The Whispering Trades

Volume 5, Issue 2 ● April 2018

National Weather Service | San Juan, Puerto Rico

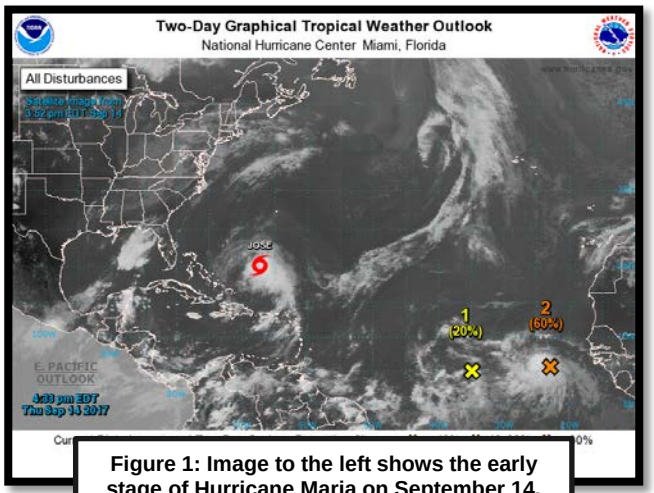
SPECIAL EDITION

By: Ernesto Rodriguez, SOO

Maria formed from a tropical wave that moved across the tropical Atlantic during the week of September 10th 2017. Six days later on September 16th, the tropical wave was classified as a tropical depression about 700 miles east of the Lesser Antilles. The depression was then upgraded to Tropical Storm Maria later in the afternoon. Maria continued to intensify and the on very next day, September 17th, became the 8th hurricane of the season with sustained winds of 75 mph.

Maria's center moved over the coastal waters off northwestern Puerto Rico early that afternoon. Even though hurricane force winds started to diminish once the system moved offshore, tropical storm force winds continued well into the evening and overnight hours across mainland Puerto Rico.

Hurricane Maria rapidly intensified from a category 1 to category 5 hurricane in less than 30 hours. Maria's first landfall was in Dominica, part of the Windward Islands, as a category 5 hurricane on September 18th. Maria approached the U.S. Virgin Islands and Puerto Rico during the afternoon and evening hours of September 19th. During the overnight hours of September 20th, the eyewall of Hurricane Maria brushed the western half of St. Croix with sustained winds of 175 mph. Around 5 AM AST, hurricane force winds were reported in Vieques and the eastern half of mainland Puerto Rico. At approximately 615 AM AST (1015 UTC), Maria made landfall in Yabucoa, Puerto Rico as a strong category 4 hurricane with maximum sustained winds of 155 mph. As the center of the storm moved west-northwestward over Puerto Rico, hurricane force winds spread over the entire island along with extremely heavy rainfall that produced catastrophic flooding, especially across the northern half of Puerto Rico.



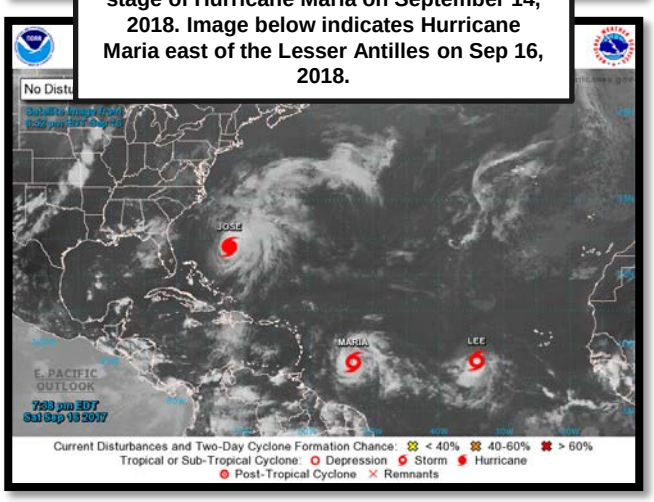


Figure 1: Image to the left shows the early stage of Hurricane Maria on September 14, 2018. Image below indicates Hurricane Maria east of the Lesser Antilles on Sep 16, 2018.

Hurricane Maria's Life Cycle

By: Ernesto Rodriguez, SOO

Inside this Issue:

As we look back at our lives during this past year, both hurricanes Irma and María should serve as reminders of the importance of preparedness. If anything good came from them, learning to be better prepared should be at the top. Hurricanes will continue to come our way, and we must not forget the lessons learned.

– Roberto Garcia-Hiraldo, Meteorologist in Charge (MIC)

