

Meteorological Service of the Netherlands Antilles & Aruba

Annual Report 2006



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Cover : Seismogram of Earthquake

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Climate Summary 2006

Globally

The average global surface temperature in 2006 was approximately 0.5°C above the climatological normal of 1961-1990. This places 2006 therefore as probably the 6th warmest year on record since global instrumental records started in 1861. However, because of uncertainties in the global calculations due to large gaps in data coverage, 2006 could be anywhere between the first and eighth warmest year on record. The year 1998 remains with 0.59°C above normal, the warmest year since these instrumental records started.

Temperature extremes included a heat wave that affected a large portion of the USA during July (40°C), with 140 deaths in California. Hot weather also enveloped much of Europe during the summer with temperatures over 32°C; at least 50 deaths were blamed on this in Spain, France, Italy and the Netherlands.

The global precipitation in 2006 was above the 1961-1990 average. Eastern China, India, the Philippines and northeastern USA experienced wetter than average conditions. While most parts of Australia, the west part of Canada, the Gulf Coast region of the USA experienced drier than normal conditions. In February about 500 mm fell during two weeks on an island of the Philippines, killing about 100 people. On the other hand, in May a dry spell in Northern China threatened the drinking water supply for about 14 million people.

Caribbean Area

The sea surface temperature (SST) of Caribbean Sea and the Northern Tropical Atlantic Ocean were warm at the beginning of the year 2006 with temperatures between 0.3°C and 0.7°C above normal. As the year progressed to the northern Hemisphere summer, the SST in the Caribbean Sea gradually became warmer (0.5 - 1.0 °C above normal). During the second half of 2006, the SST in the Caribbean Sea and the Northern Tropical Atlantic Ocean stayed warm, about 0.5- 0.8 °C above normal.

The year 2006 began with El Niño/Southern Oscillation (ENSO) as a weak La Niña, which had originally developed in the last months of 2005. By April and May the SST of the equatorial Pacific had warmed as the La Niña transformed to a neutral phase. In October a weak El Niño developed and by December the SST in the eastern equatorial Pacific was more than 1.0°C above normal. In May heavy rains produced the worst disaster in the interior of Surinam. The flooding was immense; about 15,000 square km were submerged and at least 25,000 people were affected.

Hurricane Season 2006

The 2006 Atlantic hurricane season was much quieter than the previous record breaking 2005 season. It produced nine named (and one unnamed) storms of which five became hurricanes and two became major (category three or more) hurricanes. These numbers are near the long-term averages. However, the season was compact and the amount of four hurricanes that formed during September is above the long-term average for that month.

The Caribbean Area remained almost hurricane free; only *Ernesto* became briefly a minimal hurricane near southwestern Haiti. Three systems made landfall in the United States as tropical storms. No hurricanes hit the United States this year which is the first time this has occurred since 2001.

In addition, a July weather system over the Atlantic south of Nova Scotia, Canada was reexamined by the National Hurricane Center as part of its standard post-storm analysis process and it was determined that it qualified as an unnamed tropical cyclone.

Tropical storm *Gordon* caused hurricane force wind gusts on Santa Maria in the Azores and as an extratropical low did the same in portions of Spain and the British Isles. As a tropical cyclone it caused minor damage in the Azores and as an extratropical low it caused wind damage and power outages in Spain, Britain and Ireland.

As far as our islands are concerned, the SSS Islands were briefly threatened by tropical storm *Chris* during the first couple of days of August. Tropical storm warnings were issued by the Meteorological Service for these islands but this system however stayed at a safe distance north of St. Maarten and only caused a few showers with westerly winds over these islands.

Tropical storm *Ernesto* developed later that same month over the southeastern Caribbean Area and briefly appeared to become a potential threat to the ABC Islands. A few cautionary Information Advisories were issued on August 24 and the next day but issuance of these was discontinued after this system moved away toward the northwest.

General conditions Aruba, Bonaire and Curaçao

In general the atmospheric and the oceanic conditions were not favorable for rainfall events during 2006. However, the annual rainfall on the islands was diverse. On Bonaire only 217.2 mm (about 47% below normal) was recorded at the Flamingo Airport. At Hato Airport the annual rainfall was 400 mm (27.7% below normal) and the average for rainfall stations on Curaçao was 537.1 mm (5.9% below normal). On the other hand, the annual rainfall for Aruba was 611.0 mm (49% above normal).

Isolated heavy thunderstorms during the rainy season caused heavy rainfall on different occasions, which contributed to the above normal annual rainfall.

