surface wind speed (the standard wind height and averaging period for the World Meteorological Organization) for forecasts and ship routing, which is not applicable to the larger freighters, tankers, and tugs. Instead, operations managers rely on the 30, 60, and 90 meter winds to assess on-the-ocean conditions for their larger ships. In addition to learning ways to improve NWS products and services, the forecasters and industry professionals took part in a hurricane avoidance exercise, which tasked teams with finding routes away from the path of a simulated strengthening hurricane in the Western Caribbean.

Getting to Know the New Staff: Keren Rosado-Vazquez

What were you doing before joining the team at the Florida Keys National Weather Service (NWS)?

Before joining the Florida Keys National Weather Service, I was a University of Miami / Cooperative Institute for Marine and Atmospheric Studies (CIMAS) postdoctoral fellow affiliated to NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) Hurricane Research Division (HRD). As a postdoc, I worked in the implementation and testing of the National Centers for Environmental Prediction (NCEP's) Advanced Bending Angle Method (NABAM), and its inclusion into the operational version of the Finite Volume Cubed-Sphere dynamical core Global Forecasting System (FV3GFS) Gridpoint Statistical Interpolation (GSI) to improve the assimilation of Radio Occultation (RO) observations.

Where do you see yourself in ten years?

Joining the NWS has been a dream come true to me. I was missing the action packed days of weather as a researcher. In ten years, I see myself as a NWS Science and Operations Officer (SOO). It will be great to incorporate my research experience with the operations related to the office. I would like to enhance the breach between operations-to-research and research-to-operations.

What do you like to do in your free time?

Most of the time, I am training for a race such as a triathlon, half marathon, or a marathon. I also like trying new restaurants and spending quality time with my family.

Hot Summer 2020

By: Dave Ross

Summer 2020 entered the record books for Key West as the warmest summer on record. With an average temperature of 86.1°F, it ended up 2 degrees above the 30-year normal. While the days were warm, as to be expected during the summer, an abundance of warmer than usual nights really helped to boost the average temperature for this period. For June, July, and August, the official climate reporting site for Key West (Key West International Airport) saw a month's worth of warm low temperature records.

These 32 records at Key West far outweighed the seven similar records recorded at the Florida Keys Marathon International Airport, the official climate reporting site for Marathon. They did, however, see several more daily high temperature records than Key West. In addition to Key West, two other Keys' sites saw their warmest summer on record from June through August. Bahia Honda State Park and John Pennekamp State Park cooperative observing sites came in 2.6 and 2.5 degrees above normal, respectively, claiming the top spots in their 15-year periods of record.

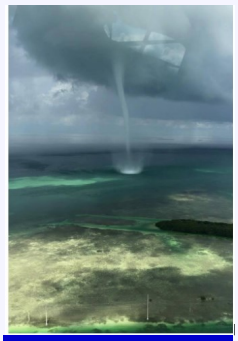
SUMMER RECORDS *(Set or Tied)*	**DAILY TEMPERATURE**				**DAILY RAINFALL**
	Maximum	Low Maximum	High Minimum	Minimum	
Key West ***Summer***	**2**	**1**	**32**	**0**	**2**
June	0	0	15	0	1
July	2	1	7	0	1
August	0	0	10	0	0
Marathon ***Summer***	**5**	**0**	**7**	**0**	**1**
June	2	0	7	0	0
July	3	0	0	0	1
August	0	0	0	0	0

Summary of daily records that were either set or tied at Key West and Marathon during summer 2020

Key West did see one other record that stands out this past summer, an elusive cool temperature record. On July 21st, a high of 84 degrees was recorded at Key West, tying the daily cool high temperature record. Perhaps unsurprising, this was on a day that Key West set a new daily rainfall record of 2.35 inches. The last time Key West set or tied one of these records was on May 26th, 2018.

NOAA Hollings Scholarship Provides Opportunity for Research-to-Operations Collaboration

By: Bryce Tyner

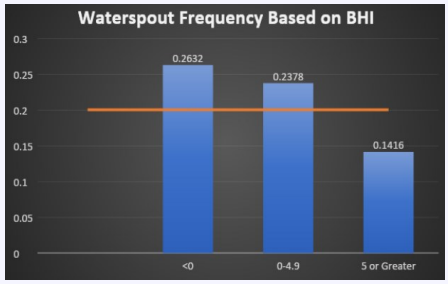


A waterspout observed by helicopter pilot Luis Folgueira on Sept. 24, 2016.

