

CLIMATOLOGICAL SUMMARY 2021

&

~ Hurricane Season Review ~

2021 Dry Season



Oct. 2021 Hazy Day



METEOROLOGICAL DEPARTMENT ST. MAARTEN

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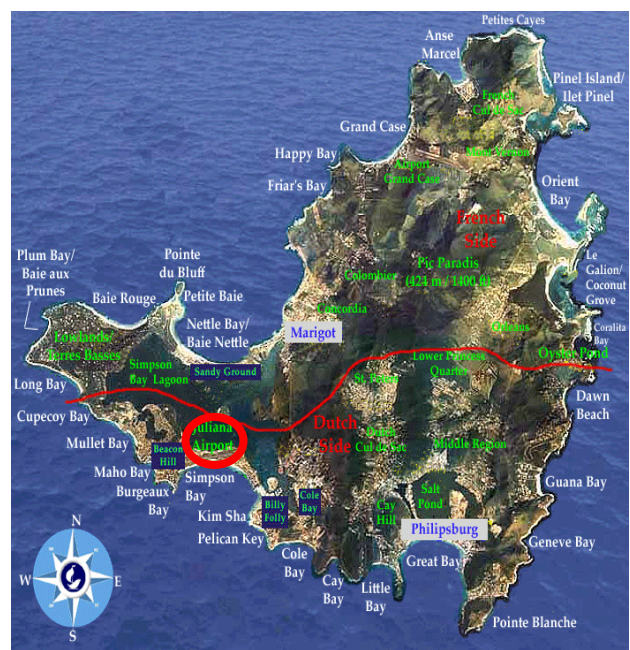
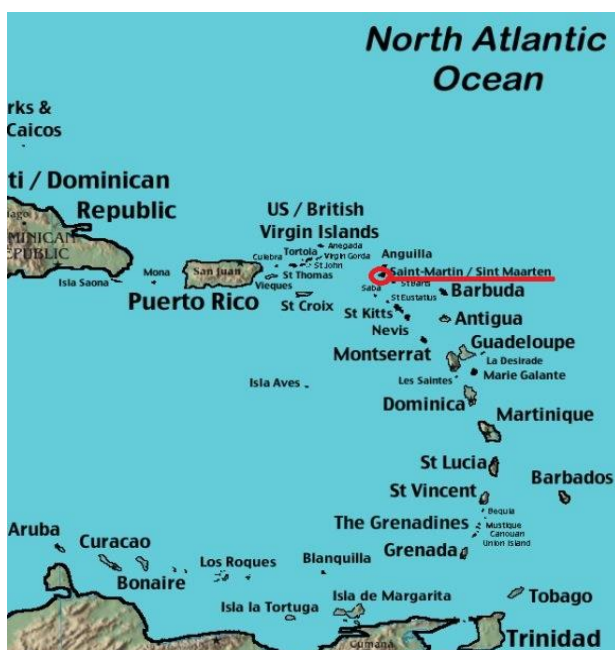
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Introduction

The country of Sint Maarten is located in the extreme northeast section of the Eastern Caribbean. It is part of an island which is approximately 37 square miles shared by two countries: French St. Martin to the north and Dutch Sint Maarten to the south, they occupy 21 and 16 square mile respectively. The island is relatively flat but has a central range with various peaks. Pic Paradis on the French side is the highest point (1400ft) on the island while Sentry Hill is the highest point on the Dutch side (1100ft).



The Princess Juliana International Airport (PJIA) is located on the southwestern strip of Sint Maarten at latitude 18.02° north and longitude 63.06° west.

ISLAND CLIMATOLOGY

Based on records (1991-2020) at Princess Juliana International Airport (PJIA), the normal annual rainfall is approximately 1112mm or 44 inches. Like many other Caribbean islands, the driest months are from January to June while the wettest months are from July to November. December, May and June are considered transition-months since they can be either dry or wet.

The driest month on record is March while the wettest is November. On average, there are about 140 rain days a year with March and April having the least (8 days) August and November have the most (14 days).

Rainfall during December to April is mainly as a result of old frontal boundaries or shear lines, dipping southwards from the northeast coast of the United States while the rainfall during May and June are often associated with upper-level trough interactions and from July onwards, rainfall is mostly associated with tropical cyclone activity.

The average daily temperature is 27 °C or 81 °F, the normal maximum and minimum temperatures are 32 °C and 23 °C respectively. August and September are the warmest months while February is the coolest.

On average St. Maarten receives approximately 250 hours of sunshine monthly with 8 to 10 hours daily. The months with the most sunshine hours are March and April and the least hours are recorded in November.



ABOUT US

The Meteorological Department of St. Maarten (MDS) — most commonly referred to as the Met. Office — is a scientific organization that operates 24 hours a day, all year round, monitoring and continuously keeping watch of the weather conditions across the island.



OUR MISSION

Our aim is to “Protect life and property through the issuance of timely and appropriate weather products for the adjacent waters, air space and the general public and to provide meteorological, hydrological and seismological related services to specific sectors, in order to sustain social and economic developments.”



OUR VISION

The vision of the Meteorological Department of St. Maarten is to be a leading weather service provider collaborating with stakeholders to deliver services of high quality and accuracy.



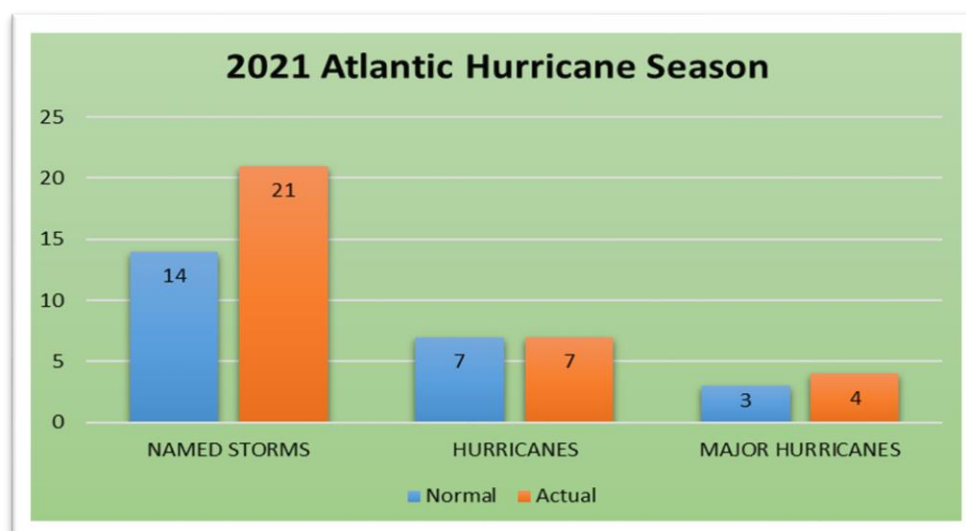
2021 Hurricane Season Summary

The 2021 Atlantic hurricane season officially ended on November 30. There were twenty-one (21) named storms, of which seven (7) became hurricanes including four (4) major hurricanes. This was the third most active year on record in terms of named storms, the sixth consecutive year with above normal hurricane activity and it was the first time on record that two consecutive seasons exhausted the list of named storms (21)

The season started in May with tropical storm Ana that formed just northeast of Bermuda on May 22. This was the seventh consecutive year with tropical storm activity beginning before the official June 1st start of the hurricane season. Three (3) storms developed in June and one (1) in July, which became the first hurricane of the season. As expected activity intensified in August with six (6) storms, three of which reached hurricane status. September was definitely the month to remember as it produced nine (9) named storms, three (3) became hurricanes. The season ended early with the final storm of the season forming on October 30.