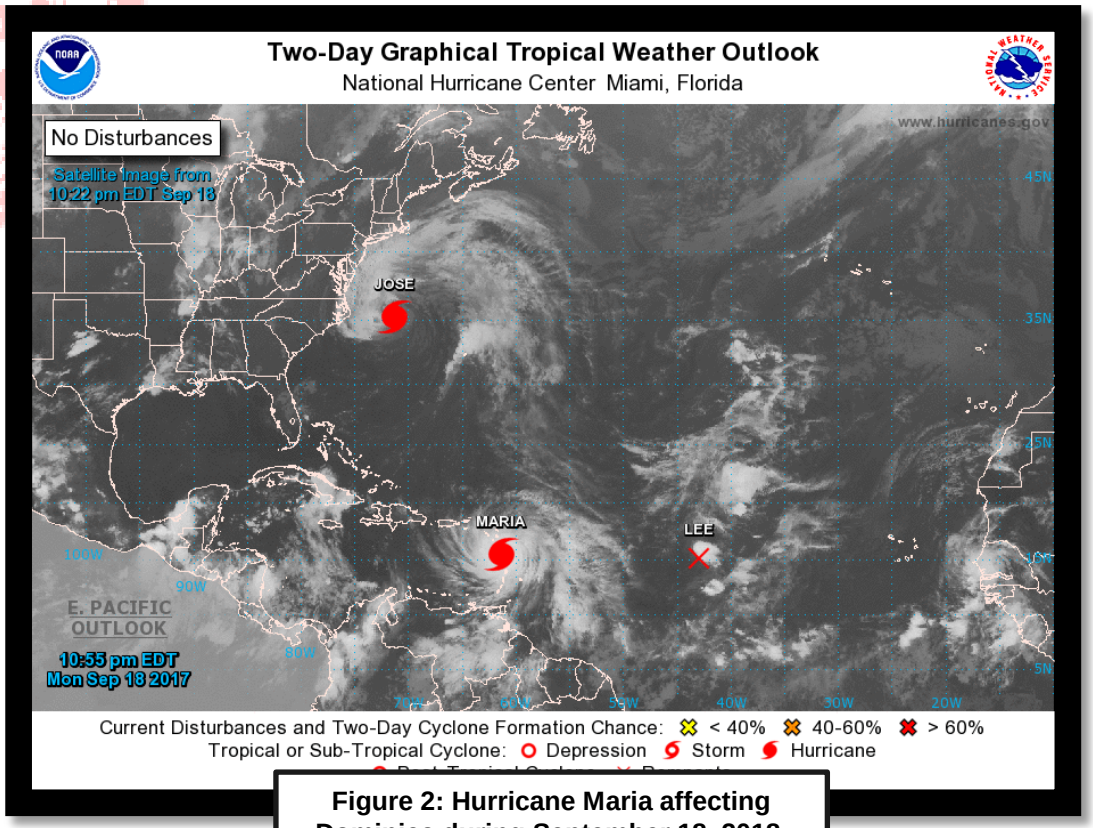


Figure 2: Hurricane Maria affecting Dominica during September 18, 2018.

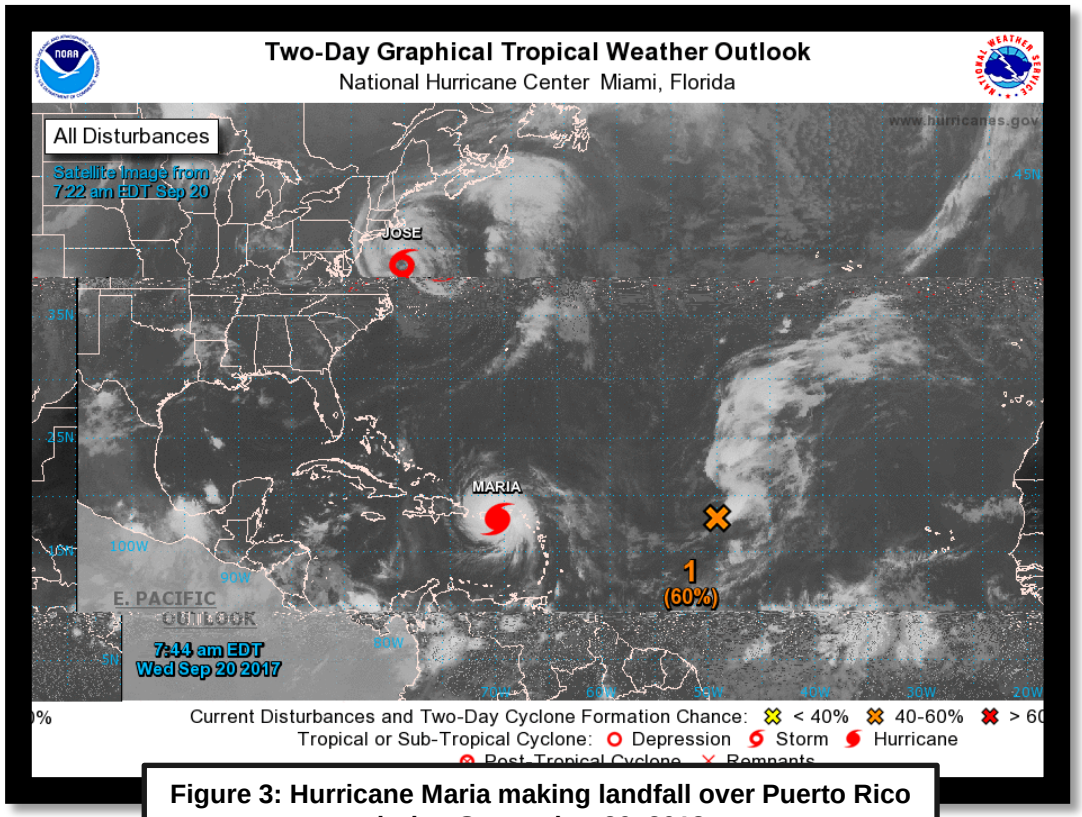


Figure 3: Hurricane Maria making landfall over Puerto Rico during September 20, 2018.

