2020 Climate Review for Puerto Rico and the U.S. Virgin Islands

Synopsis: *Overall near normal to above normal rainfall was observed across Puerto Rico and the northern U.S. Virgin Islands during 2020; with the exception of portions of the interior of Puerto Rico and Saint Croix, which observed below normal rainfall. The summer months were particularly dry, and it caused the U.S. Drought Monitor to consider parts of Puerto Rico and Saint Thomas island as having a "Severe Drought" (D2), while Saint John and Saint Croix as having an "Extreme Drought" (D3). Our local area was affected by Tropical Storms Isaías and Laura, which brought a great deal of rainfall to the local area, causing significant flooding. We closed the year with above normal mean temperatures across all the main climate sites, with this year being in the top-5 warmest years on record for all of the climate sites.*

Summary: The typical and seasonable weather patterns were observed this year, whether it was the brief onshore showers, hot summer temperatures and strong thunderstorms, Saharan dust events or tropical cyclones, all were observed this year. However, some of these events were more significant this year than in other years, some were unusual for the respective time of year, some were record breaking. The overall rainfall patterns favored the coastal municipalities of Puerto Rico, causing near to above normal rainfall, while the eastern and central interior of Puerto Rico received slightly below normal rainfall with estimates indicating about 75% to 85% of normal in those areas. The U.S. Virgin Islands also observed below normal rainfall, especially Saint Croix, but the northern islands received near normal rainfall, albeit slightly below normal. That said, the summer months were generally dry overall, causing the U.S. Drought Monitor to classify some of the local area to be under a Severe Drought and others under an Extreme Drought. However, later in the summer we were affected by two tropical cyclones; Tropical Storms Isaías and Laura, both of which brought significant rainfall to the local islands, though Isaías brought more rainfall than Laura. As far as Saharan dust, even though we did not observe as many events as we have in other years, we did observe the most significant and dense Saharan dust event on record, causing great reductions in visibility and hazardous air quality. In addition, the hot temperatures were significant this year as well. Almost every month we observed mean monthly temperatures in the "top-10 warmest" for at least one of our main climatological sites, which are the San Juan (**JSJ**), Saint Thomas (**IST**), and Saint Croix (**ISX**) international airports.

During January and February, the weather pattern was fairly typical, but above normal rainfall was observed across much of Puerto Rico and the U.S. Virgin Islands. Late in January, a frontal boundary stalled just south of the local area, which caused heavy rain to affect southern Puerto Rico, in this case, flooding occurred where makeshift shelters were located. These shelters temporarily housed people that were displaced from their homes due to a strong 6.4 magnitude earthquake that affected the area on the 7th of January. February was another rainy month, one that broke the record for rainiest February at the San Juan International airport with 8.23". Another cold front affected the area late in the month, which caused persistent rainfall and flooding across several areas of northern and eastern Puerto Rico, setting a single-day rainfall

record at JSJ with 4.35" on February 25th; this single-day record is also the highest amount for any given day in the month of February. The month of March was also much wetter than normal for most of the local area. Some areas received as much as 500% of normal rainfall, but a small area of western Puerto Rico observed about 60% of normal rainfall. The U.S. Virgin Islands also received about 150% to 250% of normal rainfall. April observed below normal rainfall across the local islands, with the exception of an isolated area of extreme eastern Puerto Rico, which observed higher than normal rain. The month of May was much drier and warmer than normal, being the warmest May on record at JSJ with an average temperature of 84.1ºF. The U.S. Drought Monitor started classifying portions of the local islands as at least Abnormally Dry (D0), by the end of the month there were several sections with a "Moderate Drought" (D1) classification.

The drought situation continued worsening into the summer months, causing Saint Croix and Saint John of the U.S. Virgin Islands to have a drought classification of D3, while many sectors of Puerto Rico were under the D2 classification. That said, the drought could have been worse if it weren't for Tropical Storm Isaías causing significant rainfall towards the end of July over Puerto Rico. This summer not only was one of the driest, but also one of the warmest on record. As far as temperatures go, each of the summer months (June, July, August) had top-10 warmest monthly mean temperatures at all of the main climatological sites, most of them actually being in the top-5. In the month of June, a record breaking Saharan dust event, which caused the visibility to decrease so much that it had an impact in the local aviation, the air quality also degraded into the Hazardous category, which posed a health hazard to many of the local citizens.