This activity was attributed to the Atlantic Multi-Decadal Oscillation (AMO) —, which began in 1995 that has favored more, stronger, and longer-lasting storms. The AMO is thought to be driven by a combination of internal climate variability and changes over time in small airborne particles, often referred to as aerosols, over the North Atlantic. Additionally, the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report, released in August 2021, projects with high confidence that the global proportion of tropical cyclones that reach very intense (category 4-5) levels, along with their peak winds and rainfall rates, are expected to increase with climate warming at the global scale.

The 2021 Atlantic Hurricane season may have officially ended, however it is still possible for storms to form outside the season. Therefore, we must remain vigilant and prepared to take the necessary action when called upon. Monitor weather information from credible sources and remember it does not have to be a storm or hurricane; heavy rainfall events can also have significant impacts on our lives.



Local Weather Effects

The 2021 Atlantic Hurricane season had no significant impact on the island of St. Maarten. A tropical storm watch was issued for the island on August 13 as Tropical storm Grace approached the region. The watch was upgraded to a warning the following day and cancelled on August 15 2021. Tropical Storm Grace passed approximately 100 miles south of St. Maarten.

Other notable weather impacts occurred in 2021:

Heat waves

The Caribbean hot season is from June to October. Based on data (1991-2020) St. Maarten experiences approximately thirty-nine (39) hot days (days with Max. temp. above 32.2°C/90°F). In 2021, there were 51 hot days during that period; this was more than 130%. There were six (6) heat wave periods; a heat wave period is considered: two (2) or more consecutive days when the maximum temperature is above 32.2°C (90°F). The longest heat wave was eighteen (18) days from September 22 to October 9. There were 21 hot days in September compared to 23 in 2020. Meanwhile there were 14 hot days in October the highest number in October since 2001. September 2021 was the warmest month of the year with a maximum temperature of 34.1°C (94°F) recorded on September 7.

Summary Table

Below is a recap of the 2021 Atlantic Hurricane Season and associated effects on St. Maarten.

	Storm Name	Active Dates	Highest Category	Min. Pressure	Max. Winds		Local Effects	Observed Rainfall (mm)	Observed Winds Gusts	
				mbs	Kt.	Mph			Kt.	Mph
1	Ana	May 22-23	TS	1004	50	58		-	-	-
2	Bill	Jun. 14-16	TS	992	55	63		-	-	-
3	Claudette	Jun. 19-22	TS	1003	40	46		-	-	-
4	Danny	Jun. 28-29	TS	1009	40	46		-	-	-
5	*Elsa	Jul. 1-9	H					-	-	-
6	Fred	Aug. 10-18	TS	991	55	63		-	-	-
7	*Grace	Aug. 14-21	MH					-	-	-
8	*Henri	Aug. 16-23	H					-	-	-
9	*Ida	Aug. 26-Sept. 1	MH					-	-	-
10	Julian	Aug. 29-30	TS	993	50	58		-	-	-
11	Kate	Aug. 30-Sept. 1	TS	1004	40	46		-	-	-
12	Larry	Sept. 1-31	MH	953	110	127		-	-	-
13	*Mindy	Sept. 8-10	TS					-	-	-
14	*Nicholas	Sept. 12-16	H					-	-	-
15	Odette	Sept. 17-18	ETS	989	55	63		-	-	-
16	Peter	Sept. 19-23	TS	1005	45	52		-	-	-
17	*Rose	Sept. 19-23	TS					-	-	-
18	*Sam	Sept. 23-Oct. 5	MH					-	-	-
19	Teresa	Sept. 24-25	STS	1008	40	46		-	-	-
20	Victor	Sept. 29-Oct. 4	TS	997	55	63		-	-	-
21	*Wanda	Oct. 30-Nov. 7	STS					-	-	-

* denotes NOAA analysis is incomplete'

Overview of the Storms formed in the 2021 Hurricane Season

May 2021

Tropical storm Ana, the first storm of the 2021 season formed on May 22 northeast of Bermuda.

This was the seventh consecutive year that tropical storm activity started prior to June 1.

June 2021

Three (3) tropical storms formed in the month of June. Tropical Storm Bill formed on June 14 along the eastern coast of the United States and became extratropical the following day. Tropical

Storm Claudette formed on June 19 in the Gulf of Mexico and tropical storm Danny formed on June 28 along the eastern coast of the US.

July 2021

One (1) tropical storm formed in the month of July. Tropical Storm Elsa formed on July 1 east of the Lesser Antilles and became a hurricane on July 2 west of Barbados. Elsa accounted for heavy rainfall and structural damage in Barbados and the southern Windward Islands. Elsa was the first hurricane of the 2021 season.

August 2021

There were six (6) named storms in the month of August, three (3) of which became hurricanes. Tropical storm Fred formed South of Puerto Rico on August 10, Grace, Henri and Ida all became hurricanes and during the last few days of August, tropical storms Julian and Kate formed in the NW Atlantic and northeast of the Leeward Islands respectively.

September 2021

The month of September was as busy as September 2020 producing nine (9) named storms, three (3) of which became hurricanes.