The Hydrological Side of *Maria*

By: Walter Snell, FIC

Figure 1 The bridge over the Canóvanas River looking east up highway 957 The river had risen around 5 feet above the roadway at the height of the flooding. It likely failed after its central support had been undermined.

Hurricane Maria had us all in awe of her powerful winds and fierce hillside altering rains, but there was another side to her destructive nature: river flooding. Above any low-lying areas, tucked away behind solid concrete walls anchored on a firm foundation supporting a secure roof, we thought we had made it through the worst. But, on venturing out, some of us confronted a world of deeply altered landscapes. Rivers cut new paths, undermined hillsides, and washed away familiar ways to get to need supplies, work and loved ones. The National Weather Service not only recorded winds and rain but also water levels as they surged out of the mountains and across wide valleys. Not all of the river gages survived and not all recorded the worst that transpired, but those that did told a story of island-wide disaster.

One of the most amazing things of all is that not all of the rivers in Puerto Rico reached flood stage. The National Weather Service was monitoring 75 operational river gages that fateful night. Not all water level gages have flood stages—some merely keep track of irrigation flows. Some are on lakes and for some the level of water that could be considered a flood just hasn't yet been determined. But of the 75 we watched that night 65 did have flood stages. Of those 65 gages, 12 had river rises but no flooding. Of the 53 remaining gages, 11 reached minor flood stage, 12 had moderate flooding, and a majority of 30 suffered major flooding. Of those 53 gages 13 set new all-time records. One of those failed after setting a new record another 16 failed before reaching any record. We will never know how badly it flooded there unless the water left some Other telltale sign or mark as it often does.

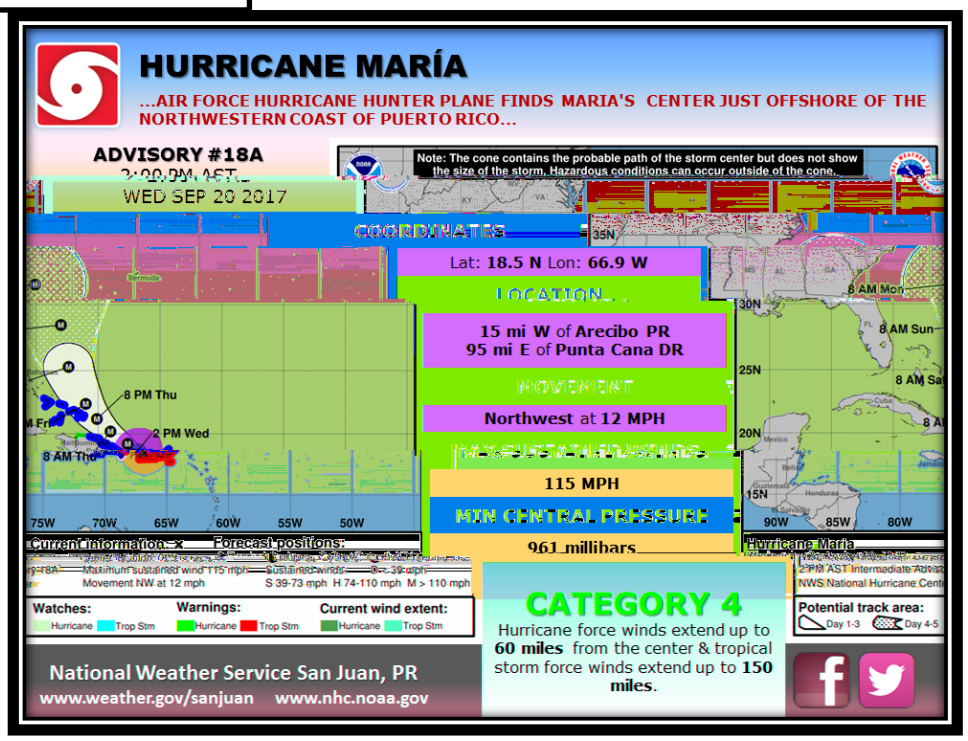
Figure 2 Roads turned into mud. Jayuya, PR.

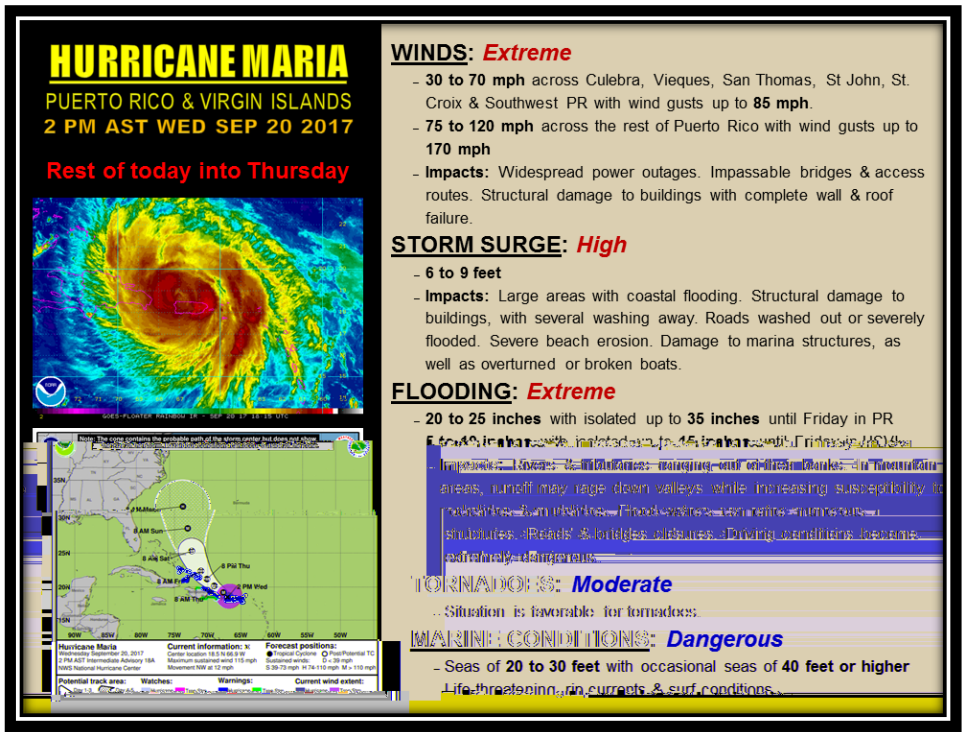
This astonishing record helps explain how so many bridges were lost and how whole communities suddenly became cut-off from everyone else—islands to themselves. It shows the destructive power of water and the need to reinforce the instruments that we use to keep track of our rivers. But it also reminds us where it is safe to live and where it is better to just to leave to the cattle and the birds.