The month of July did not start much better, with several Saharan dust events, but none as bad as the one in late June. However, the month of July was essentially dry, with the exception of the typical diurnal showers and thunderstorms across western Puerto Rico, but at the very end of the month, July 30th, Tropical Storm Isaías affected the local islands. Isaías caused significant flooding in many areas of Puerto Rico with rainfall totals ranging from 5 to 10 inches across most of the island, providing much needed relief to the drought conditions. In fact, before Isaías, about 21% of Puerto Rico had a D0 classification, 28% as D1, and 17% as D2; then after Isaías, all D2 and D1 classifications were removed and only a 17% of Puerto Rico remained with a D0 classification. However, Isaías did not produce the same amounts of rain across the U.S. Virgin Islands; they observed generally less than an inch of rain with Isaías, and some areas of Saint John observed almost no rain. The heat was no stranger this July, but no place saw it as bad as Saint Croix where 9 daily maximum temperature records were either tied or broken.

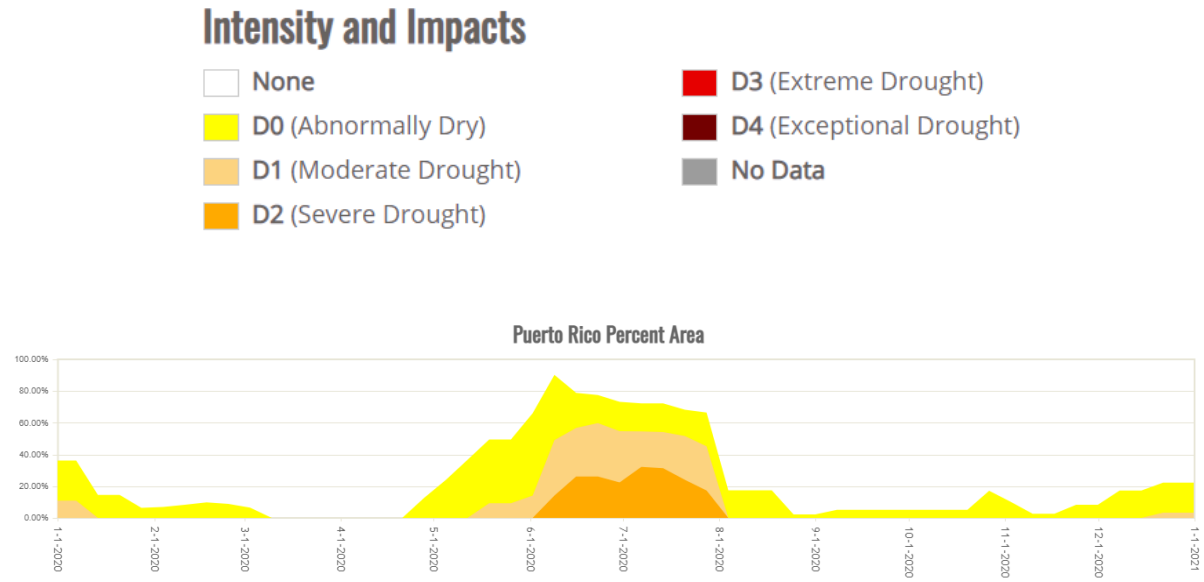


Figure 1. Percent Area of PR under U.S. Drought Monitor - Drought Categories 2020.

The month of August was also relatively dry, keeping the overall pattern of below normal rainfall across most areas in Puerto Rico, except the northwestern quadrant. However, the drought conditions improved slightly across Puerto Rico, leaving only a small portion of southeastern Puerto Rico with a D0 classification by the end of August. Across the U.S. Virgin Islands, Saint Croix did observe higher than normal rainfall, which helped the drought conditions, but by the end of the month all 3 islands still had the D1 classification. Tropical Storm Laura affected the local islands on the 22nd and 23rd of the month, leaving between 2 and 5 inches of rain across the eastern and southern sections of Puerto Rico as well as over Saint Croix, but an inch of rain or less was observed elsewhere.