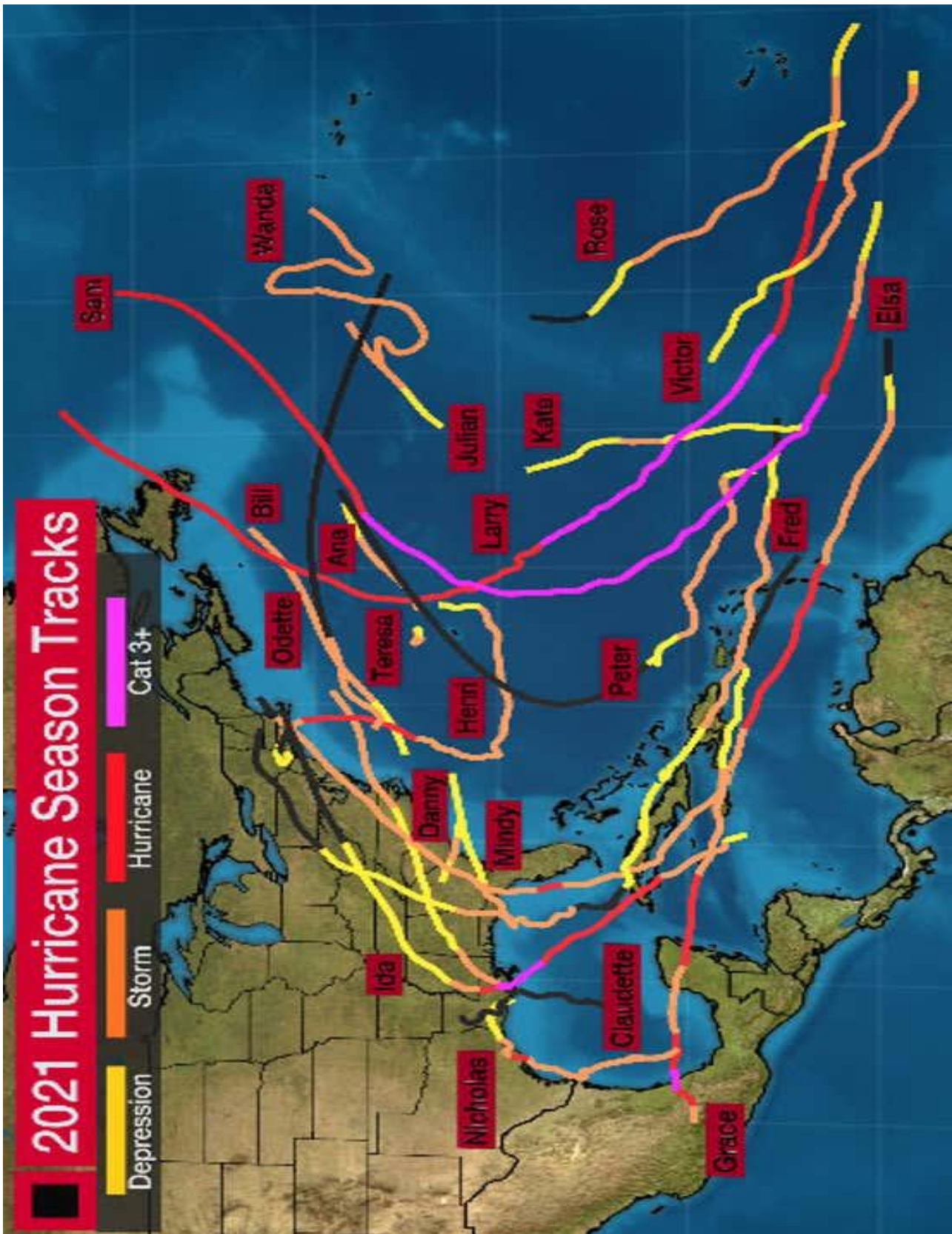
October 2021

October only produced one (1) named storm; Wanda which formed in the north Atlantic on October 30th. This was a very quiet October.

November 2021

There was no storm formation in November of 2021.

2021 Atlantic Hurricane Season Storm Track



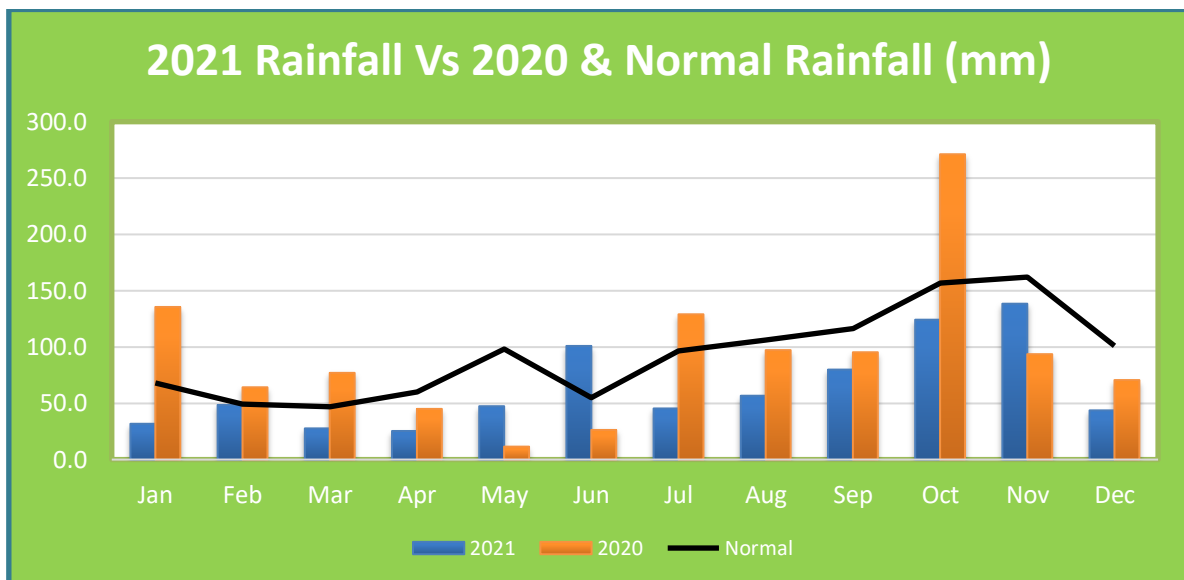
Map compliments "The Weather Channel"

2021 Climate Data

Rainfall

The total rainfall recorded at the Princess Juliana International Airport, for the year 2021 was **770.0 mm or 30.3 inches**. The normal annual rainfall ranges from about 976–1246 mm/38 – 49 inches (1991–2020). This year’s total rainfall was below the normal range by approximately 31%. The year 2021, was the driest since 2015 and the seventh consecutive year with below normal rainfall.

Fig. 1

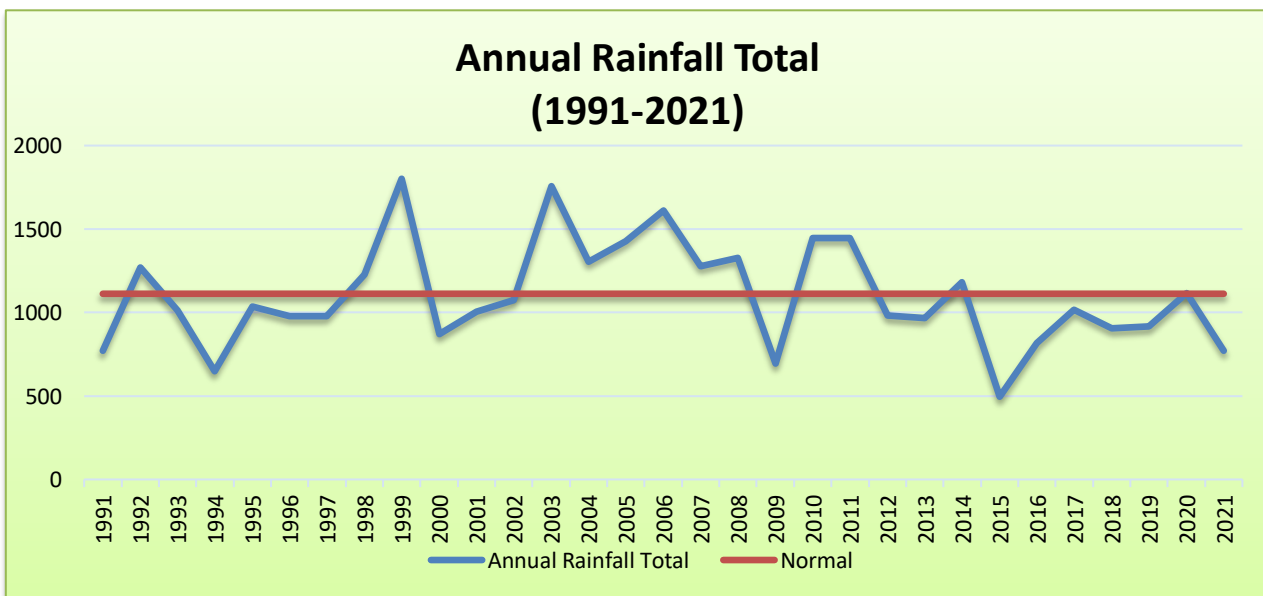
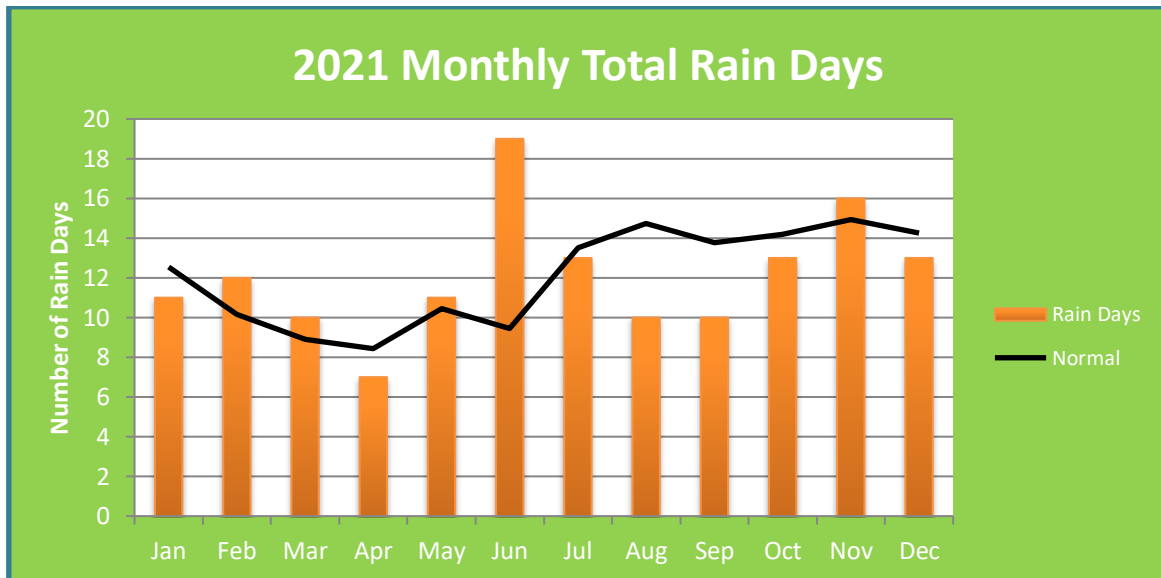


