

Climatological Summary 2012

~ Including Hurricane Season Review ~



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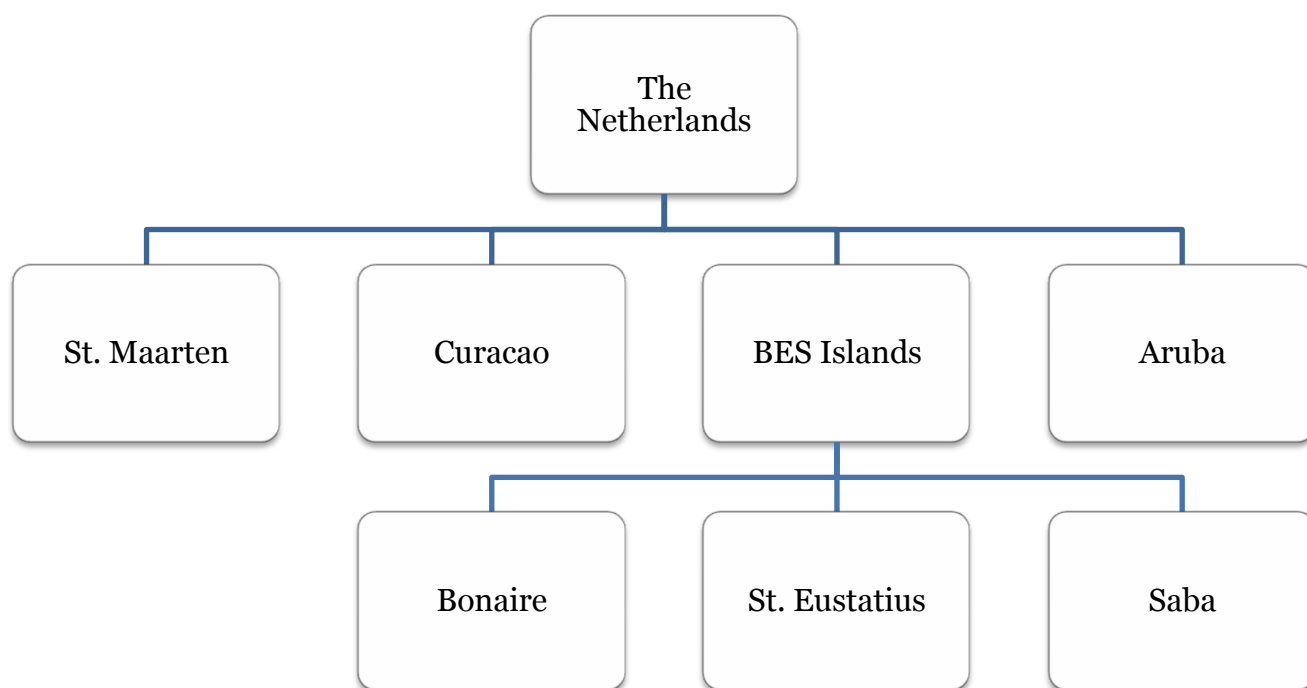
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Introduction

St. Maarten is an island located in the northeastern portion of the Caribbean – more specifically at 18.03° N, 63.05° W. After the constitutional changes of the Netherlands Antilles, St. Maarten became an autonomous country within the Kingdom of the Netherlands on 10 October, 2010 (10-10-10). The other islands of the former Netherlands Antilles also gained a new status, thus forming the following structure:



After the status change on 10-10-10, St. Maarten became fully responsible for the Meteorological Department and its activities. Due to the fact that St. Maarten didn't have all the professional manpower, a yearly contract was signed with Meteo Curaçao to help St. Maarten with their daily tasks until St. Maarten could function on its own.

MDS (Meteorological Department St. Maarten) thus only became fully independent on 1 January 2013 -- providing accurate up-to-date weather information that aims to keep its community and the surrounding region informed on any meteorological hazards.

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, to improve the quality of life for everyone on St. Maarten and the surrounding region. Reliable early warnings are issued in the event of any severe weather, seismic issues or climatic events allowing decision-makers, communities, and individuals to be better prepared; thus avoiding socio-economic setbacks.

Our Mission

Our aim is to protect life and property, by providing 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.

