METEOROLOGICAL SERVICE

NETHERLANDS ANTILLES & ARUBA

CLIMATOLOGICAL SUMMARY
2002

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Summary of North Atlantic Tropical Cyclone Activity during 2002

Introduction

As expected by both the team of Dr. William Gray of the Colorado State University and a group of experts of the United States weather service (NOAA), the 2002 Atlantic hurricane season became less active than in the previous year. The main reasons of this reduced activity were the presence of a moderate *El Niño* event and also slightly lower sea surface temperatures over much of the tropical Atlantic waters.
Twelve named storms formed during the 2002 Atlantic hurricane season and four of these became hurricanes. Two strengthened into major hurricanes (category three or higher on the *Saffir/Simpson* hurricane scale). The long-term averages are ten, six and two respectively. Eight named storms formed during the month of September, the highest number on record for any month. The first hurricane of the season formed on September 11, the latest date for this event since reliable records began in 1944. Seven tropical cyclones made landfall in the United States and an eighth made an indirect hit. *Lili* was the first hurricane to make landfall in the U.S. since *Irene* in October 1999.
The islands of the Netherlands Antilles and Aruba were spared of tropical cyclones in 2002 although two systems, tropical depression 10 and tropical storm *Lili*, temporarily became a minor threat to the ABC Islands (Aruba, Bonaire and Curaçao) during the second half of September. The islands of St. Maarten, Saba and St. Eustatius (SSS Islands) were not threatened at all by any tropical cyclone during the past season.

Individual Storm Summaries

Tropical storm ***Arthur*** formed near the coast of North Carolina in the United States on July 14. It reached its peak intensity with 95 kilometers per hour maximum sustained winds as it accelerated East Northeastward several hundred kilometers South of Nova Scotia, Canada two days later. *Arthur* lost its tropical characteristics the next day while located a few hundred kilometers South of Newfoundland, Canada.

Bertha formed just East of the mouth of the Mississippi river on August 4. It moved Northwestward over Southeastern Louisiana in the U.S.A. as a minimal tropical storm early on the next day and soon weakened to a tropical depression. The depression meandered over Southern Louisiana on the 6th, then moved Southwestward into the Gulf of Mexico on the 7th. *Bertha* moved across the Southern Texas coast on the 9th as a depression and dissipated over South Texas later that day.
Bertha caused one death, a drowning in rough seas in Northwestern Florida. Rainfall totals of 125 to 250 millimeters over portions of Southeastern Louisiana and Southern Mississippi caused some flood damage.

Cristobal was a relatively weak tropical cyclone that meandered over the Western Atlantic Ocean. It formed about 280 kilometers East Southeast of Charleston, South Carolina (U.S.A.) on August 5 within a low pressure trough that extended from the Northern Gulf of Mexico across Florida into the Western Atlantic. This was the same trough that had spawned tropical storm *Bertha* a day earlier. *Cristobal* reached its peak intensity of 85 km/h early on the 8th but later that day became absorbed within a frontal zone.

The first “real” tropical system

Dolly formed from a tropical wave early on August 29 at a low latitude in the far Eastern Atlantic Ocean. It moved Westward and became a tropical storm later that day. The storm's winds briefly reached 110 km/h on August 30 as it moved West Northwestward. *Dolly* then turned Northwestward and Northward over open waters. The system was absorbed by a frontal trough on September 4 about 1125 kilometers Northeast of St. Maarten.

Very Active September

Edouard developed about 175 kilometers East of Daytona Beach, Florida on September 1. It moved in a clockwise loop off the Northeast Florida coast for a few days. *Edouard* strengthened to a peak intensity of 115 km/h two days later but strong upper level winds soon weakened the storm as it headed for the (Florida) coast. *Edouard* was barely of tropical storm strength when it made landfall near Ormond Beach, Florida on the 4th. The system quickly weakened to a depression and crossed North-Central Florida. Persistently strong winds aloft prevented any re-intensification and *Edouard* dissipated over the Northeast Gulf of Mexico on the 6th. Its remnants were absorbed into the large circulation of tropical storm *Fay* centered off the Texas coast. *Edouard* caused some flooding due to locally heavy rains over North-Central Florida.

Fay originated from a broad low pressure system over the Western Gulf of Mexico and became a tropical depression on September 5 about 160 kilometers Southeast of Galveston, Texas. It strengthened into a tropical storm later that day. *Fay* moved little while strengthening to 110 km/h maximum sustained winds. Late on the 6th the storm began moving slowly Westward and the center moved inland along the central Texas coast near Palacios early on the 7th. Although the tropical cyclone dissipated soon after making landfall, the remnant low pressure area meandered across Southern Texas and Northeast Mexico for several more days, producing torrential rainfall and widespread flooding across the region.

Tropical depression ***Seven*** developed over the central tropical Atlantic Ocean on September 7 and dissipated about 1530 kilometers Southeast of Bermuda the following day. It was the first of two tropical depressions in 2002 which did not reach tropical storm strength.

Another Late First Hurricane

For the second year in a row, the first hurricane of the Atlantic season developed only in September. ***Gustav*** developed as a subtropical depression on September 8 about 885 kilometers South Southeast of Cape Hatteras, North Carolina. It moved Northwestward and quickly became a subtropical storm. *Gustav* continued Northwestward on the 9th, then turned Northward on the 10th. The system transitioned to a tropical storm before the center passed just East of Cape Hatteras late that day. *Gustav* turned Northeastward into the Atlantic early on the 11th and strengthened into the first hurricane of the season. Maximum winds reached 160 km/h before *Gustav* made landfall in Eastern Nova Scotia (Canada) early on the 12th. The system became extratropical later that day near Western Newfoundland. *Gustav* produced hurricane force wind gusts in portions of Nova Scotia and sustained tropical storm force winds in the coastal areas of North Carolina. The storm caused one death due to rough seas along the South Carolina coast. Damage associated with the storm was minor.

Hanna developed from a broad area of disturbed weather and low pressure in the Gulf of Mexico. A tropical depression formed from the disturbance late on September 11 about 385 kilometers South Southwest of Apalachicola, Florida. It became a tropical storm on the 13th about 410 kilometers South Southwest of Pensacola, Florida. *Hanna* then moved Northwestward and Northward passing near the mouth of the Mississippi river early on the 14th. It made landfall near the Alabama-Mississippi border on the 14th with 80 km/h winds. *Hanna* generated rip currents responsible for three deaths off the beaches of Northwestern Florida. The remnants of *Hanna* produced more than 380 mm of rain in parts of Georgia.

First Major Hurricane

Hurricane ***Isidore*** formed from a Westward moving tropical wave and became tropical depression 10 as it was approaching the Southeastern Caribbean islands on September 14. It moved over Trinidad and Northeastern Venezuela which caused it to weaken significantly. Before it weakened, it threatened to affect the weather on the ABC Islands. Local authorities therefore were informed about possible severe weather. As expected though, it weakened to a tropical wave just before reaching Bonaire on the 15th causing only a minor wind shift and a few (thunder)showers on parts of mainly Bonaire and Curaçao. The system continued toward the West Northwest and reformed two days later near Jamaica. On the 18th, it became a tropical storm and it intensified further to a hurricane over the Northwestern Caribbean Sea

on the next day. *Isidore* hit Western Cuba on the 20th, strengthened after that over the Southeastern Gulf of Mexico and hit the North coast of the Yucatán peninsula with category three intensity on the Saffir-Simpson hurricane scale (230 km/h winds) in the next two days. It weakened over land and then moved Northward over the Gulf of Mexico, making landfall on the Louisiana coast as a 110 km/h tropical storm early on the 26th. *Isidore* brought torrential rain to Jamaica and caused damage to Western Cuba, Northern Yucatán and portions of the Louisiana/Mississippi coastal areas. Four people drowned in the United States due to *Isidore*.

Josephine was a short-lived tropical storm that developed within an old frontal zone several hundred kilometers Southeast of Newfoundland (Canada) on September 17. It quickly became a tropical storm and moved Northeastward. *Josephine* was a minimal tropical storm until the 19th. A little later that day it merged with a cold front and accelerated Northeastward as an extratropical storms.

Long-lasting *Kyle*

Kyle lasted for 22 days making it the third longest-lived Atlantic tropical cyclone after *Ginger* of 1971 and *Inga* of 1969. *Kyle* strengthened into a tropical storm four separate times. It developed from a non-tropical low about 1330 kilometers East Southeast of Bermuda on September 20. After moving in a loop for a few days, it moved West Southwestward and strengthened into a hurricane with peak winds of 160 km/h on the 26th. *Kyle* began weakening on the 27th and by October 1, it was a tropical depression located about 410 kilometers South Southwest of Bermuda. Moving erratically, Kyle re-intensified to a 105 km/h tropical storm on October 2. *Kyle* then moved Northwestward and weakened back to a tropical depression early on the 5th. The depression meandered for the next three days while regaining tropical storm status on the 6th. *Kyle* began moving Southwestward and again weakened to a depression on the 8th. A day later the system turned Westward toward Florida but as *Kyle* approached land, it curved toward the Northwest, paralleling the Northeast Florida coast. It re-strengthened into a tropical storm just to the East of Jacksonville early on the 11th. *Kyle* soon turned Northward and Northeastward and made landfall that afternoon in South Carolina with maximum winds near 70 km/h. *Kyle* continued to move Northeastward along the North Carolina coast and passed near Cape Hatteras early on the next day. It finally became extra tropical shortly thereafter.

The long track of hurricane ***Lili*** began on September 21 when a tropical depression formed in the tropical Atlantic about 1600 kilometers east of Barbados. *Lili* moved quickly across the Southeastern Caribbean islands on the 23rd as a developing tropical storm and left four dead in St. Vincent from mud slides. Just as happened with tropical depression 10 (*Isidore*) ten days earlier, this tropical storm also weakened to a tropical wave on the 25th a little North of the ABC Islands. Once again local authorities were informed about possible inclement weather and possibly rough seas as this system approached. Except for a few heavy thunderstorms (with frequent cloud to ground lightning strikes) over Southeastern Curaçao and parts of Bonaire during the afternoon and early evening of the 25th, no adverse weather conditions were experienced on these islands.
The tropical wave continued to move West Northwestward across the central Caribbean Sea and regained tropical storm status on the 27th. *Lili* took a slow jog around the North coast of Jamaica on the 28th to the 30th and dumped heavy rain there as well as over Southern Haiti and, to a lesser extent, Eastern Cuba. There were four flood-related deaths in Jamaica. *Lili* strengthened into a category 2 hurricane before it hit Western Cuba on October 1, just eleven days after hurricane *Isidore* struck the same area. *Lili* then moved into the Gulf of Mexico where it quickly strengthened to 235 km/h (category 4 intensity) on the 2nd. Almost as quickly as it strengthened, *Lili* rapidly lost strength and made landfall as a borderline category 1/category 2 hurricane in Louisiana on the 3rd. *Lili* merged with an extratropical low over the East-central United States on October 4.

