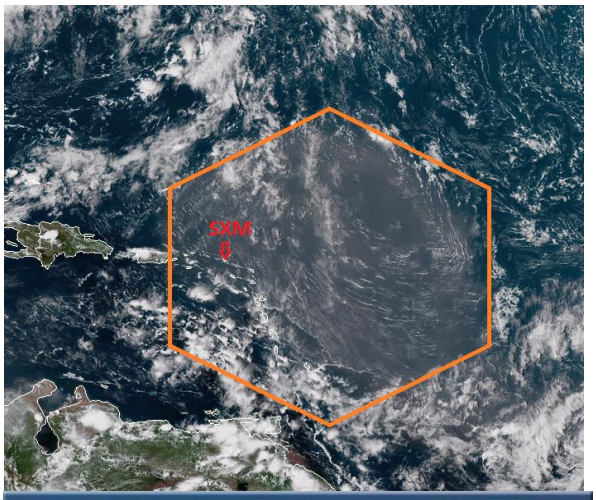
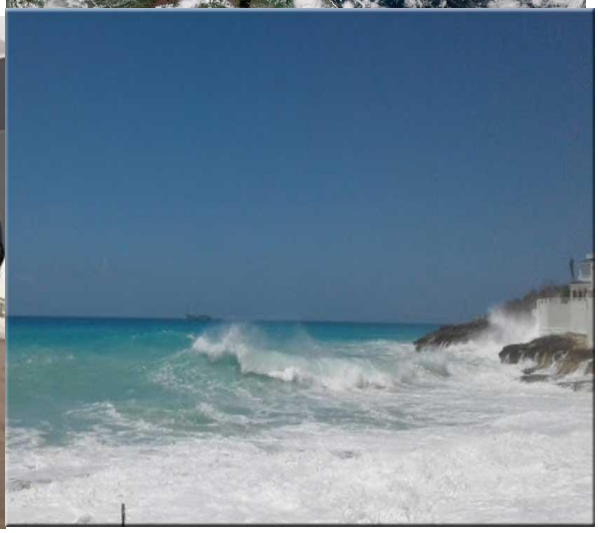
Climatological Summary

2018

&

~ Hurricane Season Review ~





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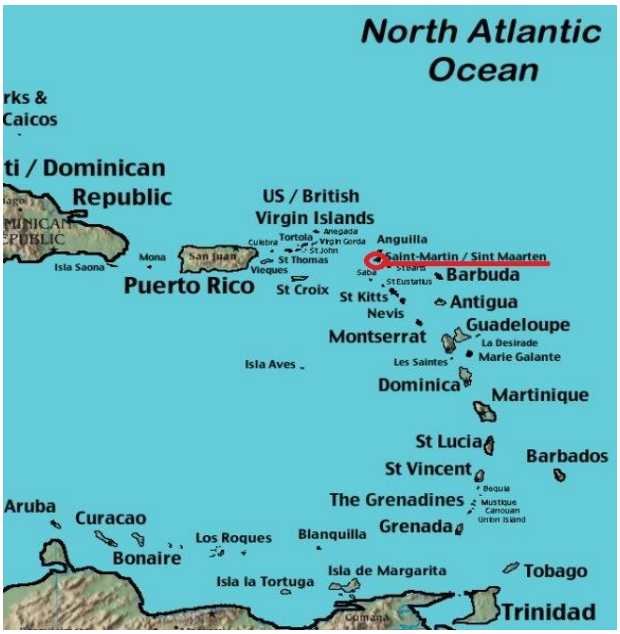
Introduction

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, which occupies 16 square miles. 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 south western strip of Sin. Maarten at latitude 18.02º north and longitude 63.06º west.

ISLAND CLIMATOLOGY

Based on records (1981-2010) at Princess Juliana International Airport (PJIA), the normal annual rainfall is approximately 1170mm or 46 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 to be 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 145 rain days a year with April having the least (8 days) and November the most (15 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 from tropical cyclones.

The normal daily average 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.

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 aim is to protect life and property, by providing reliable meteorological services in support of the social and economic development of the country through monitoring and predicting weather & climate, using up-to-date technology to enable optimal utilization of resources. We issue appropriate weather forecasts and warnings for St. Maarten, its adjacent waters and air space.

The vision of the Meteorological Department of St. Maarten is to achieve excellence in meteorological science, and the provision of quality and accurate weather and climate services.


OUR TASKS
Produce Monthly Climate Outlooks & bulletins
Maintain National, Regional & International Standards/ Policies
Compile & Analyze Meteorological & Climate Data
Monitor weather conditions 24 hours daily/ all year round
Observe, Record & Transmit Surface/ Upper Air Data
Produce Aviation Forecasts & Flight Folders
Produce Public & Marine weather forecasts
Issue Special reports/warnings for tropical storms & other hazardous weather phenomena.

2018 Hurricane Season

The 2018 Atlantic Hurricane season officially came to an end on November 30th 2018. The season produced fifteen (15) named storms, eight (8) hurricanes; two (2) of which were major (Cat 3 or higher). In an average season there are twelve (12) named storms, six (6) hurricanes with at least three (3) being major hurricanes.

Overall, this season had more activity than an average season, reasons being warm sea surface temperatures and the late onset of the El Nino phenomenon which is often responsible for suppressing storm development.

In the 2018 season a few records were made:

- It was the fourth consecutive year in which activity began before June 1st ; the first storm formed on May 25th 2018. This reminds us that tropical storm activity is not only limited to the period, June 1st to November 30th.
- It was the first season since 2008 when there were four (4) active systems in the Atlantic Basin at the same time. (Florence, Helene, Isaac and Joyce)

The 2018 Atlantic Hurricane Season was a much better season for St. Maarten as compared to the 2017 season. Alerts were issued for Tropical Storms Beryl and Isaac however there were no significant impacts on the island.

As this season has ended officially we must be reminded firstly, that adverse weather conditions are possible even outside of the hurricane season and secondly, in a few months the 2019 hurricane season will be here. Therefore, preparedness is the key and it is never too early.

Cyclone Statistics for 2018 Season.

	NORMAL	NOAA'S PREDICTION	ACTUAL
NAMED STORMS	12	9-13	15
HURRICANES	6	4-7	8
MAJOR HURRICANES	3	0-2	2

Local Effects

The 2018 Atlantic Hurricane season was a quiet one for the island of St. Maarten. Tropical storm watches were issued for the island on two occasions; for tropical storms Beryl and Isaac. However, they were discontinued the following day with no significant impact on the island.

Many tropical waves moved across the area with little impact. On October 13th instability associated with an upper level trough brought heavy rainfall and thunderstorms over the island leading to flooding across many areas.

Flooding in Philipsburg: October 13th 2019

On November 11th low-level moisture and instability produced heavy down pours and flooded streets in Philipsburg.

Flooding in Philipsburg: November 11th 2018

Photos compliments Caribbean Hurricane Network

Summary

Below is a recap of the 2018 Atlantic Hurricane Season and associated effects on St. Maarten.