General conditions St. Maarten, St. Eustatius and Saba

The atmospheric and the oceanic conditions were also favorable for rainfall events in the northeastern Caribbean during 2006. The annual rainfall at the Princess Juliana Airport, St Maarten was 1671.6 mm (about 60% above the normal). As a result of a low level disturbance, heavy thunderstorms formed during October and a new monthly record of 361.2 mm was established. The 24-hour rainfall on October 20 (192.8 mm) is also a new record. The annual rainfall recorded at Windward side (1284.2 mm) on Saba was also above normal. In contrast, the annual rainfall (788.2 mm) at Roosevelt Airport on St. Eustatius 18.6% was below normal.

Rainfall Outlook 2007

Most of the forecasts of the numerical models suggest that the sea surface temperature in the Caribbean Sea and the Tropical Atlantic will be warmer than normal for 2007. The sea surface temperature in the equatorial Pacific on the other hand, which has decreased during the first months of 2007, will continue its cooling trend. Consequently this will reflect a weak La Niña condition during 2007. As a result of a warm Caribbean Sea and the North Tropical Atlantic Ocean in 2007 again, the moisture in the atmosphere will be abundant in the Caribbean Area. The upper level winds in the Caribbean are forecasted to be weak, hence reducing the vertical wind shear and therefore enhancing the vertical development of deep convection. Therefore the rainfall season is more likely to be wet for the Netherlands Antilles and Aruba in 2007.

Hurricane Season Outlook 2007

The Atlantic Ocean will remain anomalously warm and central and eastern tropical Pacific sea surface temperatures anomalies will continue its cooling trend. Currently, normal conditions are observed. Weak La Niña conditions are forecast to be present during the upcoming hurricane season. Therefore the 2007 Atlantic hurricane season will be much more active (85%) than the average 1950-2000 season.

The forecast* for the 2007 hurricane season is:

- 9 hurricanes (average is 5.9),
- 17 named storms (average is 9.6)
- 85 named storm days (average is 49.1)
- 40 hurricane days (average is 24.5),
- 5 intense (Category 3-4-5) hurricanes (average is 2.3)
- 11 intense hurricane days (average is 5.0).
- Atlantic basin Net Tropical Cyclone (NTC) activity 185 % of the long-term average.

* According to the Klotzbach/Gray forecast team of the Colorado State University as of May 31, 2007.

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Seismic Network Netherlands Antilles and Aruba

In the past 10-20 years the Meteorological Service of the Netherlands Antilles and Aruba (MDNA&A) and the KNMI (Royal Dutch Meteorological Institute) have recognized the potential threat of earthquakes, volcanic eruptions and tsunamis in the Caribbean region. In this connection the Dutch Government, on request of the Government of the Netherlands Antilles, has approved the support for a proposal of KNMI and MDNA&A for a seismic monitoring system in the Netherlands Antilles. This project proposal includes: (1) the installation of three broad-band seismometers (one for each of the islands). (2) real-time data exchange of these seismic stations to MDNA&A, KNMI and to other seismic institutions in the Caribbean Region. With this data exchange a virtual seismological network will be established.



One of the STS-2 seismometers installed in the SSS Islands.



KNMI seismologist Reinoud Sleeman (right) and St. Maarten branch chief Rignald Eugenio installing the seismic equipment on top of the St. Peter Hill in St. Maarten

Recently three seismometers were installed by KNMI and MDNA&A, which will provide information on seismic activity on these islands. This new network of seismometers is part of an experimental project to better monitor volcanoes and seismic activity on and around these islands (St. Maarten, St. Eustatius and Saba). With the addition of these three stations our seismic network, including Curaçao and Aruba, now consists of five seismic observation stations.

These seismic stations will also contribute to information for a tsunami warning system, which

is programmed to be established in the Caribbean Area in the future. Additionally, following the example of the KNMI-web site (<http://www.knmi.nl/seismologie>), a special page will be developed on the MDNA&A-web site (<http://www.meteo.an>) for real-time seismic activity information of the seismic stations. For the time being, the monitoring of seismic activity in the Netherlands Antilles will be done at KNMI in De Bilt, Holland, in close collaboration with MDNA&A. Professionals of MDNA&A will be trained with the purpose that at a later stage, the analysis of seismic activity will also be done in the Antilles.



On the slopes in Saba, from left to right, KNMI seismologist Bernard Dost, Head Climate and Research, Albert Martis and KNMI seismologist Reinoud Sleeman.

