

CLIMATOLOGICAL SUMMARY 2022

&

~ Hurricane Season Review ~



METEOROLOGICAL DEPARTMENT ST. MAARTEN

Modesta Drive # 12, Simpson Bay

(721) 545-4226

www.meteosxm.com



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Prepared by:

Sheryl Etienne-Leblanc
Climatologist

Published by:

Climate Section
Meteorological Department St. Maarten
Modesta Drive # 12, Simpson Bay
St. Maarten, Dutch Caribbean

Telephone: (721) 545-4226/545-2024
Website: www.meteosxm.com
E-mail: meteo@sintmaartengov.org



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New (Vaisala C-band) Weather Radar at St. Peter's Hill
Installed Sept. 2022

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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 Paradise 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 because 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.

The Caribbean hot season is from June to October. Based on the climatological data (1991-2020) St. Maarten experiences approximately thirty-nine (39) hot days (days with Maximum temperature above 32.2°C/90°F) during that season. Heat waves are also prevalent during this season. A heat wave period is considered: two (2) or more consecutive days when the maximum temperature is above 32.2°C (90°F).

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) — 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.



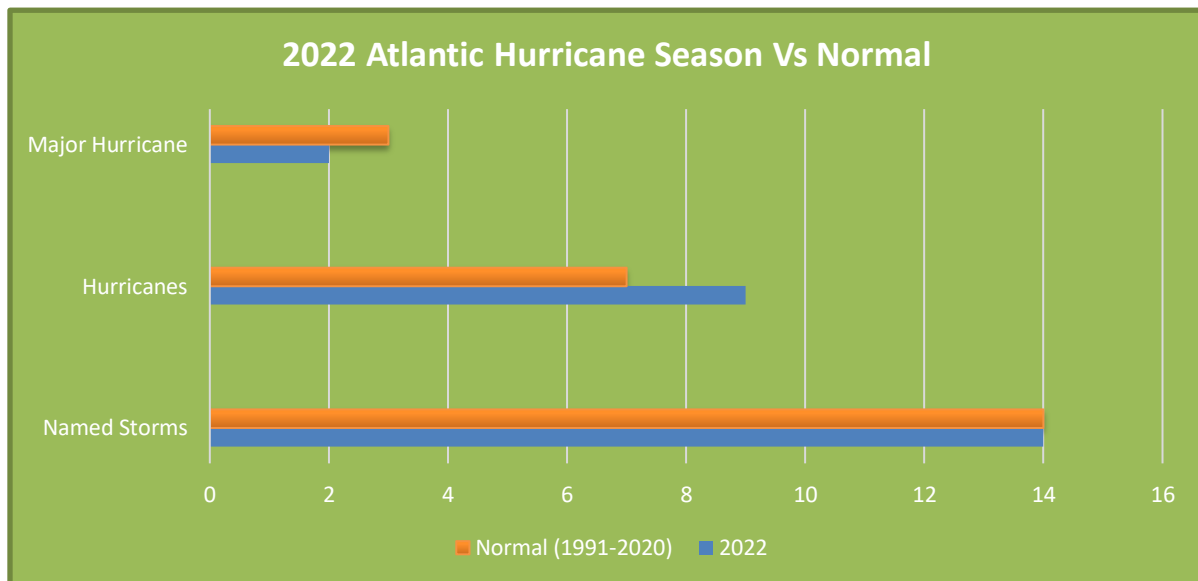
2022 Hurricane Season Summary

The 2022 Atlantic hurricane season officially ended on November 30. There were fourteen (14) named storms, of which nine (9) became hurricanes including two (2) major hurricanes. An average hurricane season has 14 named storms, seven hurricanes and three major hurricanes. The 2022 season was quieter than 2020 and 2021, which were both so active that the regular list of rotating names was exhausted.

The season started off on June 5th with tropical storm Alex developing off the eastern coast of Florida. Two (2) storms formed in July, one of which became a hurricane. August was relatively calm with no tropical storm activity. Activity intensified in September with six (6) storms, four (4) of which reached hurricane status including two (2) major hurricanes (category 3 and above). Three (3) storms formed in October; two of them became hurricanes. The season ended in mid-November with two (2) storms forming both became hurricanes.

This unusual season was distinguished by a rare storm-free period in the middle of the season, which researchers believe was brought on by increased wind shear and less atmospheric moisture high over the Atlantic Ocean. The season also saw Hurricane Nicole, a rare late-season storm, make landfall on November 10 in Florida's east coast.

The 2022 Atlantic Hurricane season has officially ended; however, it is still possible for storms to form outside the season. Therefore, we must continue to monitor weather information from credible sources and remain vigilant as it does not have to be a storm or hurricane; heavy rainfall events can also have significant impacts on our lives.



Local Weather Effects

Throughout the 2022 Atlantic Hurricane season, only two storms ventured near St. Maarten with no significant impacts reported. On September 3, tropical storm Earl passed approximately 80 miles north northeast of the island with only rough sea conditions reported along the eastern shores.

Two weeks later; September 14, tropical depression 7 formed east of the Lesser Antilles and was moving west. A tropical storm watch was issued for the island that day and was upgraded to a warning the following day when the depression had intensified to tropical storm Fiona. Fiona passed about 110 miles south of St. Maarten on September 17th, a maximum wind gust of 40kt/46mph was recorded at the airport and a 24-hr rainfall total of 44.5mm/1.8inches. The warning was cancelled that same day.

Other notable weather impacts occurred in 2022:

Heat Season (June to October)

In 2022, there were 38 hot days during the heat season compared to 51 days in 2021. The 2022 hot season was near normal. There were six (6) heat wave periods, the longest heat wave was nine (9) days from August 8 to 16, in total there were 17 hot days in August. August 2022 was the warmest month of the year with a maximum temperature of 33.3°C (92°F) recorded on August 10.

Rainfall Events

On November 5, unstable conditions associated with an upper-level low pressure system accounted for significant flooding across sections of St. Maarten. A total of 76.6mm/3 inches of rainfall was measured at the airport in a 24-hour period. 68.8mm/2.7inches was recorded within a 12-hour period between 2pm on the 5th and 2am on the 6th of November.



Pictures taken from social media.

Summary Table

Below is a recap of the 2022 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	Alex	Jun. 5-6	TS	984	60			-	-	-
2	Bonnie	Jul. 1-2	H	964	100			-	-	-
3	Colon	Jul. 1-2	TS	1011	35			-	-	-
4	Danielle	Sept. 1-8	H	972	75			-	-	-
5	Earl	Sept. 3-10	H	948	95			-	-	-
6	Fiona	Sept. 14-23	MH	931	120			76.6	40	46
7	Gaston	Sept. 20-26	TS	994	55			-	-	-
8	Hermine	Sept. 23-25	TS	1003	35			-	-	-
9	Ian*	Sept. 23-30	MH					-	-	-
10	Julia	Oct. 4-7	H	982	75			-	-	-
11	Karl	Oct. 11-15	TS	997	50			-	-	-
12	Lisa	Oct. 31- Nov. 5	H	985	80			-	-	-
13	Martin	Nov. 1-3	H	965	75			-	-	-
14	Nicole	Nov. 7-11	H	980	65			-	-	-
15	Owen									
16	Paula									
17	Richard									
18	Shary									
19	Tobias									
20	Virginie									
21	Walter									

* denotes NOAA analysis is incomplete.