During the early fall months, normally fairly rainy, we observed the typical increase in available moisture, upper troughs, and tropical waves, all of which enhanced rainfall and thunderstorm development over Puerto Rico this fall. Generally speaking, this fall had near normal temperatures in Puerto Rico, and also near normal rainfall but mainly along the coastal areas. Eastern Puerto Rico received much above normal rainfall, but below normal rainfall was observed across portions of the interior and isolated areas elsewhere. This is the reason why the drought monitor increased the coverage of D0 into portions of the interior of Puerto Rico by the end of the fall. The U.S. Virgin Islands were split in what they observed, the northern islands observed slightly above normal rainfall and near normal temperatures, while Saint Croix observed above normal temperatures and below normal rainfall. By the end of the fall months, the northern islands had no drought classification, but Saint Croix still had a D0 classification.

September was a month with below normal rainfall and above normal temperatures across most areas of the local islands, including all 3 of the main climate sites. In terms of temperatures, the month of September had most of the highest daily maximum temperatures of the year. A few

temperature records were broken at JSJ and one in ISX, while several of the local COOP stations also observed their highest temperatures of the year in September, with September 18th being a particularly hot day across the island. October was another month with unimpressive amounts of rainfall compared to normal, with the exception of some areas of eastern and western Puerto Rico. The U.S. Virgin Islands observed below normal rainfall, approximately 60% to 80% of normal with Saint Croix in the lower end of that range. Temperatures were also above normal for the local islands, though most significantly in Saint Croix by having the 3rd warmest October on Record. November was not much different for Saint Croix, they once again observed below normal rainfall and above normal temperatures, which caused the drought monitor to keep the D0 classification. However, eastern and a few areas of western Puerto Rico as well as the northern U.S. Virgin Islands observed higher than normal rainfall and near normal temperatures. The main rain producer was a multi-day wet spell that affected eastern Puerto Rico and the northern U.S. Virgin Islands on November 8th - 11th. This rainfall event was due to a plume of deep moisture being pulled by then Tropical Storm Eta. The rainfall event left over 5 inches of rain in that period at JSJ and IST, but it left over 10 inches of rain across southeastern Puerto Rico. However, the interior of Puerto Rico observed below normal rainfall, causing the drought monitor to keep the D0 classification and even expanding on it over that area by the end of the month.

For rainfall accumulation and percent of normal per climate division visit:
https://www.weather.gov/media/sju/climo/stats/2020.pdf

The local islands ended the year with mean temperatures warmer than the 30-year average from the National Centers for Environmental Information (NCEI). This pattern of above normal temperatures was observed across most of the Caribbean region (Fig 2). The mean annual temperature at JSJ was 81.9ºF, which is approximately 0.9ºF warmer than normal. Saint Thomas observed an annual mean temperature of 82.4ºF and Saint Croix of 82.1ºF, which is 0.8ºF and 1.1ºF above normal respectively.

Across our COOP sites, the highest daily temperature was 100ºF, observed at the Aguirre station on September 18th, and the lowest temperature was 48ºF at the Toro Negro station on January 28th. The highest temperatures across the main climate sites were 95ºF on May 24th, September 22nd, and September 23rd at JSJ; 94ºF was the highest temperature at IST, observed 7 times with the latest day of occurrence being September 2nd; ISX observed 95ºF on August 17th and 18th. The lowest temperatures observed across the main climate sites were 70ºF on February 27th , March 20th, and March 26th at JSJ; 70ºF also on March 26th at IST; and 67ºF at ISX on February 23th and 24th.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Observed	4.88	4.12	7.65	2.44	3.77	5.19	11.00	5.22	7.27	7.70	9.02	3.00
Normal	3.33	2.60	2.86	4.68	6.98	4.53	5.01	6.01	7.81	7.94	6.69	4.06
% PON per month	**147**	**158**	**267**	**52**	**54**	**115**	**220**	**87**	**93**	**97**	**135**	**74**
Accumulated	4.77	9.00	16.65	19.09	22.86	28.05	39.05	44.27	51.54	59.24	68.26	71.26
Normal accumulation	3.33	5.93	8.79	13.47	20.45	24.98	29.99	36.00	43.81	51.75	58.44	62.50
% PON accumulated	**147**	**152**	**189**	**142**	**112**	**112**	**130**	**123**	**118**	**114**	**117**	**114**