November was the *wettest month* of the year, with a total of 138.4 mm or 5.4 inches. The *driest month* was **April** with 25.4 mm or 1.0 inches. The *wettest day* of the year was **October 12th**, when 44.9 mm or 1.8 inches of rainfall was recorded during the passage of a tropical wave which produced 36.7mm/1.4 inches in a 12-hour period.

A rain day is considered as any day, which records 1.0 mm or more of rainfall. On average there are approximately 140 rain days in a year on St. Maarten. For 2021, 145 rain days were recorded with the month of June having the most (19 days), the highest for any June on record while April had the least days (7).

June 2021 was the wettest June since 2010 while December 2021 was the driest December since 2012.

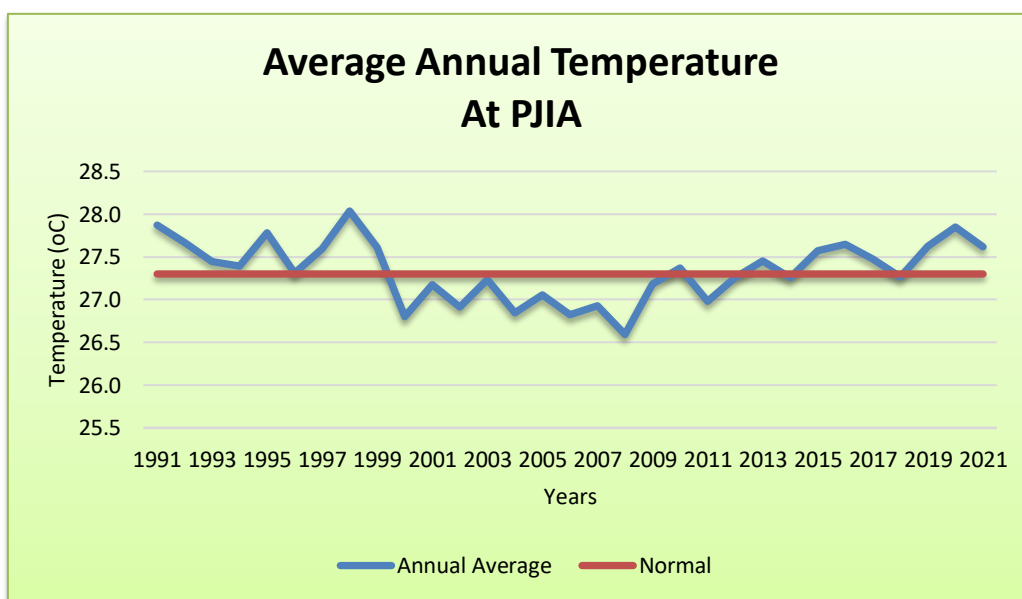
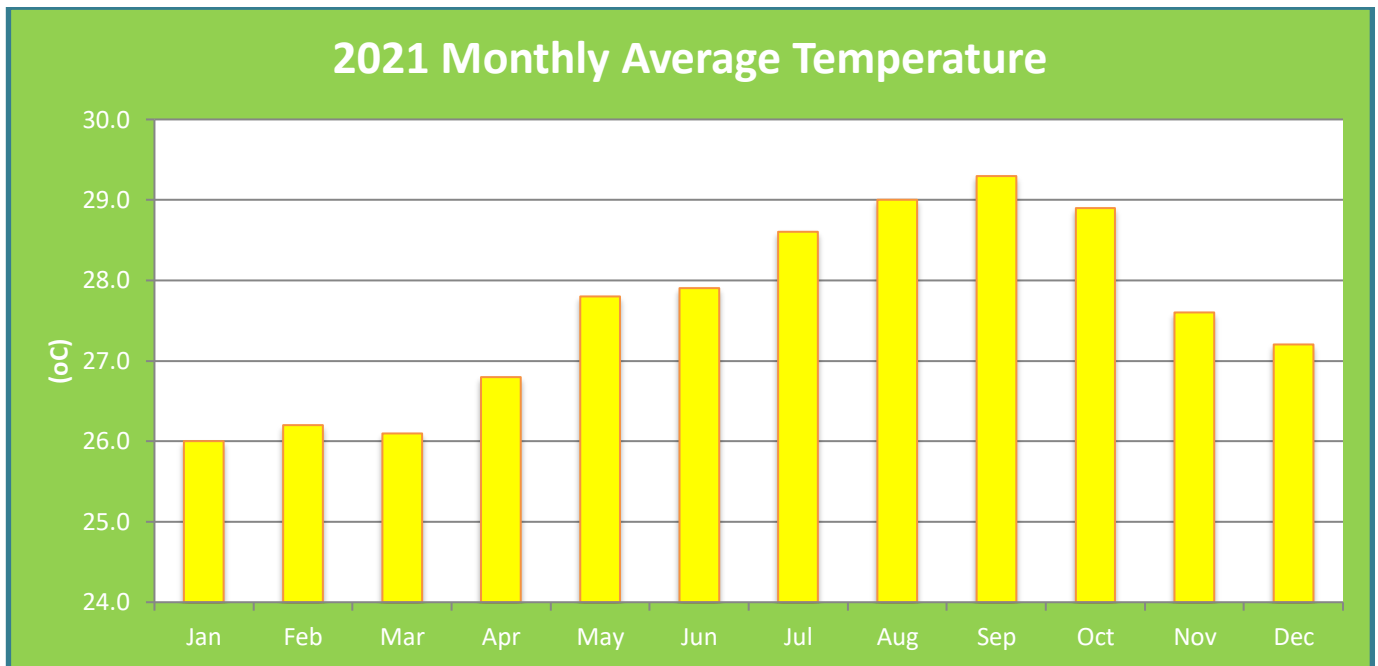
Fig. 2