Hurricane Season 2006 in Detail

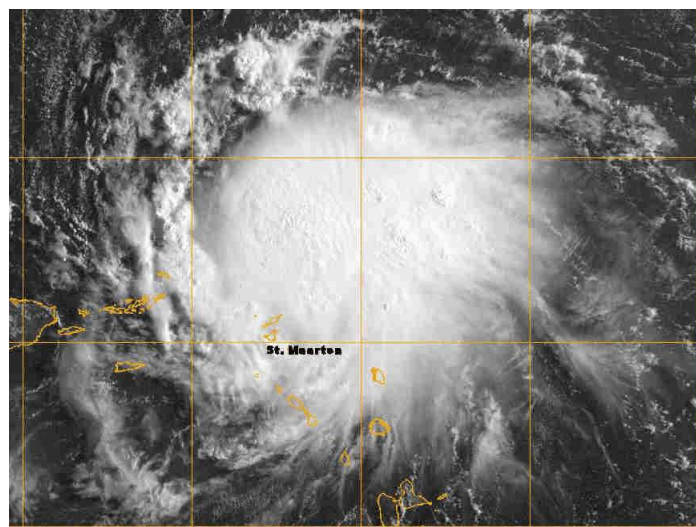
Alberto formed as a tropical depression in the northwestern Caribbean Sea early on June 10. The center of the poorly organized depression moved northwestward through the Yucatan channel that night. The system became a tropical storm over the Southeastern Gulf of Mexico early on June 11 while centered about 160 kilometers west northwest of the western tip of Cuba. *Alberto* then turned northward and strengthened slightly with maximum winds of 80 km/h early on June 12 over the central Gulf. The storm turned northeastward later that morning while abruptly strengthening to its peak intensity of 115 km/h. *Alberto* weakened the following night as it approached the northeastern coast of the Gulf of Mexico. Its center made landfall near Adams Beach in the Big Bend area of (Northern) Florida, about 80 kilometers southeast of Tallahassee on June 13.

Alberto weakened to a depression early on June 14 over Georgia and then emerged off the Mid-Atlantic coast of the United States as an extratropical low pressure system that night. The system accelerated northeastward and became a powerful extratropical storm just south of Nova Scotia, Canada. It passed over Newfoundland and then crossed the North Atlantic Ocean, reaching the British Isles where it was absorbed by a frontal system on June 19. While the damages caused by this system were limited, some structures were damaged by storm surge flooding in Levy and Citrus counties in Florida.

Beryl developed in a surface trough associated with a decaying stationary frontal zone off the Southeastern U.S. coast. A tropical depression formed on July 18 about 465 kilometers east-southeast of Wilmington, North Carolina. The cyclone strengthened to a tropical storm later that day. Moving generally northward, *Beryl* passed about 185 kilometers east of Cape Hatteras on July 19 and it intensified to its peak intensity of 95 km/h a little later that day. Over the next couple of days, *Beryl* turned toward the north northeast and northeast with increasing forward speed, passing over Nantucket, Massachusetts early on July 21 where wind gusts to tropical storm force were reported. The weakening storm continued to accelerate northeastward and *Beryl* lost its tropical characteristics over western Nova Scotia, Canada late on July 21. The remnants of this storm merged with another extratropical low the next day. There were no reports of casualties or significant damages.

Chris developed from a tropical wave and became a tropical depression during the late evening of July 31 at about 320 kilometers east of the SSS Islands. A tropical storm watch was issued that same evening by the Meteorological Service for the SSS Islands and a tropical storm warning during the early morning of the next day, August 1. Moving northwestward, the depression indeed became a tropical storm a few hours later. Early on August 2, the storm reached its peak intensity of 105 km/h while centered about 80 kilometers north of St. Maarten. At that time, all warnings had already been discontinued since the tropical storm strength winds would stay well away from our islands.

The storm abruptly weakened early on August 3 as the mid-level circulation separated from the low-level center in an environment of strong vertical wind shear. The system continued westward



Tropical storm Chris, as it was located just northeast of St. Maarten during the morning of August 2, 2006.

Visible image, courtesy of NRL/U.S. Navy

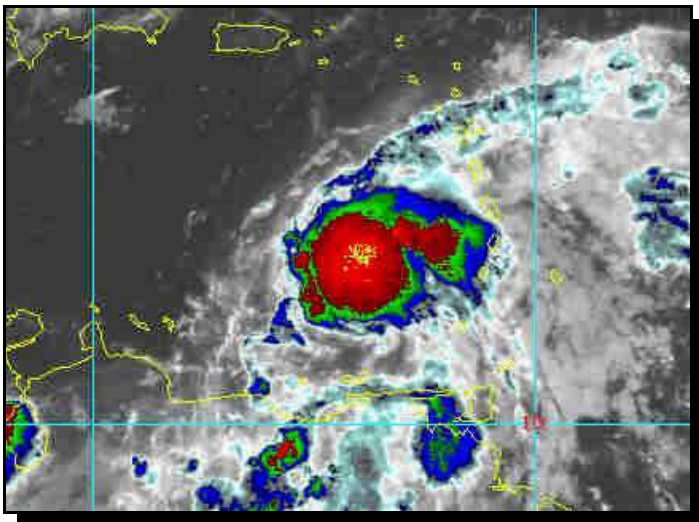
and weakened to a tropical depression on August 4 near the Turks and Caicos Islands and it dissipated early the next day while approaching Cuba.