Overview of the Storms formed in the 2022 Hurricane Season

June 2022

Alex was the only named storm in June. It was a short-lived tropical storm that formed just east of Florida and became a post-tropical cyclone when it passed near Bermuda.

July 2022

Two (2) tropical storms formed in the month of July. Tropical Storm Bonnie was a rare Atlantic-to-Pacific basin-crossing tropical cyclone that developed over the southern Caribbean Sea on July 1, made landfall in southern Nicaragua, and then emerged into the far eastern North Pacific. Tropical storm Collin, the second July storm was a short-lived tropical storm that formed offshore of the South Carolina/Georgia coast.

August 2022

There was no tropical storm activity in the month of August.

September 2022

Activity increased during the month of September, six (6) storms formed, four (4) became hurricanes two (2) were Major hurricanes. T.S Danielle formed on the 1st in the N. Atlantic and became a hurricane the following day but remained over open water. T. S Earl formed on the 2nd east of the Leeward Islands, it then moved towards the north and became a hurricane on the 6th south of Bermuda like Danielle, Earl remained over ocean.

T. S. Fiona formed east of the Leeward Islands on the 14th, moved just north of Guadeloupe on the 17th and into the Caribbean Sea. Fiona became a hurricane on the 18th just before crossing the eastern tip of the Dominican Republic heading north westward. Fiona became a major hurricane on the 20th and remained over the northwestern Atlantic until it dissipated.

T. S Gaston formed in the N. Atlantic on the 20th while T. S Hermine formed over the eastern Atlantic on the 23rd both storms remained over ocean waters.

T. S. Ian formed in the Caribbean Sea on the 23rd moved south of Jamaica and became a hurricane on the 26 before crossing the western tip of Cuba as a Major hurricane of the 27th. Ian made a devastating landfall on western coast of Florida on the 28th, thereafter it was downgraded to a storm and later regained hurricane status on the eastern seaboard.

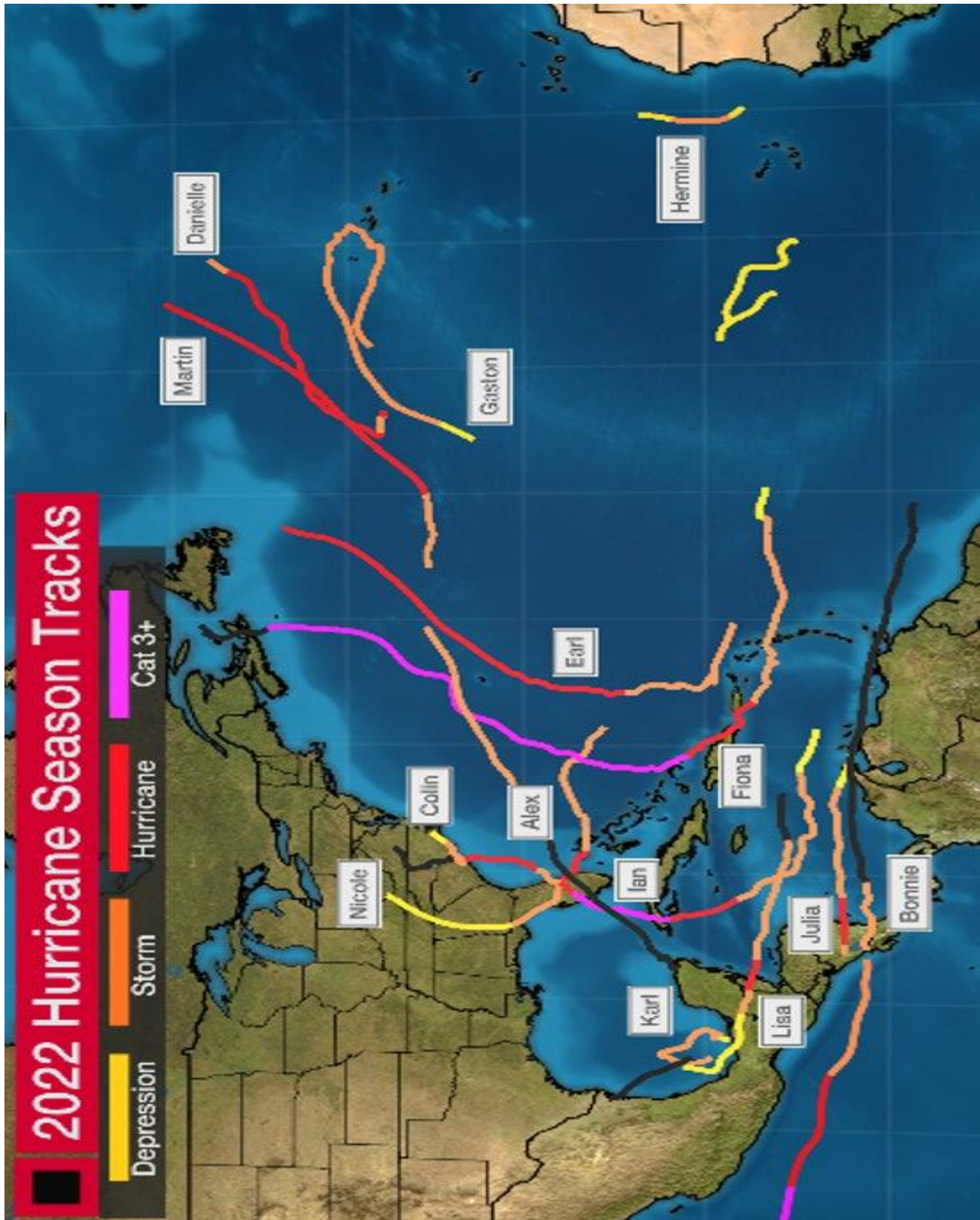
October 2022

October produced three (3) named storm; Julia which formed in the southern Caribbean Sea on October 7th became a hurricane the following day and made landfall in Nicaragua. T. S Karl form in the Gulf of Mexico on the 11th while T. S Lisa formed in the Caribbean Sea on the 31st became a hurricane on the 2nd of November and made landfall in Belize.

November 2022

In November, two (2) storms formed, and both became hurricanes. T.S. Martin formed on the 1st and became a hurricane on the 2nd but remained over open water. Nicole was the final storm of the season, formed on 7th, became a hurricane on the 9th and made landfall on Florida's Eastern border.

2022 Atlantic Hurricane Season Storm Track



Map compliments "Weather Underground"

2022 Climate Data
Rainfall

The total rainfall recorded at the Princess Juliana International Airport, for the year 2022 was **857.0 mm or 33.7 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 for the second consecutive year.