Temperature

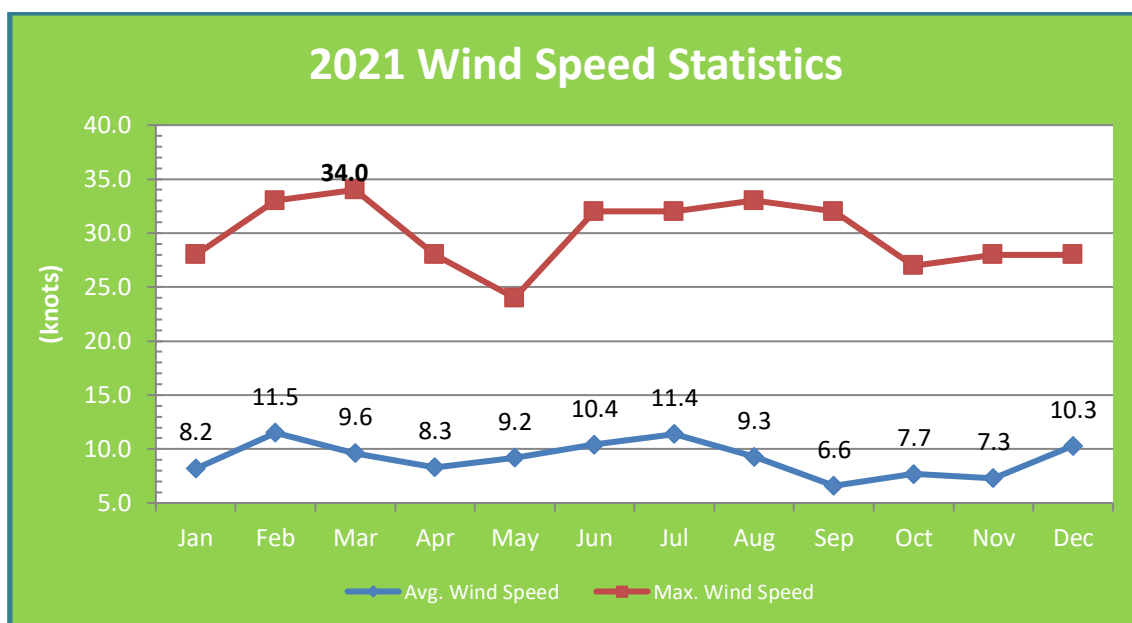
The average temperature recorded in 2021 was **27.6° C (82° F)** which was above-normal. The 30-year normal (1991–2020) is 27.3° C. **September** was the warmest month with an average temperature of 29.5° C (85° F) while **January** was the coolest month with an average temperature of 26.0° C (79° F). 2021 was cooler than 2020 and near normal to above normal for the past ten (10) years.

The highest daytime *temperature* recorded in 2021 was **34.1° C (94° F)** which was recorded on September 7th while the lowest night-time *temperature* was recorded on January 20th as **21.3° C (70° F)**.



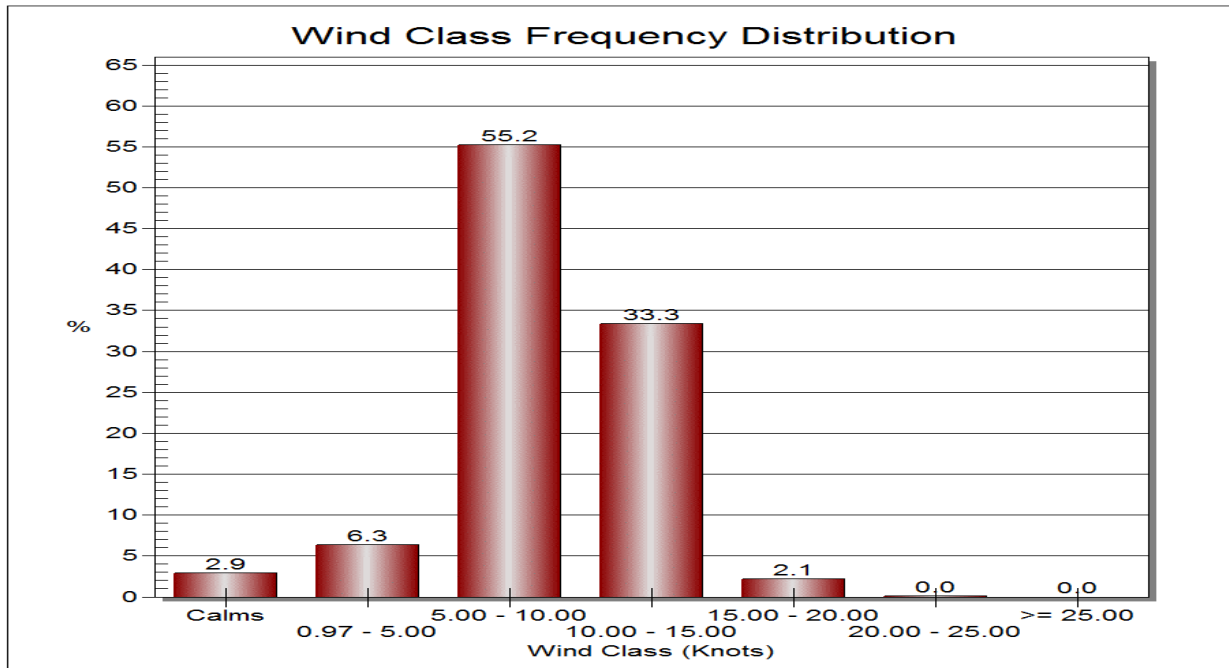
Wind

Surface winds at the Princess Juliana International Airport for 2021 were generally from the east at an average speed of **9 knots** (10 mph) which was slightly above the average compared to the 30–year average (1991–2020) of 10kt. The *highest monthly average wind speeds were recorded in **February*** as 12 knots (14 mph); while **September** had the *lowest monthly average wind speeds* of 7 knots (8 mph). The highest wind gust was recorded on March 31st as **34 knots** (39 mph)

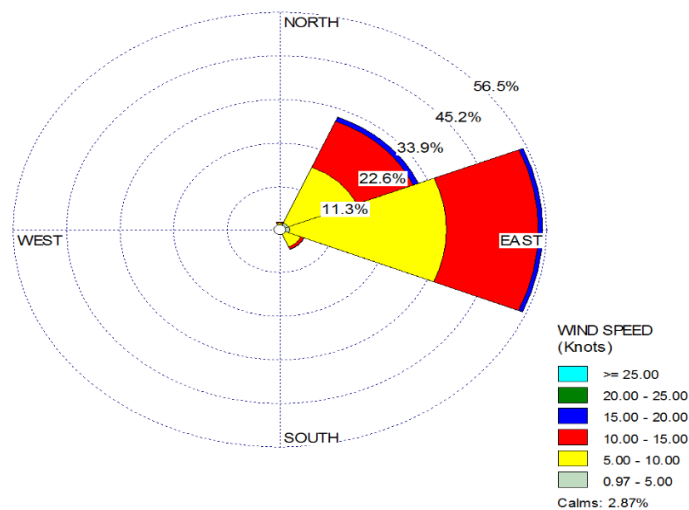


This following wind analysis was obtained, by using the average hourly wind speeds and direction from 1st January to 31st December 2021.