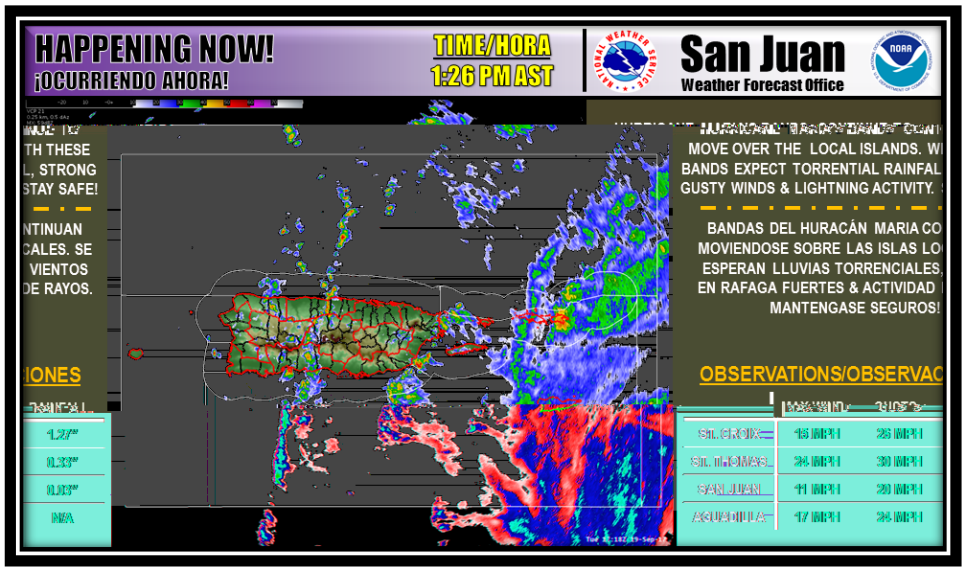
Communications & Graphics

By: Amaryllis Cotto, MetIntern

The National Weather Service San Juan Puerto Rico Weather Forecasting Office introduced new briefings and graphics to assist in the preparation and emergency processes of the local government, emergency personnel, core partners and general public before, during and after the historical devastation of Hurricane Maria. Weather briefings were tailored with relevant information and graphics for the local government and emergency personnel. The graphics created for social media contained simple, concise and consistent impact statements and meteorological data to augment awareness and understanding of Hurricane Maria's characteristics and expected hazards. The NWS San Juan PR reached out to millions of residents in Puerto Rico and U.S. Virgin Islands, as well as an international audience that were directly or indirectly affected by Maria, even after the loss of communication. Moreover, the agency helped mitigate the loss of life and property by means of delivering specific and consistent information as well as aid in the decision-making process of the local government, emergency personnel, core partners and the public in the wake of Hurricane Maria.







Impact Decision Support Services (IDS)