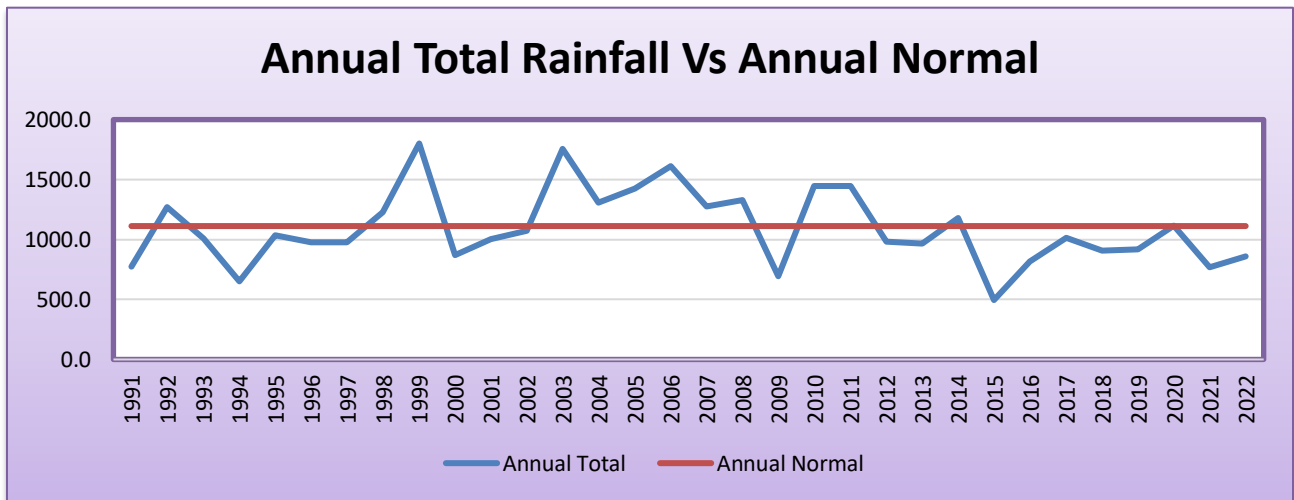


Fig. 1

November was the *wettest month* of the year, with a total of 190.6 mm or 7.5 inches. The *driest month* was **June** with 13.1 mm or 0.5 inches. The *wettest day* of the year was November 5th, when 76.6 mm or 3.0 inches of rainfall was recorded. This was as a result of the presence of an upper-level low pressure system which produced unsettled weather across the region. 68.8mm/2.7inches of rainfall was recorded within a 12-hour period between 2pm on the 5th and 2am on the 6th of November.

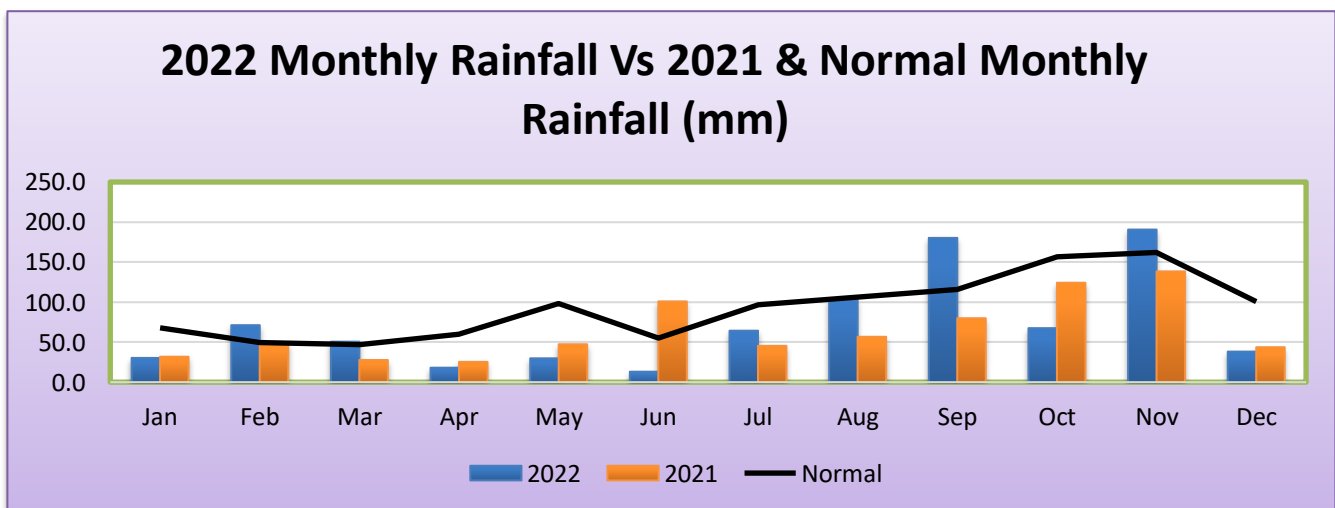


Fig. 2

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 2022, 142 rain days were recorded with the month of March having the most (19 days), the highest for any March on record while June had the least days (6).

January 2022 was the driest since 2011, June 2022 was the driest June since 2018 and December 2022 was the driest since 2012 while November 2022 was the wettest November since 2014.