Mr. Benjamin Fellman, who is pursuing a degree in Atmospheric Science at Millersville University, was selected as a prestigious 2020 NOAA Hollings Scholar. For his six-week research project, he chose to work with Florida Keys National Weather Service Science and Operations Officer, Andy Devanas, and myself as his co-mentors. Although COVID-19 forced the program to be conducted virtually, we decided to move forward with the research, with the project officially beginning in May 2020.

Waterspouts pose a significant hazard to mariners, and perhaps nowhere in the world are waterspouts more frequent in the wet season months of May-September than the Florida Keys. Using 1200 UTC daily weather balloon upper-air sounding data from Key West, previous research at the Florida Keys National Weather Service resulted in the development of a logistic regression (statistical) model to predict the probability of observing a waterspout in the Florida Keys on a given day. Although the resulting Waterspout Index is a valuable tool for meteorologists working in operations on a given day in the Florida Keys, the study was limited due to it only using data from one point in the Florida Keys (Key West). However, the radiosonde location at Key West was found to be statistically representative of the Florida Keys island chain and surrounding waters.

In the Florida Keys, subtle differences in both the small-scale (on the order of 1-100 miles) and large-scale (on the order of 100-1000 miles) environment can result in very different meteorological impacts. The 2020 Hollings research project aimed to examine some of the large-scale conditions that provide favorable conditions for the development of waterspouts in the Florida Keys. For part of his research, Ben used both statistical compositing analysis to examine the potential link of waterspout frequency in the Florida Keys to a defined parameter known as the Bermuda High Index (BHI). The BHI is quite simply a measure of the difference in sea level pressure at Bermuda and at New Orleans, Louisiana, with positive values indicating higher sea level pressure at Bermuda than at New Orleans.



Waterspout frequency as a function of BHI for wet season days 2007-2016. The orange line highlights the mean daily waterspout frequency of 0.2.

Ben used data for the wet seasons between 2007-2016 and examined observed waterspout frequency for three bins: a negative BHI (< 0), a weak positive BHI (0-4.9), and a strong positive BHI (>4.9). Using a statistical test of significance known as a Fisher's Test, he showed a statistically significant drop off in observed waterspout frequency when the BHI was strongly positive. To provide a meteorological cause for such a relationship between observed waterspouts and BHI, Ben used composite analysis to compare the large-scale environments for days with a negative BHI, weak positive BHI, and a strong positive BHI. One of his key discoveries was that days with a strong positive BHI tend to have much weaker northerly and/or easterly (or even southerly and/or westerly) wind components relative to climatology, whereas days with a negative and weak positive BHI tend to have stronger northerly and easterly wind components. It is speculated that the strength and position of the Bermuda High likely results in producing conditions more favorable for waterspout formation.

We are continuing to move forward with this research. Mr. Jonny Benoit, who is pursuing his Geophysics degree at Brown University, will join the Florida Keys National Weather Service as a NOAA Hollings Scholar in the summer of 2021. For his research, he will continue examining the large-scale patterns that ultimately result in favorable conditions for waterspouts in the Florida Keys, using statistical techniques and in-depth case studies of past waterspout outbreaks.

Getting to Know the New Staff: Justin McReynolds

What were you doing before joining the team at the Florida Keys National Weather Service (NWS)?

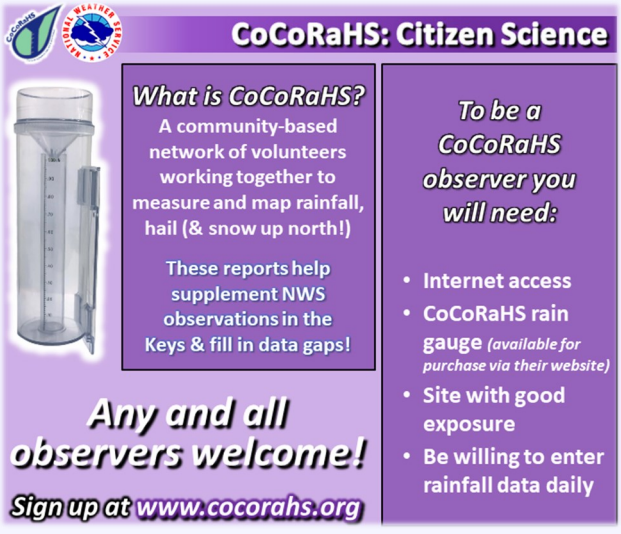
Before joining the Florida Keys National Weather Service, I was in that strange summer Covid-19 limbo "vacation" immediately following my graduation from Florida State University in May of 2020. While in Tallahassee, I worked with Dr. Bob Hart researching the asymmetrical decay of a tropical cyclone's wind field at landfall for my Master's research project. I was also a teacher's assistant for a synoptic meteorology class and a meteorological instruments and observations course, as well as an instructor of a weather discussion course and an introductory meteorology lab. During my final semester at Florida State, I volunteered at the Florida Division of Emergency Management (FDEM) as the Intern Meteorologist, where I got my first official taste of the operational application of meteorology.