By: Carlos Anselmi, Forecaster

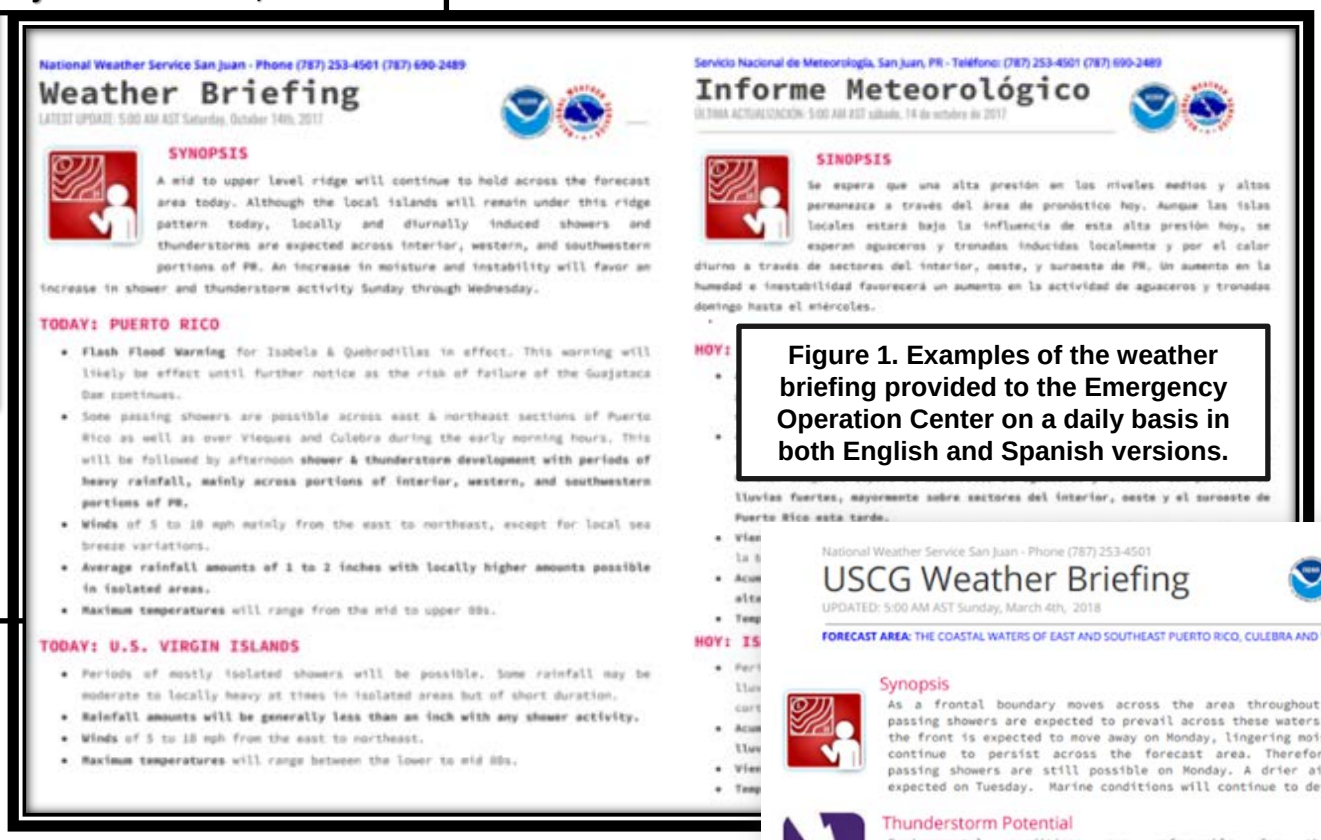
In an effort to build a resilient community, a few WFO-San Juan meteorologists were deployed to assist the local government, state, and federal partners at the Emergency Operations Center (EOC) of Puerto Rico Emergency Management Agency (PREMA) during María. In addition, we kept a close communication with the U.S. Virgin Islands Territorial Emergency Management Agency (VITEMA) EOC prior and during the event. The Science and Operations Officer (SOO) and the Warning Coordination (WCM) were in constant communication with the Governor of the U.S. Virgin Islands and VITEMA Director. During both events our staff provided first-hand information about the latest information provided by the National Hurricane Center and the possible impacts based on Maria's latest forecast advisory. However, prior to the activation of VITEMA and PREMA EOCs, our office provided continuous updates with overviews and possible impacts based on the latest NHC's Maria's forecast advisory.

During Hurricane Maria, the staff of the NWS Forecast Office-San Juan had the opportunity to assist the state and federal agencies at the EOC. Throughout the events, we were able to positively and effectively interact with the Puerto Rican community and our core partners. At the EOC we had the opportunity to conduct numerous radio and TV stations interviews which included: Telemundo, Univision, Radio Isla, Wapa Radio, Noti Uno, Wapa TV, Fidelity, Sal Soul, Hot 1020, WKAQ, El Nuevo Día, Metro, Noticel, TV-Caracol among others. Also, we provided specific briefings to the Governor of Puerto Rico, Hon. Ricardo A. Rosselló-Nevares, the Puerto Rico Emergency Management Agency (PREMA) Director, Abner Gomez, among other public servers, which served for the planning and decision making before, during and after María. In addition, this opportunity also helped to build and strengthen the relationship between our office, the government of Puerto Rico and the Federal government.

At the Command Post situated in the Puerto Rico Convention Center we had the opportunity to provide specific weather briefings to the PR Search and Rescue Team, FEMA, USCG, ARMY, NAVY, Marines, ARMY Corp of Engineers, PREMA Director among others, which helped them to plan accordingly the expected recovery missions conducted during the Maria's operations.

Impact Decision Support Services (IDSS)

By: Carlos Anselmi, Forecaster



National Weather Service San Juan - Phone (787) 253-4501 (787) 690-2489

Weather Briefing

LATEST UPDATE: 5:00 AM AST Saturday, October 14th, 2017

SYNOPSIS

A mid to upper level ridge will continue to hold across the forecast area today. Although the local islands will remain under this ridge pattern today, locally and diurnally induced showers and thunderstorms are expected across interior, western, and southwestern portions of PR. An increase in moisture and instability will favor an increase in shower and thunderstorm activity Sunday through Wednesday.