Trop. Depr. Nr.	Name	Period	Lowest Atmospheric pressure	Maximum sustained winds
1	TS Arthur	July 14 - 16	992 hPa	95 km/h
2	TS Bertha	August 4 - 9	1008 hPa	75 km/h
3	TS Cristobal	August 5 - 8	999 hPa	95 km/h
4	TS Dolly	August 29 - September 4	994 hPa	110 km/h
5	TS Edouard	September 1 - 6	1002 hPa	115 km/h
6	TS Fay	September 5 - 7	998 hPa	110 km/h
8	Hur. Gustav	September 8 - 12	960 hPa	165 km/h
9	TS Hannah	September 11 - 14	1001 hPa	95 km/h
10	Hur. Isidore	September 14 - 26	934 hPa	230 km/h
11	TS Josephine	September 17 - 19	1004 hPa	75 km/h
12	Hur. Kyle	September 20 - October 12	980 hPa	160 km/h
13	Hur. Lili	September 21 - October 4	938 hPa	270 km/h

Tropical depression **fourteen** developed on October 14 from a broad low pressure area off the Northeastern coast of Honduras. Initially moving Northwestward, the depression turned slowly Northeastward later that day. The center passed West of the Cayman Islands on the 15th, then reached the Southern coast of central Cuba as it merged with a cold front on the 16th. While the depression brought locally heavy rains to portions of Cuba, Jamaica and the Cayman Islands, there are no reports of damage or casualties.

Outlook for the 2003 season

Dr. William Gray expects the 2003 Atlantic hurricane season to be more active than the 2002 season. El Niño was fading away at the start of 2003 and that would be the main reason conditions for tropical cyclone development would be more favorable during 2003.
The preliminary numbers, issued by Gray's outlook in December 2002 for the 2003 season, were twelve named storms of which eight should become hurricanes. Of these eight, three are expected to become major hurricanes (maximum sustained winds of more than 185 kilometers per hour). As always, this outlook does not give any indication of when or where these storms will develop nor how their exact tracks will be.

The Climate of 2002

Globally
The final calculation of the global land and sea surface temperature for 2002 is expected to be approximately 0.50/C, above the global 1961-1990 annual mean value.
In this connection 2002 can be considered to be the second warmest year since instrumental temperature measurement record taking started in 1860. The warmest year from 1860 to present remains 1998.

During the second quarter of last year, based on observed oceanic and atmospheric conditions in the Tropical Pacific Ocean, it became clear that a warm phase of ENSO (El Niño Southern Oscillation) was developing. It was likely that the development of El Niño would continue, with weak-to-moderate El Niño conditions through early 2003. In October it became obvious that the El Niño condition was one of a moderate status. The climate anomalies in different parts of the world, like South and North America, Australia, parts of Africa reflected the occurrence of a moderate El Niño.

Furthermore, another climate phenomena, the North Atlantic Oscillation (NAO), -a large-scale swing in the atmospheric mass between the Azores High and the Iceland-sub-polar Low- can also be held accountable for climate extremes in several parts of the world. Especially in countries surrounding the Atlantic Ocean. Since 1998 the NAO is in a positive stage, which led to more persistent and stronger Westerly winds over regions surrounding the Atlantic Ocean. As a result of these climate anomalies, climate extremes have occurred during 2002 in several regions of North America, Northern Africa and West and Central Europe.

Netherlands Antilles & Aruba
The sea surface temperature of the Caribbean Sea was normal during the year 2002. As a part of the Northeastern South America ENSO-related rainfall-region, Aruba, Bonaire and Curacao experienced large rainfall deficits in 2002, due to the presence of a moderate El Niño. As was anticipated in the Outlook for 2002 section of the Climatological Summary 2001.
While Saint Maarten had a normal rainfall year, the islands of Saba and Saint Eustatius also experienced rainfall deficits in 2002 but for other reasons than the presence of the El Niño event. In particular due to the absence of active tropical waves and tropical cyclones during the hurricane season, the major contributors for rainfall, they also experienced dry conditions over the year 2002.

Outlook for 2003
It is expected that the influence of this El Niño event will start to diminish in the first part of 2003. However it is not expected that the El Niño phase will turn to a La Nina phase later this year as happened in 1997-1998. An intermediate stage of ENSO (El Niño Southern Oscillation) is expected during 2003.
The sea surface temperature of the Caribbean Sea is expected to be slightly cooler in the first half of 2003. Therefore the rainfall over the ABC islands is expected to remain below normal during the first half of the year and in the rainfall season (the last three months of the year) the rainfall is expected to increase to the level of a normal year. On the SSS islands the rainfall is expected to remain normal in the first have of 2003 and due to the expected increased hurricane activity, the rainfall will increase in the second half of the year.

ABC-Islands

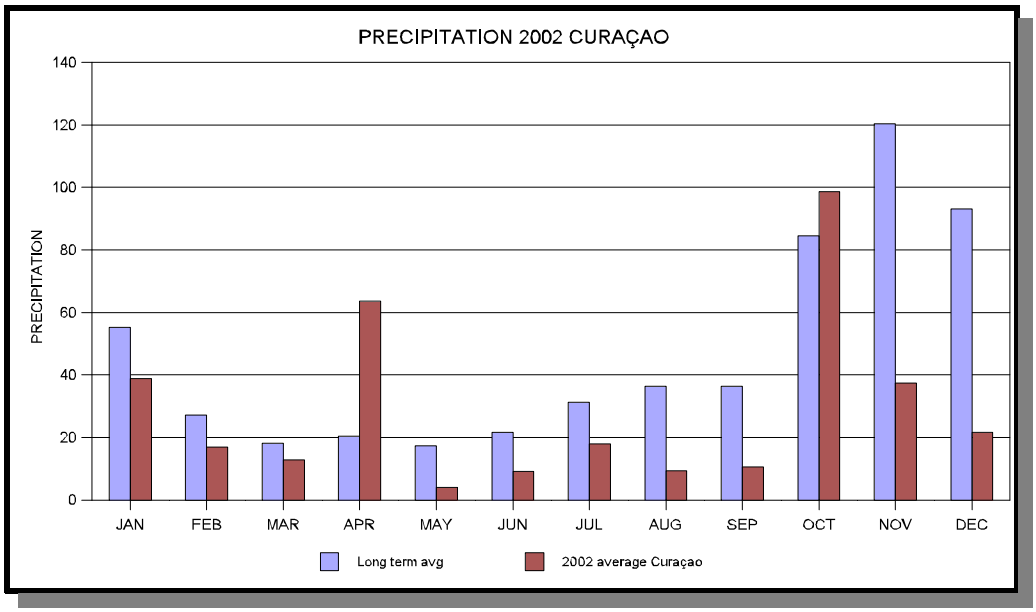
Curaçao

PRECIPITATION

The rainfall season was dominated by an El Niño event. The rainfall season, October through December recorded a average of 158 mm (long term normal 298 mm). With an island average rainfall of 356.9 mm, the year 2002 can be considered a very dry year. When analyzing the individual data from the rain gauge network, the rainfall station at Mahuma recorded the highest total, namely 427 mm. The maximum 24-hour rainfall total for Curaçao was 69.8 mm and was measured at rainfall station *Aqualectra* at Mundu Nobo on October 24. Rainfall station Mahuma had also the largest amount of days with rainfall greater than or equal to 1.0 mm (67 days).

On September 25, heavy thunderstorm activity accompanied by severe lightning occurred during the late afternoon but with hardly any rainfall over most of the island of Curaçao.

Rainfall data from Hato rainfall station

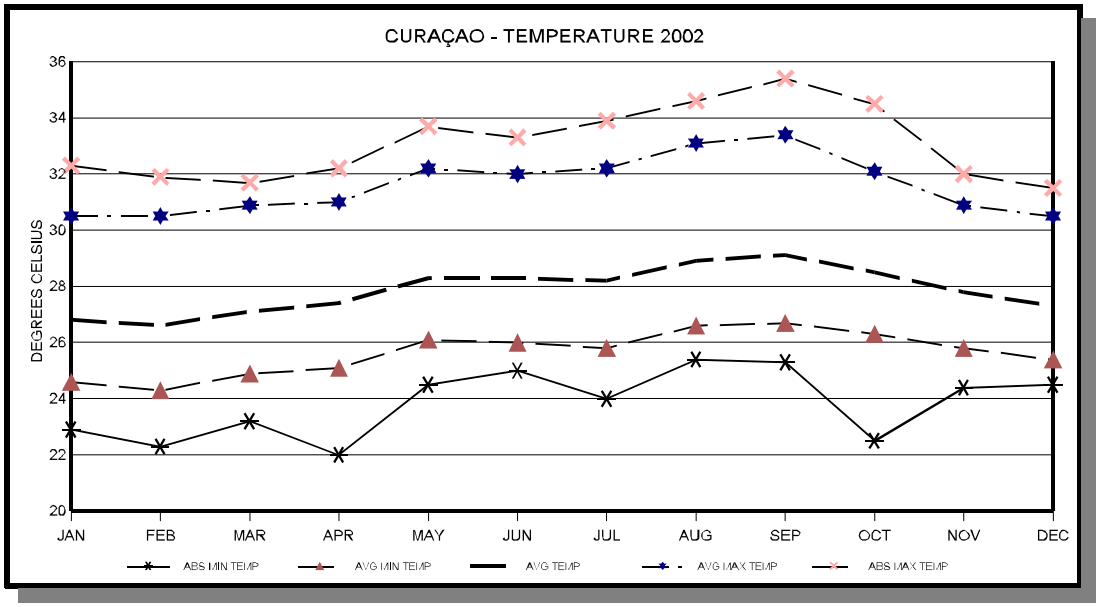


The rainfall total for Hato in 2002 was 332.4 mm. The 24 hour maximum of 61.2 mm was recorded on October 24. The one hour maximum 29.2 mm was recorded on October 24 between 09:00 and 10:00 hours. The maximum intensity per minute for 2002 was 1.8 mm. The hours with rainfall for the year 2002 recorded at Hato International Airport totaled 196 hours. The maximum rainfall duration (in minutes) was 90 minutes and was observed on October 24.

The number of days with thunder was 13. This is about 44% below the climatological normal of 23 days.

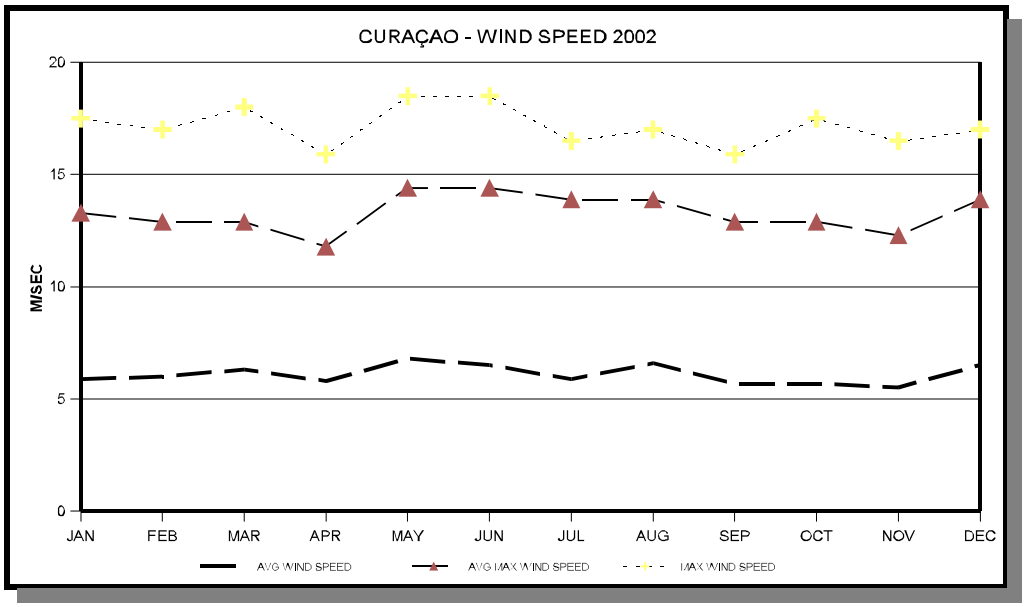
TEMPERATURE

The average air temperature as recorded at Hato International Airport over the year 2002 was 27.9/C (normal is 27.8/- standard deviation 0.8). September was the warmest month with a daily average temperature of 29.1/C (normal is 28.9/C). This month also had the highest average maximum temperature of 33.4/C (normal is 31.9/C). The maximum temperature was 35.4/C and was recorded on September 19 at 13:02 hours (Absolute maximum 38.3/C established in 1996).The warmest day of 2002 was September 28th with a 24 hour average temperature of 29.7/C.
The coolest month was February with a daily average temperature of 26.6/C. The month with the lowest average minimum temperature of 24.3/C was February .
The absolute minimum temperature of 22.0/C was recorded on April 19 at 05:39 hours.
The coolest day of the year was April 10th with a 24 hour average temperature of 25.6/C.