- Approximately 55% of the time, wind speeds at Juliana were between 5 and 10 knots.
- Approximately 33% of the time, wind speeds were between 10 and 15 knots.
- Approximately 6% of the time, wind speeds were between 1 and 5 knots.
- Approximately 3% of the time, winds were calm.
- Approximately 2% of the time, winds speeds were between 15 and 20 knots.
- Approximately 1% of the time, winds speeds were greater than 20 knots.



2021 Wind Rose



56% of the time winds came from the **East**.

32% of the time winds came from the **Northeast**.

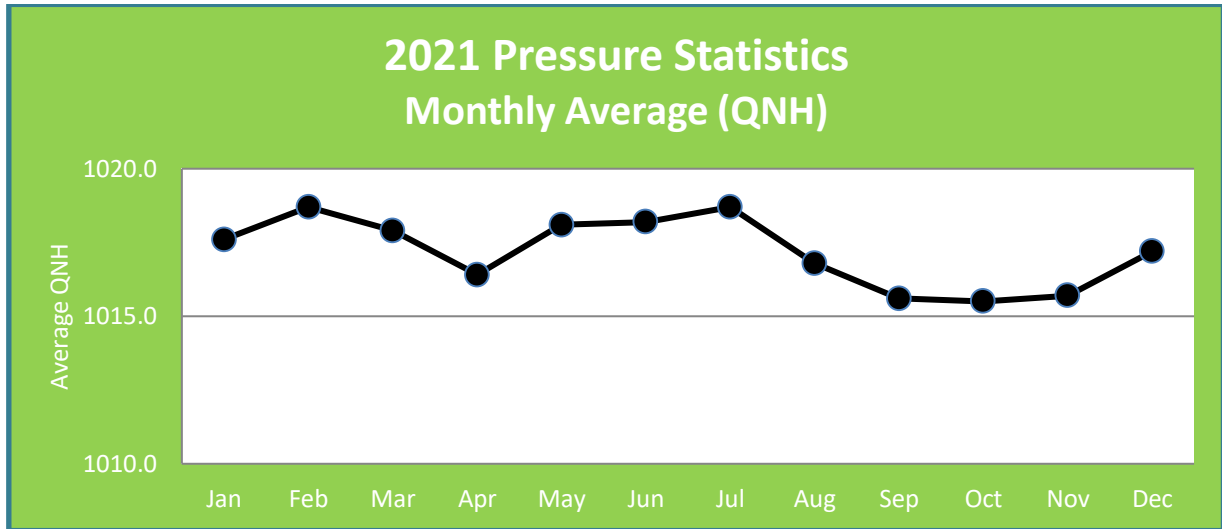
6% of the time winds came from **Southeast**.

3% of the time winds were calm.

Winds came from other directions 3% of the time or less.

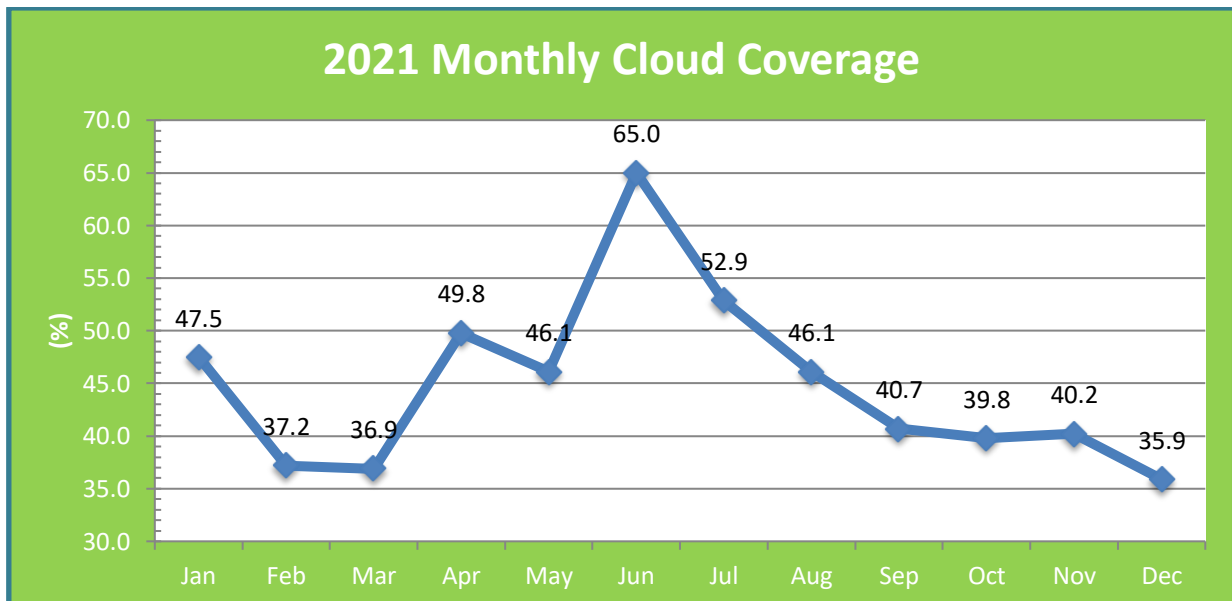
Air Pressure

At the Princess Juliana International Airport, on average the mean sea level Pressure for 2021 was **1017.2 millibars**. The highest daily average was recorded as **1020.2 mb** on several days in January and February while the lowest daily average of 1012.0 mb occurred on October 14th.



Cloud Cover

The average cloud cover for St. Maarten over the past year as recorded at the Princess Juliana International Airport was about 44.8%. The *highest monthly average cloud cover* was 65.0% during the month of June while December had the *lowest value* of 35.9%.