TODAY: PUERTO RICO

- **Flash Flood Warning** for Isabela & Quebradillas in effect. This warning will likely be effect until further notice as the risk of failure of the Guajataca Dam continues.
- Some passing showers are possible across east & northeast sections of Puerto Rico as well as over Vieques and Culebra during the early morning hours. This will be followed by afternoon **shower & thunderstorm development with periods of heavy rainfall, mainly across portions of interior, western, and southwestern portions of PR.**
- **Winds** of 5 to 10 mph mainly from the east to northeast, except for local sea breeze variations.
- **Average rainfall amounts of 1 to 2 inches with locally higher amounts possible in isolated areas.**
- **Maximum temperatures** will range from the mid to upper 80s.

TODAY: U.S. VIRGIN ISLANDS

- Periods of mostly isolated showers will be possible. Some rainfall may be moderate to locally heavy at times in isolated areas but of short duration.
- **Rainfall amounts will be generally less than an inch with any shower activity.**
- **Winds** of 5 to 10 mph from the east to northeast.
- **Maximum temperatures** will range between the lower to mid 80s.

Servicio Nacional de Meteorología, San Juan, PR - Teléfono: (787) 253-4501 (787) 690-2489

Informe Meteorológico

ÚLTIMA ACTUALIZACIÓN: 5:00 AM AST sábado, 14 de octubre de 2017

SINOPSIS

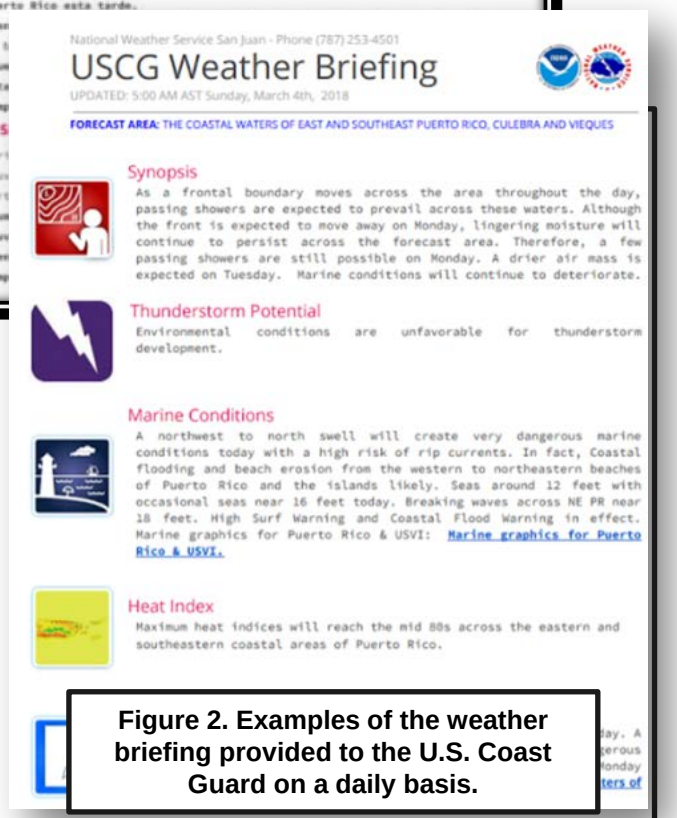
Se espera que una alta presión en los niveles medios y altos permanezca a través del área de pronóstico hoy. Aunque las islas locales estará bajo la influencia de esta alta presión hoy, se esperan aguaceros y tronadas inducidas localmente y por el calor diurno a través de sectores del interior, oeste, y suroeste de PR. Un aumento en la humedad e inestabilidad favorecerá un aumento en la actividad de aguaceros y tronados domingo hasta el miércoles.

HOY:

lluvias fuertes, mayormente sobre sectores del interior, oeste y el suroeste de Puerto Rico esta tarde.

HOY: IS

Figure 1. Examples of the weather briefing provided to the Emergency Operation Center on a daily basis in both English and Spanish versions.



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USCG Weather Briefing

UPDATED: 5:00 AM AST Sunday, March 4th, 2018

FORECAST AREA: THE COASTAL WATERS OF EAST AND SOUTHEAST PUERTO RICO, CULEBRA AND VIEQUES

Synopsis

As a frontal boundary moves across the area throughout the day, passing showers are expected to prevail across these waters. Although the front is expected to move away on Monday, lingering moisture will continue to persist across the forecast area. Therefore, a few passing showers are still possible on Monday. A drier air mass is expected on Tuesday. Marine conditions will continue to deteriorate.

Thunderstorm Potential

Environmental conditions are unfavorable for thunderstorm development.

Marine Conditions

A northwest to north swell will create very dangerous marine conditions today with a high risk of rip currents. In fact, Coastal flooding and beach erosion from the western to northeastern beaches of Puerto Rico and the islands likely. Seas around 12 feet with occasional seas near 16 feet today. Breaking waves across NE PR near 18 feet. High Surf Warning and Coastal Flood Warning in effect. Marine graphics for Puerto Rico & USVI: Marine graphics for Puerto Rico & USVI.

Heat Index

Maximum heat indices will reach the mid 80s across the eastern and southeastern coastal areas of Puerto Rico.

Figure 2. Examples of the weather briefing provided to the U.S. Coast Guard on a daily basis.