	Storm Name	Active Dates	Highest Category	Min. Pressure (mbar)	Max. Winds		Local Effects	Observed Rainfall (mm)	Observed Winds Gusts	
					Kt.	Mph			Kt.	Mph
1	Alberto	May 25-31	TS	990	55	63	None	-	-	-
2	Beryl	Jul. 4-15	Hurricane Cat. 1	991	70	81	None	-	-	-
3	Chris	Jul. 6-12	Hurricane Cat. 2	969	90	104	None	-	-	-
4	Debby	Aug. 7-9	TS	998	45	52	None	-	-	-
5	Ernesto	Aug. 15-17	TS	1003	40	46	None	-	-	-
6	Florence	Aug. 31-Sep. 17	MH Cat.4	937	130	150	None	-	-	-
7	Gordon	Sep. 3-6	TS	996	60	69	None	-	-	-
8	Helene	Sept.7 – 16	Hurricane Cat. 2	967	95	109	None	-	-	-
9	Isaac	Sept. 7-15	Hurricane Cat. 1	995	65	75	Minor	21.1	-	-
10	Joyce	Sept. 12–18	TS	995	45	52	None	-	-	-
	TD11	Sept. 21-22	TD	1007	30	56		-	-	-
11	Kirk	Sept. 22-28	TS	998	55	63	None	-	-	-
12	Leslie	Sept. 23- Oct. 13	Hurricane Cat. 1	968	80	92	None	-	-	-
13	Michael	Oct.7-11	MH Cat. 5	919	140	161	None	-	-	-
14	Nadine	Oct. 9-12	TS	995	55	63	None	-	-	-
15	Oscar	Oct. 27-31	Hurricane Cat. 2	966	95	109	None	-	-	-

Overview of the Storms formed in the 2018 Hurricane Season

Tropical Storm Alberto (May 25th to 31st)

Alberto formed as a subtropical depression over the northwestern Caribbean Sea, became a subtropical storm over the southeastern Gulf of Mexico, and then transformed into a tropical storm before making landfall along the coast of the Florida Panhandle.

Tropical Storm Beryl (July 4th to 15th)

Tropical Storm Beryl formed east- southeast of the Lesser Antilles on July 5th, became a hurricane the following day and degenerated into a remnant low on July 8th.

Tropical Storm Chris (Jul. 6th to 12th)

Chris moved slowly offshore of the east coast of the United States as a tropical storm for a few days before intensifying to a category two hurricane as it headed northeastward over open water.

Tropical Storm Debby (August 7th to 9th)

Debby made a transition from an extratropical cyclone to a subtropical storm, and eventually became a high-latitude tropical storm, while remaining out at sea.

Tropical storm Ernesto (August 15th to 17th)

Ernesto had a non-tropical origin and a short life span over the North Atlantic.

Major Hurricane Florence (August 31st to September 17th)

Florence was a long-lived, category 4 hurricane that made landfall along the southeastern coast of North Carolina. Florence caused devastating freshwater flooding across much of the southeastern United States and significant storm surge flooding in portions of eastern North Carolina. Florence resulted in twenty-two (22) direct deaths and was also associated with thirty (30) indirect fatalities.

Tropical Storm Gordon (September 3rd to 6th)

Gordon formed near the southeastern coast of Florida, moved across the Florida Keys and extreme southwestern Florida, and made a final landfall as a strong tropical storm along the north-central Gulf of Mexico coast just west of the Mississippi-Alabama border.

Hurricane Helene (September 7th to 16th)

Helene passed south of the Cape Verde Islands as a tropical storm before it strengthened into a category two hurricane. Helene recurved over the eastern Atlantic and passed near the western islands of the Azores as a tropical storm.

Hurricane Isaac (September 7th to 15th)

Isaac was a category 1 hurricane that formed over the east-central tropical Atlantic and moved westward. The cyclone weakened and passed through the Lesser Antilles as a tropical storm, causing locally heavy rain and flooding.

Tropical Storm Joyce (September12th to 18th)

Joyce evolved from an extratropical low to a subtropical storm and then to a tropical storm, meandering over the north-central Atlantic Ocean well to the southwest of the Azores.

Tropical Depression Eleven (September 21st to 22nd)

Tropical Depression Eleven was a short-lived cyclone over the tropical Atlantic.

Tropical Storm Kirk (September 22nd to 28th)

Kirk formed in the eastern tropical Atlantic at an unusually low latitude before opening up into a tropical wave only a day later. Eventually the wave reformed into a tropical cyclone and made landfall on St. Lucia as a moderately strong tropical storm before dissipating over the eastern Caribbean Sea.

Hurricane Leslie (September 23rd to October 13th)

Leslie wandered across the subtropical Atlantic for about 3 weeks before finally hitting Portugal as an extratropical cyclone.

Major Hurricane Michael (October 7th to 11th)

Michael was a category 5 hurricane that made a catastrophic landfall near Mexico Beach and Tyndall Air Force Base, Florida, producing devastating winds and storm surge near the coast, and rain and wind inland. It was directly responsible for 16 deaths and about $25 billion in damage in the United States. Before hitting the United States, the cyclone brought hurricane-force winds to the western tip of Cuba when it was a category 2 hurricane.

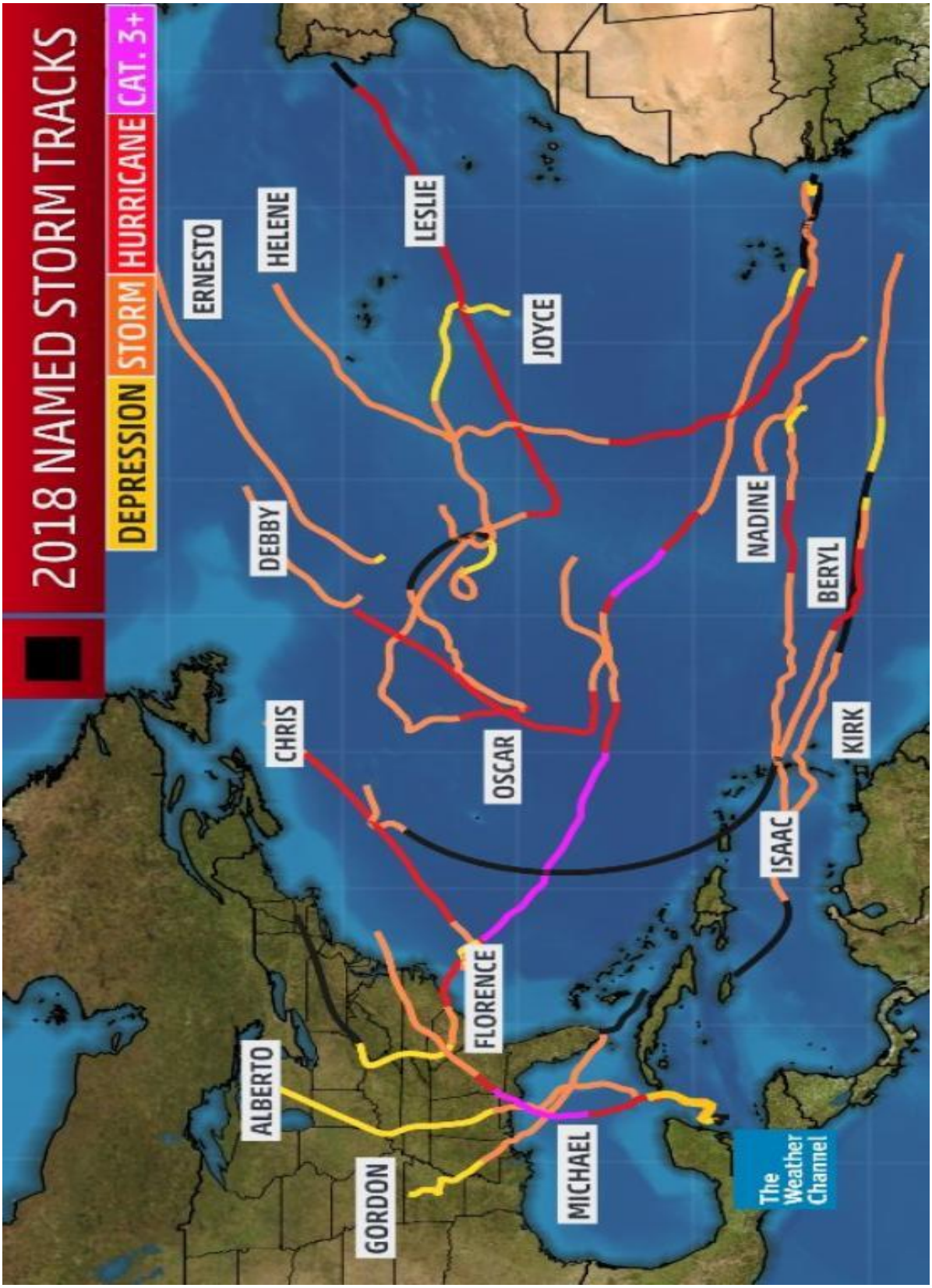
Tropical Storm Nadine (October 9th to 8th)