WIND

The average wind speed for the year 2002 was 6.1 m/sec (21.9 km/hr) (normal is 6.6 m/sec - 23.8 km/hr) at a height of 10m and the average wind direction was 94/.
May was the month with the highest average wind speed of 6.8 m/sec (24.5 km/hr) and November had the lowest average wind speed 5.5 m/sec (19.8 km/hr). The highest 24 hour average wind speed of 8.2 m/sec (29.7 km/hr) was recorded on March 25 and the lowest 3.7 m/sec (13.3 km/hr) was recorded on October 24. The highest wind gust of 18.5 m/sec (66.6 km/hr) was observed on May 20 at 12:12 hours.



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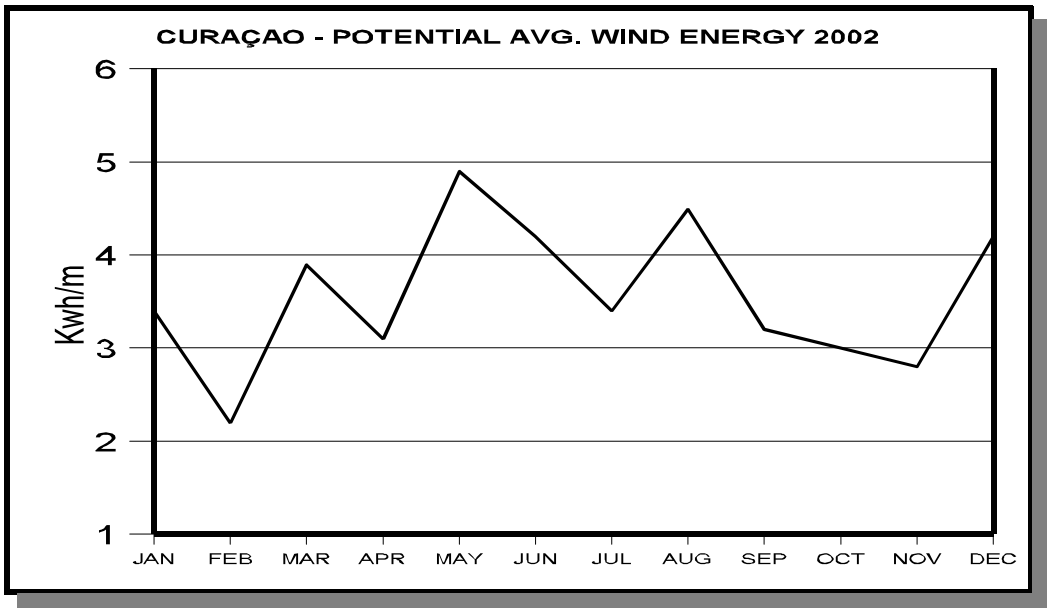
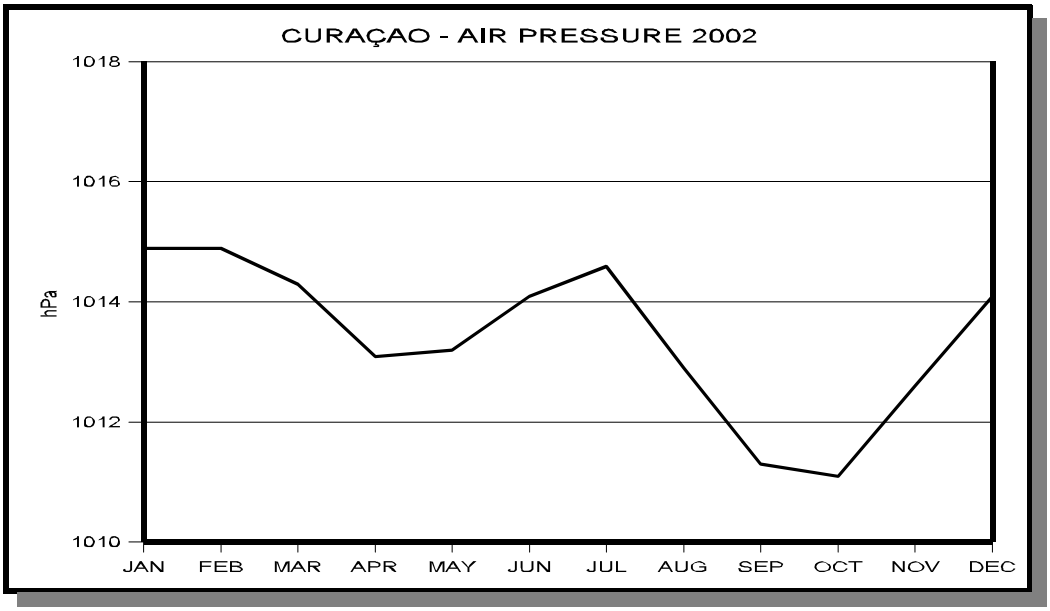
POTENTIAL WIND ENERGY

The total potential wind energy (at 10m height and wind speeds $ 4 m/sec) for the year 2002 was 1300 kWh/m^2 The daily average was 3.6 kWh/m^2/day



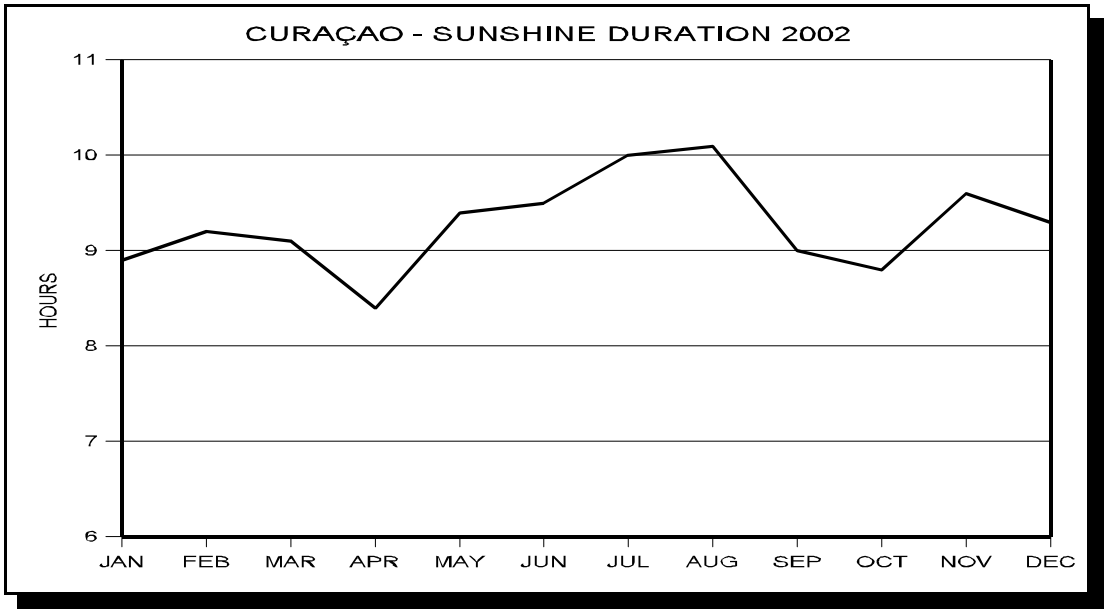
ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Hato Airport over the year 2002 was 1013.4 hPa. The maximum atmospheric pressure of 1018.8 hPa was recorded on March 5 while the minimum of 1006.6 hPa was recorded on October 7.



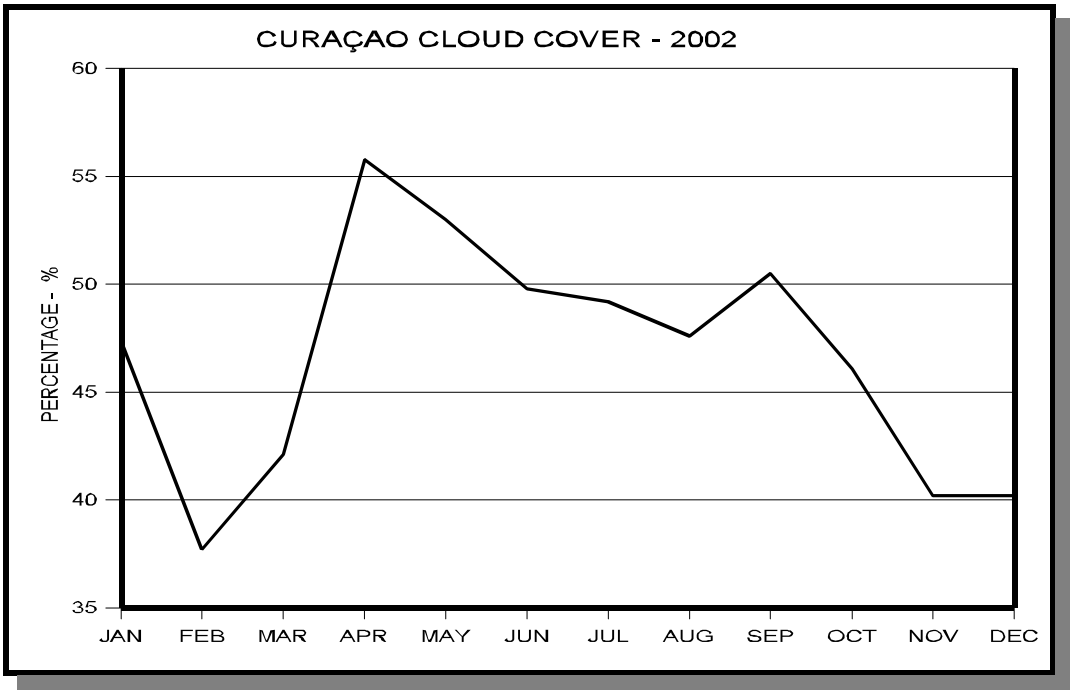
SUNSHINE DURATION

The total sunshine duration for the year 2002 was 3381.5 hours. This is 76.4 % of the maximum possible duration (4428 hrs). The average daily sunshine duration was 9 hours and 18 minutes.
The sunniest month, August, had a daily average sunshine duration of 10.1 hours while the month with the least sunshine was May, with a daily average of 8.4 hours of sunshine duration. The day with the maximum sunshine duration, 11 hours and 48 minutes, was July 23.