The National Weather Service/Weather Forecast Office (NWS/WFO) in San Juan provided weather information to the Emergency Operation Center (EOC) and the U.S. Coast Guard on a daily basis for Approximately 150 uninterrupted days. For the EOC, the weather briefings were disseminated in both English and Spanish versions (Figure 1). This information was vital during Search and Rescue Mission, Goods Distribution, and recovery efforts after the impact of Major Hurricane María. Our staff delivered these briefings on a daily basis from September 24th, 2017 through February 20th, 2018, which helped Local and Federal agencies, as well as the Military, during decision-making processes as they planned and performed recovery efforts across Puerto Rico and the U.S. Virgin Islands. In addition, we assisted the U.S.C.G. during the Marine Salvage and Boat Recovery Operations across eastern Puerto Rico, Vieques, and Culebra on a daily basis from October 6th, 2017 through March 5th, 2018 (Figure 2). The USCG Vessel removal team received this impact decision support document, which included short and long-term marine and weather condition forecasts. This information helped them during the planning and decision-making process. Our ultimate goal is that these products help our Partners during the planning and decision-making process in order to provide timely, accurate and consistent information about the potential weather impacts during their operations. We will continue our commitment to provide unwavering assistance during the recovery efforts for Puerto Rico and the U.S. Virign Islands.

Climate Review for Puerto Rico and U.S. Virgin Islands

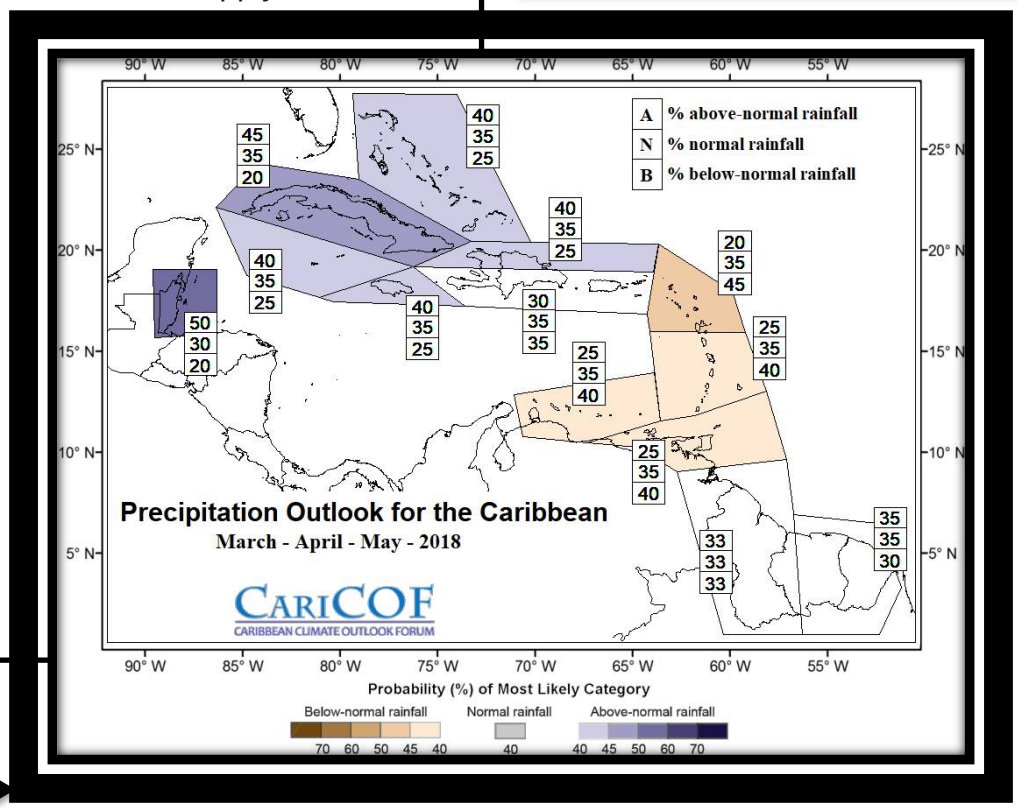
By: Odalys Martinez, SH

Near to above normal rainfall was observed across the local islands during 2017 with March and September as extremely wet months. The beginning of 2018 brought similar conditions across the forecast area with near to above normal rainfall particularly along the northern and eastern slopes of Puerto Rico as well as Saint Thomas and Saint John. Although January, February and March are climatologically speaking dry months; frequent shower activity was observed with even minor urban flooding reported. These showers kept rivers and major water supply reservoirs across Puerto Rico in optimum conditions. However, the Guajataca Lake is well below the normal pool because the U.S. Army Corps of Engineers (USACE) continues to repair the spillway which was affected by excessive runoff during Hurricane María. This situation at Guajataca Lake is a clear example of an induced drought which can be classified as a socioeconomically drought. This occurs when physical water shortage starts to affect people, individually and collectively or, in more abstract terms, most socioeconomic definitions of drought are associated with the supply and demand of an economic good.

In terms of the primary climate sites, San Juan Area (Luis Muñoz Marín Airport) had a cool and wet February with 216% of normal rainfall, the most since 1989. The February temperature was 1.1F below normal, the lowest in 10 years.

San Juan had a cool and wet Feb with 216% of normal rain, the most since 1989. The Feb temperature was 1.1˚F below normal, the lowest in 10 years.

The dry season ended back in March with a transition expected during April and the onset of the wet season in May. At this time, based on the probabilistic forecast through May 2018 there is a high chance above normal rainfall across the western Caribbean; while across the eastern Caribbean there is a high chance of below normal rainfall. More info: http://rcc.cimh.edu.bb/climate-outlooks/



Behind the Scenes...