Where do you see yourself in ten years?

Honestly, a lot is going to happen in the next ten years! Joining the National Weather Service has been a long-time dream for me, so I am in the process of figuring out my next big thing. To accomplish that, I want to explore the different roles in the office to see what I gravitate towards with my specific skill sets. From some of my time at the University of Oklahoma and FDEM, I have an interest in getting involved with Decision Support Services and examining the products used to inform the public about severe and dangerous weather. I could see using the experience I get over this decade along with some research as a tool to help streamline messages and products so that they are easier for the intended audience to see and digest. On the flipside, I am curious about forensic meteorology and how we can tell how drastic an event is versus others. One thing is for sure, I will have learned a lot by the time this decade has passed, and I wouldn't want it any other way!

What do you like to do in your free time?

I am blessed to be very well-traveled during vacations, whether it be close to home in the Florida theme parks or farther away in parts of Europe and the edges of the US. I have been a singer for most of my life and have experience playing cello, electric bass, and the piano, which I use for song writing when I have time. I enjoy watching college football (Boomer Sooner!) along with any sort of action, fantasy, and sci-fi movies or shows. I am also pretty big into games of the PC, Switch, and Dungeons and Dragons variety.



Did you know that our office also contributes rainfall measurements to The Community Collaborative Rain, Hail, & Snow Network (CoCoRaHS)? Our White Street facility in Key West (across from City Hall) manually measures 24-hour rainfall at midnight standard time every day of the year. These reports are then submitted to the online CoCoRaHS database, one of 22 such observation sites in the Florida Keys.

Rainfall Associated with Eventual Tropical Storm Sally

By: Dave Ross

Flooded roadways near Atlantic Boulevard in Key West on Sept. 12th, 2020.

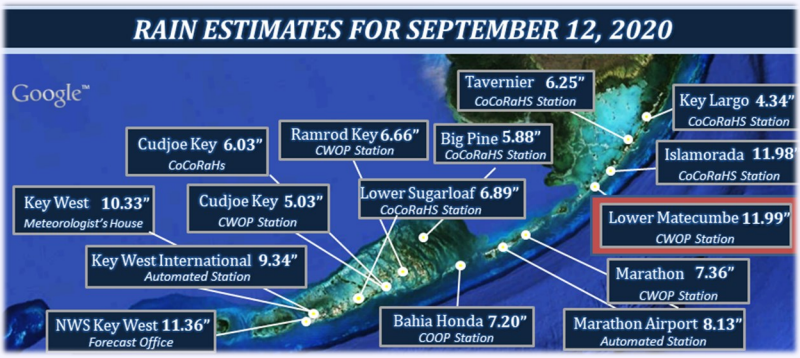
Deep cumulus convection associated with developing Tropical Depression 19, on Friday, September 11th continued to increase across the Straits of Florida and Florida Keys into the early morning hours of Saturday, September 12th. By Saturday midday, Tropical Storm Sally was born near East Cape Sable, Florida. By this time, over 11 inches of rain had fallen in portions of the Upper Keys, with similar amounts recorded across Key West and its vicinity by late Saturday evening.

Widespread ponding of water and street flooding escalated in Key West during a short period with exceptional rain rates (1.10" in 10 minutes ending at 9:43 PM EDT and 3.98" in 60 minutes ending at 9:56 PM EDT) as thunderstorm outflow reached the island chain from the south. Residents reported stalled cars, popped manhole covers, and residential flooding in low-lying areas of Key West that evening, with the intense convective rain finally diminishing just before midnight.

Of note, the 11.36 inches of rainfall measured at the Florida Keys National Weather Service office on White Street in Key West is the wettest day on record since observations at the facility began in September 2005. While this may be a short period of record, it is significant in that it was over 4 inches greater than the next wettest day, 7.00 inches on October 23, 2008.

For the Key West climate location (Key West International Airport ASOS) 9.37 inches of rainfall was a dual record. It shattered the daily record for September 12th of 2.26 inches from 1924. It is also now the wettest September day on record, surpassing the previous record of 7.47 inches on September 10, 1919. In addition to these two new titles, it became the 5th wettest day ever recorded in Key West, with records dating back to 1871. The wettest day on record for Key West is November 11 1980, when 22.75 inches of rainfall was measured.