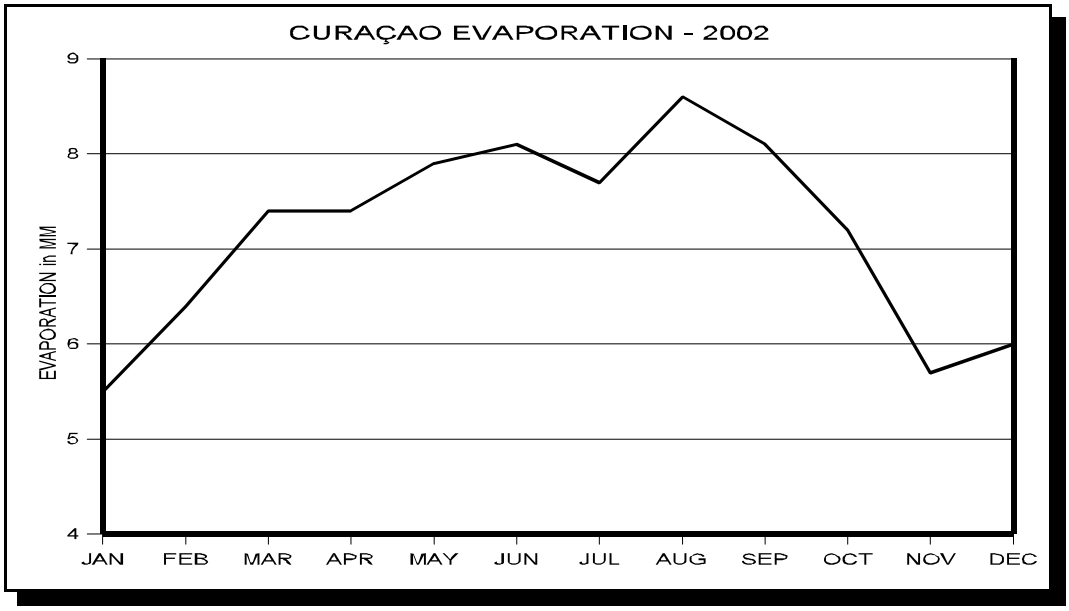
CLOUD COVER

The average cloud cover for the year 2002 was 46.6%. The highest total cloud coverage per month, 55.8% was observed in April. The lowest, 37.7% was observed in February**.**



EVAPORATION

The site of the evaporation pan is located at the Meteorological Service at Seru Mahuma. The daily average evaporation for the year 2002 was 7.2 mm. August had the highest daily average evaporation of 8.6 mm while January had the lowest, 5.5 mm.



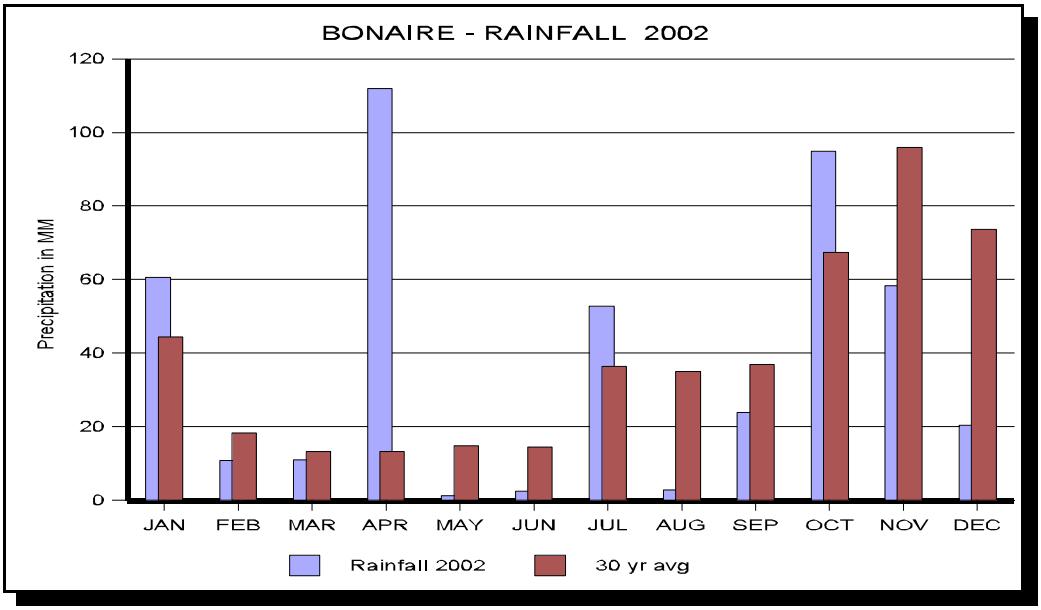
Bonaire

PRECIPITATION

The rainfall total, over the year 2002, as recorded at the Flamingo Airport of Bonaire was 463.4 mm (normal 1971-2000 463.3 mm). The rainfall season was dominated by the presence of the El Niño event. The total amount of rainfall for the months of October, November and December was 173 mm (normal 1971-2000 is 236 mm).

April was the wettest month of the year with a total of 112 mm. It is the second time over the last 32 years that the total amount of rainfall over the month of April broke the 100mm mark. It was the result of a cold frontal trough which dominated the weather from the 8th through the 12th of April. Only 4 months had above average rainfall amounts during the year 2002. Very dry conditions where experienced during the month of August.

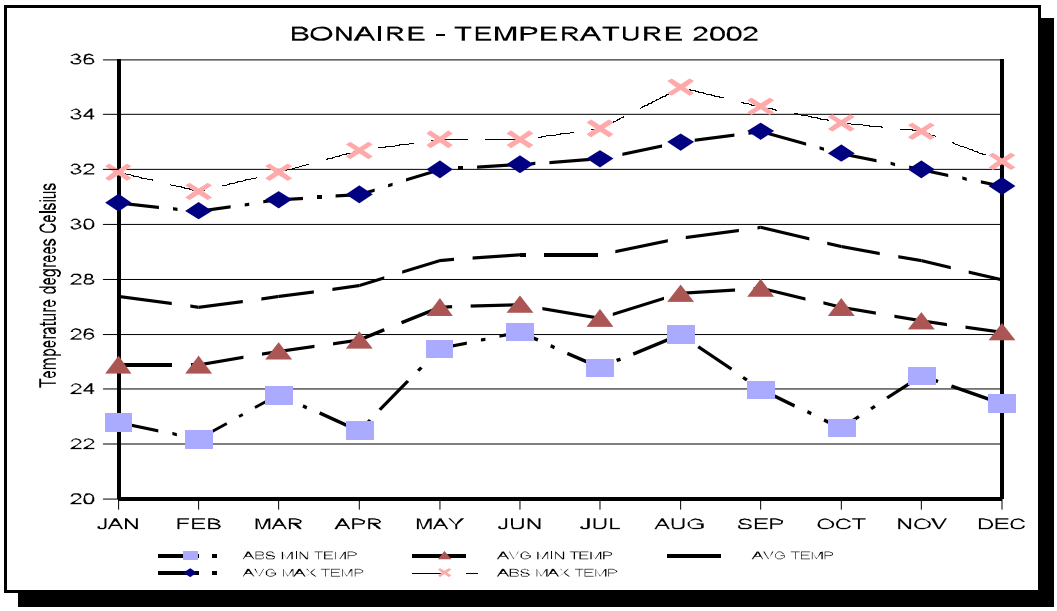
The 24-hour maximum was 73.4 mm and occurred on April 11. The number of days with precipitation greater than or equal to 1.0 mm was 63.



TEMPERATURE

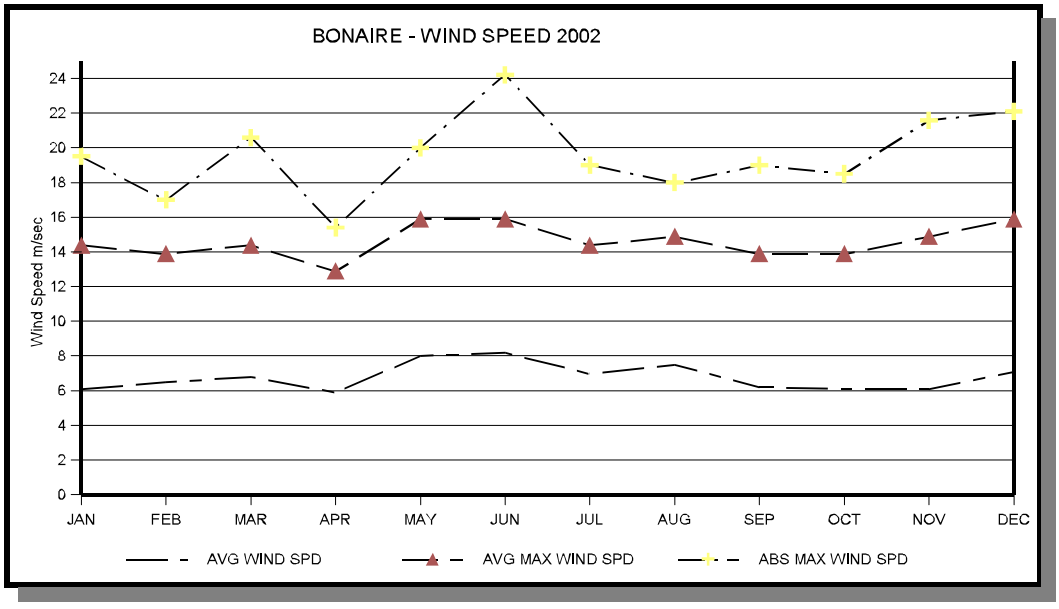
The average air temperature recorded at the Flamingo Airport of Bonaire over the year 2002 was 28.5/C (normal is 28.0). The month of September was the warmest month with an average temperature of 29.9/C. It was also the month with the highest average maximum temperature of 33.4/C. The absolute maximum temperature of the past year was 35.0/C. It was recorded on August 21 at 13:17 hours. The warmest day of 2002 was September 28 with a 24 hour average temperature of 30.3/C.

The coolest month was February with an average temperature of 27.0/C and was also the month with the lowest average minimum temperature 24.9/C. The absolute minimum temperature of 22.2/C was recorded on February 28 at 06:30 hours. The coolest day of 2002 was February 25th with a 24 hour average temperature of 25.5/C.



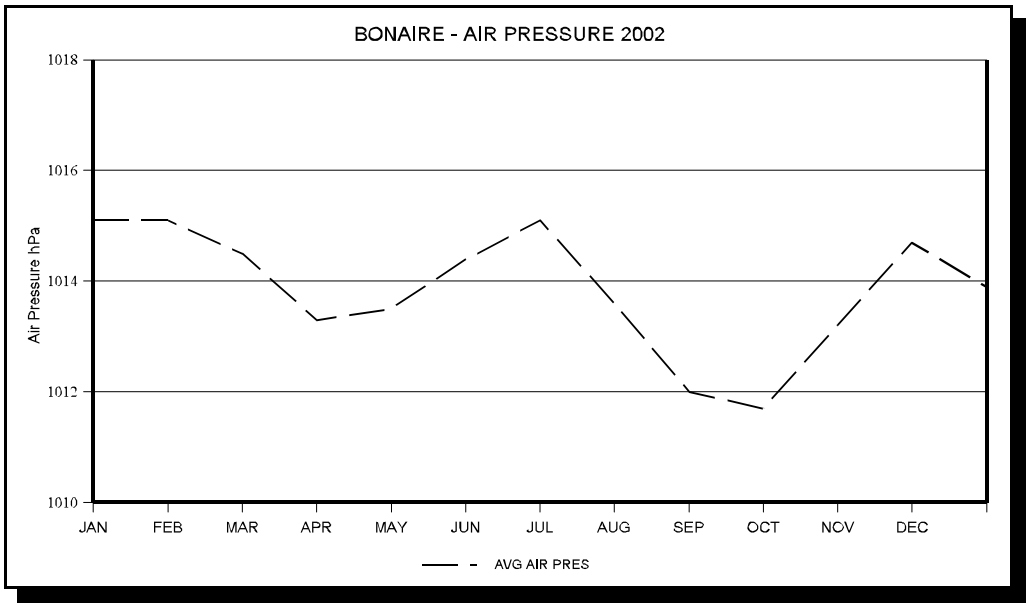
WIND

The average wind speed of 2002 recorded at the Flamingo Airport was 6.8 m/sec (24.5 km/hr) at 10 m height.
June was the month with the highest average wind speed of 8.2 m/sec (29.5 km/hr). Three months ended up with the lowest monthly average of 6.1 m/sec (22 km/hr): January, October and November. The day with the highest recorded average wind speed of 10.4 m/sec (37.6 km/hr) was May 19. The lowest average wind speed 0.7 m/sec (2.4 km/hr) was observed on November 3. The highest wind gust of 20.0 m/sec (72.0 km/hr) was recorded on May 19 at 08:39 hours.



ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Flamingo Airport over the year 2002 was 1013.9 hPa.. The maximum atmospheric pressure of 1019.2 hPa was observed on December 27 while the minimum atmospheric pressure of 1007.3 hPa was recorded on September 25.

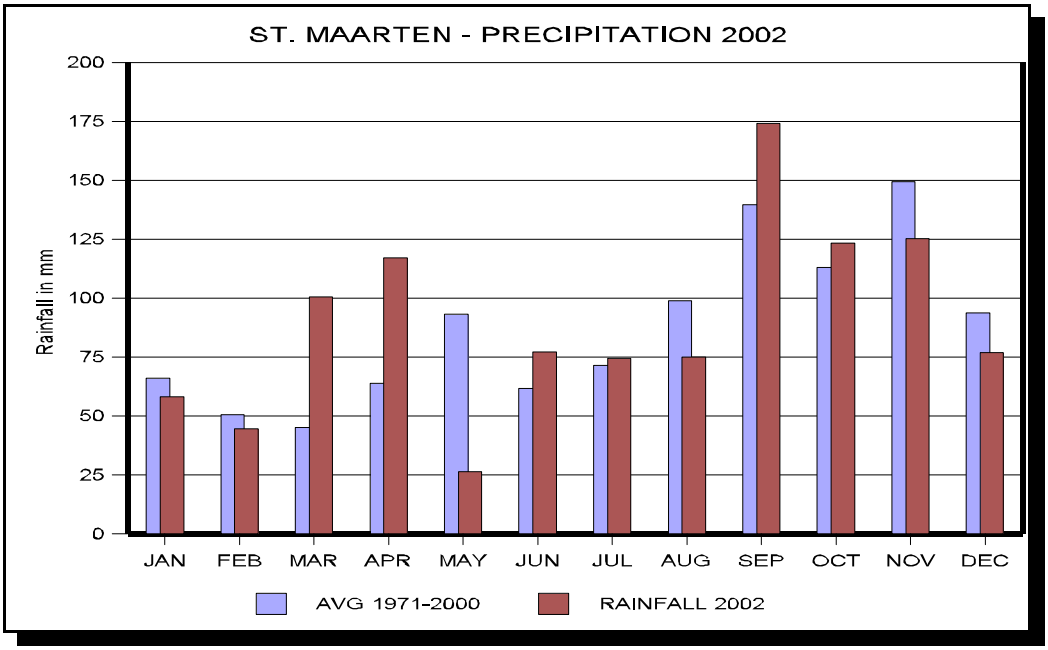


SSS ISLANDS

Sint Maarten

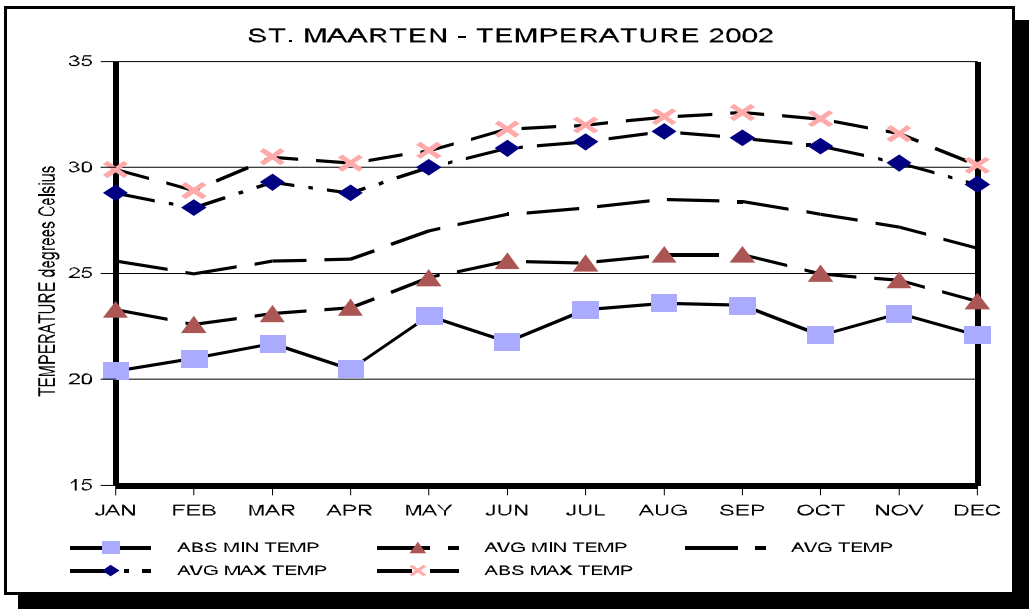
PRECIPITATION

The year 2002 was a normal year compared to the 30 year average. The rainfall total, recorded at the Princess Juliana Airport was 1073 mm. This amount is just above the 30-year average (1971-2000) which is 1047.1 mm. May was a very dry month with 26.4 mm while September was the wettest month with 174.2 mm. The 24-hour maximum was 60.2 mm and was occurred on September 14. The number of days with precipitation greater than or equal to 1.0 mm was 139.



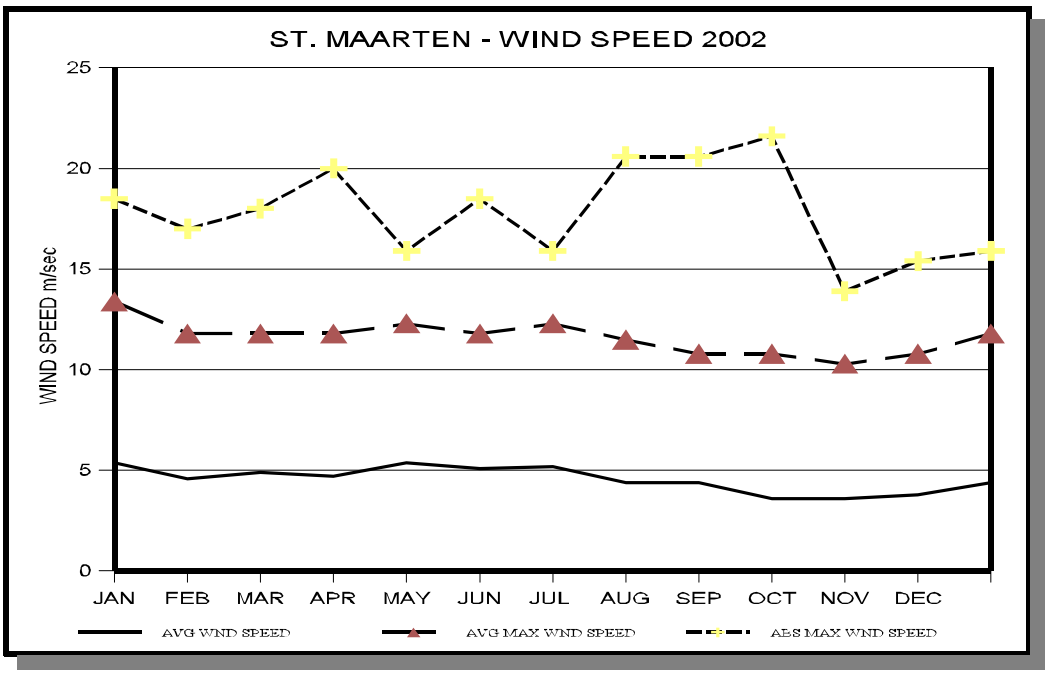
TEMPERATURE

The average air temperature as recorded at the Princess Juliana Airport over the year 2002 was 26.9/C (normal is 27.2/). August was the warmest month with a monthly average temperature of 28.5/C and August also had the highest monthly average maximum temperature of 31.7/C . The absolute maximum temperature for the year was 32.6/C and was recorded on September 13 at 13:27 hours local time. August 24th and September 24th were the warmest days of 2002 with an average temperature of 29.0/C.
The month with the lowest monthly average temperature 25.0/C was February. February had also the lowest average minimum temperature of 22.6/C. The absolute minimum temperature was 20.4/C and was recorded on January 29 at 00:37 hours. The coolest day of 2002 was April 12th with an average temperature of 23.3/C



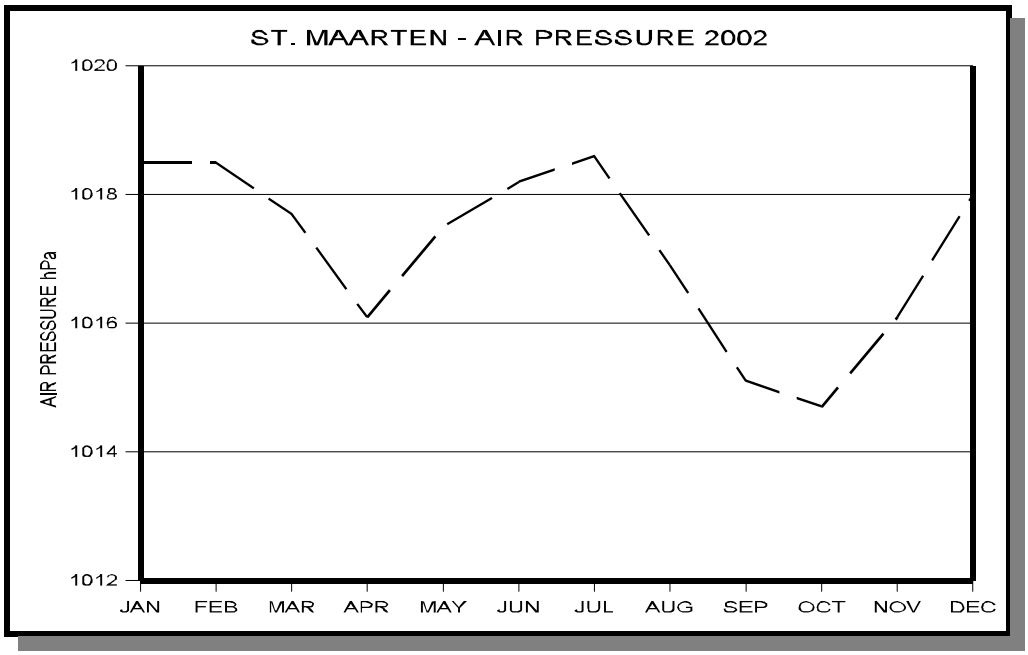
WIND

The average wind speed of 2002 as recorded at the Princess Juliana Airport was 4.6 m/sec (16.6 km/hr) at 10m height. January and May had the highest average wind speed 5.4 m/sec (19.4 km/hr) while September and October had the lowest average wind speed 3.6 m/sec(13.0 km/hr).
The highest daily average wind speed of 8.7 m/sec (31.6 km/hr) was recorded on April 9 and the lowest daily average wind speed of 1.1 m/sec (3.9 km/hr) was on September 19.
The highest wind gust 21.1 m/sec (76.0 km/hr) was observed on August 22 at 04:31 A.M. and on December 13 at 18:13 hours.