Our Vision

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

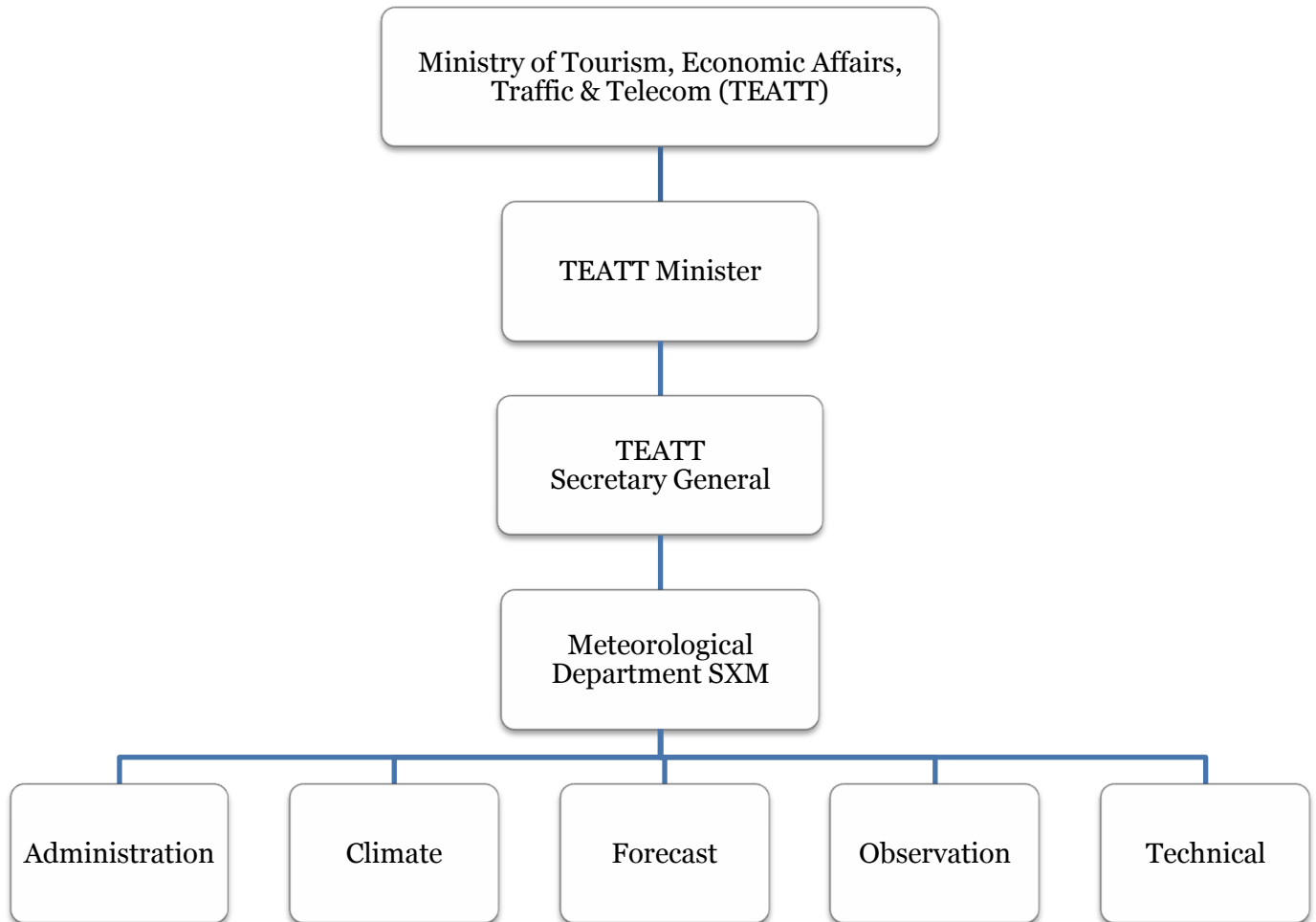
Tasks

The objectives of the Meteorological Department of St. Maarten are to:

- Monitor weather conditions 24/7, 365 ¼ days a year
- Observe, record, and transmit upper-air data (temperature, humidity, winds, etc)
- Correspond with regional & international weather stations on various meteorological & climatological phenomena
- Produce and disseminate weather forecasts and warnings to the general public, marine and aviation industries
- Issue special reports whenever necessary, such as in the event of heavy rainfall, tropical storms, and/or other hazardous weather phenomena
- Manage and maintain meteorological and climatological data on a regular basis (monthly and yearly)
- Uphold national & international policy in the field of meteorology, climatology and other geophysical fields

Staff

Several sections work together to collectively provide meteorological services to the public and other key stakeholders (i.e. aviation & marine industry). These sections are namely: Forecast, Observation, Technical, Climate, and Administration. Our proposed organizational chart is as follows:



Hurricane Season

Hurricane Season officially begins on June 1st and ends on November 30th in the Atlantic Basin; however, tropical cyclones can and do form outside of these dates (as we have seen in the past). The 2012 Atlantic Hurricane Season was an above-average, record-breaking period with a total of **19 named storms**, 10 of which were hurricanes, and 1 was a major hurricane¹ (Category 3+). It was the seventh hurricane season in the last 162 years that has had 19 or more named storms; and tied with 1887, 1995, 2010, and 2011 as being the third most-active season since 1851. A typical hurricane season has 12 named storms, six of which become hurricanes, and three of those intensify into major hurricanes.

Oddities

In addition to being above-average, the oddities began when ***Tropical Storm Alberto*** formed before the “official start” of the Atlantic Hurricane Season on May 19th -- becoming the earliest-forming Atlantic tropical storm since Ana in April 2003. ***Tropical Storm Beryl***, which formed on May 26th, then broke the record for being the strongest tropical cyclone to make a U.S. landfall prior to June 1st.

Hurricane Chris (Cat. 1) continued the record-setting streak when it became the first Atlantic hurricane in the open waters of the North Atlantic Ocean at a latitude of 41° North -- which is farther north than New York City. Only one hurricane was further north as a hurricane in June than Chris, which occurred in 1893. Only twice before in history (1887 and 1959) has the third-named or “C”-named storm of the season form earlier than Chris. Moreover, the average date for the first Atlantic hurricane is August 10th; Chris became a hurricane on June 21st!

Tropical Storm Debby then beat ***Tropical Storm Dennis***² (2005) by becoming the earliest fourth-named or “D”-named storm in the Atlantic season when it formed on June 23rd. The fourth-named Atlantic storm usually forms by August 23rd -- a full two months later. However, none of these four storms affected the local region.

After a very quiet July, where neither a tropical storm nor tropical depression formed, ***Hurricane Ernesto*** (Cat. 2) brought the season back to life when it became one of eight named storms to form in August 2012. This tied with August 2004 for the most named storms to form in the month of August. The other storms that formed in August were: ***Tropical Storm Florence***, ***Hurricane Gordon*** (Cat. 2), ***Tropical Storm Helene***, ***Hurricane Isaac*** (Cat. 1), ***Tropical Storm Joyce***, ***Hurricane Kirk*** (Cat. 2), and ***Hurricane Leslie*** (Cat. 1).

Some of these storms from late August to early September rivaled other past active years (1995 and 2005) for how early they formed in the season. ***Tropical Storm Joyce*** formed on August 23rd and tied with ***Tropical Storm Jerry*** in 1995 as the second-earliest forming tenth-named or “J”-named storm on record. Only one storm formed earlier in history, which was ***Tropical Storm Jose*** on August 22nd, 2005.

¹ A major hurricane is a Category 3 or higher on the Saffir-Simpson Hurricane Wind Scale (see Appendix), which has maximum sustained winds of 111 miles per hour (178 km/h).

² Tropical Storm Dennis became a hurricane on 6 July 2005, two days after formation.

The only major hurricane of the 2012 season, **Hurricane Michael**³ (Cat. 3) formed on September 3rd. Only 2005 and 2011 had the thirteenth-named or “M”-named storm form earlier than September 4th. This hurricane became the third earliest seventh hurricane of the season on record -- only behind 1886 and 1893. Moreover, the large number of storms thus far in the 2012 season caused the first (and only) major hurricane to form deeper in the alphabetic named-storm list on record (since 1950). The first major hurricane of the season usually develops around September 4th. On the other hand, there have been four Atlantic hurricane seasons since 1950 without a major hurricane at all: 1968, 1972, 1986, and 1994 -- but these years didn’t make it past the “G”-named storm.

Hurricane Nadine broke the record for the longest-lasting Atlantic tropical cyclone on record at an astounding 21.75 days old⁴. Maintaining the odd track-record of the season, **Nadine** strengthened to a hurricane at three different times, and also affected the Azores Islands (just west of Portugal, Europe) twice.

Tropical Storms Oscar and **Patty** did not break any records, and neither did **Hurricane Rafael**. However, **Rafael** affected the local region when it moved through the eastern Caribbean as a tropical storm between October 13th and 14th. **Rafael** later strengthened into a hurricane on October 15th.

Hurricane Sandy became known as a “superstorm” when it wreaked havoc through the Caribbean (Jamaica, Haiti, Dominican Republic, Cuba, Puerto Rico, Bahamas), northeastern United States, and southeastern Canada. Sandy only caused minor effects on St. Maarten, which is described in the following section.

Wrapping up the season was **Tropical Storm Tony**, which formed on October 22nd and lasted just under three days and stayed in the central Atlantic Ocean -- thus affecting no land areas. The final stretch of the Atlantic Hurricane Season was eerily quiet with no tropical cyclones forming during the entire 30 days of November.