Table 1. 2020 Rainfall Totals and Percent of Normal (PON) across Puerto Rico based on COOP

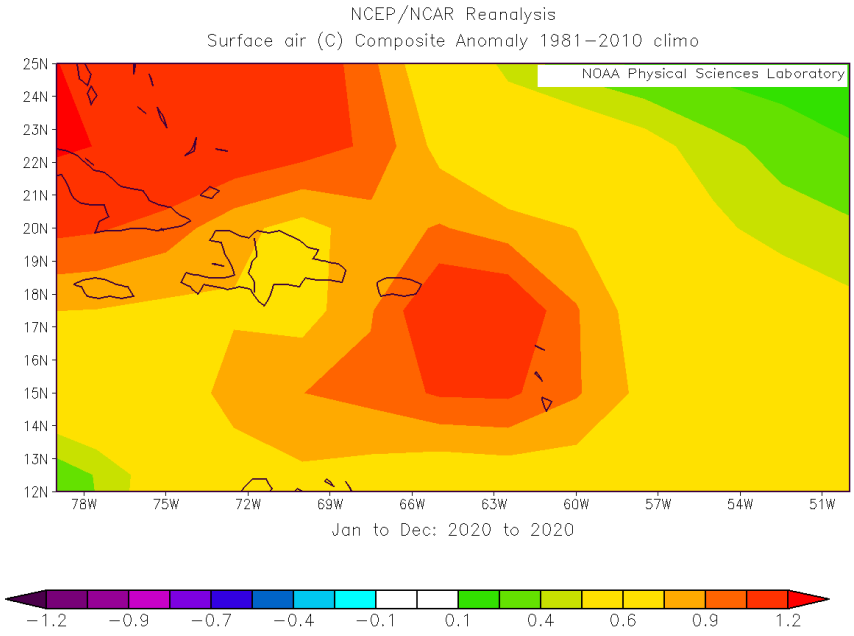


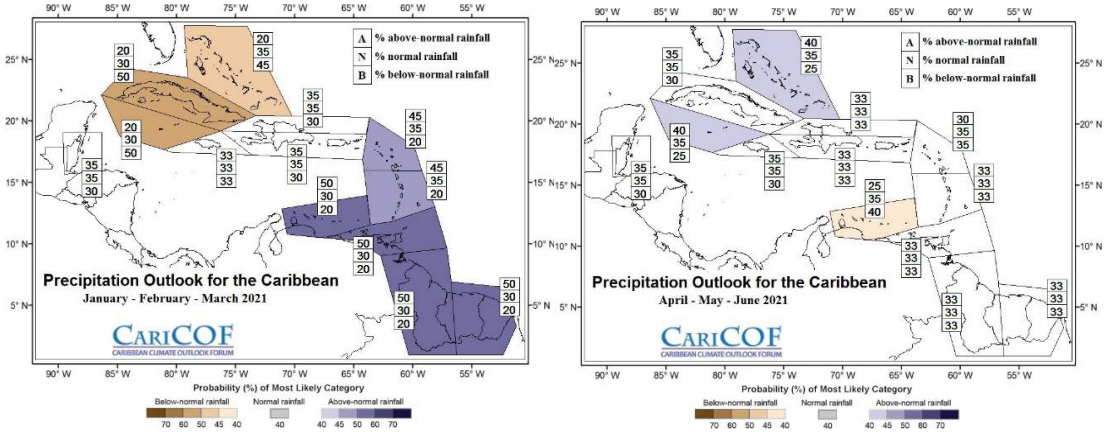
Figure 2. Surface Air Temperature Anomaly for the Caribbean from Jan 1st 2020 through Dec 31st 2020.