The Marathon climate location (Florida Keys Marathon International Airport) was not to be left out, also setting a record for any September day. The daily rainfall total of 8.13 inches was more than 7 times the previous daily record of 1.13 inches set in 1995. Until this year, the wettest September day was September 28, 1953, when 5.92 inches of rainfall was measured. With records going back to 1950, this rain-soaked day also now ranks as the 3rd wettest day ever recorded for the Marathon area. August 24, 1995 remains the wettest day on record for Marathon, with 8.33 inches of rainfall.



Rainfall totals for Sept. 12th, 2020.

Inaugural NOAA Florida Diversity & Inclusion Workshop Held Virtually

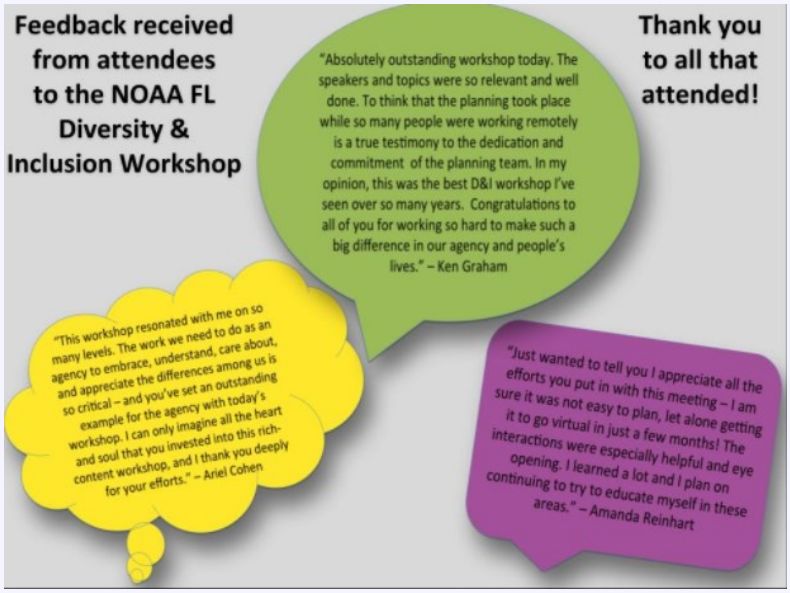
By: Luis Ingram-Westover

The planning committee of the First NOAA Florida Diversity & Inclusion (D&I) Workshop, from the top left: Krizia Negron (WFO MLB), Molly Merrifield (MFL WFO MFL), Jeffrey Lewitsky (NHC TAFB), myself (KEY WFO KEY), and Dr. Nelsie Ramos (NHC TAFB).

The inaugural NOAA Florida Diversity & Inclusion (D&I) Workshop was held on Tuesday, June 2nd, 2020. Given the Covid-19 pandemic, the workshop was transitioned to a virtual event. Despite the change, we had a successful event with a variety of topics presented by outstanding speakers and panelists with decades of combined experience in D&I, including Catalina Martinez (Regional Program Manager at the NOAA Office of Ocean Exploration and Research) , Richard "Pete" Hill (National Weather Service Director of the Equal Opportunity and Diversity Management Division), Earl Breon (WFO Indianapolis), Amneris Caba (Equal Employment Opportunity and Diversity Specialist in the NOAA Office of Inclusion and Civil Rights), Dr. Vernon Morris (Howard University Professor Emeritus and incoming Director of the School of Mathematical and Natural Sciences at Arizona State University), Dr. Sim Aberson (Meteorologist of NOAA's AOML Hurricane Research Division), Kenneth Bailey (Director of NOAA OICR), and myself (WFO Key West and NWS Diversity Ambassador for LGBTQ+ and Hispanics). Some topics covered included unconscious bias, creating a respectful workplace, the importance of self-awareness to improve how we relate to others, and making the workplace more diverse and inclusive using empathy and sympathy.

Though there are benefits to having these kinds of workshops in person, we have demonstrated that holding a virtual workshop can be just as beneficial and effective in reaching more people who might have been unable to attend otherwise. The feedback received from participants, speakers, and panelists was overwhelmingly positive, which propelled us to consider extending more opportunities like this in the future. One participant noted having the workshop 100% virtual had a positive impact on the participants, as they felt more compelled to participate and express their true feelings, questions, and concerns about D&I.

Our utmost gratitude goes out to all the speakers, panelists, and participants for their time and commitment participating in this workshop. The commitment to bring forth an open, honest discussion with each other is what made this workshop truly great and will carry us forward on the path to further promote diversity and inclusion. We hope you will be inspired to continue these conversations at your workplace as you go forward in your daily lives.



Comments from select attendees of the Florida Diversity & Inclusion Workshop.

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