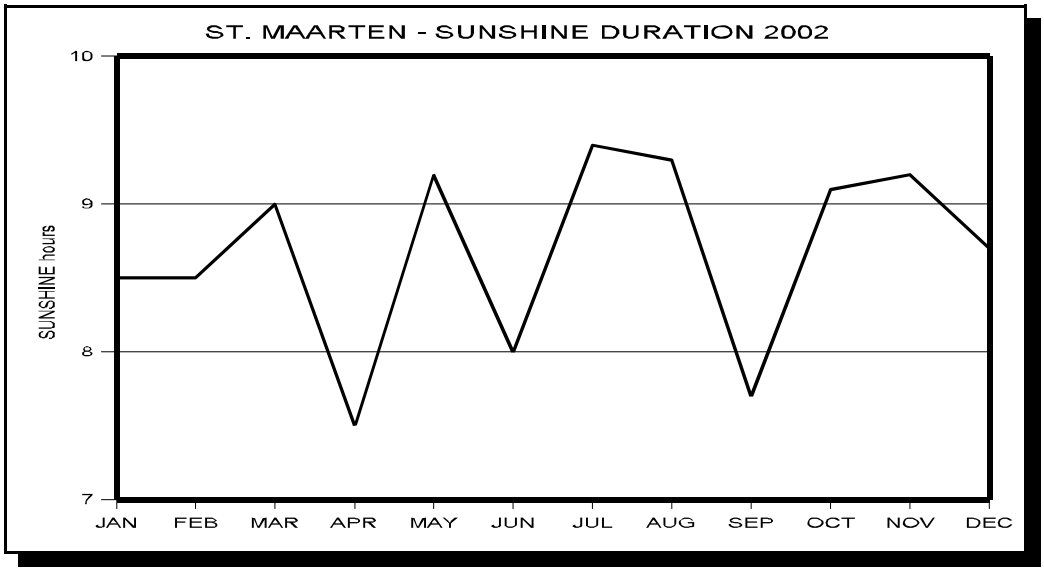
ATMOSPHERIC PRESSURE

The average atmospheric pressure, recorded at Princess Juliana Airport, over the year 2002, was 1017 hPa. The maximum atmospheric pressure of 1022.5 hPa was observed on the 23th of January while the minimum atmospheric pressure of 1011.1 hPa was recorded on September 26.



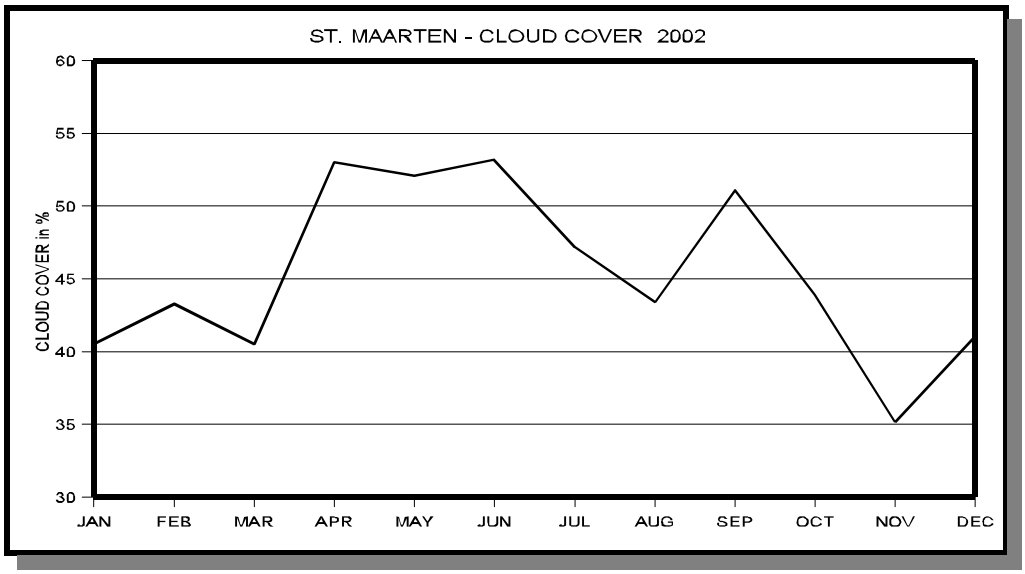
SUNSHINE

The total sunshine duration for 2002 as recorded at the Princess Juliana Airport, was 3166.9 hours. This is 71.5% of the maximum annual possible duration (4431.3 hrs).
The daily average sunshine duration in 2002 was 8 hours and 42 minutes. This was just above the long-term average daily sunshine duration (8 hours and 16 minutes).
The sunniest month was July with a daily average sunshine duration of 9 hours and 24 minutes. The month with least sunshine in 2002 was April with a daily average of 7 hours and 30 minutes. The longest daily sunshine duration for the past year was 11 hours and 54 minutes and it was recorded on May 8.



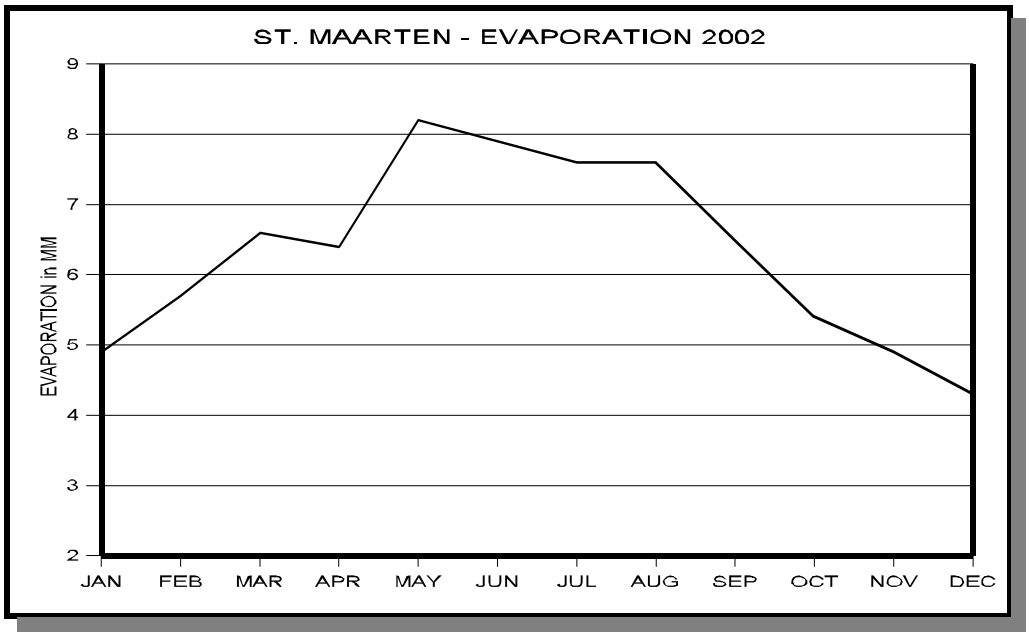
CLOUD COVER

The daily average cloud cover for St. Maarten over the year 2002 as recorded at Princess Juliana Airport was 45.4%. The highest daily average cloud cover/month of 53.2% was recorded in June while January and March had the lowest cloud cover value of 41.2%.



EVAPORATION

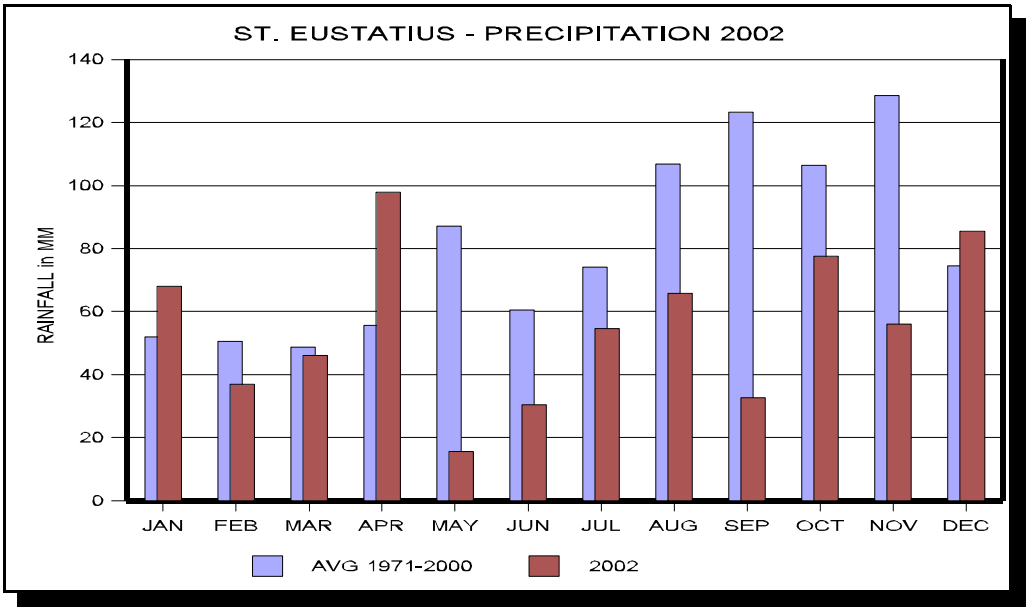
The average daily evaporation, measured at the Princess Juliana Airport, over the year 2002 was 6.3 mm. May had the highest average evaporation value of 8.2 mm while December had the lowest value of 4.3 mm.



Sint Eustatius

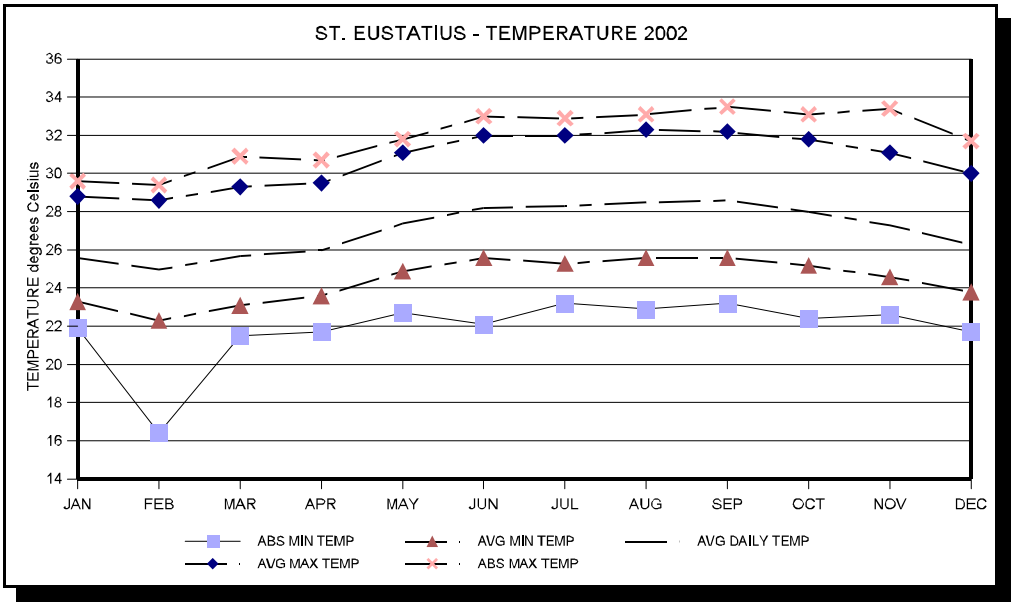
PRECIPITATION

The island of Saint Eustatius experienced a dry 2002. Due to the absence of tropical cyclones, the major contributors for rainfall, Saint Eustatius experienced a dry hurricane season.
The total rainfall amount, recorded at the Roosevelt Airport, was 667.0 mm. This amount is 31.1% below the 30-year average (1971-2000) which is 968.6 mm. The 24-hour maximum rainfall, 47.0 mm, was recorded on April 15th. The number of days with precipitation greater than or equal to 1.0 mm was 117. April was the wettest month of 2002 with a monthly total of 97.8 mm and the driest month was May with 15.6 mm. Out of the 12 months of 2002 only January, April and December had rainfall amounts higher than the 30 year climatological average.