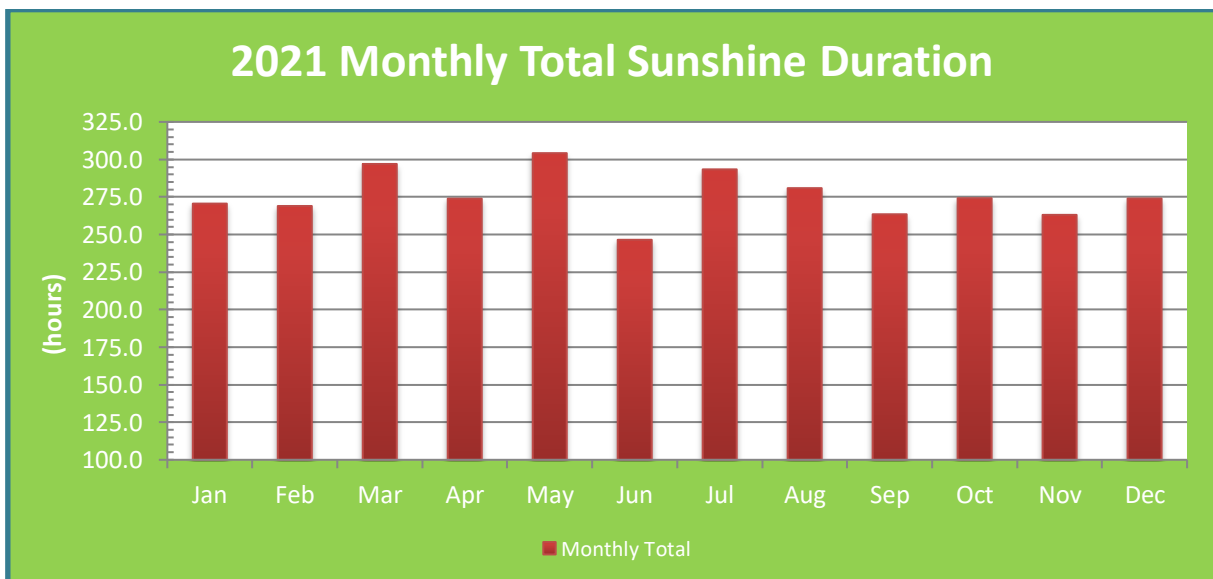
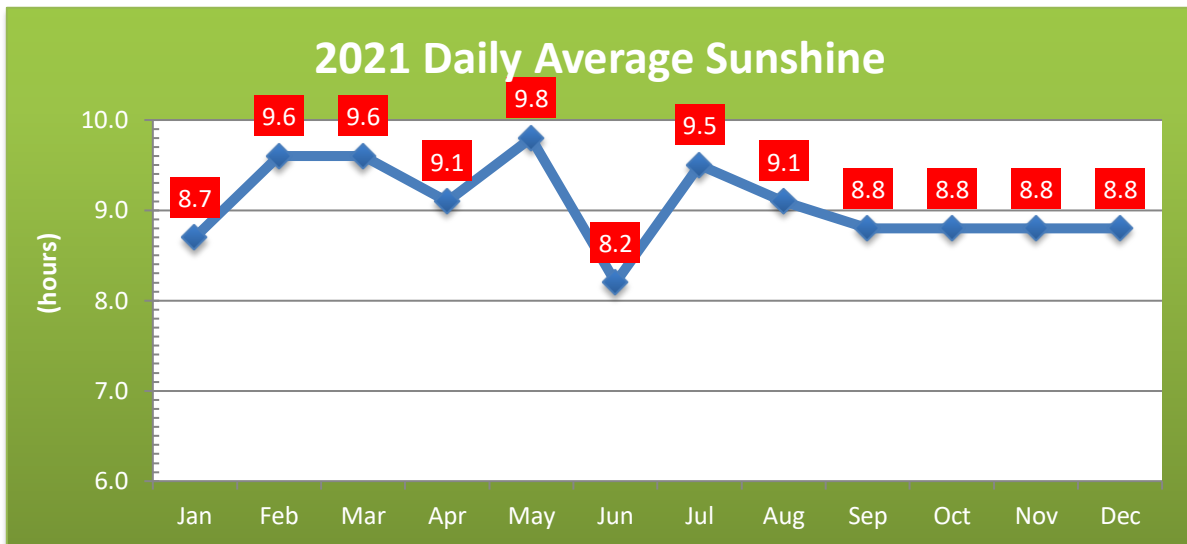


Sunshine Duration

Approximately 74% of possible sunshine was recorded at the surface at the Princess Juliana International Airport, that is, 3310.3 hours out of a possible 4443.1 hours. The *average daily sunshine duration* was **9 hours 42 minutes**.

May received the most hours of sunshine in 2021 and was the month with the highest daily average sunshine: 9 hours and 48 minutes. **June** received the least sunshine and was the month with the lowest daily average: 8 hours 12 minutes.

The day with the highest daily sunshine hours was **July 1st** with 12 hours. The day with the least sunshine in 2021 was **August 10th** when only 18 minutes of sunshine was recorded due to overcast conditions.



Statistical Summary

Below is a recap of the 2021 climate data, in terms of averages, extremes, and totals:

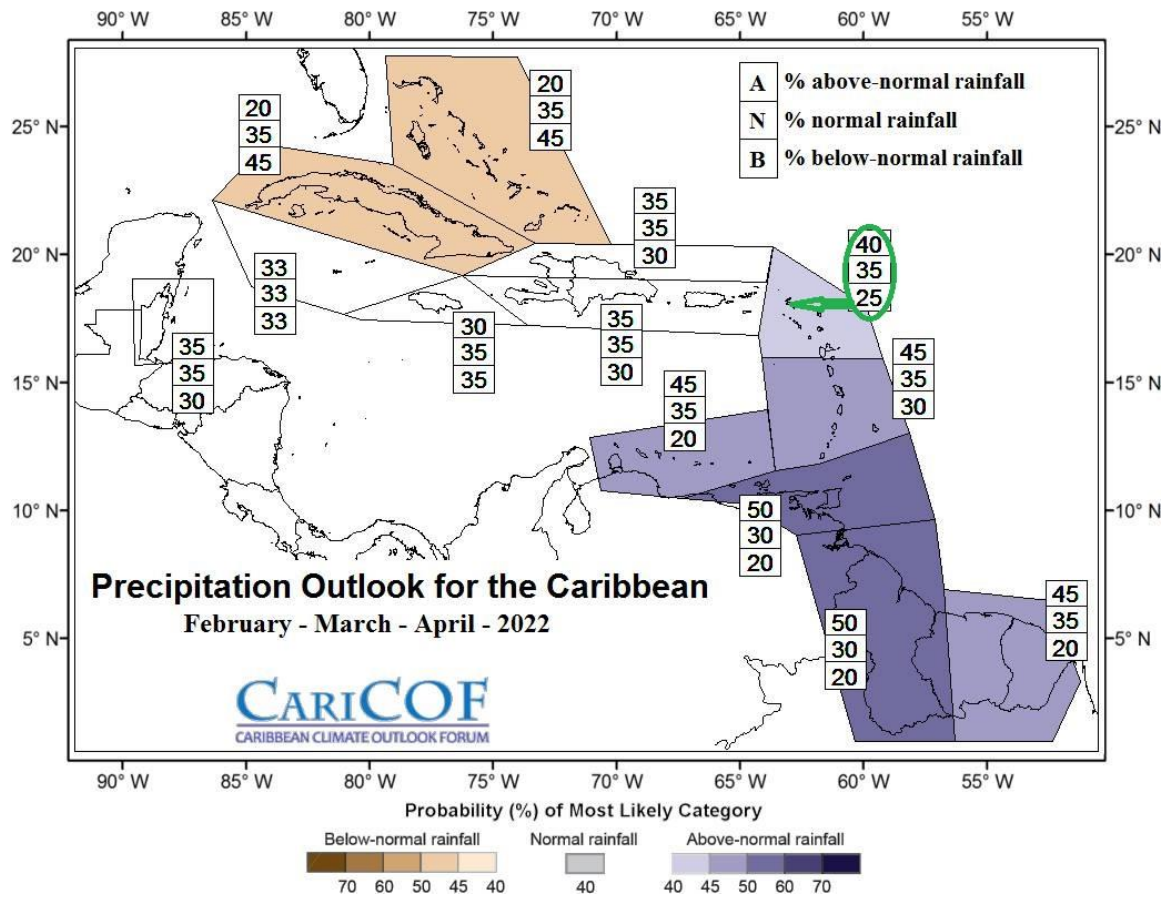
Rainfall		
Total Rainfall for the year	770.0 mm	30.3 inches
Wettest Month	138.4mm/5.4 in	November
Driest Month	25.4 mm/1.0 in	April
24-hr Maximum Rainfall	44.9 mm/1.8 in	October 12 th
Number of Rain Days (with 1.0+ mm)	145 days	
Number of Heavy Rain Days (with 10.0+mm)	16 days	
Temperature		
Average Air Temperature	27.6° C	82° F
Absolute Maximum Temperature	34.1° C/ 93° F	September 7 th
Absolute Minimum Temperature	21.3° C/ 70° F	February 20 th
Warmest Month	29.5° C/85° F	September
Coollest Months	26.0° C/79° F	January
Average Relative Humidity	73%	
Wind & Pressure		
Average Wind Speed	9.4 knots	10 mph
Average wind Direction	90 degrees	East
Maximum Wind Gust	March 31 st	34 kts /39 mph
Most frequent category speed	5-10 knots	55%
Average Air Pressure	1017.2 mb.	
Clouds & Sunshine		
Average Cloud Coverage	44.8%	
Average Daily Sunshine Duration	9 hours : 06 minutes	
Month: Maximum Sunshine	May	
Month: Minimum Sunshine	June	
Daily Maximum Sunshine	12 hrs. 00 min.	Jul. 1 st
Daily Minimum Sunshine	0 hrs. 18 min.	Aug. 10 th