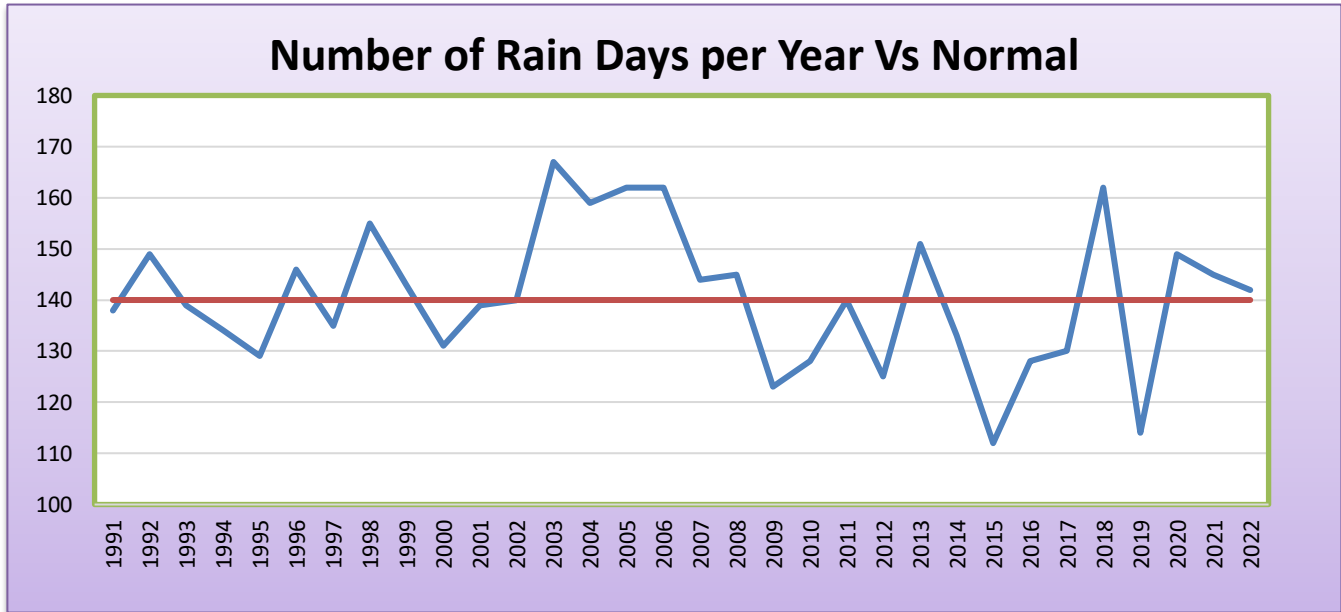


Fig. 3

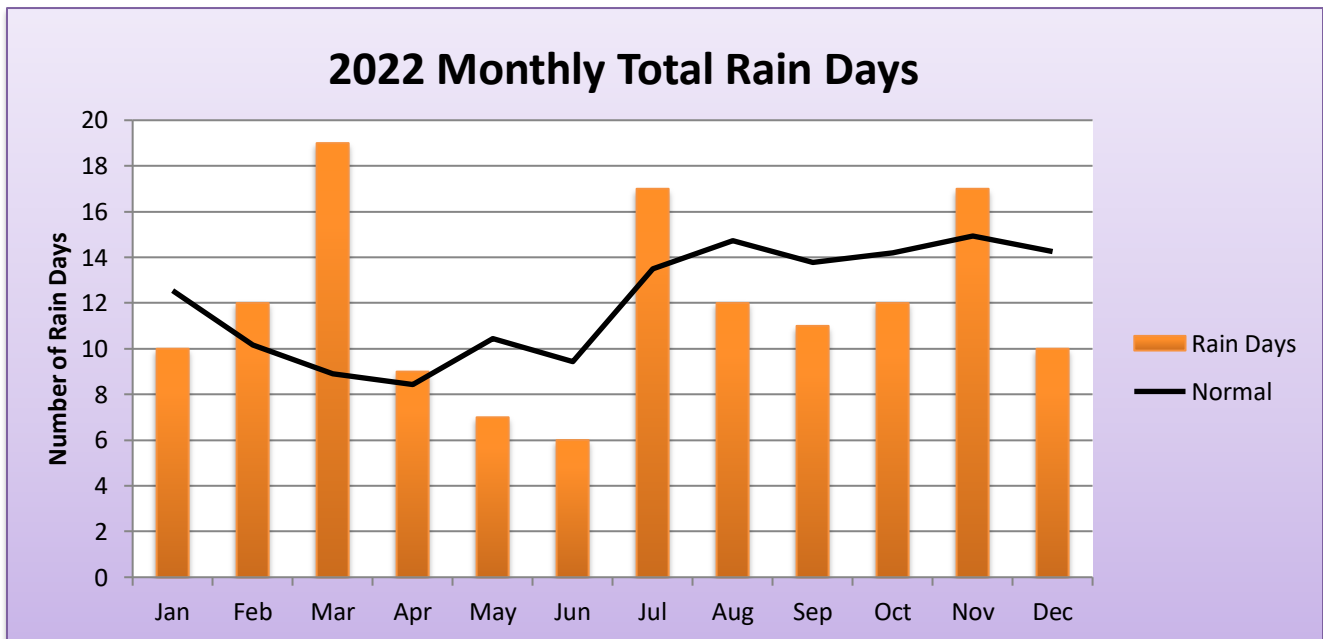


Fig. 4

Temperature

The average temperature recorded in 2022 was **27.4° C (82° F)** which was slightly above normal. The 30-year normal (1991–2020) is 27.3° C/(81°F). **August** was the warmest month with an average temperature of 29.1° C (84° F) while **February** was the coolest month with an average temperature of 25.7° C (78° F). 2022 was slightly cooler than 2021 and near normal for the past ten (10) years.

The highest daytime *temperature* recorded in 2022 was **33.3° C (92°F)** which was recorded on August 10th while the lowest night-time *temperature* was recorded on February 17th as **21.5° C (71° F)**.