Debby developed from a tropical wave in the far eastern Atlantic about 420 kilometers south-southeast of the Cape Verde Islands on August 21. After becoming a depression, it moved west-northwestward, passing about 160 kilometers to the southwest of the islands on 22 August. Early on the next day, the depression became a tropical storm about 360 kilometers west of the Cape Verde Islands and its winds reached 80 km/h later that day. *Debby* moved west-northwestward with little change in strength over the next couple of days but it began to weaken on August 25 due to southerly wind shear. *Debby* weakened to a depression and degenerated to a remnant low the next day about 2255 kilometers east southeast of Bermuda. The remnant low then turned northward and dissipated on August 28 ahead of an approaching frontal system.

Ernesto originated from a vigorous tropical wave and became a tropical depression on August 24 as it was passing over the Southeastern Caribbean islands. The Meteorological Service issued a series of Information Advisories on this system when it appeared to pose threat to the ABC Islands. It strengthened into a tropical storm the next morning about 255 kilometers north northeast of Bonaire. When it became apparent during that same afternoon (of August 25) that this system's tropical storm force winds wouldn't threaten these islands anymore, the final information advisory was issued. Continuing northwestward, *Ernesto* slowly strengthened and had maximum winds of 80 km/h by the next morning. The storm turned northwestward on 26 August over the central Caribbean and continued to intensify.

Early the next day, while centered about 115 kilometers south of Haiti, *Ernesto* was briefly a hurricane with maximum winds of 120 km/h. Steady weakening occurred however during the following day as *Ernesto* passed very near the southwestern tip of Haiti. *Ernesto* then made landfall just west of Guantanamo Bay, Cuba on 28 August as a tropical storm with 65 km/h winds and emerged off the north-central coast early the next day.

The storm continued northwestward with little change in strength and made landfall in extreme southern Florida early on 30 August with 75 km/h maximum winds. *Ernesto* weakened to a depression later that day while moving northward over the Florida peninsula.



Tropical Storm Ernesto, while located to the East Northeast of the ABC Islands during the early morning hours of August 25.

Infrared image, courtesy of CIRA/NOAA.

After departing the east coast of Florida near Cape Canaveral early on 31 August, *Ernesto* strengthened over the warm waters of the Atlantic while heading north-northeastward. *Ernesto* then made landfall early on September 1 near Oak Island in North Carolina, just west of Cape Fear as a strong tropical storm with maximum sustained winds of 115 km/h. It weakened inland and became a tropical depression over North Carolina later that day. However, the combination of *Ernesto* and a large high pressure system to its north produced gale force winds over many areas near the coast of the United States from Virginia to New York. *Ernesto* lost its tropical characteristics by early on September

2 as it moved over Virginia. The system moved slowly northward over Pennsylvania and New York and was gradually absorbed into a larger extratropical system during the following couple of days. Five fatalities were directly caused by *Ernesto* in Haiti and two fatalities in Virginia (U.S.A.) occurred when a tree fell on a residence in strong winds north of *Ernesto*. Many locations in Haiti, the Dominican Republic and the eastern United States experienced damages due to floods caused by heavy rains associated with *Ernesto*.

Florence originated from a tropical wave that left the coast of Africa on August 29 and it developed into a tropical depression on September 3 about 2455 kilometers east of the SSS Islands. The system moved west-northwestward and became a tropical storm on September 5. *Florence* turned northwestward and strengthened on September 9, becoming a hurricane early the next day about 580 kilometers south of Bermuda. The hurricane turned northward, passing about 95 kilometers west of Bermuda on September 11 while at its estimated peak intensity of 145 km/h. It turned northeastward later that day and became extratropical on September 12 about 965 kilometers southwest of Cape Race, Newfoundland in Canada. As a powerful extratropical low, *Florence* passed near Cape Race on September 13 and then moved eastward into the open North Atlantic for several days. The extratropical remnants of *Florence* were absorbed by another low southwest of Iceland on September 19. *Florence* brought hurricane conditions to Bermuda, causing widespread power outages, minor damage and a few injuries. As an extratropical low, *Florence* brought hurricane force winds to southeastern Newfoundland where minor damage was reported as well.

Gordon formed from a tropical wave that left the west coast of Africa on September 1. As the wave moved westward for about a week, development was hindered by nearby hurricane *Florence*. By September 9, *Florence* had moved far enough away from the wave to allow the system to develop and the following day a tropical depression formed about 870 kilometers east northeast of the SSS Islands. The depression strengthened into a tropical storm on September 11 and turned toward the northwest. Late on September 12, *Gordon* became a hurricane and started moving toward the north. It intensified rapidly on September 13 and reached its peak intensity of 195 km/h about 925 kilometers east southeast of Bermuda. Moving northeastward over the central Atlantic, *Gordon* maintained major hurricane status for about a day. The cyclone then stalled over the central Atlantic for a couple days and weakened. An upper level trough finally accelerated *Gordon* northeastward on September 17.