Local Effects

Although the season was very active, St. Maarten had only a few close-calls and no landfalls, resulting in minor damage mainly along the coast. The following systems became hurricanes after bypassing the local region: **Ernesto**, **Isaac**, **Leslie**, **Rafael**, and **Sandy** – with Rafael being the most destructive to St. Maarten. **Tropical Storm Helene** also affected St. Maarten, but did not develop into a hurricane.

The center of **Tropical Storm Ernesto** passed 295 miles south of St. Maarten (between Barbados and St. Lucia) late August 2nd/early August 3rd before it became a hurricane on August 6th. MDS recorded wind gusts up to 34 miles per hour or ‘mph’ (55 kilometers per hour or ‘km/h’) and a rainfall total of 7.9 millimeters or ‘mm’ between August 3rd and 4th.

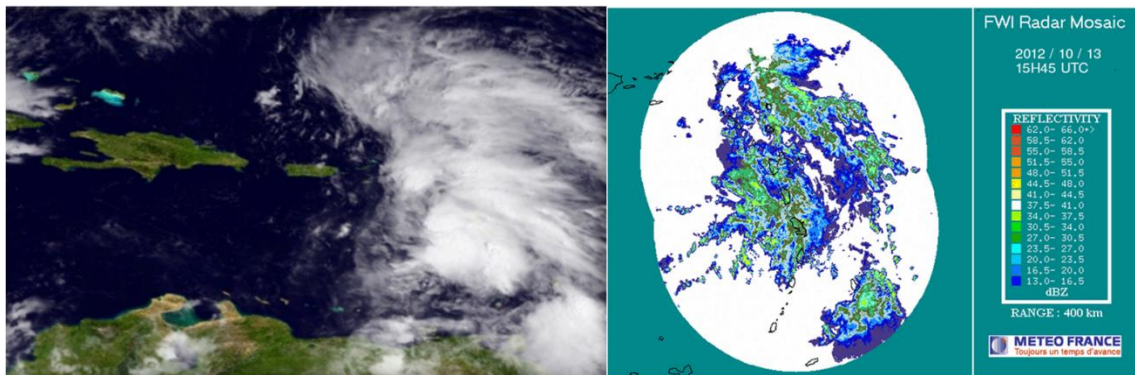
The center of **Tropical Storm Helene** passed 270 miles south of St. Maarten (between St. Lucia and St. Vincent) on August 11th. MDS recorded a 32mph (52km/h) wind gust and a 0.5mm rainfall total between August 11th and 12th.

³ Hurricane Michael initially formed as a tropical storm on 3 September, before strengthening into a hurricane on the 5th.

⁴ Hurricane Nadine briefly became post-tropical from 11pm on 21 September to 11am on 23 September.

The center of ***Tropical Storm Isaac*** passed 155 miles south of St. Maarten (just south of Guadeloupe) on August 23rd, prior to becoming a hurricane five days later. MDS recorded wind gusts up to 41mph (66km/h) and a rainfall total of 0.9mm between August 23rd and 24th. Although the center of the system bypassed St. Maarten, *Tropical Storm Warnings*⁵ were issued -- due to the storm's size, rapid intensification, and proximity.

The center of ***Tropical Storm Leslie*** passed 265 miles northeast of St. Maarten on September 2nd, prior to becoming a hurricane three days later. MDS recorded wind gusts up to 18mph (29km/h) and a rainfall total of 0.9 mm between September 1st and 2nd. Leslie also caused dangerous waves, which triggered *High Surf* and *Small Craft Advisories*.



Images of ***Tropical Storm Rafael*** over the eastern Caribbean on Saturday, 13 October, 2012.
On left: Satellite Image (courtesy: NOAA/GOES). On right: Radar Image (courtesy: Meteo France – Martinique).

The center of ***Tropical Storm Rafael*** passed 25 miles west of St. Maarten late October 13th/early October 14th before it became a hurricane on October 15th. MDS recorded a 37mph (60km/h) wind gust and a 92.3mm rainfall total between October 13th and 14th. Besides these heavy showers and strong winds, Rafael also caused rough seas with dangerous waves -- resulting in a lot of debris (sea moss, trash, etc.) along the coastline. Additionally, *Tropical Storm Warnings* were issued as this near-hurricane barely missed the island.



Effects of ***Tropical Storm Rafael*** at Great Bay, St. Maarten on October 14th & 15th.
All photos courtesy: A. Blijden (posted on StormCarib).

Although the center of ***Tropical Storm Sandy*** passed 905 miles west of St. Maarten just before making landfall over the eastern tip of Jamaica as a hurricane on October 24th, the local region experienced dangerous sea conditions, wind gusts up to 19mph (31km/h), and MDS recorded 0.0mm of rainfall at the Princess Juliana International Airport.

⁵ Tropical Storm Watches and Warnings are defined in Appendix.

Summary

Below is a recap of the 2012 Atlantic Hurricane Season in relation to its effects on St. Maarten:

	Storm Name	Active Dates	Peak Category	Max. Winds	Local Effects	Observed Rainfall	Observed Wind Gust
1	Alberto	19 May - 22 May	Tropical Storm	60 mph (95 km/h)	None		
2	Beryl	26 May - 30 May	Tropical Storm	70 mph (110 km/h)	None		
3	Chris	19 Jun. - 22 Jun.	Cat. 1 Hurricane	75 mph (120 km/h)	None		
4	Debby	23 Jun. - 27 Jun.	Tropical Storm	60 mph (95 km/h)	None		
5	Ernesto	1 Aug. - 10 Aug.	Cat. 2 Hurricane	85 mph (140 km/h)	Minor (gusty winds, brief showers)	7.9 mm	34 mph (55 km/h)
6	Florence	3 Aug. - 6 Aug.	Tropical Storm	60 mph (95 km/h)	None		
7	Helene	9 Aug. - 18 Aug.	Tropical Storm	45 mph (75 km/h)	Minor (gusty winds, brief showers)	0.5 mm	32 mph (52 km/h)
8	Gordon	15 Aug. - 20 Aug.	Cat. 2 Hurricane	110 mph (175 km/h)	None		
9	Isaac	21 Aug. - 1 Sep.	Cat. 1 Hurricane	80 mph (130 km/h)	Minor (gusty winds, brief showers)	0.9 mm	41 mph (66 km/h)
10	Joyce	22 Aug. - 24 Aug.	Tropical Storm	40 mph (65 km/h)	None		
11	Kirk	28 Aug. - 2 Sep.	Cat. 2 Hurricane	105 mph (165 km/h)	None		
12	Leslie	30 Aug. - 11 Sep.	Cat. 1 Hurricane	75 mph (120 km/h)	Minor (dangerous waves, moderate winds, brief shower)	0.9 mm	18 mph (29 km/h)
13	Michael	3 Sep. - 11 Sep.	Cat. 3 Hurricane	115 mph (185 km/h)	None		
14	Nadine	11 Sep. - 4 Oct.	Cat. 1 Hurricane	90 mph (150 km/h)	None		
15	Oscar	3 Oct. - 5 Oct.	Tropical Storm	50 mph (85 km/h)	None		
16	Patty	11 Oct. - 13 Oct.	Tropical Storm	45 mph (75 km/h)	None		
17	Rafael	12 Oct. - 17 Oct.	Cat. 1 Hurricane	90 mph (150 km/h)	Moderate (rough seas/ dangerous waves, strong winds, heavy showers)	92.3 mm	37 mph (60 km/h)
18	Sandy	22 Oct. - 29 Oct.	Cat. 2 Hurricane	110 mph (175 km/h)	Minor (dangerous waves, breezy conditions, no showers)	0.0 mm	19 mph (31 km/h)
19	Tony	22 Oct. - 25 Oct.	Tropical Storm	50 mph (85 km/h)	None		