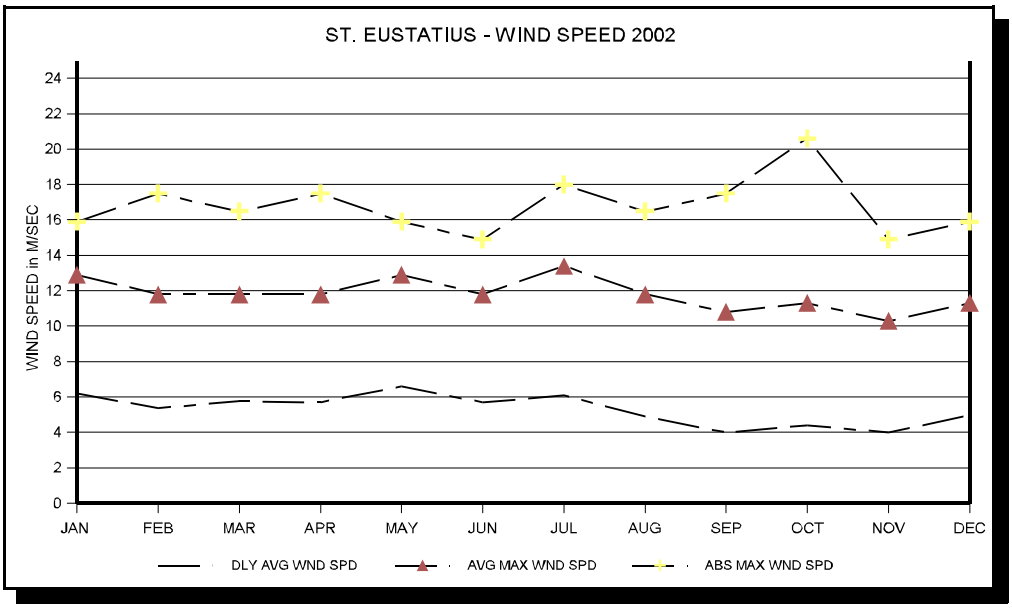
TEMPERATURE

The average air temperature recorded at Roosevelt Airport over the year 2002 was 27.1/C (normal is 26.9/). September was the warmest month with highest daily average temperature 28.6/C. August had the highest average maximum temperature of 32.3/C. The absolute maximum temperature was 33.5/C and was recorded on September 22 at 12:28 hours local time. The warmest day of 2002 was September 11th with a 24 hour average temperature of 29.6/C.
February was the coolest month with an average temperature of 25.0/C and it was also the month with the lowest average minimum temperature of 22.3/C. The absolute minimum temperature was 16.4/C and was recorded on the 26th of February at 05:55 hours.
The coolest day of 2002 was February 25th with an average temperature of 23.0/C.



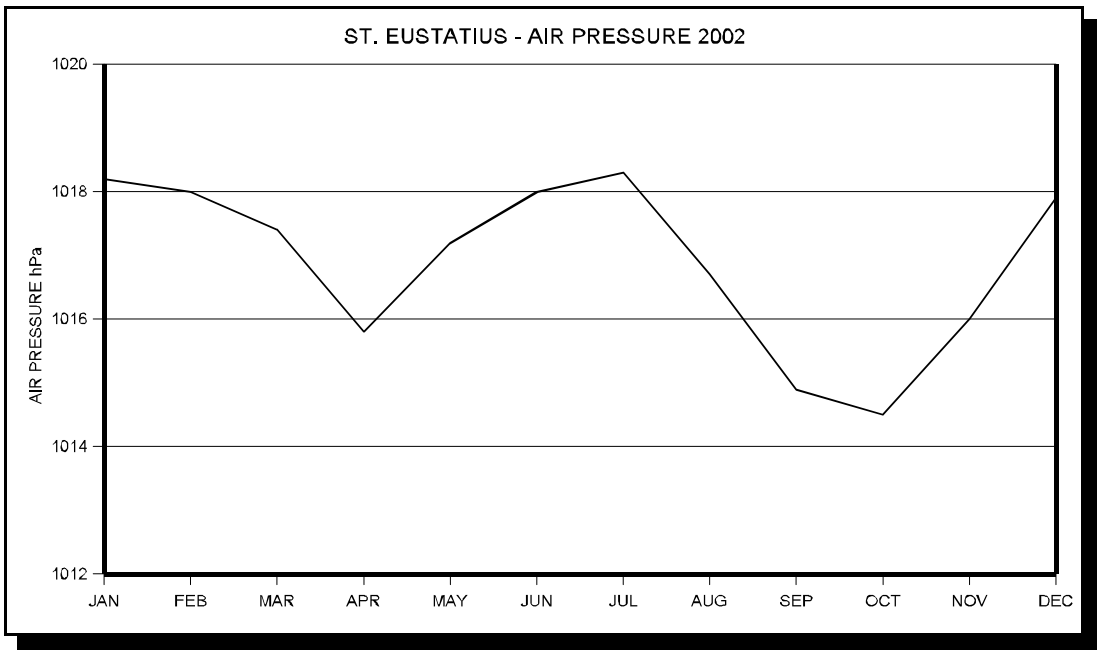
WIND

The average wind speed, at a height of 10 m, as recorded at the Roosevelt airport was 5.3 m/sec (19.1 km/hr). May was the month with the highest average wind speed 6.6 m/sec (23.8 km/hr). September and November had the lowest average wind speed 4.0 m/sec(14.4 km/hr).
The highest 24-hour average wind speed of 10.5 m/sec (37.7 km/hr) was recorded on April 9 and the lowest 24-hour average wind speed of 0.9 m/sec (3.3 km/hr) was on August 2. The highest wind gust of 20.6 m/sec (74.2 km/hr) was observed on October 25 at 22:04 hours.



ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Roosevelt Airport the year 2002 was 1017.0 hPa. The maximum atmospheric pressure of 1022.3 hPa was observed on the 22th and 23th of January while the minimum atmospheric pressure of 1010.9 hPa was recorded on September 26.



Saba

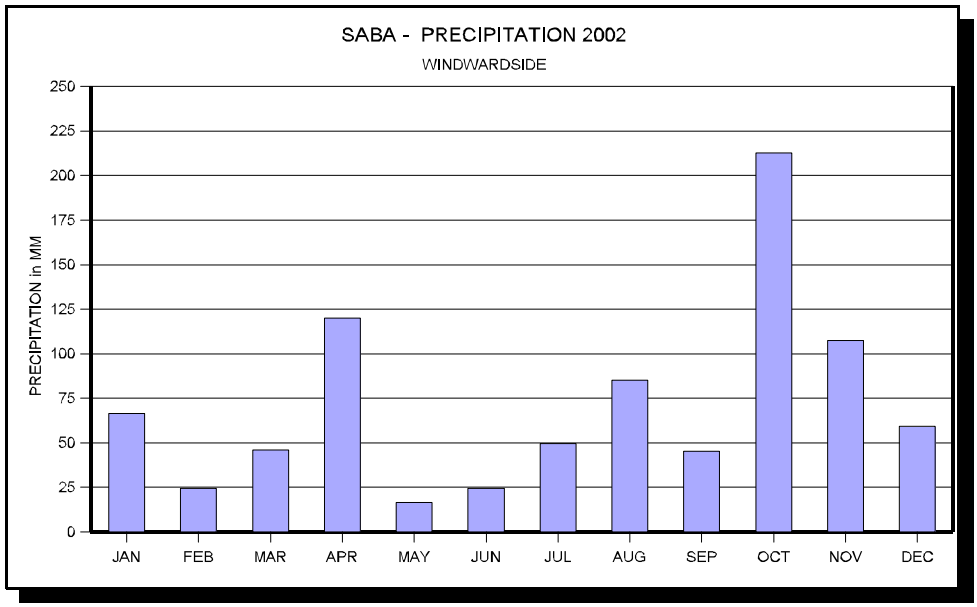
PRECIPITATION

The rainfall data for Saba was recorded at the rain gauge in Windwardside. Due to the absence off tropical cyclones, the major contributors for rainfall, Saba also experienced a dry 2002 hurricane season.

The rainfall total recorded at Windwardside, for the year 2002, was 857.4 mm. This was 19% below the long term average of 1050.4 mm.

The 24-hour maximum was 152.0 mm and occurred on October 11. The total number of days with precipitation greater than or equal to 1.0 mm was 83.

October was the wettest month with a total of 212.7 mm while May was the driest month with a total of 16.5 mm.

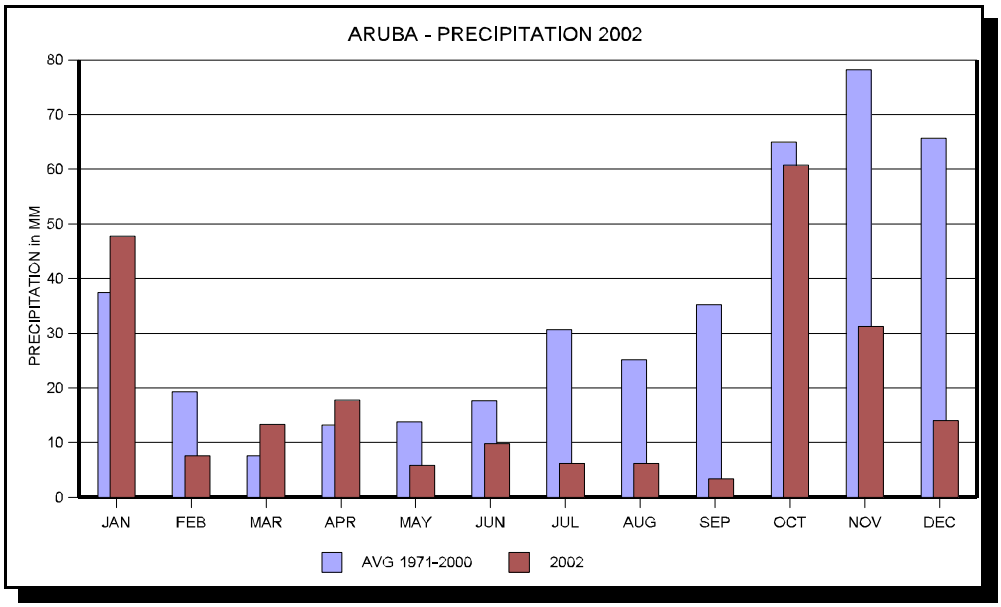


Due to technical problems, no data is available from the Juancho Yrausquin Airport at Saba.