Nadine was a small tropical storm that remained over the eastern tropical Atlantic Ocean and did not directly affect any land areas.

Hurricane Oscar (October 26th to 31st)

Oscar was a late-season category 2 hurricane that originated as a subtropical storm over the central Atlantic. Oscar passed well east of Bermuda before becoming a large and powerful extratropical low over the north Atlantic in early November.

2018 Atlantic Hurricane Season Storm Track



Map compliments "The Weather Channel"

2018 Climate Data

Rainfall

The total rainfall recorded at the Princess Juliana International Airport, for the year 2018 was **905.5 mm or 35.6 inches**. The normal annual rainfall ranges from about 1026 mm – 1274 mm/40 – 50 inches (1981–2010). This year's total rainfall was below the normal range by approximately 23%. 2018 was also drier than 2017.

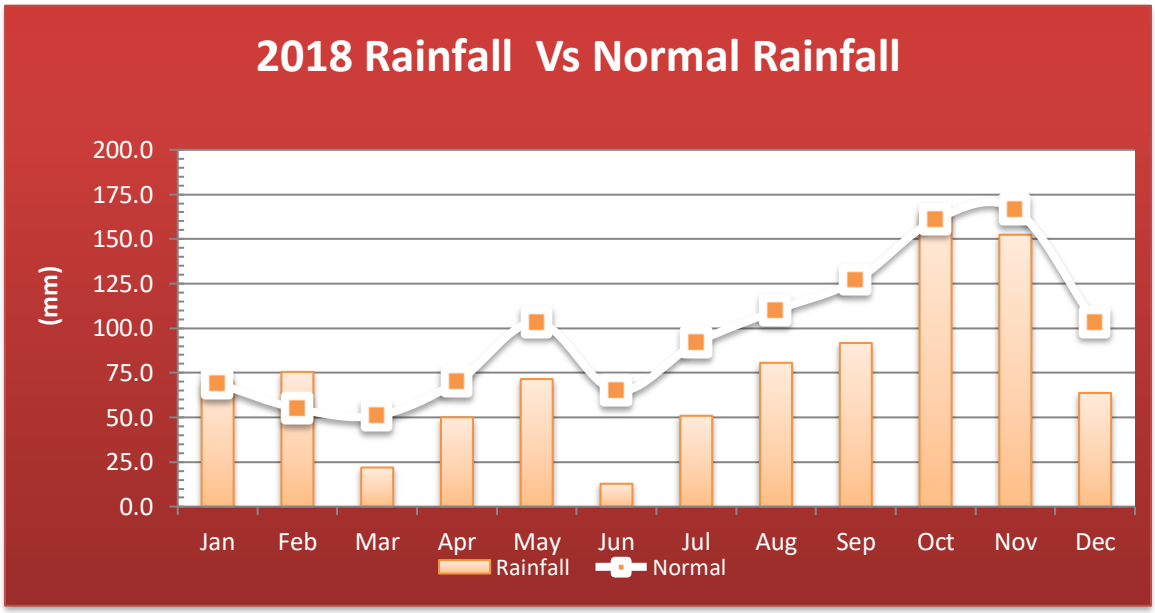


Fig. 1

October was the *wettest month* of the year, with a total of 164.3 mm or 6.5 inches; while the *driest month* was **June** with 12.8 mm or 0.5 inches. The *wettest day* of the year was **October 13th**, when 56.9 mm or 2.2 inches was recorded as a result of instability associated with an upper level trough across the area.