The tropical cyclone turned toward the east on September 19 and strengthened, reaching a second peak intensity of 170 km/h about 1015 kilometers west of the Azores. *Gordon* weakened and passed through the southernmost Azores early on September 20, then became extratropical late in the day about 445 kilometers west of the coast of Portugal. As a strong extratropical low, *Gordon* turned northward on September 21 and intensified. The low passed over western Ireland late that day, then made a cyclonic loop before dissipating between Ireland and England on September 24.

Gordon caused hurricane force wind gusts on Santa Maria in the Azores and as an extratropical low did the same in portions of Spain and the British Isles. As a tropical cyclone it caused minor damage in the Azores and as an extratropical low it caused wind damage and power outages in Spain, Britain and Ireland.

Helene developed from a vigorous tropical wave that emerged from the coast of Africa on September 11. Shower activity quickly increased and a tropical depression formed over the far eastern Atlantic about 370 kilometers south southeast of the Cape Verde Islands. The large depression passed about 305 kilometers south of the Cape Verde Islands before strengthening to a tropical storm early on September 14. Moving west northwestward, *Helene* gradually strengthened and became a hurricane on September 16 while located about 1850 kilometers east of the SSS Islands. The next day, the hurricane slowed down and turned northwestward while continuing to

intensify. *Helene* became a major hurricane on September 18 and shortly thereafter reached an estimated peak intensity of 195 km/h. On September 19, the hurricane moved westward briefly and weakened to a category 2 hurricane. *Helene* then turned northward on September 20 ahead of a large deep layer trough moving off the east coast of the United States. *Helene* passed about 885 kilometers east of Bermuda early on September 21 and then turned east northeastward over the open waters of the central Atlantic. *Helene* retained hurricane strength until becoming extratropical on September 24 about 505 kilometers west northwest of the Azores. The extratropical low gradually weakened and passed near Northwestern Ireland and Scotland on September 27. It was absorbed by a larger extratropical low late that day.

Isaac developed from a tropical wave that exited the coast of Africa on September 18. This large wave and associated shower and thunderstorm activity was tracked for nine days as it moved west northwestward across the eastern Atlantic. On September 27, a tropical depression formed from the wave about 1500 kilometers east-southeast of Bermuda. The depression strengthened to a tropical storm on the next day and became a hurricane about 595 kilometers east southeast of Bermuda on September 30 while being steered west northwestward by mid-level high pressure over the central Atlantic. *Isaac* reached its estimated peak intensity of 135 km/h during the early evening of September 30 about 620 kilometers east southeast of Bermuda.

On the next day, *Isaac* recurved around the western periphery of a subtropical ridge with an increase in forward speed. The cyclone moved quickly to the north northeast on October 2 ahead of an approaching deep-layer trough from the west. During this time, *Isaac* encountered increasing southwesterly shear and cooler waters and by the morning that day, it weakened to a tropical storm. Later on October 2, the center of *Isaac* quickly passed about 65 kilometers southeast of the Avalon peninsula of Newfoundland, Canada. Even though *Isaac* remained offshore, winds of tropical storm force were experienced across portions of the southern Avalon peninsula. *Isaac* transitioned to an extratropical cyclone during the evening of October 2 and merged with a larger extratropical area of low pressure later that day.

Trop. Depr. Nr.	Name	Period	Lowest Air Pressure	Maximum sustained winds
1	TS Alberto	June 10 - 14	969 hPa	115 km/h
-	Unnamed TS	July 17 - 18	998 hPa	80 km/h
2	TS Beryl	July 18 - 21	1000 hPa	95 km/h
3	TS Chris	August 1 - 5	1001 hPa	105 km/h
4	TS Debby	August 21 - 26	999 hPa	80 km/h
5	Hur. Ernesto	August 24 - September 2	985 hPa	110 km/h
6	Hur. Florence	September 3 - 12	972 hPa	145 km/h
7	Hur. Gordon	September 10 - 20	955 hPa	195 km/h
8	Hur. Helene	September 12 - 24	955 hPa	195 km/h
9	Hur. Isaac	September 27 - October 2	985 hPa	135 km/h