With respect to rainfall at the main climate sites; 124, 92, 78 percent of the normal rainfall was observed at Luis Muñoz Marin Airport **(JSJ)** in San Juan, Cyril E. King Airport **(IST)** in Saint Thomas, and Henry E Rohlsen Airport **(ISX)** in Saint Croix, respectively. A preliminary rainfall total of 69.88 inches was measured at TJSJ, which is 13.53 inches above normal; Saint Thomas observed 36.20 inches of rain, which is 3.14 inches below normal; and Saint Croix observed 30.31 inches of rain, which is 8.36 inches below normal. That said, the Saint Thomas Airport reported missing data late in the month of May, and about 1.55 inches of rain was estimated by radar in that time period that is not reported, so the actual rainfall total at the Saint Thomas Airport may be closer to 37.55 inches of rain.

Looking Ahead

Below average Sea Surface Temperatures (SSTs) were recently observed across the El Niño region of the Pacific, exhibiting moderate La Niña conditions. Most models strongly suggest for La Niña conditions to continue through March, and possibly observing ENSO-Neutral (neither El Niño or La Niña) for the months of April-May-June. Near normal rainfall is expected in the first half of 2021, but the forecast slightly favors mean temperatures below normal. SSTs across the Caribbean are expected to be from near normal to slightly above normal during the first half of 2021.

More Info: http://rcc.cimh.edu.bb/long-range-forecasts/caricof-climate-outlooks/



Images 1 and 2. CariCOF precipitation forecast for Jan-Feb-Mar and Apr-May-Jun

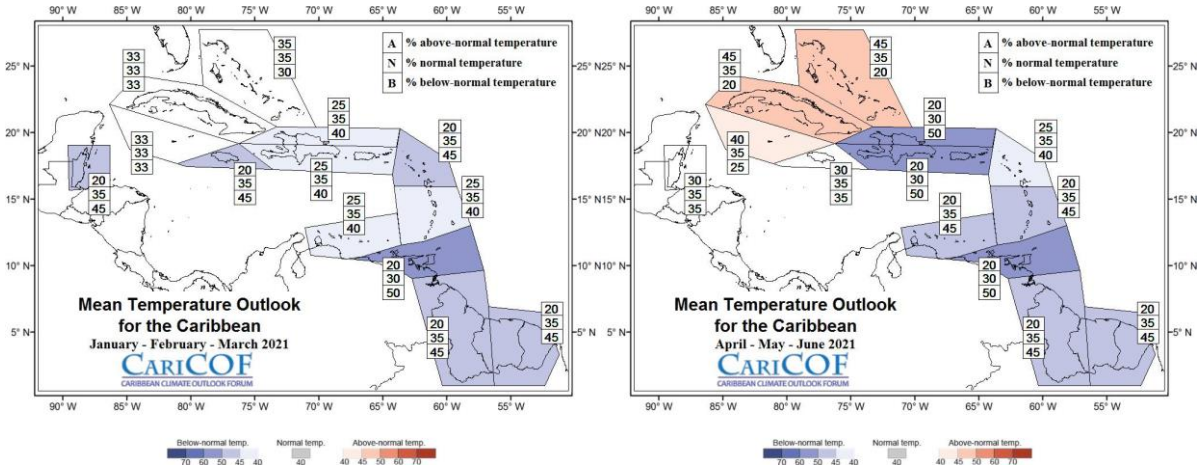


Image 3 and 4. CariCOF mean temperature forecast for Jan-Feb-Mar and Apr-May-Jun

Highlights for Primary Climatological Data Sites

1. There were a total of 48 days (nights) with a minimum temperature of 80ºF or above at the **Luis Muñoz Marin Airport** in 2020. This ranks as the 3rd highest number of "80ºF or above" minimum temperature days on record**.**

Rank	Year	Number of days
1st	2009	59
2nd	2017	54
3rd	2020	48

2. There were a total of 115 days (nights) with a minimum temperature of 80ºF or above at the **Cyril E. King** airport in **Saint Thomas**. This ranks as the 2nd highest number of "80ºF or above" minimum temperature days on record.

Rank	Year	Number of days
1st	2016	116
2nd	2020	115
3rd	2010	106
4th	2015	94

3. There were a total of 68 days (nights) with a minimum temperature of 80ºF or above at the **Henry E. Rohlsen** airport in **Saint Croix**. This ranks as the 4th highest number of "80ºF or above" minimum temperature days on record.