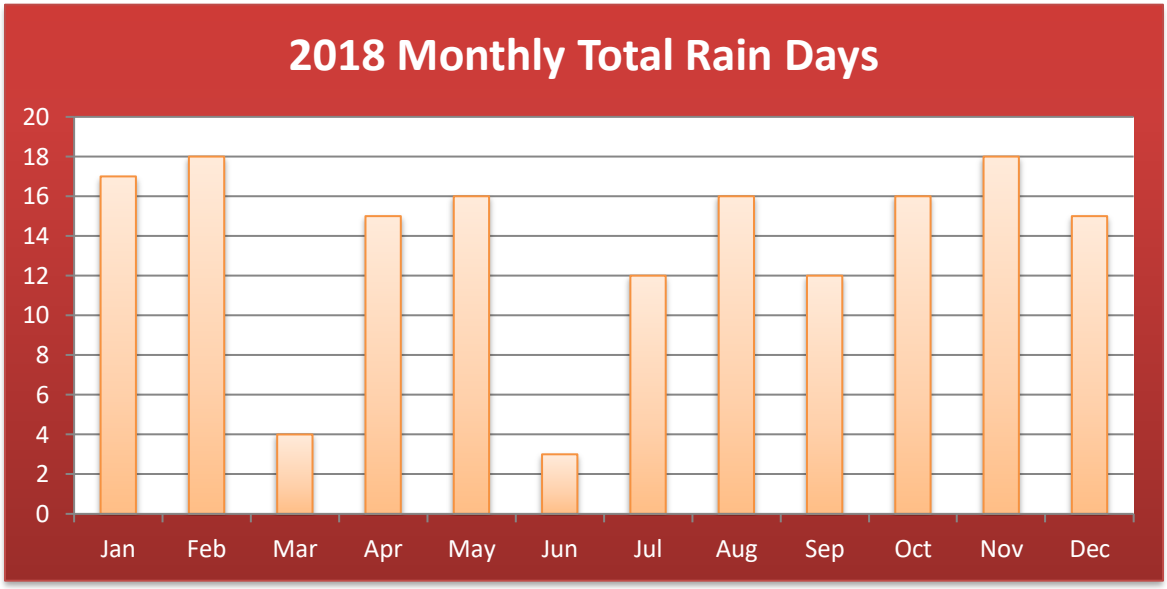
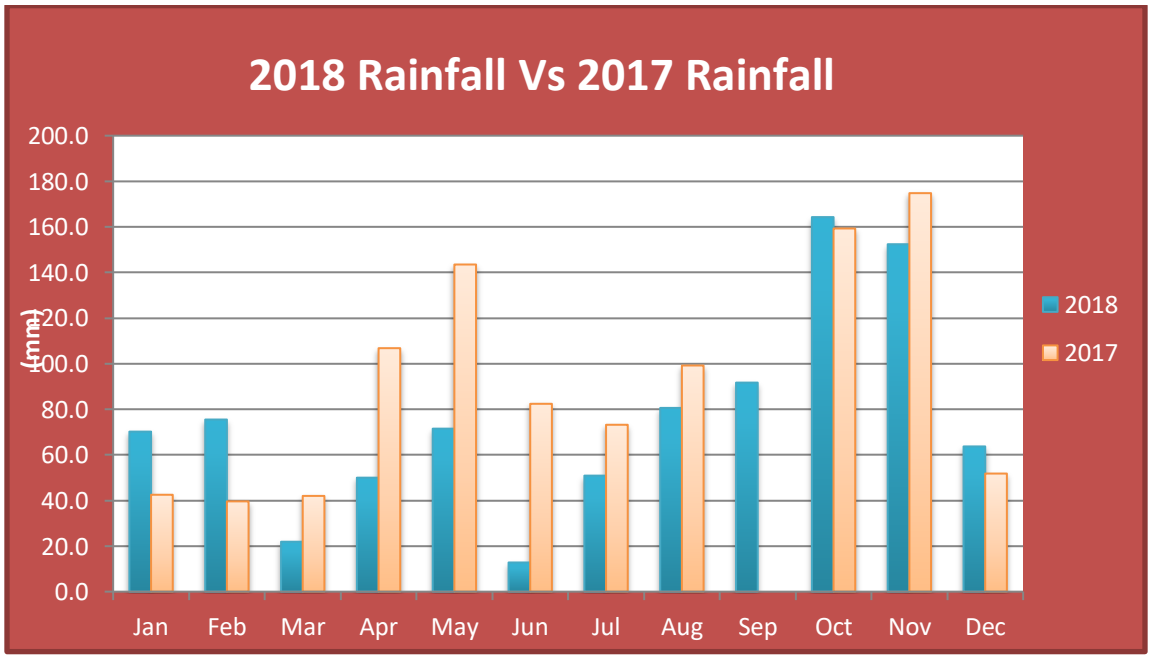


Fig. 2

A rain day is considered as any day, which records 1.0 mm or more of rainfall. Normally there are approximately 145 rain days in a year on St. Maarten. For 2018, there were 162 rain days with the months of February and November having the most (18 days) followed by January with seventeen (17) days.

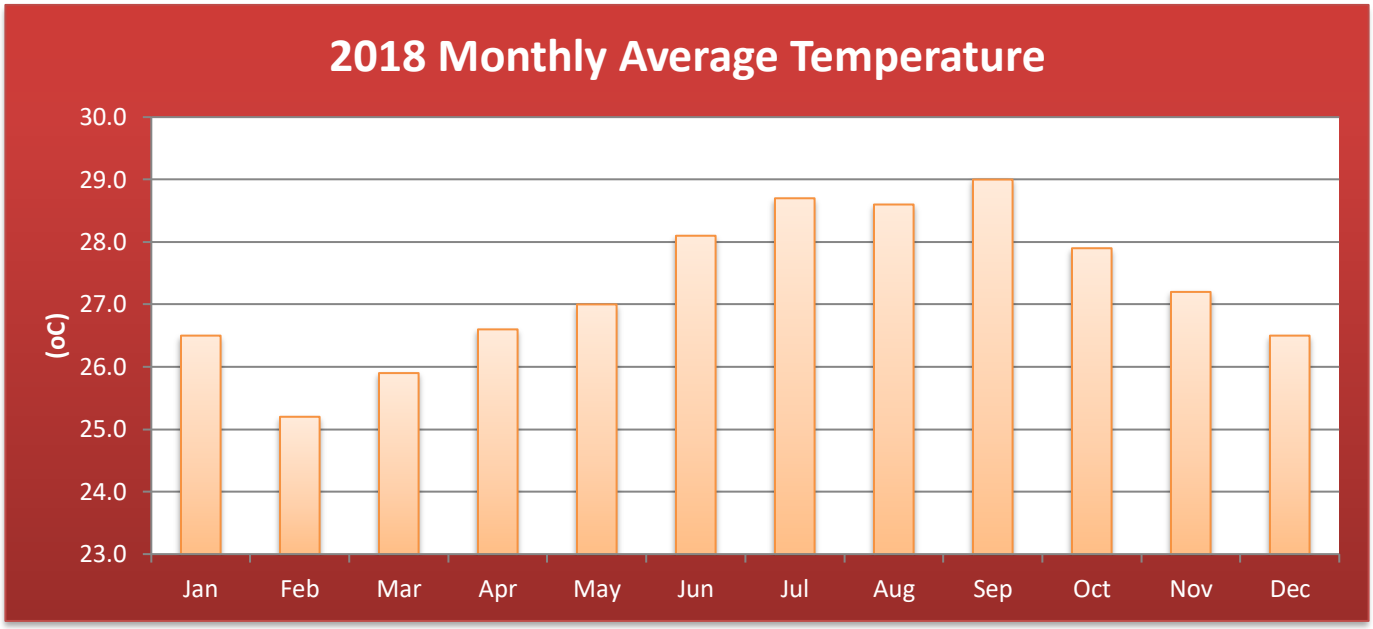
January 2018 was the wettest January since 2012 while February 2018 was the wettest February since 2011. There are about 10 rain days in the month of February on average, February 2018 had the highest number of rain days among all the Februarys on record (since 1961); 18 days. In total 2018 had the highest number of rain days (162) since 2006.