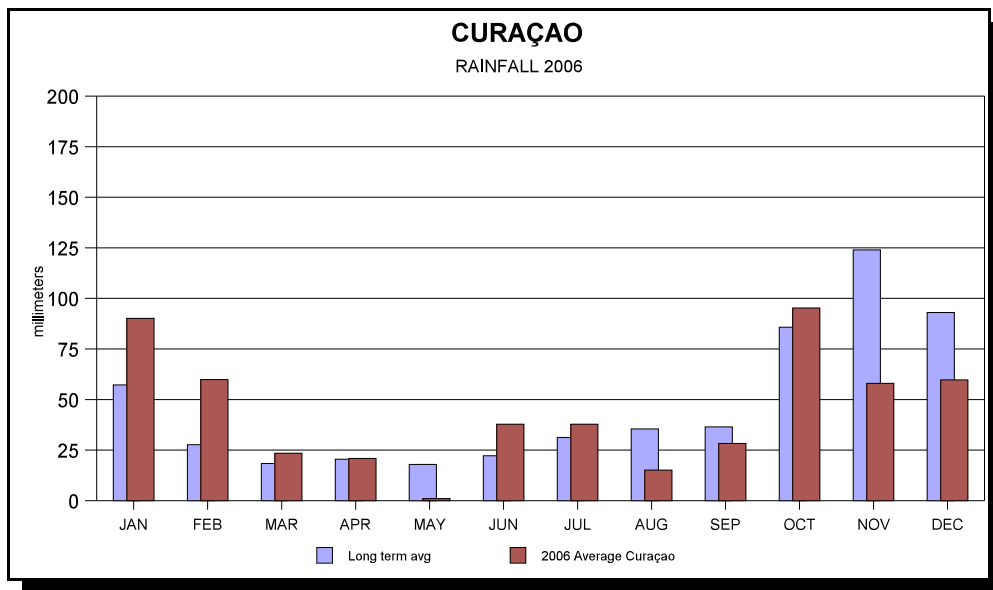
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ABC-Islands

Curaçao

PRECIPITATION

The island average rainfall for 2006 was 537.1 mm. This is just below the long-term average of 570.4 mm. When analyzing the individual data from the rain gauge network, the rainfall station at *Grote Berg* measured the highest annual total of 708 mm during 2006. The maximum 24-hour rainfall total for Curaçao was 99.8 mm and was measured at rainfall station *Grote Berg* on October 22, 2006. The highest monthly total for 2006 was 234.9 mm, measured in October at rainfall station *Grote Berg*. The highest total of rain days (days with rainfall greater than or equal to 1.0 mm) for 2006 was 71 days and was observed at rainfall station *Mahuma* and the rainfall station at *Hato* .



Rainfall data from Hato rainfall station

The annual rainfall total for Hato in 2006 was 400 mm, 27.7% below the 30-year average of 1971-2000 (normal 553.4 mm). The wettest month of 2006 was January with a monthly total of 80.6 mm and the driest was April with 0.6 mm.

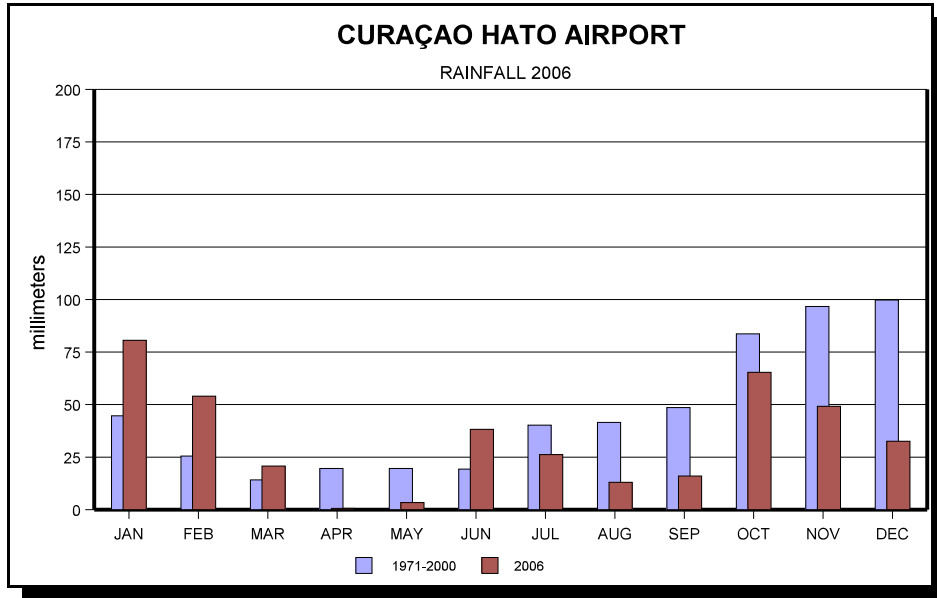
The 24-hour maximum of 52.6 mm was recorded on October 21. The one-hour maximum of 26.6 mm was recorded on October 21 between 12:00 and 13:00 hours.

The maximum intensity per minute of 2.6 mm was recorded on October 21. The maximum rainfall duration in minutes was 106 minutes, also recorded on October 21, 2006.

The number of days with rainfall greater or equal to 1.0 mm was 66 days (normal 70).

The hours with rainfall for 2006 recorded at Hato International Airport totaled 245 hours.