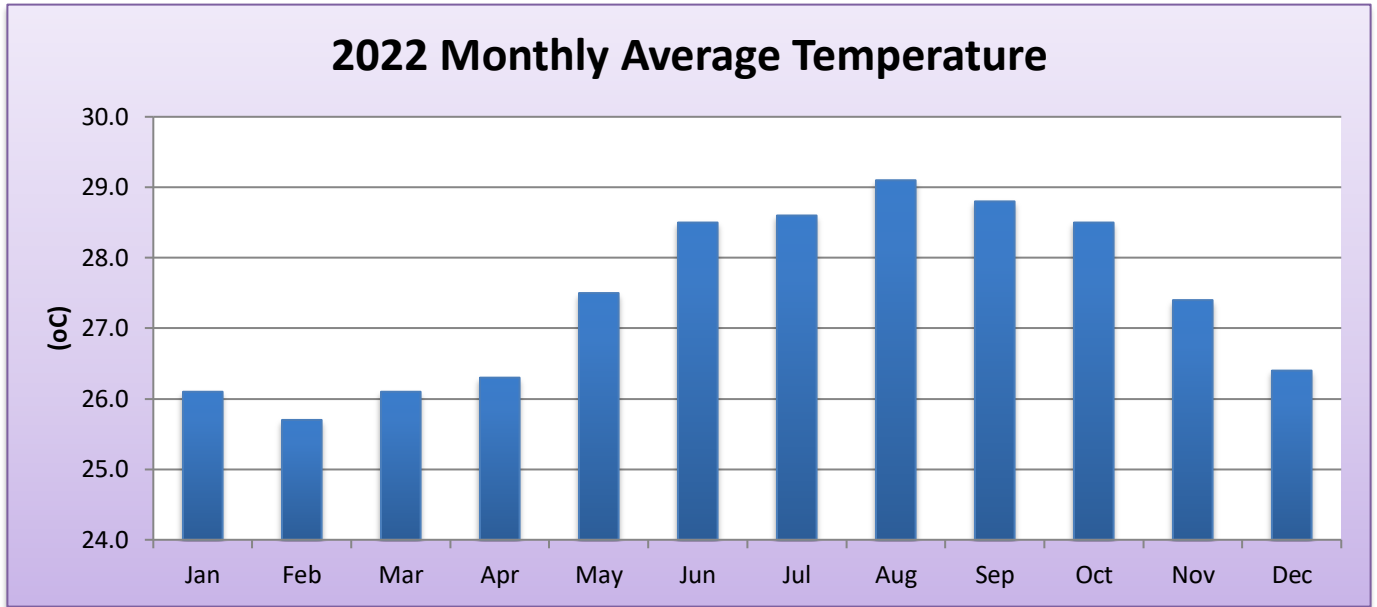


Fig. 5

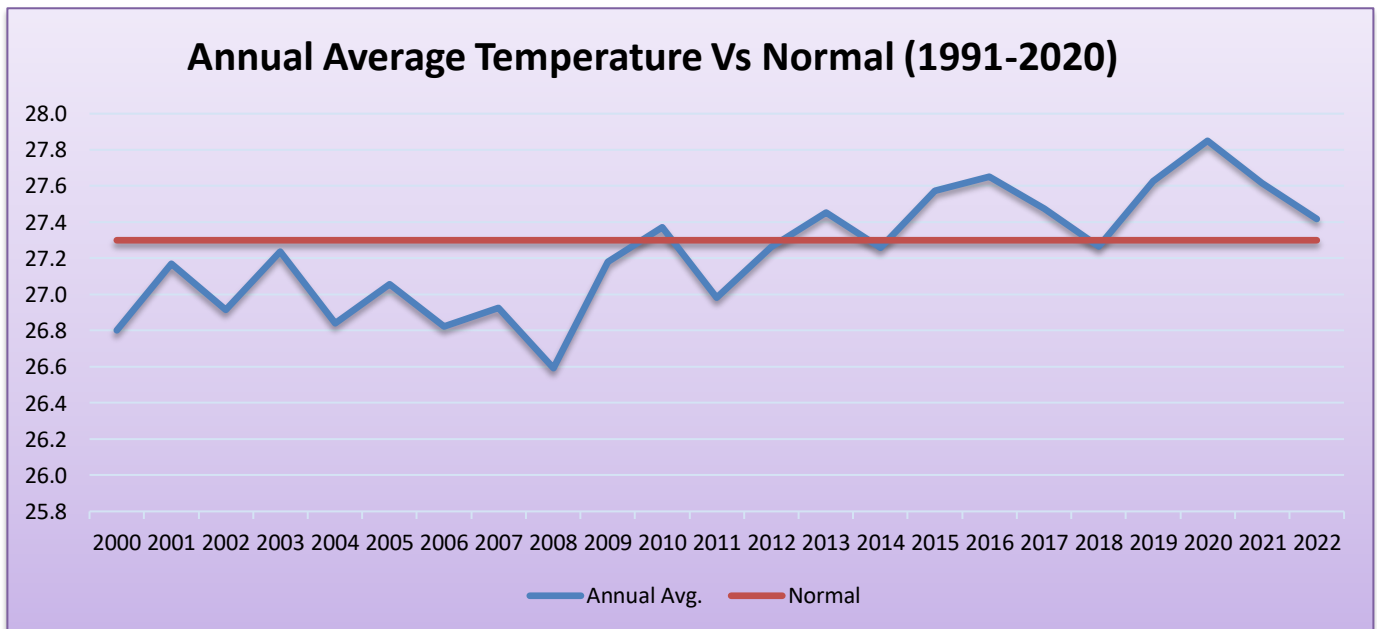


Fig. 6

Wind

Surface winds at the Princess Juliana International Airport for 2022 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 **July*** as 12 knots (14 mph); while **October** had the *lowest monthly average wind speeds* of 8 knots (9 mph). The highest wind gust was recorded on **September 17th** as **40 knots** (46 mph)

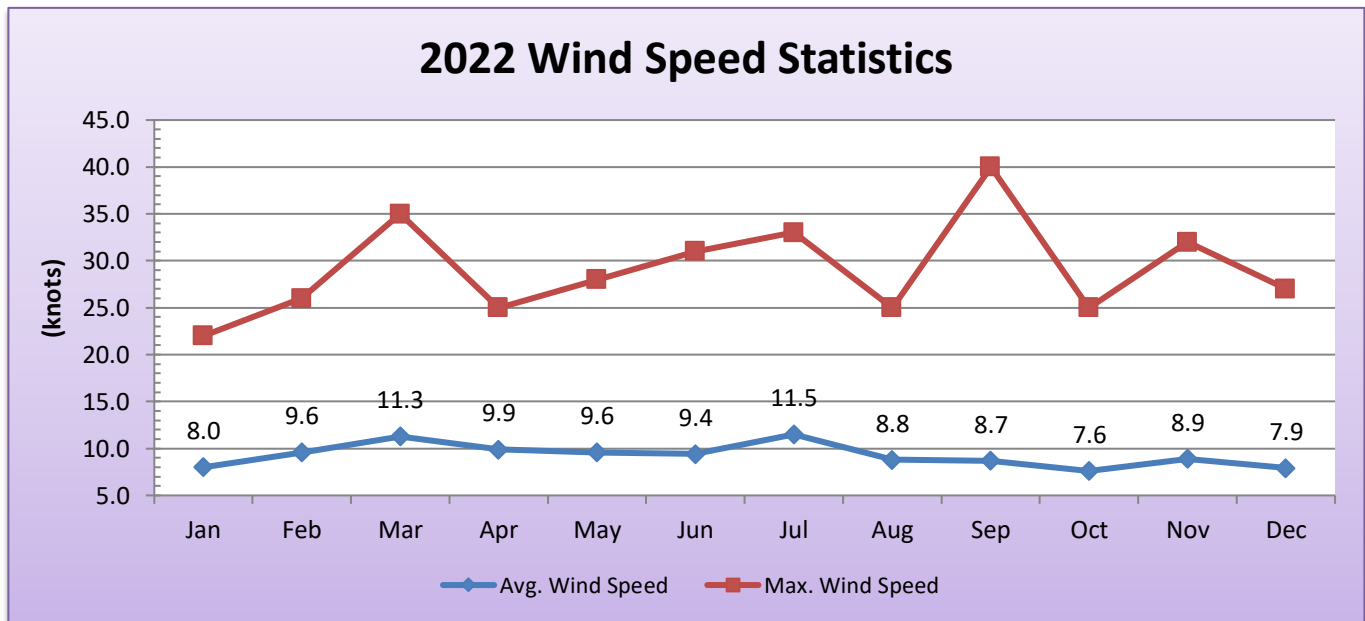


Fig. 7

This following wind analysis was obtained, by using the average hourly wind speeds and direction from 1st January to 31st December 2022.

- Approximately 60% of the time, wind speeds at Juliana were between 5 and 10 knots.
- Approximately 31% of the time, wind speeds were between 10 and 15 knots.
- Approximately 5% of the time, wind speeds were between 1 and 5 knots.
- Approximately 1% of the time, winds were calm.
- Approximately 2% of the time, winds speeds were between 15 and 20 knots.
- Less than 1% of the time, winds speeds were greater than 20 knots.