ATLANTIC SEASON 2012

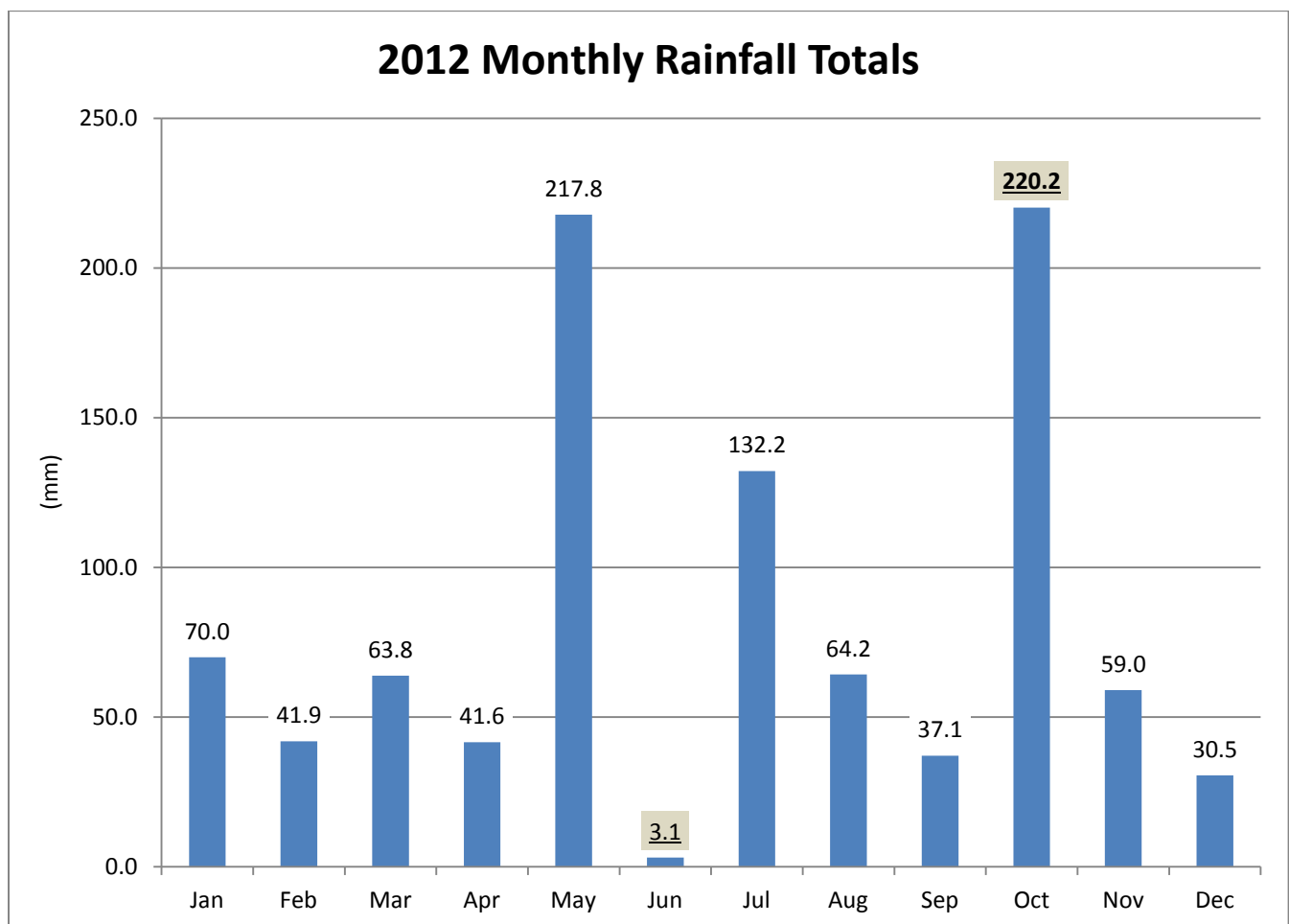


2012 Climate Data

Rainfall

The rainfall total, recorded at the Princess Juliana International Airport, for the year 2012 was **981.4 mm or 38.64 inches**. This amount is below average compared to the 30-year normal (1981-2010), which is 1160.1 mm or 45.67 inches. **October** was the *wettest month* of the year, with a total of 220.2 mm or 8.67 inches; while the *driest month* was **June** with 3.1 mm or 0.12 of an inch of rainfall. The *wettest day* was **May 4th**, when 118.8 mm or 4.68 inches was recorded. St. Maarten received **125 rain days** for the year, which means that these days received at least 1.0 mm of rain within a 24-hour period.