Rank	Year	Number of days
1st	1987	144
2nd	1986	104
3rd	1980	75
4th	2020	68

4. Longest streak of consecutive days with Maximum Temperature of 90ºF or higher at the **Henry E. Rohlsen Airport in Saint Croix.**

Rank	Year	Number of Consecutive Days With Temperature of 90ºF or Higher
1st	August 10th - September 25th 1997	47
2nd	August 9th - September 20th 1988	43
3rd	June 10th - July 16st 2020	37
4th	June 24th - July 28th 1974	35
5th	July 1st – August 1st 2014	32

2020 Monthly & Seasonal Highlights for Primary Climatological Data Sites

	Dec (2019)	Jan	Feb	Season
JSJ	1st warmest 81.5ºF	3rd warmest 79.4ºF 4th wettest 9.08"	1st wettest 8.23" 3rd warmest 79.7ºF	1st warmest 80.2ºF 5th wettest 23.09"
IST	3rd warmest 81.2ºF 7th wettest 4.93"	10th wettest 3.17"	8th warmest 79.5ºF	6th wettest 9.99" 6th warmest 79.8ºF
ISX	2nd warmest 81.2ºF	9th warmest 78.8ºF	7th warmest 79.2ºF	3rd warmest 79.7ºF

Table 4. Winter 2019-20

	Mar	Apr	May	Season
JSJ	8th wettest 4.95”	4th warmest 81.5ºF	1st warmest 84.1ºF	6th warmest 81.1ºF
IST	---	7th driest 0.92” 8th warmest 81.6ºF	7th warmest 83.2ºF	7th warmest 81.3ºF
ISX	4th wettest 3.76	9th driest 0.61”	2nd warmest 84.0ºF 7th driest 0.56”	6th warmest 81.1ºF

Table 5. Spring 2020

	Jun	Jul	Aug	Season
JSJ	5th warmest 84.6ºF	5th warmest 84.4ºF 8th wettest 10.42”	2nd warmest 84.6ºF	2nd warmest 84.5ºF
IST	6th warmest 85.5ºF	7th warmest 85.3ºF	3rd warmest 85.7ºF 8th driest 1.81”	5th warmest 85.5ºF
ISX	1st warmest 85.6ºF	3rd warmest 85.2ºF	2nd warmest 85.9ºF	2nd warmest 85.6ºF

Table 6. Summer 2020

	Sep	Oct	Nov	Season
JSJ	---	---	---	---
IST	4th warmest 85.1ºF	---	8th wettest 8.77”	9th warmest 83.2ºF
ISX	6th warmest 84.2º	3rd warmest 83.7ºF	10th warmest 81.6ºF	4th warmest 83.2ºF

Table 7. Fall 2020

	Dec (2020)	2020 Year-End
JSJ	---	5th warmest 81.9ºF
IST	8th driest 1.44”	4th warmest 82.4ºF
ISX	---	2nd warmest 82.1ºF

Table 8. December 2020 and Year-End 2020 Highlights

Additional Highlights Based on COOP Data

Wettest Days

Station	Rainfall	Date
San Lorenzo 3 S	8.93”	July 30th 2020
Magueyes Island	8.65”	November 11th 2020
Palma Sola	8.56”	July 30th 2020
Trujillo Alto 2 SSW	8.41”	July 31st 2020
Corral Viejo	6.75”	July 31st 2020

Stations with The Highest Daytime Temperatures

Station	Station’s Highest Temperature (ºF)	Date
Aguirre	100	September 18th 2020
Ponce 4E	97	September 18th 2020
Lajas Substation	96	June 28th 2020
Dos Bocas	96	August 22nd 2020
Guayama 2E	96	September 18th 2020

Stations with The Lowest Nighttime Temperatures

Station	Station’s Lowest Temperature (ºF)	Date
Toro Negro Forest	48	January 28th 2020
Adjuntas Substation	54	December 6th 2020
Maricao 2 SSW	57	March 17th 2020
Arecibo Observatory	59	March 27th 2020
Ponce 4E	60	February 27th 2020

Data are preliminary and have not undergone final quality control by the National Centers for Environmental Information / NCEI/. Therefore, these data are subject to revision.

Maps with radar estimated rainfall and rainfall deficits.