By: Edward Tirado, SITS

Throughout this newsletter you have heard the voices of meteorologists who worked unselfishly during both Hurricane Irma and Hurricane Maria. What you haven't heard much about are the teams that worked together behind the bright lights in anonymity. In the face of, and aftermath of Hurricane Maria, the Electronic and Information Technology team worked together to make sure the rest of the staff would be safe while they did their job. With the help of the Facilities Electronic Technician, Nick Oliveri, we were able to prepare the facilities by removing anything and everything that would become dangerous projectiles during the passage of Maria. Regretfully, this also meant removing our favorite mango tree that became a casualty of Hurricane Irma just a week prior.

RIP Mango Tree… You will be missed!

With the onslaught of Maria just hours away, it was decided that the doors and windows were to be shut and locked for the duration of the storm. Shutting the doors and windows is not one the favorite parts of the meteorologists' day, they studied long and hard for this type of scenario, and some of us believe they would much rather have preferred to be outside and closer to the weather. While most of the work during Maria was left to the meteorologists, we were able to keep everything running as smoothly as possible and prepare for what Maria had in store as she passed. One fun fact during the storm is when one of the Meteorologist came back to me and asked "We are getting a hatch door open warning on the Cayey Radar, what does that mean?". The answer, as we all know now, was that it meant the end of the radar in Cayey as we know it for quite some time.

Jason Thomas and Blair Baldridge from the ROC

However, this was not enough, since getting the information into our AWIPS system took the expertise of the Radar Operations Center (ROC) personnel. They sent down two of their experts to help us set up the satellite communications while they worked on the software issues.

After the passage of Maria, this is where the real work started for us. Not only did we have to deal with communications issues, facilities issues and fuel issues, while competing with the rest of the population, we also had no functional radars to be used to issue watches and warnings. Luckily, a plan was devised by the National Weather Service Headquarters in partnership with the Department of Defense to deploy U.S. Marines with SPAWAR and their portable radars to the airports in Aguadilla and Roosevelt Roads.

Behind the Scenes...

By: Edward Tirado, SITS

On the 23th of October the Marines had established the first radar site in Roosevelt Roads.

And a couple of days afterwards, the Aguadilla site was up and running. The Marines remained at their post until they were relieved by visiting National Weather Service Electronic Technicians on February 15, 2018. We give a great deal of thanks to everyone involved in this project and to the U.S. Marines. Semper Fi and many thanks.

Jason and Blair from the ROC.

On a personal note, even though these have been difficult and stressful times, we were able to take a second to smile and enjoy life. Here are a few of those moments.

The U.S. Marines enjoying their new NWS/Hurricane Maria shirts.

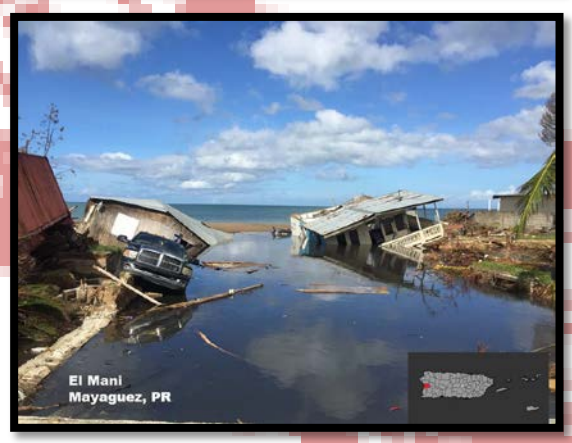
Roberto Garcia & Xiomara Cruz- delivering Thanksgiving meal for Marines.

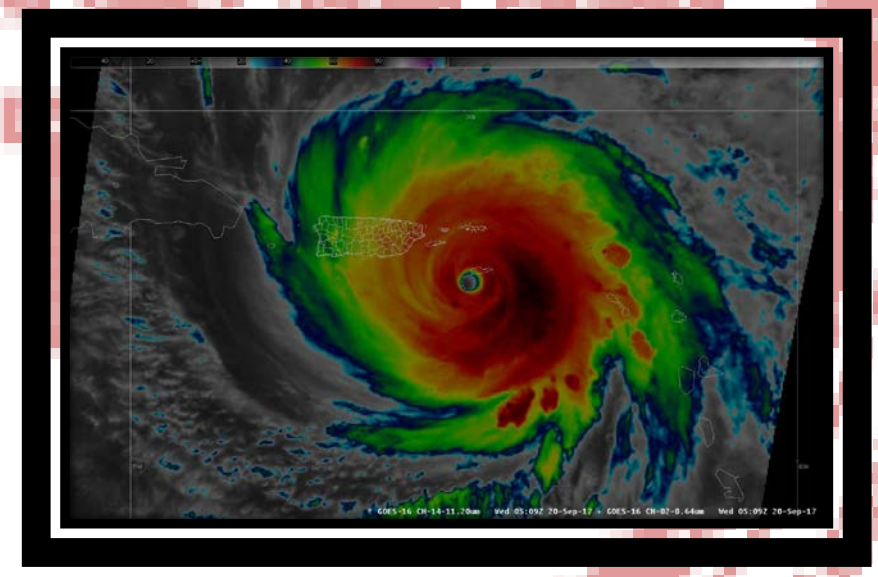
And every once and awhile you must take a second to take a photo op with Ada Monzon and Warrant Officer Adam Harmon.

Local Report for Major Hurricane Maria

Hit Link for More Information:

Local Report





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