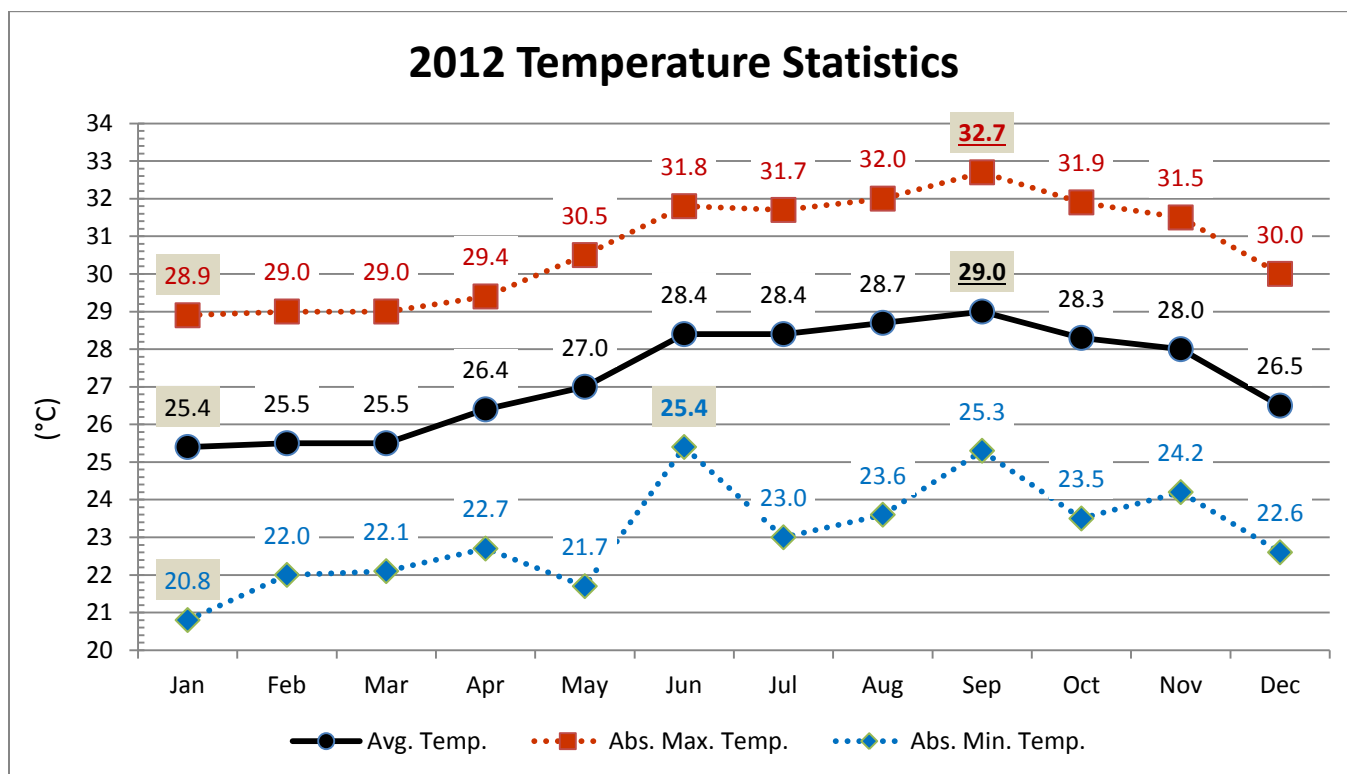
Interesting to note: St. Maarten experienced the *driest December* in the last 15 years; the *driest September* in the last 26 years; and the *driest June* on record (the last 60 years). Moreover, MDS recorded a *very wet May* (217.8 mm or 8.58 inches) this year compared to the average of 70.3 mm or 2.77 inches for the month of May. *October* was also *quite wet*, but most of that month's total was as a result of the passage of Tropical Storm Rafael.



Temperature

St. Maarten experienced an overall average temperature of **27.3 degrees Celsius** or '°C' (81 °F). This amount is near normal compared to the 30-year normal (1971-2000), which is 27.2 °C (81 °F). **September** was the *warmest month* of 2012 with an average monthly temperature of 29.0 °C (84 °F). The *coolest month* was **January**, which had an average monthly temperature of 25.4 °C (78 °F).

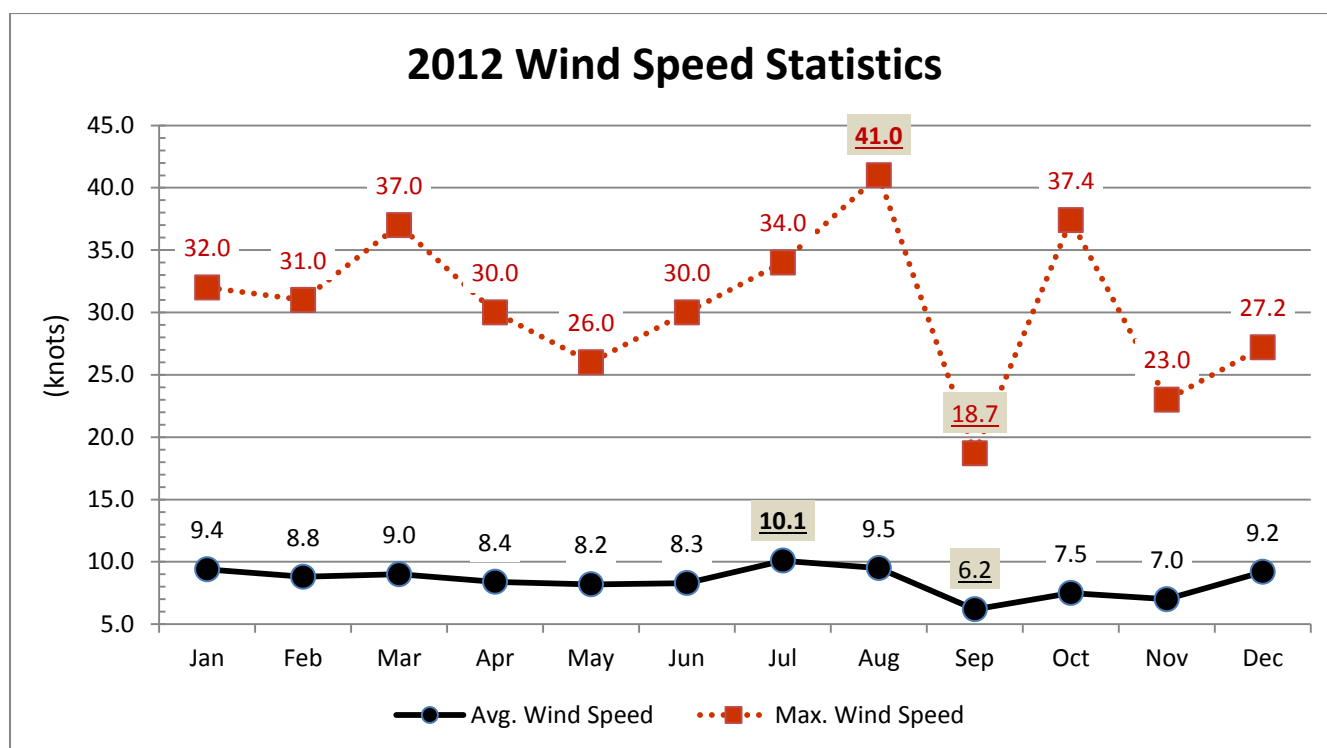
The *absolute maximum temperature* of the past year was 32.7 °C (91 °F) and was recorded on September 16th at 12:58pm local time. The *absolute minimum temperature* was 20.8 °C (69 °F) and was recorded on January 18th at 2:22am local time.