The number of days with thunder was 21 (normal 23 days)



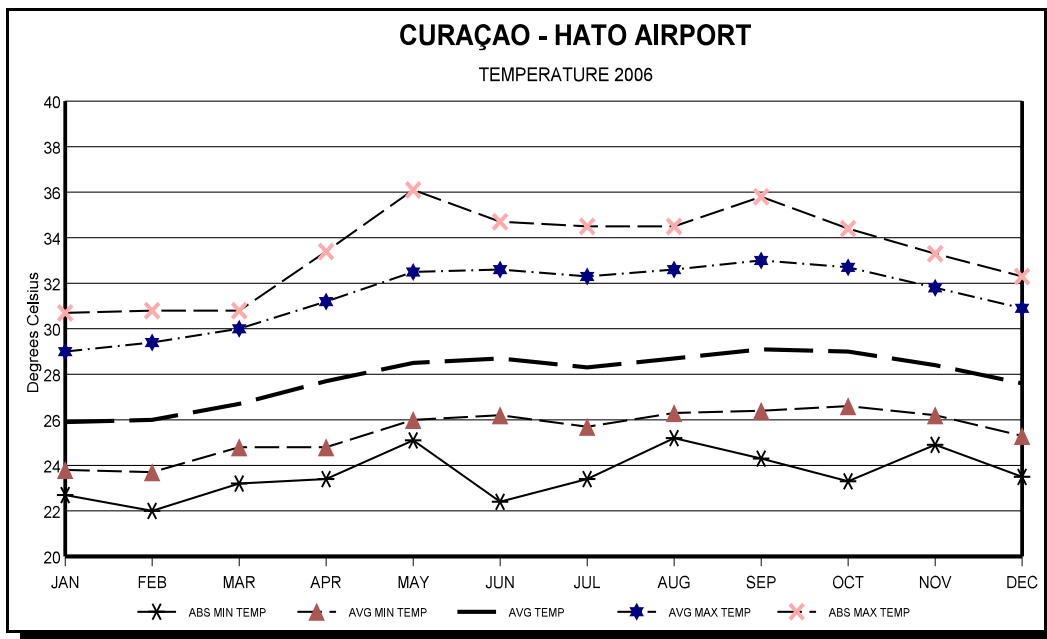
TEMPERATURE

The average air temperature, as recorded at Hato International Airport over the year 2006, was **27.9°C** (normal 27.8°- standard deviation 0.8°). September was the warmest month with a daily average temperature of **29.1°C** (normal: 28.9°C). This month also had the highest average maximum temperature of **33.0°C** (normal: 31.9°C).

The absolute maximum temperature was **36.1°C** and was recorded on May 13 at 13:45 hours (Absolute maximum record of 38.3°C was established on September 1996). The hottest day of 2006 was October 1 with a 24 hour average temperature of **31.3°C**.

January was the coolest month with a daily average temperature of **25.9°C**. February was the month with the lowest average minimum temperature of **23.7°C**.

The absolute minimum temperature of **22.0°C** was recorded on February 7, 2006 at 03:42 hours. The coolest day of the year was January 6 with a 24-hour average temperature of **24.7°C**.



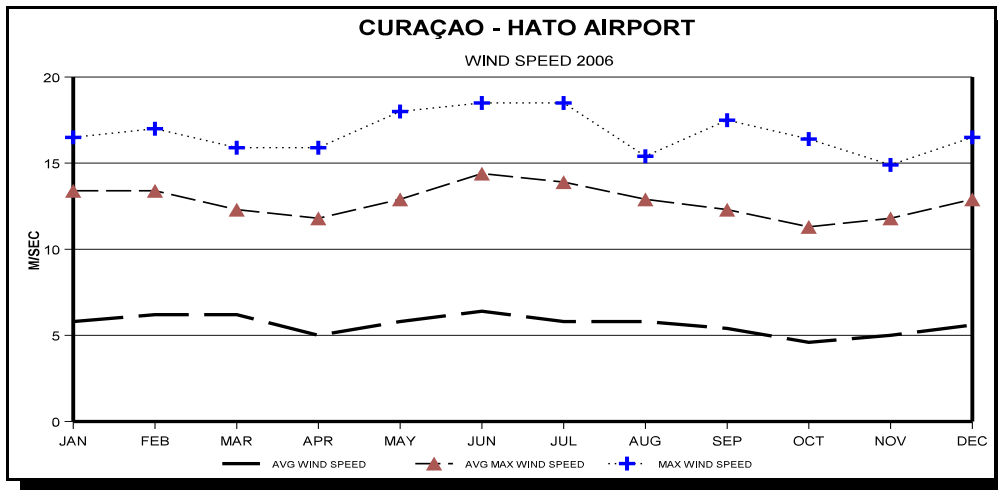
WIND

The average wind speed for the year 2006 was 5.6 m/sec (20.2 km/hr) (normal: 6.6 m/sec - 23.8 km/hr) at a height of 10 meters and the average wind direction was 94°.