Conclusion

This report provides a summary of all the meteorological data recorded at the Princess Juliana International Airport during the year 2021. The data was collected from various meteorological parameters under regulations stipulated by the World Meteorological Organization (WMO). These elements include rainfall, relative humidity, atmospheric pressure, wind speed and direction, cloud cover and sunshine duration among others.

The Meteorological Department St. Maarten (MDS) records and compiles climatological data for use in research in a number of fields and institutions. Records go as far back as the 1950's in certain parameters. Requests for data must be put in writing through the Department Head.

Outlook for 2022
Rainfall Outlook for Feb-Mar-Apr. 2022



Map compliments: CARICOF: [Caribbean Institute for Meteorology & Hydrology](#)

Rainfall for the next three (3) months Feb-Mar-Apr 2022 is expected to be the usual or wetter for St. Maarten and most of the eastern Caribbean but drier than usual in the western Caribbean.

Normal rainfall for this season ranges between 132–168 mm or 5-7 inches. Based on historical data, the current state of the weather and some subjective input, the rainfall forecast for the next three (3) months in St. Maarten is as follows: a **25%** chance of being **below Normal** (less than 132 mm); a **35%** chance of being **Near Normal** (between 132 mm and 168 mm); and a **40%** chance of being **Above Normal** (more than 168 mm).

Note that the green arrow points to St. Maarten and the forecast probabilities are circled in green on the map above.

List of Tropical Cyclone for the 2022 Atlantic Hurricane Season

ALEX	HERMINE	OWEN
BONNIE	IAN	PAULA
COLLIN	JULIA	RICHARD
DANIELLE	KARL	SHARY
EARL	LISA	TOBIAS
FIONA	MARTIN	VIRGINIE
GASTON	NICOLE	WALTER

BE PREPARED!!!

BE ALERT!!!

BE READY!!!

Be reminded that it only takes one storm to impact our island to make it an active season for us. Therefore, everyone should prepare for every season, regardless of how much activity is predicted.

Appendix

Stages of Tropical Cyclone Development

Below are the decisive factors (criteria) for the various development stages for tropical cyclones:

Stage	Criteria
<i>Tropical disturbance</i>	A discrete system of clouds, showers, and thunderstorms that originates in the tropics and maintains its identity for 24 hours or more.
<i>Tropical wave</i>	A type of trough of low pressure or tropical disturbance that moves generally from east to west, typically embedded in the tropical easterlies. They are also sometimes called easterly waves.
<i>Tropical Depression</i>	A tropical disturbance that has developed a closed circulation (counterclockwise winds blowing around a center of low pressure in the Northern Hemisphere). Tropical depressions contain maximum sustained (1-minute) winds of 38 mph (62 km/h or 33 knots) or less.
<i>Tropical Storm</i>	A well-organized warm-core tropical cyclone that has maximum sustained (1-minute) winds of 39-73 mph (63-118 km/h or 34-63 knots). Once a system reaches tropical storm status, it is given a name by the National Hurricane Center (located in Miami, Florida).
<i>Hurricane</i>	A warm-core tropical cyclone that has maximum sustained (1-minute) winds of at least 74 mph (119 km/h or 64 knots). Hurricanes are categorized by the Saffir-Simpson Scale. (<i>see next page</i>)
<i>Extra-tropical Cyclone</i>	A cyclone that is no longer tropical in origin, which usually means the system moves away from the tropics and moves toward the poles. An extra-tropical cyclone has no wind speed criteria and may exceed hurricane force.
<i>Subtropical Cyclone</i>	A closed circulation, low-pressure system that has characteristics of both tropical and extra-tropical cyclones. Subtropical cyclones typically have a radius of maximum winds occurring relatively far from the center (usually more than 60 nautical miles), and generally have a less symmetric wind field and distribution of convection (clouds and thunderstorms).
<i>Post-tropical Cyclone</i>	A former tropical cyclone that no longer possesses sufficient tropical characteristics to be considered a tropical cyclone. Post-tropical cyclones can, however, continue carrying heavy rains and high winds.

Saffir-Simpson Hurricane Scale

The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage.

	Category	Max. Sustained Winds			Effects
		mph	km/h	knots	
	1	74 - 95	119 - 153	64 - 82	Minimal Damage
	2	96 - 110	154 - 177	83 - 95	Moderate Damage
Major	3	111 - 129	178 - 208	96 - 112	Extensive Damage
	4	130 - 156	209 - 251	113 - 136	Extreme Damage
	5	157+	252+	137+	Catastrophic Damage

Watches & Warnings

Tropical Storm Watch

Issued when tropical storm conditions (sustained winds of 39-73mph, 63-118 km/h, or 34-63 knots) are possible within the specified area within the next 48 hours (2 days).

Tropical Storm Warning

Issued when tropical storm conditions (sustained winds of 39-73mph, 63-118 km/h, or 34-63 knots) are expected somewhere within the specified area within the next 36 hours (1.5 days).

Hurricane Watch

Issued when hurricane conditions (sustained winds of 74+ mph, 119+ km/h, or 64+ knots) are possible within the specified area within the next 48 hours (2 days).

Hurricane Warning

Issued when hurricane conditions (sustained winds of 74+ mph, 119+ km/h, or 64+ knots) are expected within the specified area within the next 36 hours (1.5 days).

Note: Hurricane preparedness activities become difficult once winds reach tropical storm force, therefore, hurricane watches & warnings are issued well in advance of the anticipated onset of tropical-storm-force winds.

Published by:

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