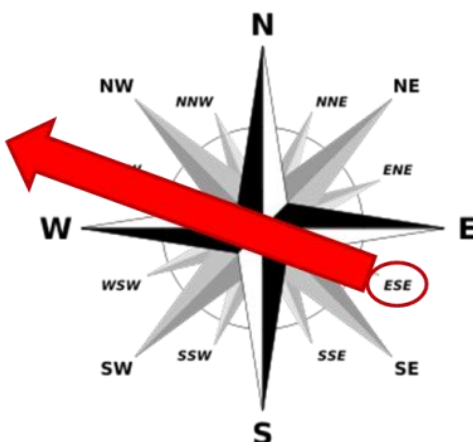
Wind

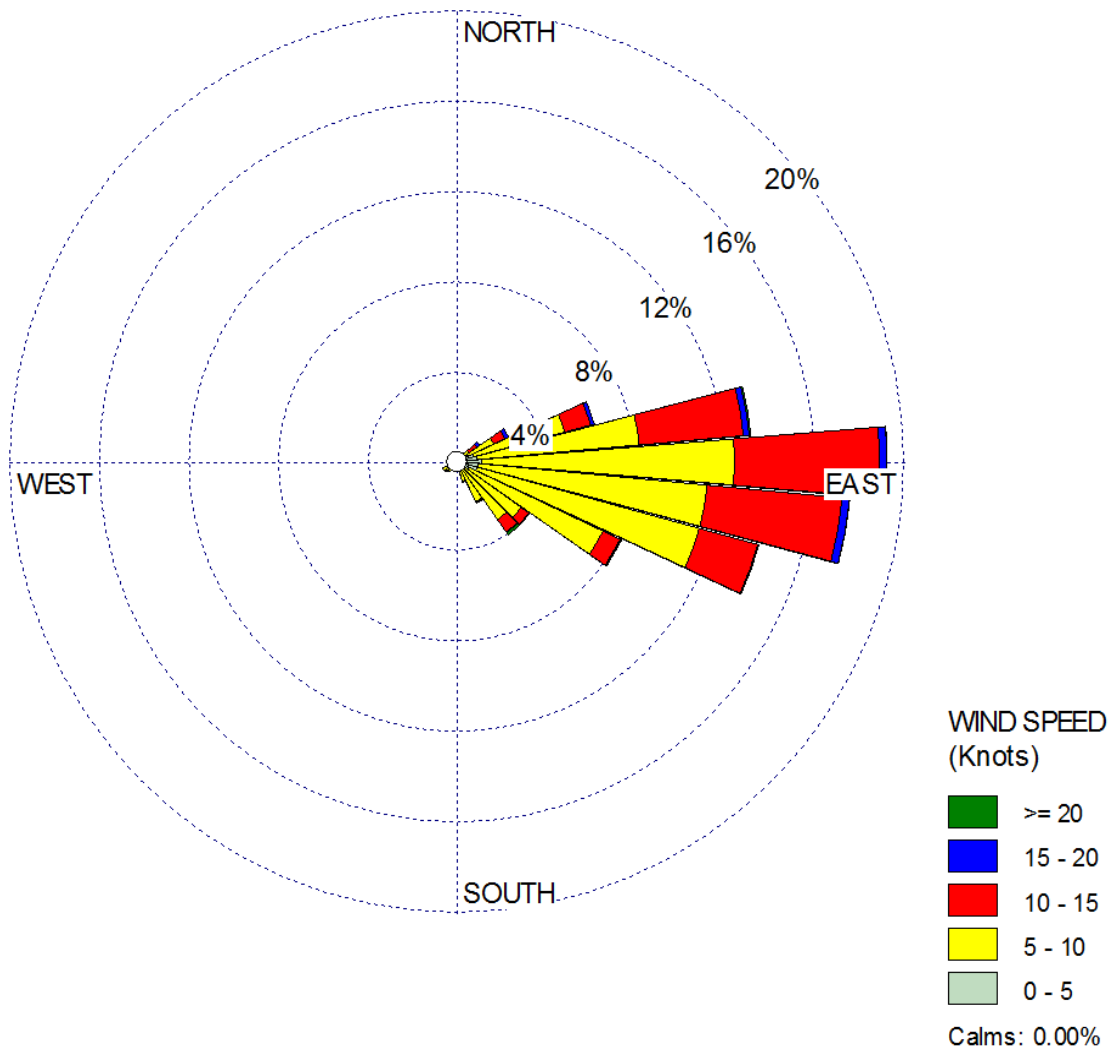
The average 2012 wind speed recorded at the Princess Juliana International Airport was **8.5 knots** (4.4 mph or 15.7 km/h) which is near-normal compared to the 30-year average (1981-2010). **July** yielded the *highest monthly average wind speed* at 10.1 knots (5.2 mph or 18.7 km/h); while **September** had the *lowest monthly average wind speed* at 6.2 knots (3.2 mph or 11.5 km/h).

Furthermore, the *highest wind gust* for the year occurred on August 23rd at 2:15am local time with an astounding speed of 41 knots (21.1 mph or 75.9 km/h). This was recorded during the passage of **Tropical Storm Isaac**.



The average wind direction for 2012 is 105 degrees or **East-Southeast**. This compares to the 30-year average (1971-2000) which is 99 degrees or **East**.





The wind rose above shows that throughout 2012 the direction of the winds at Princess Juliana International Airport was between 60 degrees (East-Northeast) and 130 degrees (Southeast) for more than 60% of the time.

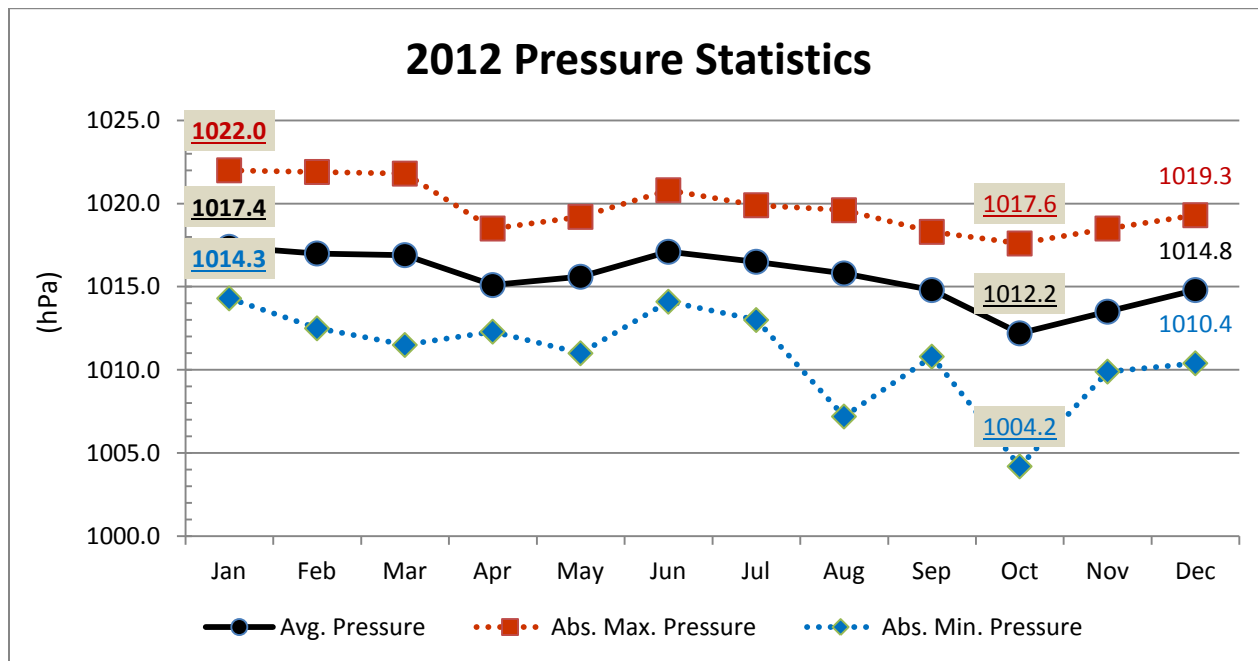
The longest spike: 19.5% of the time winds were from the East (90°) and 12.5% of which were between 5 and 10 knots, 6.5% were between 10 and 15 knots while 0.5% were above 15 knots.