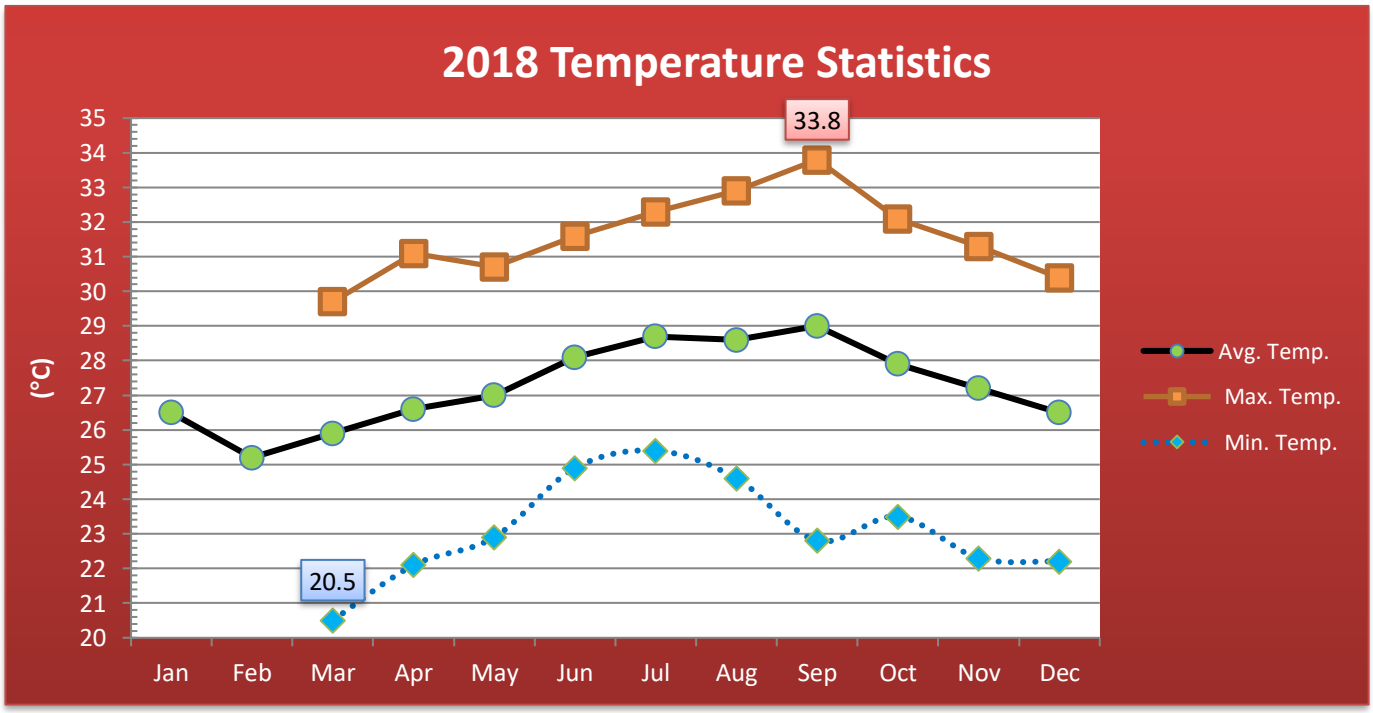


Temperature

The average temperature recorded in 2018 was **27.3° C** (81° F) which was slightly above normal. The 30-year normal (1981–2010) is 27.2° C. **September** was the warmest months with an average temperature of 29.0° C (84° F) while **February** was the coolest month with an average temperature of 25.2° C (77° F).

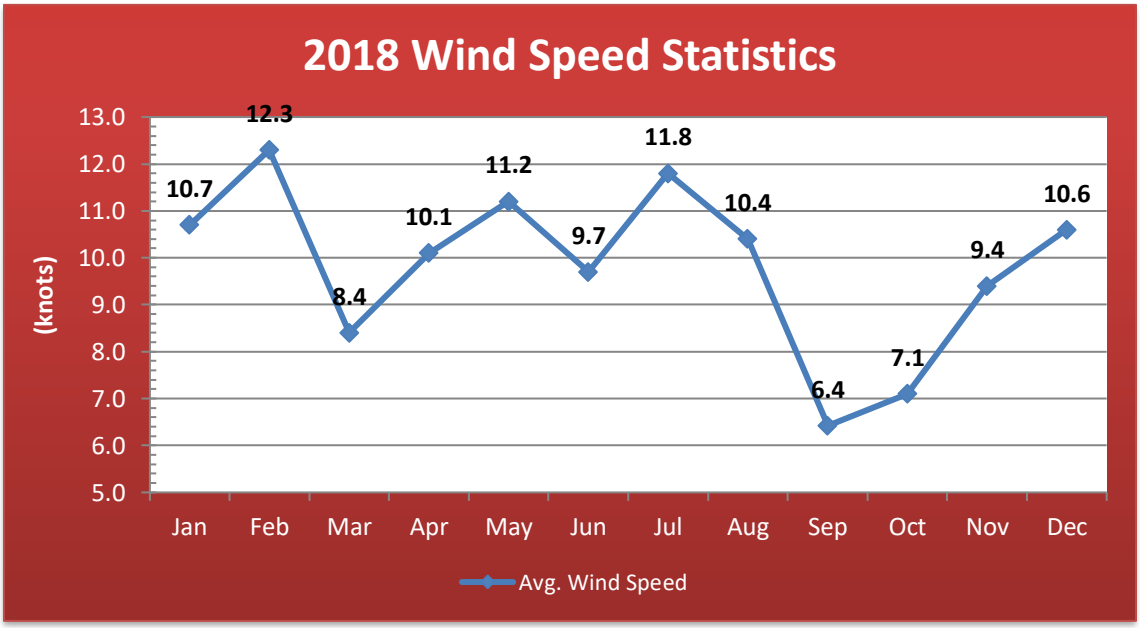
The highest daily *temperature* recorded in 2018 was **33.8° C (93° F)** which was recorded on September 10th while the lowest daily *temperature* was recorded on March 3th as **20.5° C (69° F**).