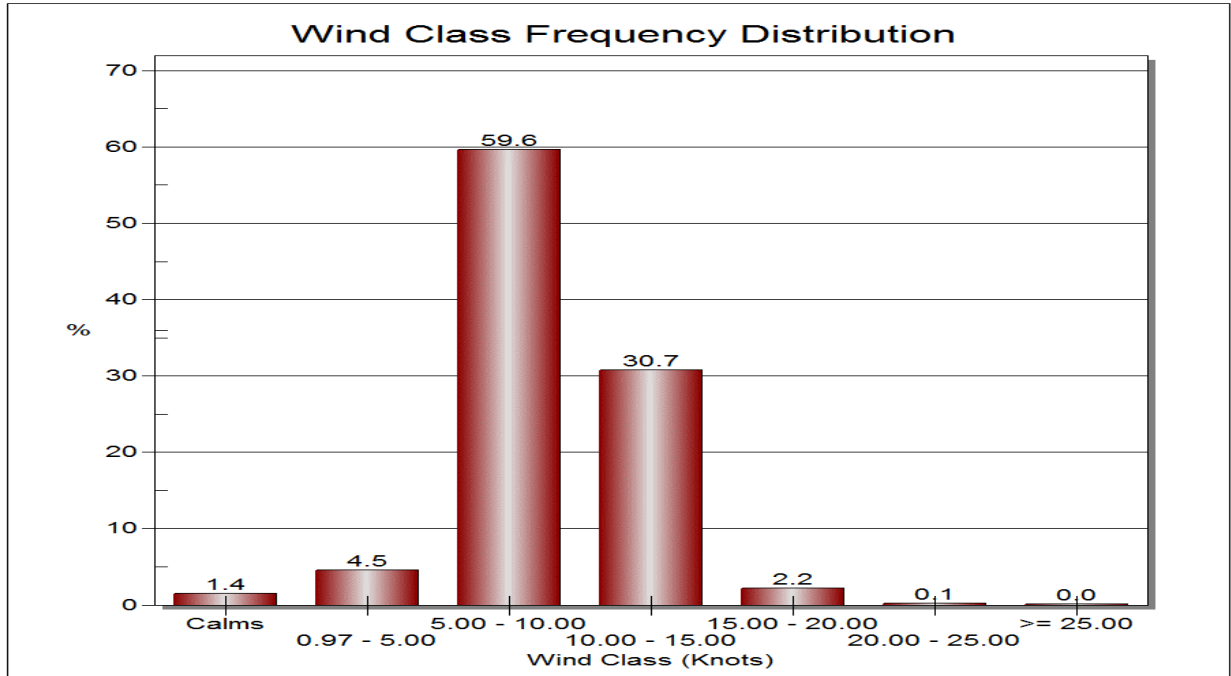


Fig. 8

2022 Wind Rose

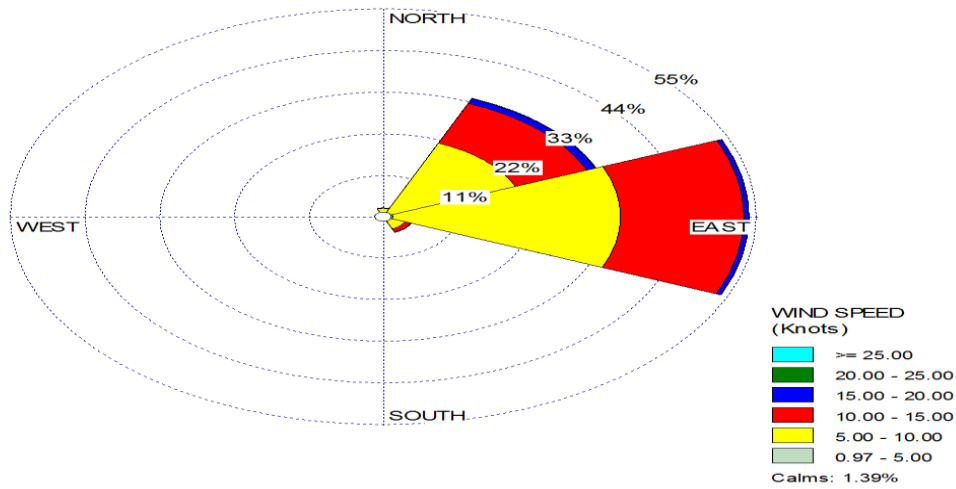


Fig. 9

55% of the time winds came from the **East**.
33% of the time winds came from the **Northeast**.
6% of the time winds came from **Southeast**.
1% of the time winds were calm.
Winds came from other directions **5%** of the time or less.

Air Pressure

At the Princess Juliana International Airport, on average the mean sea level Pressure for 2022 was **1017.0 millibars**. The highest monthly averages were in March, May, and July while the lowest was in September. The highest daily average was recorded as **1021 mb** on May 21st while the lowest daily average of 1010 mb occurred on December 5th.

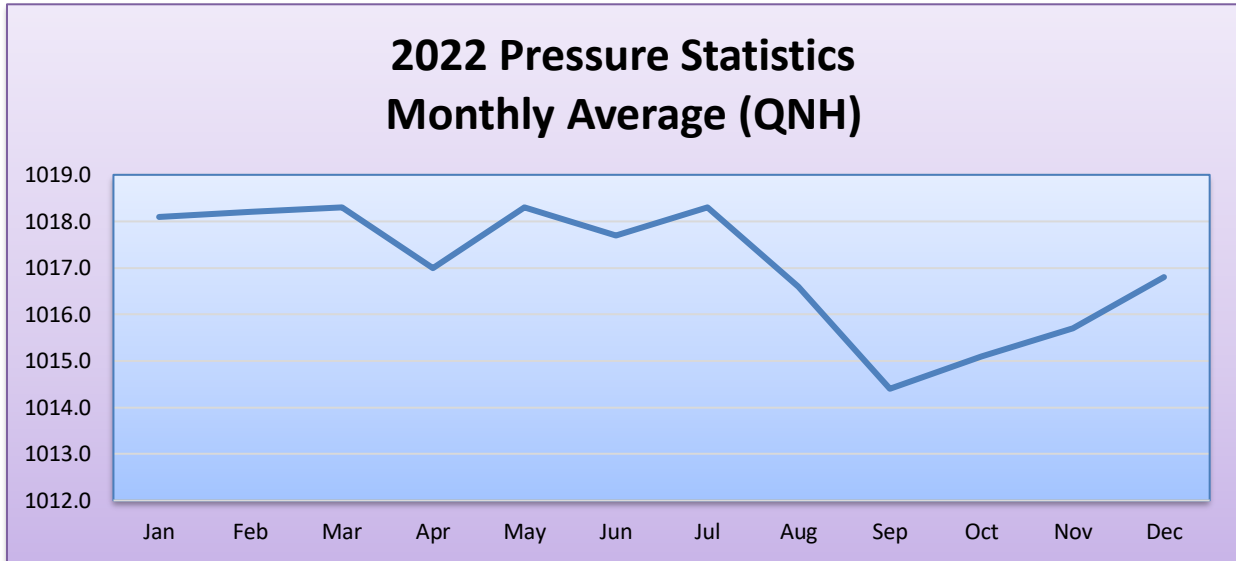


Fig. 10

Cloud Cover

The average cloud cover for St. Maarten over the past year as recorded at the Princess Juliana International Airport was about 48%. The *highest monthly average cloud cover* was 71% during the month of **October** while **December** had the *lowest value* of 31%.