Second longest spike: 17.5% of the time winds were from the East-Southeast (100-115°) and 11.5% of which were between 5 and 10 knots, 5.5% were between 10 and 15 knots while 0.5% were above 15 knots.

Air Pressure

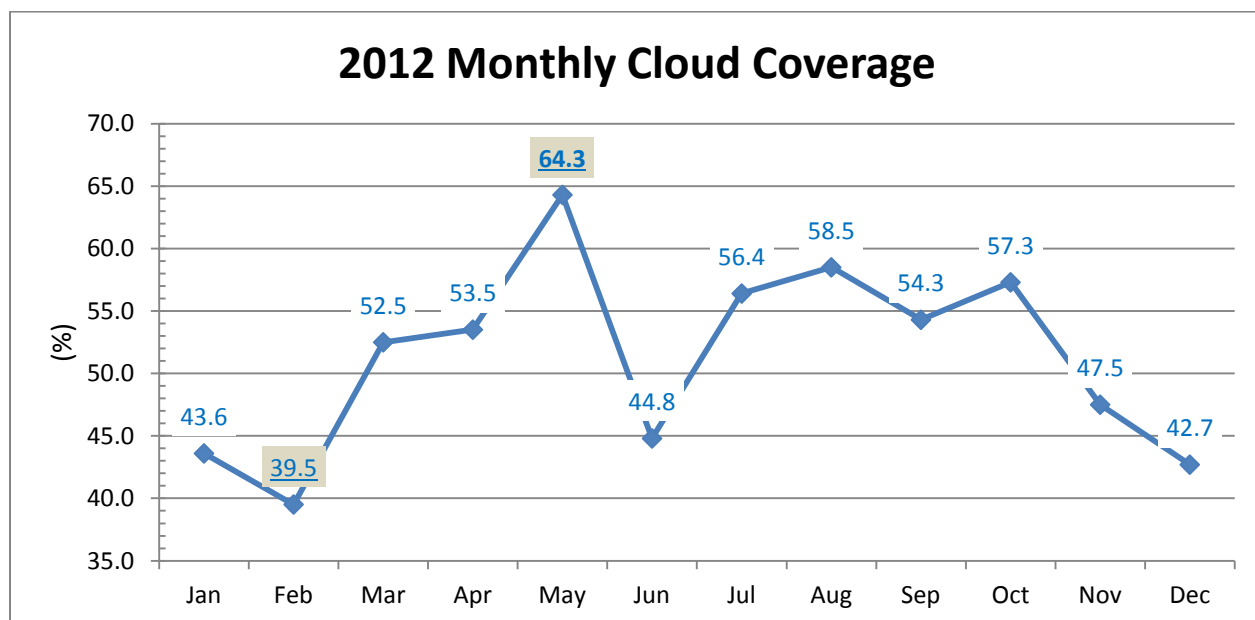
MDS recorded an average air pressure of **1015.6 hecto-Pascals** or 'hPa' over the past year. The absolute *maximum air pressure* of 1022.0hPa was recorded on January 15th, while the *absolute minimum air pressure* of 1004.2 hPa occurred on October 14th.

The lowest air pressure coincides with the passage of ***Tropical Storm Rafael***.



Cloud Cover

The average cloud cover for St. Maarten over the past year as recorded at the Princess Juliana International Airport was 51.2 %. The *highest daily average cloud cover/month* was 64.3 % and it was observed in **May**. **February** had the *lowest value* of 39.5 %.

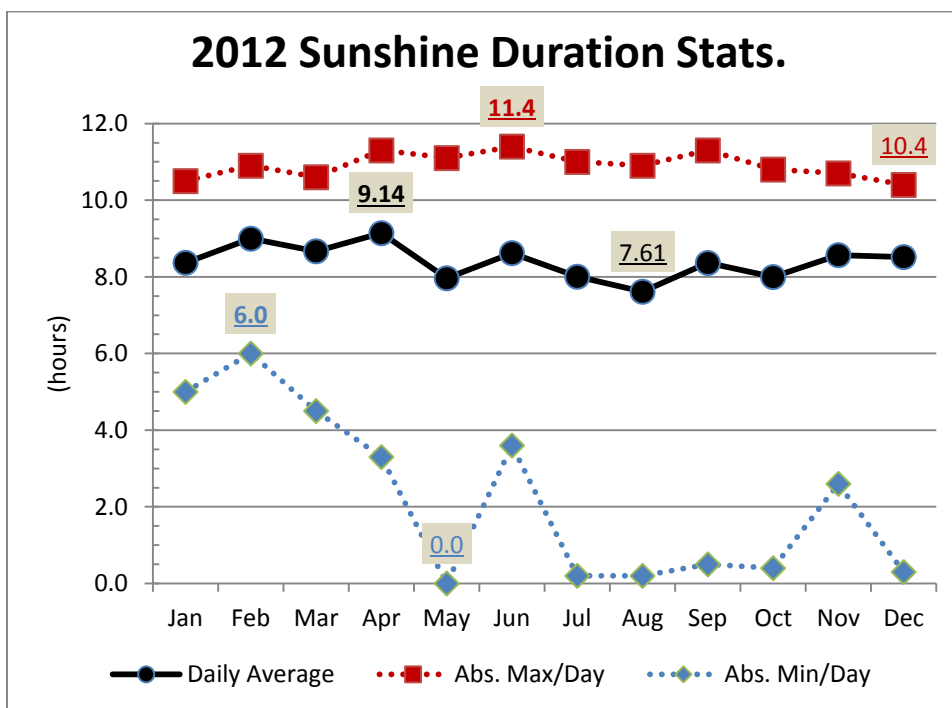
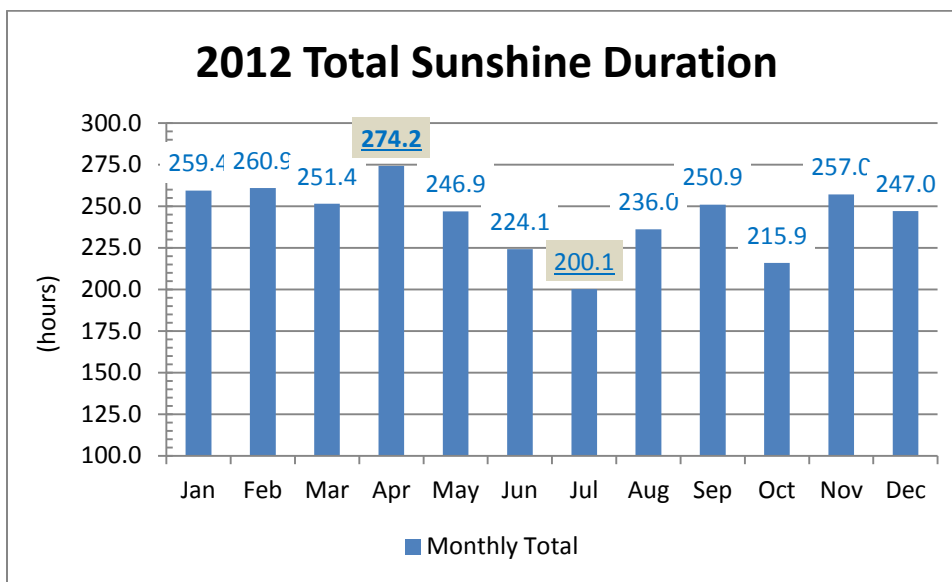