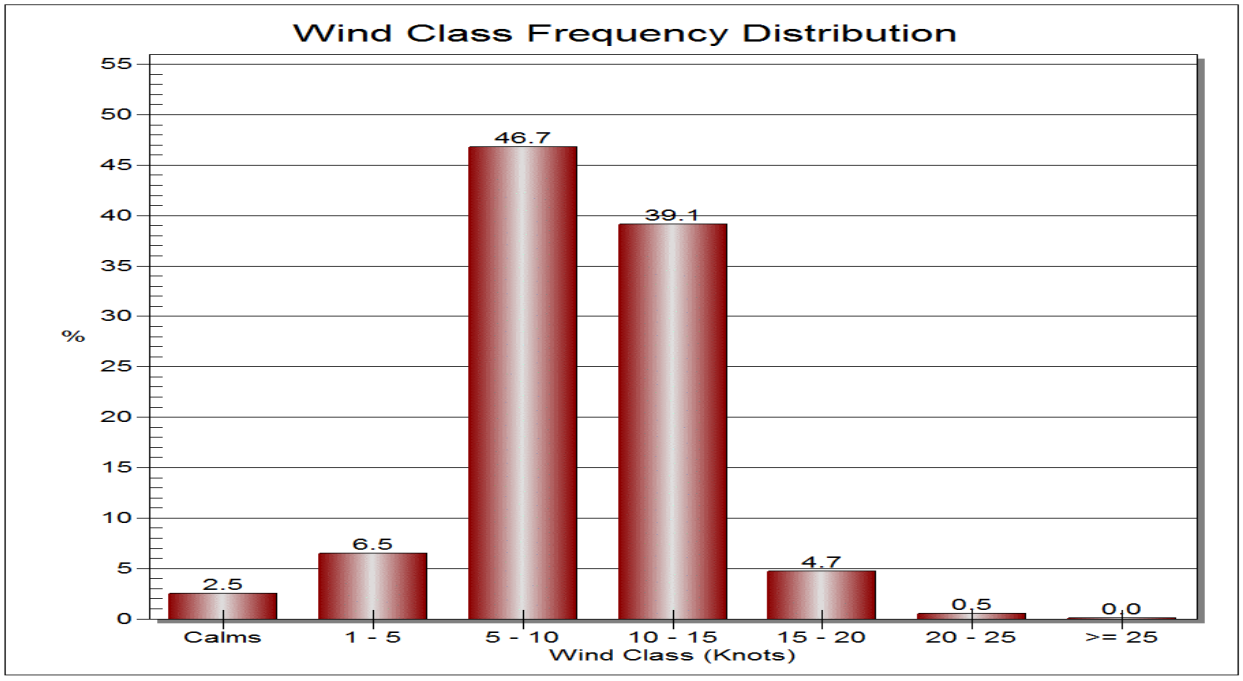


Wind

Surface wind at the Princess Juliana International Airport for 2018 was generally from the east at an average speed of **9.8 knots** (11 mph) which was slightly above average compared to the 30–year average (1981–2010). The *highest monthly average wind speeds were recorded in* **February and July** as 12 knots (14 mph); while **September** had the *lowest monthly average wind speeds* at 6 knots (7 mph).



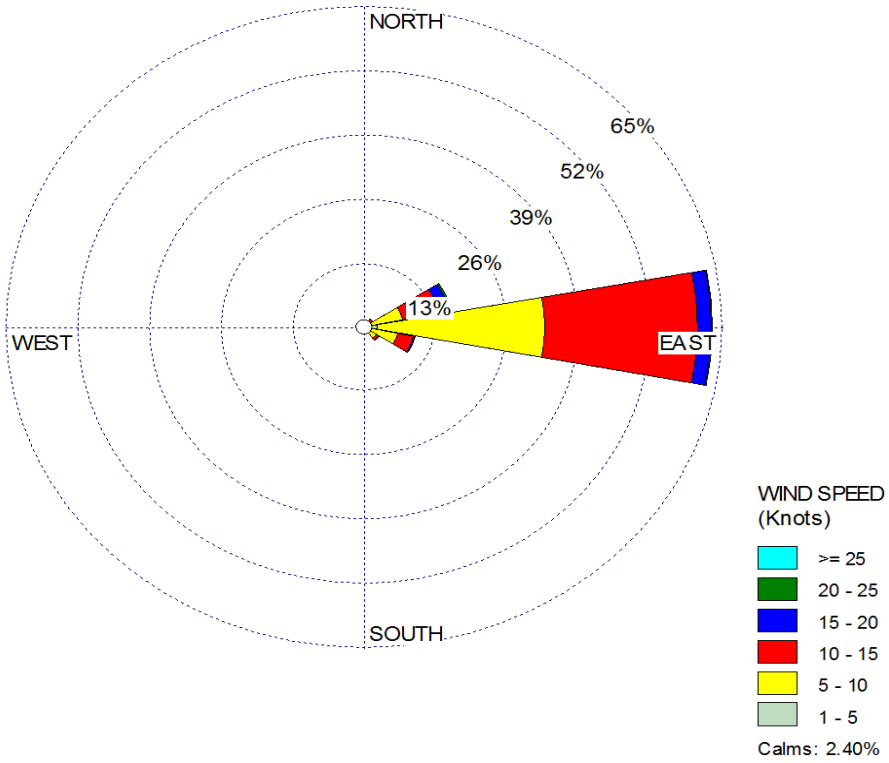
This following wind analysis was obtained, by using the average hourly wind speeds and direction from 1st January to 31st December 2018.



- Approximately 47% of the time, wind speeds at Juliana were between 5 and 10 knots.
- Approximately 39% of the time, wind speeds were between 10 and 15 knots.
- Approximately 7% of the time, wind speeds were between 1 and 5 knots.
- Approximately 5% of the time, wind speeds were between 15 and 20 knots.
- Approximately 2% of the time, speeds were greater than 20 knots or less than 1 knot.

Approximately 4% of the wind data for the year was missing due to reduced work hours after the passage of hurricane Irma. 24hour resumed on February 1st 2018.

2018 Wind Rose



79% of the time winds came from the **East**.

7% of the time winds came from **Southeast**.

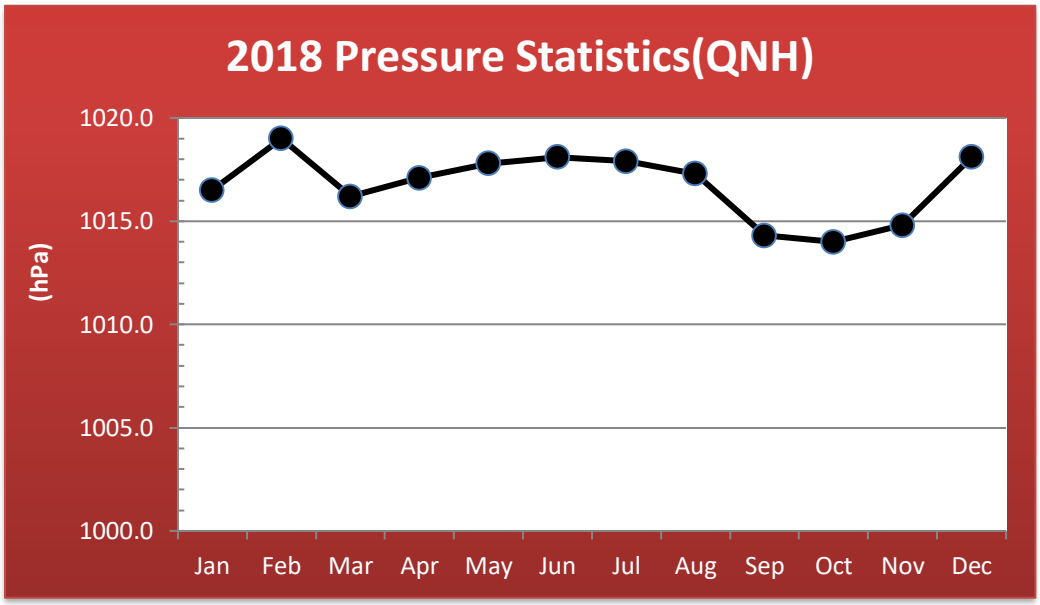
6% of the time winds came from the **Northeast**.

Winds came from other directions 1% of the time or less.

Approximately 4% of the wind data for the year was missing due to reduced work hours after the passage of hurricane Irma. 24hour-shifts resumed on February 1st 2018.