ARUBA

PRECIPITATION

The El Niño event that dominated the rainfall in Curaçao and Bonaire had the same influence on the island of Aruba.. For the second consecutive year the rainfall total was 50% or more below the 30 year average. The rainfall total, recorded at the Queen Beatrix Airport, for the year 2002 was 206.2 mm. With the exception of January and March, Aruba experienced dry to very dry conditions.
The 24-hour maximum was 32.6 mm and occurred on October 24. The number of days with precipitation greater than or equal to 1.0 mm was 48.



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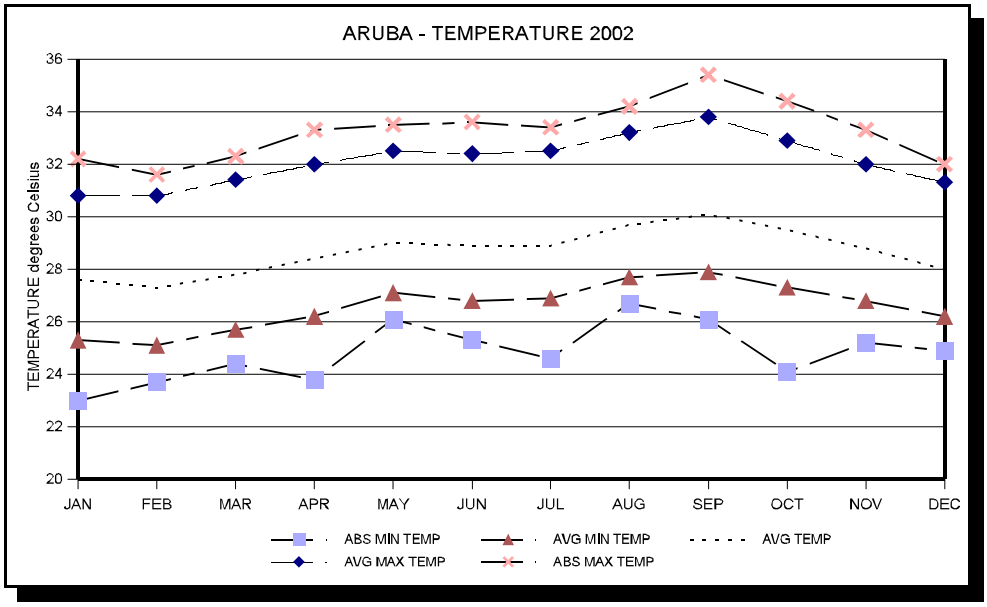
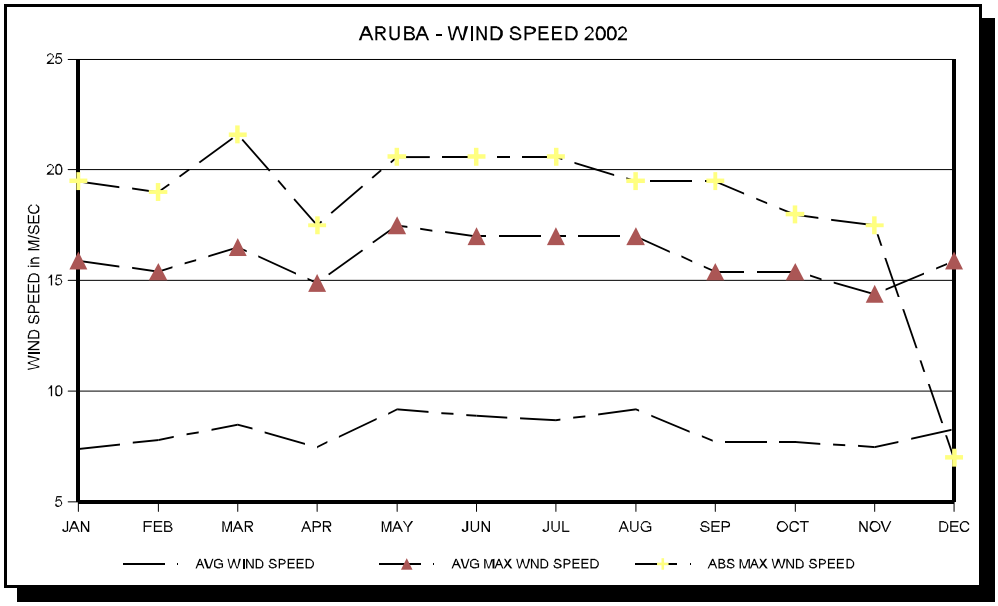
TEMPERATURE

The average air temperature as recorded at Queen Beatrix Airport over the year 2002 was 28.0/C (normal is 27.8/). September was the warmest month with the highest average temperature of 30.1/C and it also had the highest average maximum temperature of 33.8/C. The absolute maximum temperature was 35.4/C and was recorded on September 16 at 14:24 hours, local time.
February was the coolest month with an average temperature of 27.3/C and it was also the month with the lowest average minimum temperature of 25.0/C .
The absolute minimum temperature was 23.0/C and was recorded on January 11 at 06:02 hours.



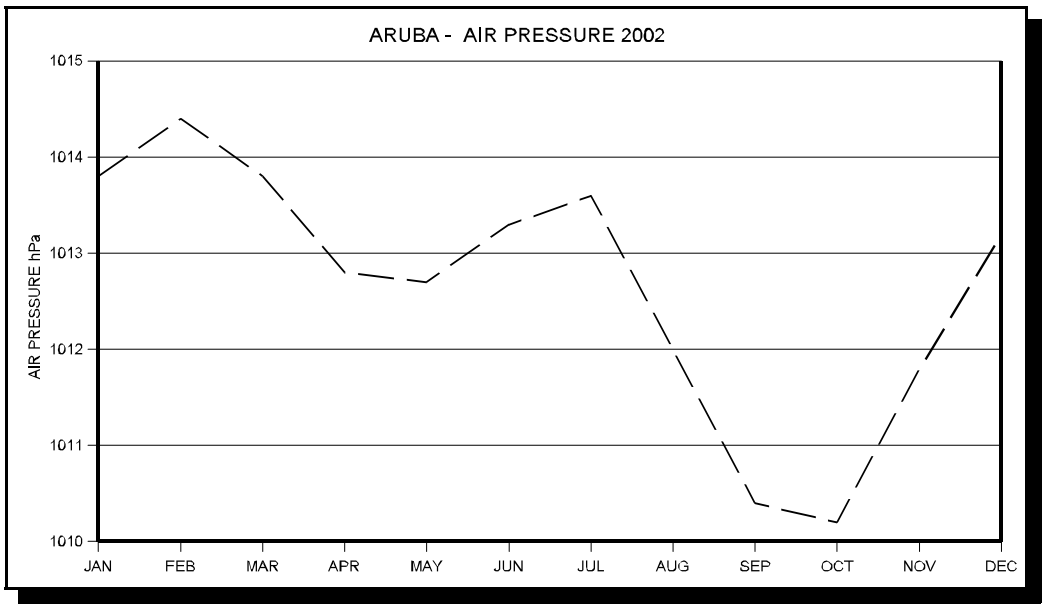
WIND

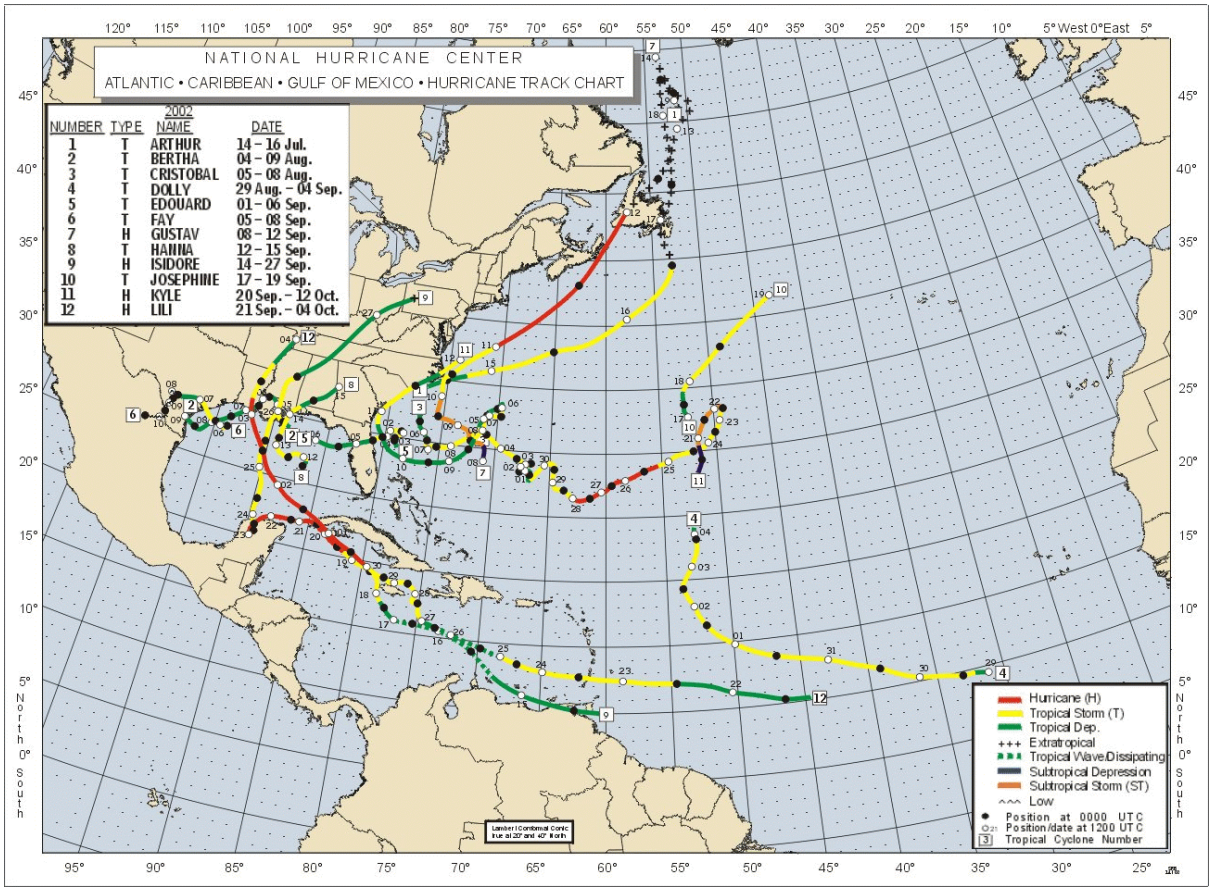
The average wind speed, at 10 m height, for the year 2002, as recorded at Queen Beatrix Airport was 8.2 m/sec (29.5 km/hr).
May and August were the months with the highest average wind speed 9.2 m/sec (33.1 km/hr) and January had the lowest average wind speed of 7.4 m/sec (26.6 km/hr). The highest 24 hour average wind speed of 11.9 m/sec (42.7 km/hr) was recorded on March 25 and the lowest 2.5 m/sec (8.9 km/hr) was recorded on September 25.
The highest wind gust of 21.6 m/sec (77.8 km/hr) was recorded on March 25 at 11:47 hours local time.



ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Queen Beatrix Airport over the year 2002 was 1012.7hPa. The maximum a pressure of 1018.7 hPa was observed on January 5 while the minimum atmospheric pressure of 1005.9 hPa was recorded on October 7.





Tracks of all 2002 Atlantic Tropical Cyclones