Sunshine Duration

The total sunshine duration for the past year was 2923 hours and 48 minutes. This is 65.8 % of the maximum possible sunshine duration (4443 hours and 6 minutes). The *average daily sunshine duration* was **8 hours and 24 minutes**.

On average, **April** received the *most daily sunshine* at 9 hours and 8 minutes; while the *least average daily sunshine* of 7 hours and 37 minutes occurred in **August**.

The *absolute longest daily sunshine duration* for the past year was 11 hours and 24 minutes, which occurred on June 24th. **May 6th** received the *absolute least amount of sunshine*, which was an astounding 0 hours and 0 minutes.



Statistic Summary

Below is a recap of the 2012 climate data, in terms of averages, extremes, and totals:

Rainfall			
Total Rainfall for the year	981.4 mm		38.64 inches
Highest Monthly Rainfall Amount	220.2 mm		8.67 inches
Highest Rainfall Month	October		
24-hr Maximum Rainfall	118.8 mm		4.67 inches
24-hr Maximum Rainfall Date	May 4th		
Number of Rain Days (with 1.0+ mm)	125 days		
Temperature			
Average Air Temperature	27.3 °C		81.1 °F
Absolute Maximum Temperature	32.7 °C		90.9 °F
Absolute Minimum Temperature	20.8 °C		69.4 °F
Average Relative Humidity	73.1 %		
Wind & Pressure			
Average Wind Speed	8.5 knots	9.8 mph	15.7 km/h
Maximum Wind Gust	41 knots	47.2 mph	75.9 km/h
Average Air Pressure	1015.6 hPa		
Sunshine & Clouds			
Average Cloud Coverage	51.2 %		
Average Daily Sunshine Duration	8 hours, 24 minutes		

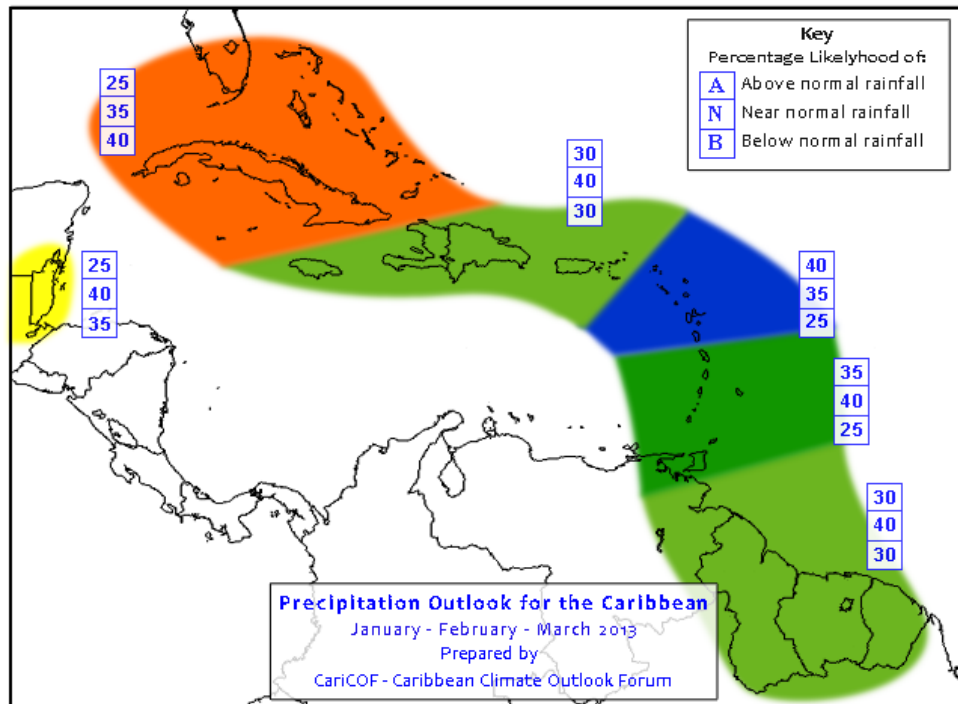
Conclusion

All data presented in this climatological summary was recorded at the Princess Juliana International Airport and have been quality controlled against the international standards of the World Meteorological Organization (WMO) and the International Civil Aviation Organization (ICAO). As the Meteorological Department St. Maarten (MDS) is a fairly new entity – in the sense of providing forecasting, climatological, and early-warning services – MDS is honored to produce the first of this annual publication. The MDS accepts requests for additional information on past and current data through the Climatology Section, where requests and/or suggestions for improvement may be submitted via e-mail or phone.

Weather affects the quality of our lives, either directly or indirectly. As such, weather forecasting is an increasingly important part of our economy and society. The MDS aims to protect life and property through quality weather and climate services.

Outlook for 2013

Rainfall Outlook for Jan-Feb-Mar 2013



Based on a number of global models, historical data and subjective input, St. Maarten is likely to experience **Normal to Above Normal Rainfall** during the next three (3) months – namely January to March. There is a **40%** chance of being ***Above Normal*** (more than 198.9mm); a **35%** chance of being ***Near Normal*** (between 148.99mm and 198.9mm); and a **25%** chance of being ***Below Normal*** (less than 148.9mm).

Also note that this is depicted in the area shaded *Blue*.

2013 Tropical Cyclone Names

Below are the names designated for the upcoming Atlantic Hurricane Season:

- | | | |
|-------------|------------|-------------|
| ▪ Andrea | ▪ Humberto | ▪ Olga |
| ▪ Barry | ▪ Ingrid | ▪ Pablo |
| ▪ Chantal | ▪ Jerry | ▪ Rebekah |
| ▪ Dorian | ▪ Karen | ▪ Sebastien |
| ▪ Erin | ▪ Lorenzo | ▪ Tanya |
| ▪ Fernand | ▪ Melissa | ▪ Van |
| ▪ Gabrielle | ▪ Nestor | ▪ Wendy |

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 74mph (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 Scale is a 1-5 rating based on the hurricane's intensity, which is used to give an estimate of the potential property damage and flooding expected from a hurricane landfall. Wind speed is the determining factor in the scale.

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