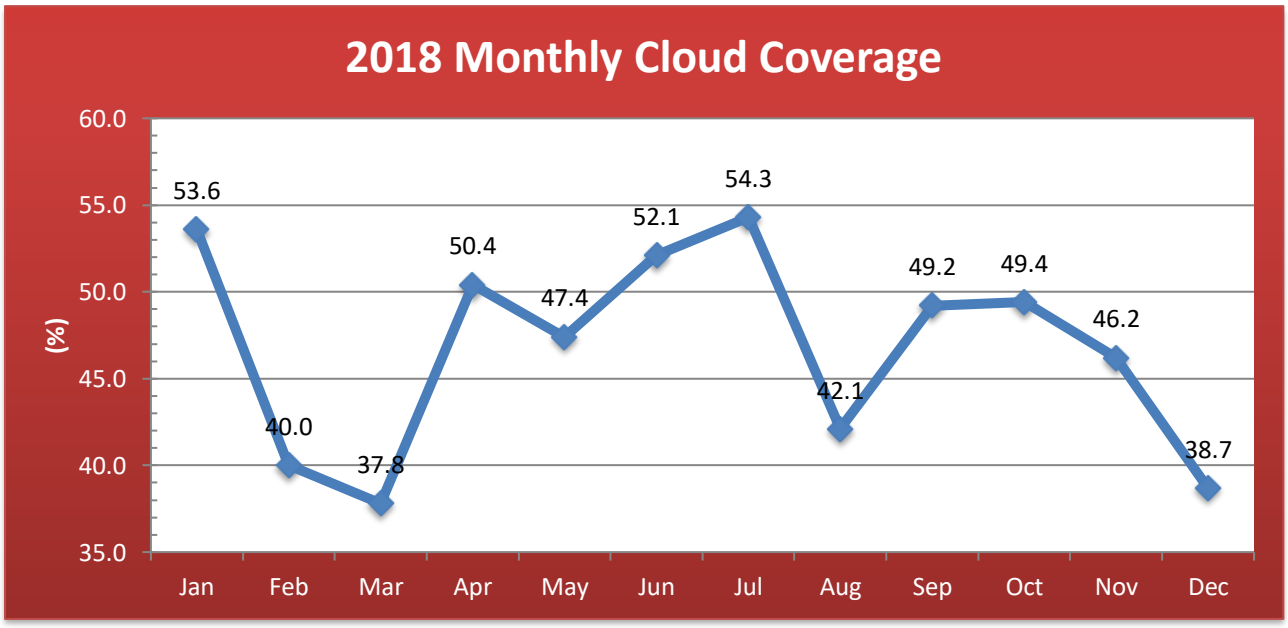
Air Pressure

At the Princess Juliana International Airport, on average the Mean Sea-Level Pressure for 2018 was **1016.8 millibars**. The Highest daily average was recorded on February 21st as 1021.4 mb while the lowest daily average of 1008.1 mb occurred on January 7th.



Cloud Cover

The average cloud cover for St. Maarten over the past year as recorded at the Princess Juliana International Airport was about 46.7%. The *highest monthly average cloud cover* was 54.3% during the month of July while March had the *lowest value* of 37.8%.

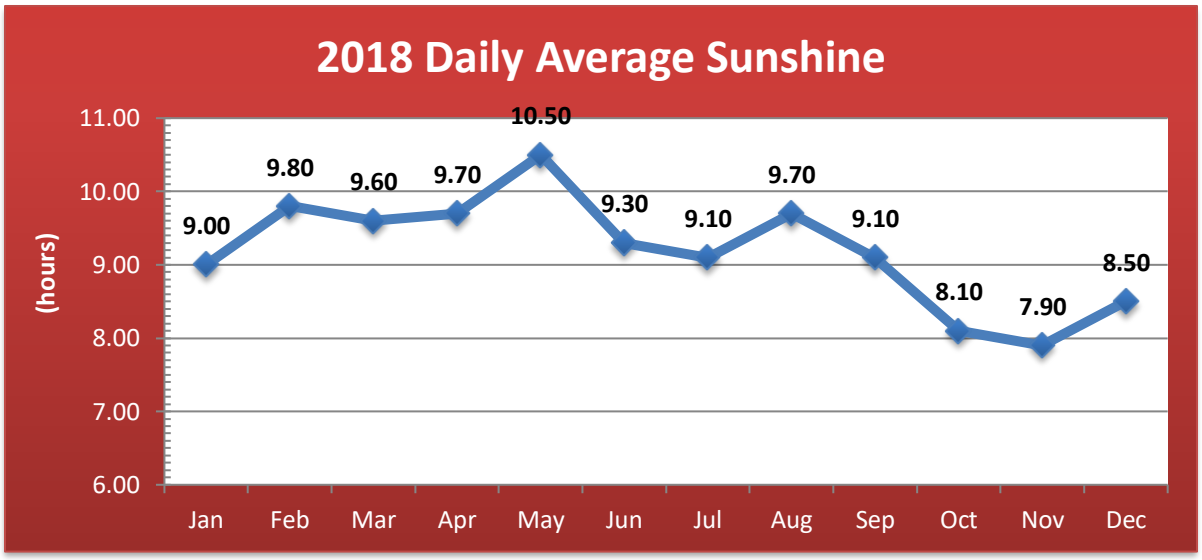


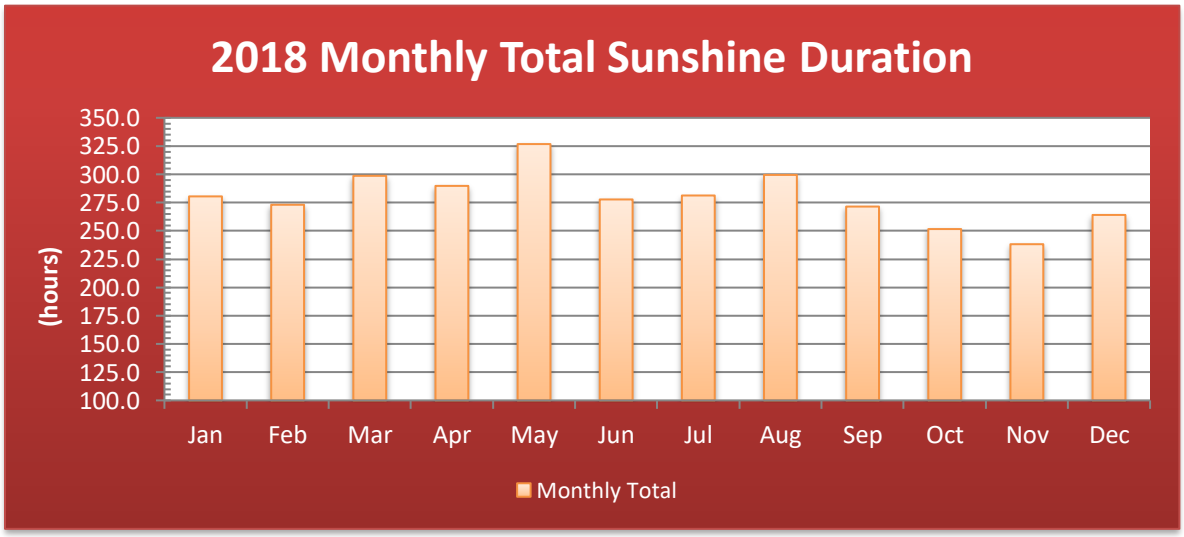
Sunshine Duration

Approximately 75% of possible sunshine was recorded at the surface at the Princess Juliana International Airport, that is, 3352.9 hours out of a possible 4443.1 hours. The *average daily sunshine duration* was **9 hours 12 minutes**.