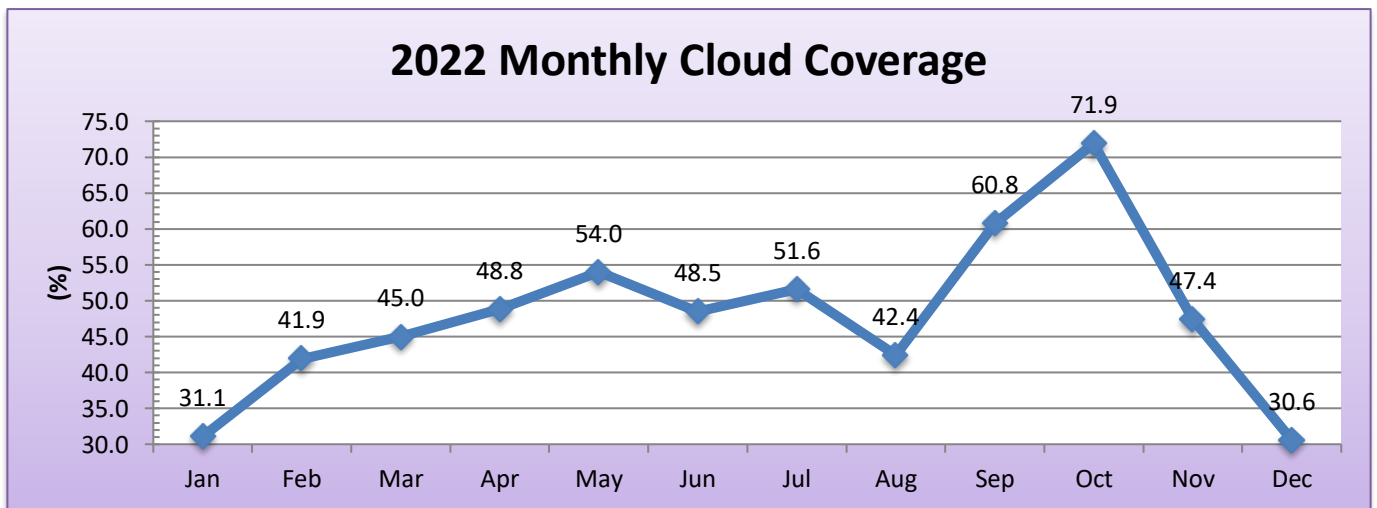


Fig. 11

Sunshine Duration

Approximately 74% of possible sunshine was recorded at the surface at the Princess Juliana International Airport, that is, 3313.5 hours out of a possible 4443.1 hours. The *average daily sunshine duration* was **9 hours 06 minutes**.

August received the most hours of sunshine (313 hours) in 2022 and was the month with the highest daily average sunshine: 10 hours and 06 minutes. **September** received the least sunshine and was the month with the lowest daily average: 7 hours 48 minutes.

The days with the highest daily sunshine hours were **June 1st** and **July 28th** with 12 hours. The days with the least sunshine in 2022 were **September 4, 15, 17 & 18th** when no sunshine was recorded due to overcast conditions.

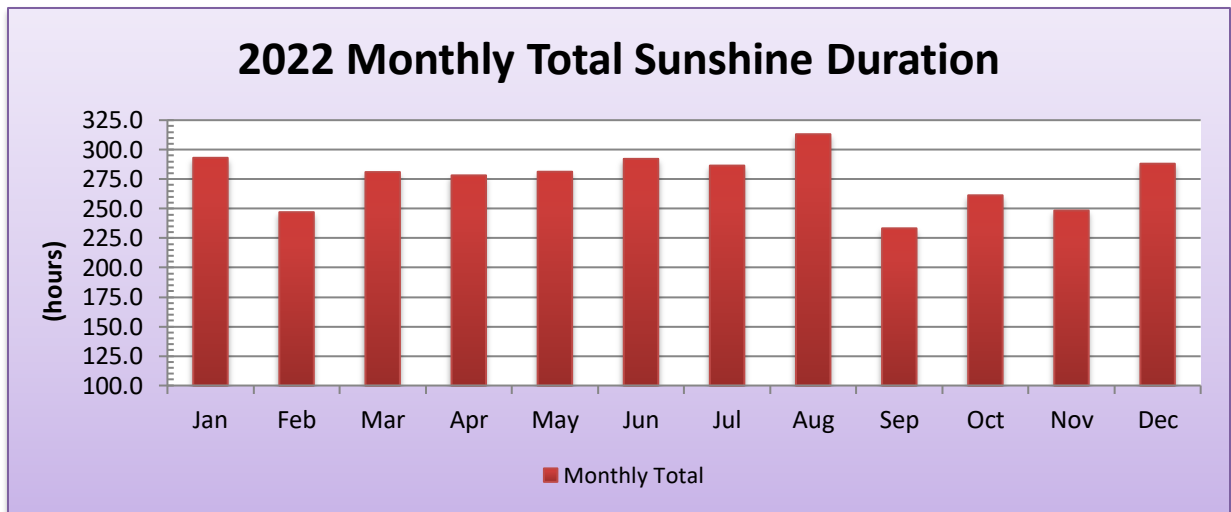


Fig. 12

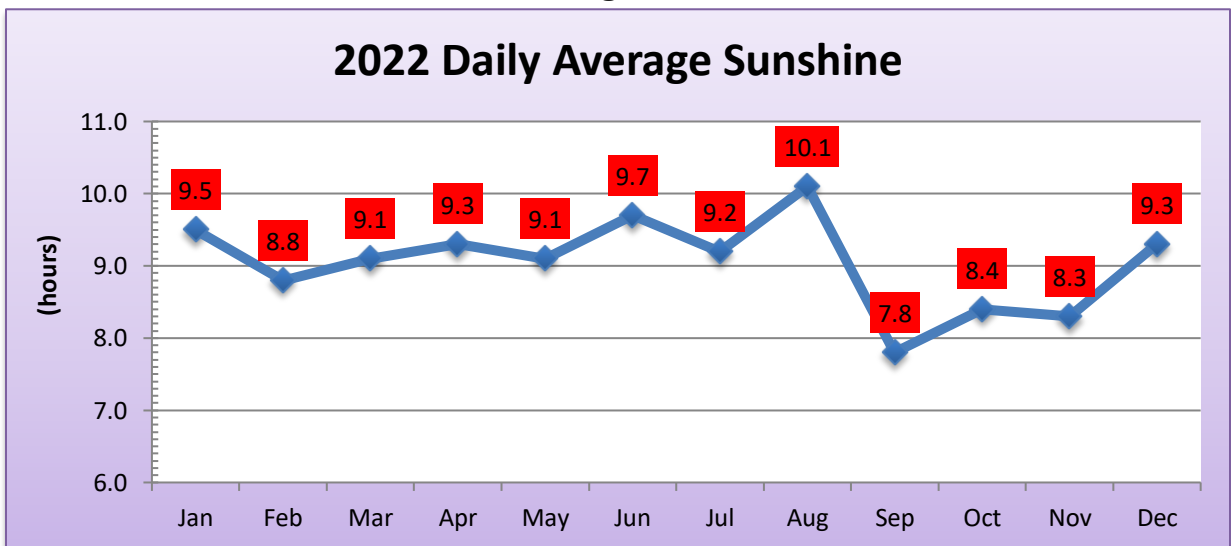


Fig. 13

Statistical Summary

Below is a recap of the 2022 climate data, in terms of averages, extremes, and totals:

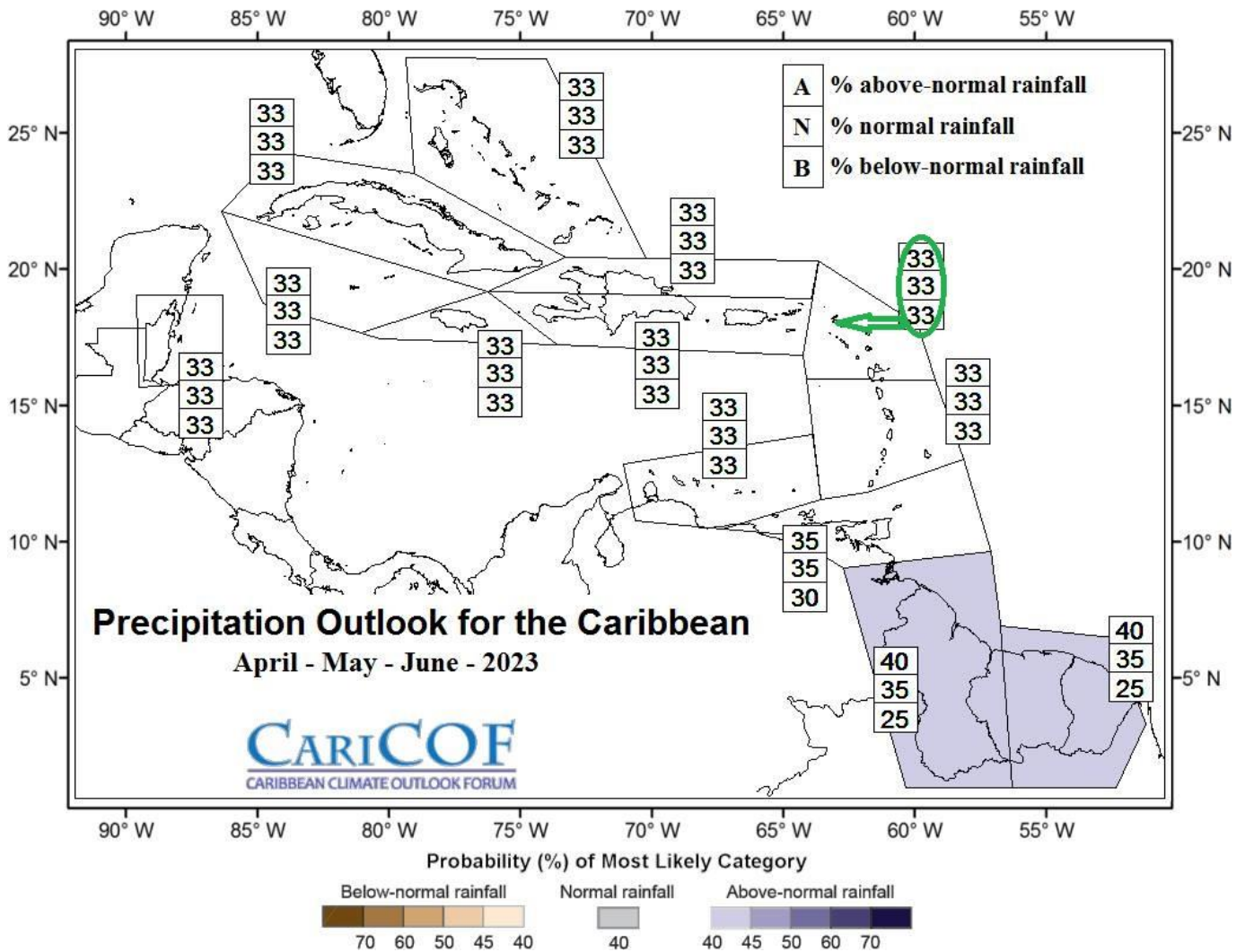
Rainfall		
Total Rainfall for the year	857.0 mm	33.7 inches
Wettest Month	190.6mm/7.5 in	November
Driest Month	13.1 mm/0.5 in	June
24-hr Maximum Rainfall	76.6 mm/3.0 in	November 5 th
Number of Rain Days (with 1.0+ mm)	142 days	
Number of Heavy Rain Days (with 10.0+mm)	19 days	
Temperature		
Average Air Temperature	27.4° C	81° F
Absolute Maximum Temperature	33.3° C/ 92° F	<i>August 10th</i>
Absolute Minimum Temperature	21.5° C/ 71° F	<i>February 24th</i>
Warmest Month	29.1° C/84° F	<i>August</i>
Coollest Months	25.7° C/78° F	<i>February</i>
Average Relative Humidity	73%	
Wind & Pressure		
Average Wind Speed	9.2 knots	10 mph
Average wind Direction	90 degrees	<i>East</i>
Maximum Wind Gust	<i>September 17th</i>	40 kts /46 mph
Most frequent category speed	5-10 knots	60%
Average Air Pressure	1017.0 mb.	
Clouds & Sunshine		
Average Cloud Coverage	47.8%	
Average Daily Sunshine Duration	9 hours: 06 minutes	
Month: Maximum Sunshine	<i>August</i>	
Month: Minimum Sunshine	<i>September</i>	
Daily Maximum Sunshine	<i>12 hrs. 00 min.</i>	<i>Jun. 1st & Jul. 28th</i>
Daily Minimum Sunshine	<i>0 hrs. 00 min.</i>	<i>Sept. 4, 15, 17 & 18th</i>

Conclusion

This report provides a summary of all the meteorological data recorded at the Princess Juliana International Airport during the year 2022. 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 several 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 2023 Rainfall Outlook for Apr-May-Jun. 2023



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

Rainfall for the next three (3) months Apr-May-Jun 2023 is expected to be the usual with equal chances of above or below normal for St. Maarten and most of the Caribbean but wetter than usual in the Guianas.

Normal rainfall for this season ranges between 148–253 mm or 6-10 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 **33%** chance of being **below Normal** (less than 148 mm); a **33%** chance of being **Near Normal** (between 148 mm and 253 mm); and a **33%** chance of being **Above Normal** (more than 253 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 2023 Atlantic Hurricane Season

ARLENE	HAROLD	OPHELIA
BRET	IDALIA	PHILIPPE
CINDY	JOSE	RINA
DON	KATIA	SEAN
EMILY	LEE	TAMMY
FRANKLIN	MARGOT	VINCE
GERT	NIGEL	WHITNEY

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:

**The Climate Section
Meteorological Department St. Maarten
Modesta Drive # 12, Simpson Bay
St. Maarten, Dutch Caribbean**

Telephone: (721) 545-4226/545-2024
Website: www.meteosxm.com
E-mail: meteo@sintmaartengov.org



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