May received the most hours of sunshine in 2018, while **November** received the least. Daily average sunshine was the highest in the month of **May**; 10 hours and 30 minutes per day; while the lowest daily average was recorded in the month of **November** as 7 hours 12 minutes per day.

Maximum daily sunshine hours was recorded on **May 8th** as 12 hours 06 mins. There were three (3) days when no sunshine was recorded due to overcast conditions: **August 30th, October 13th** and **November 3rd**.





Statistic Summary

Below is a recap of the 2018 climate data, in terms of averages, extremes, and totals:

Rainfall		
Total Rainfall for the year	905.5 mm	35.6 inches
Wettest Month	164.3 mm/6.5 in	October
Driest Month	12.8 mm/0.5 in	June
24-hr Maximum Rainfall	56.9 mm/2.2 in	October 13th
Number of Rain Days (with 1.0+ mm)	162 days	
Number of Heavy Rain Days (with 10.0+mm)	21 days	
Temperature		
Average Air Temperature	27.3° C	81° F
Absolute Maximum Temperature	33.8° C/ 93° F	*September 10th*
Absolute Minimum Temperature	20.5° C/ 69° F	*March 3rd*
Warmest Month	29.0° C/84° F	*September*
Coolest Month	25.2° C/77° F	*February*
Average Relative Humidity	71%	
Wind & Pressure		
Average Wind Speed	9.8 knots	11 mph
Average wind Direction	90 degrees	*East*
Maximum Wind Gust	NA	*NA*
Most frequent category speed	5-10 knots	*45%*
Average Air Pressure	1016.8 mb.	
Clouds & Sunshine		
Average Cloud Coverage	46.8%	
Average Daily Sunshine Duration	9 hours : 12 minutes	
Month: Maximum Sunshine	*May*	
Month: Minimum Sunshine	*November*	
Daily Maximum Sunshine	*12 hrs. 06 min.*	*May. 8th*
Daily Minimum Sunshine	*0 hrs. 00 min.*	*Aug. 30th , Oct. 13th & Nov. 3rd*

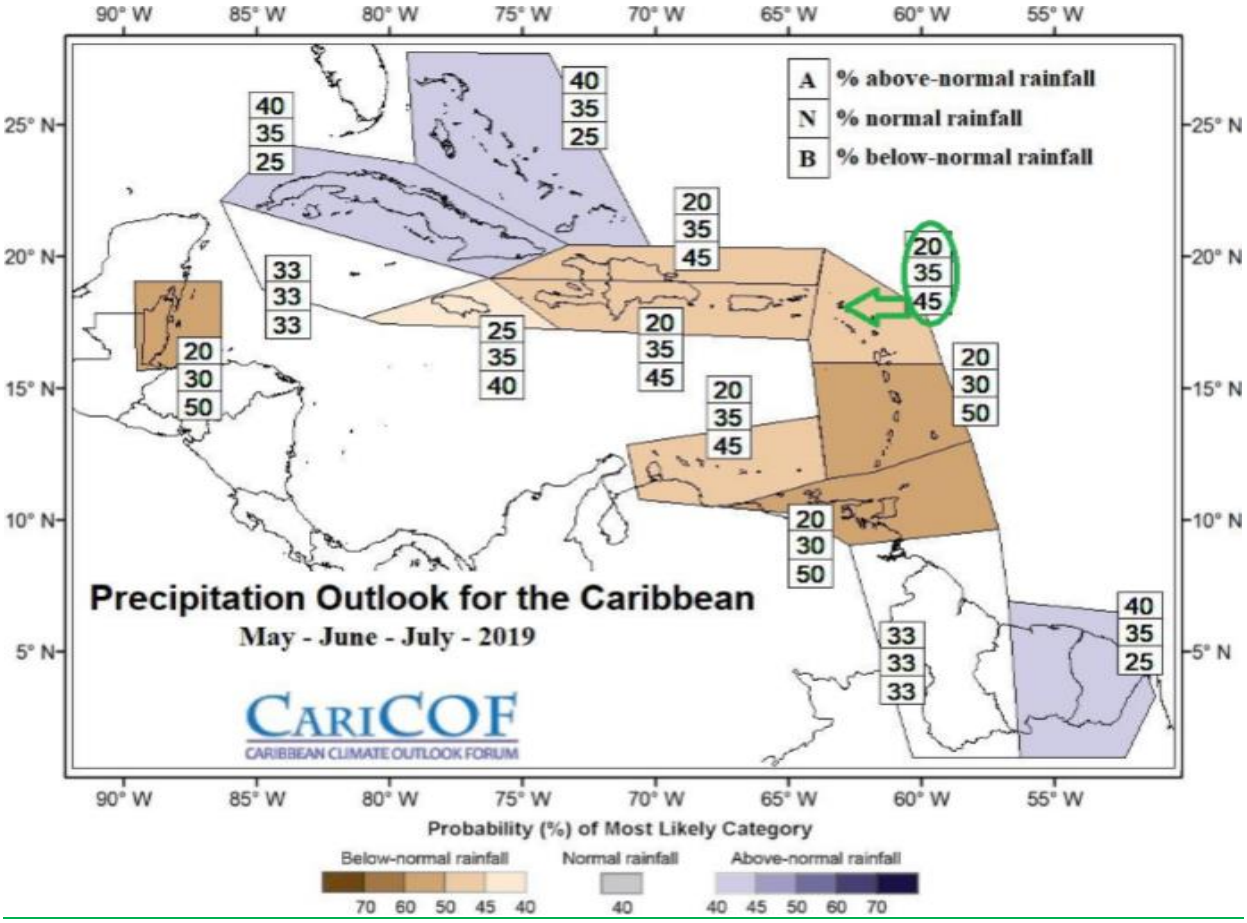
Conclusion

This report provides a summary of all the meteorological data recorded at the Princess Juliana International Airport during the year 2018. 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 2019

Rainfall Outlook for May-Jun-Jul 2019



Map compliments: CARICOF: Caribbean Institute for Meteorology & Hydrology

Rainfall for the next three (3) months May-Jun-Jul 2019 is expected to be the usual or drier for St. Maarten and most of the Caribbean except the Cuba, the Bahamas, Suriname and French Guyana.

Normal rainfall for this season ranges between 194 mm – 281 mm or 8–11 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 **45%** chance of being **below *Normal*** (less than 194 mm); a ***35%*** chance of being ***Near Normal*** (between 194 mm and 281 mm); and a **20%** chance of being **Above *Normal*** (more than 281 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 2019 Atlantic Hurricane Season

ANDREA	HUMBERTO	OLGA
BARRY	IMELDA	PABLO
CHANTAL	JERRY	REBEKAH
DORIAN	KAREN	SEBASTIEN
ERIN	LORENZO	TANYA
FERNAND	MELISSA	VAN
GABRIELLE	NESTOR	WENDY

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
Tropical disturbance	A discrete system of clouds, showers, and thunderstorms that originates in the tropics and maintains its identity for 24 hours or more.
Tropical wave	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.
Tropical Depression	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.
Tropical Storm	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).
Hurricane	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. (*see next page*)
Extra-tropical Cyclone	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.
Subtropical Cyclone	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).
Post-tropical Cyclone	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.

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