June had the highest monthly average wind speed of 6.4 m/sec (23.0 km/hr) and October had the lowest monthly average wind speed 4.6 m/sec (16.6 km/hr).

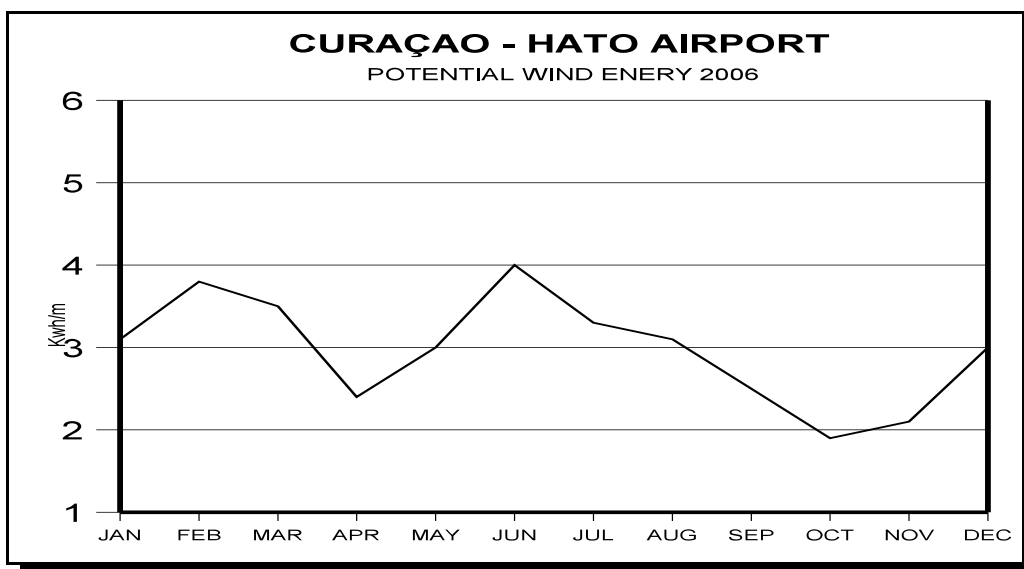
The highest wind gust 18.5 m/sec (66.6 km/hr) was recorded on June 6 at 07:32 and on July 11 at 03:39 local time.

The day with the highest 24 hour average wind speed of 8.2 m/sec (29.5 km/hr) was recorded on December 3, 2006.



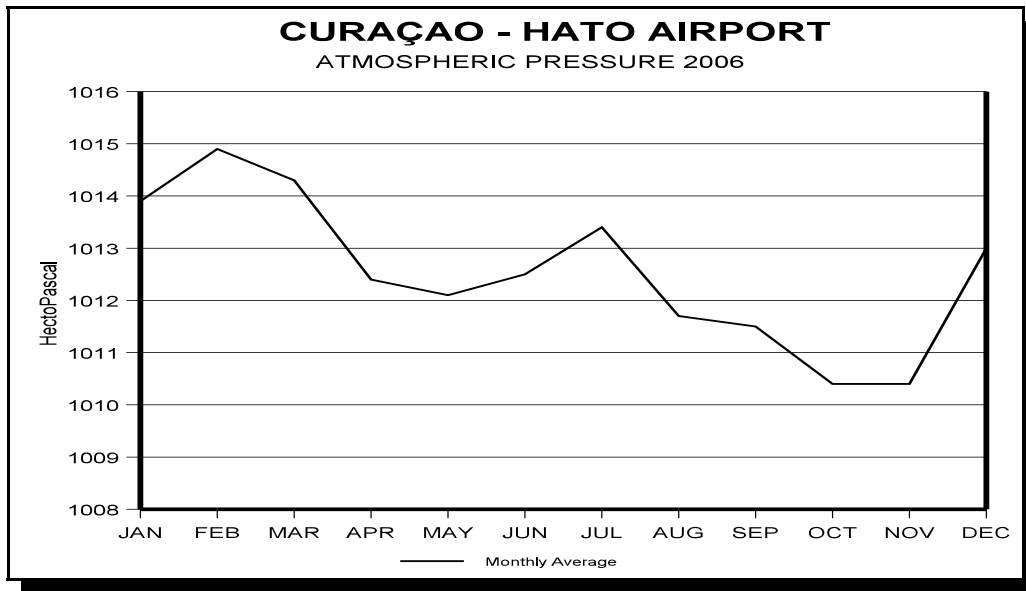
POTENTIAL WIND ENERGY

The total potential wind energy (at 10m height and wind speeds ≥ 4 m/sec) for the year 2005 was 998 kWh/m². The daily average for 2005 was 2.7 kWh/m²/day.



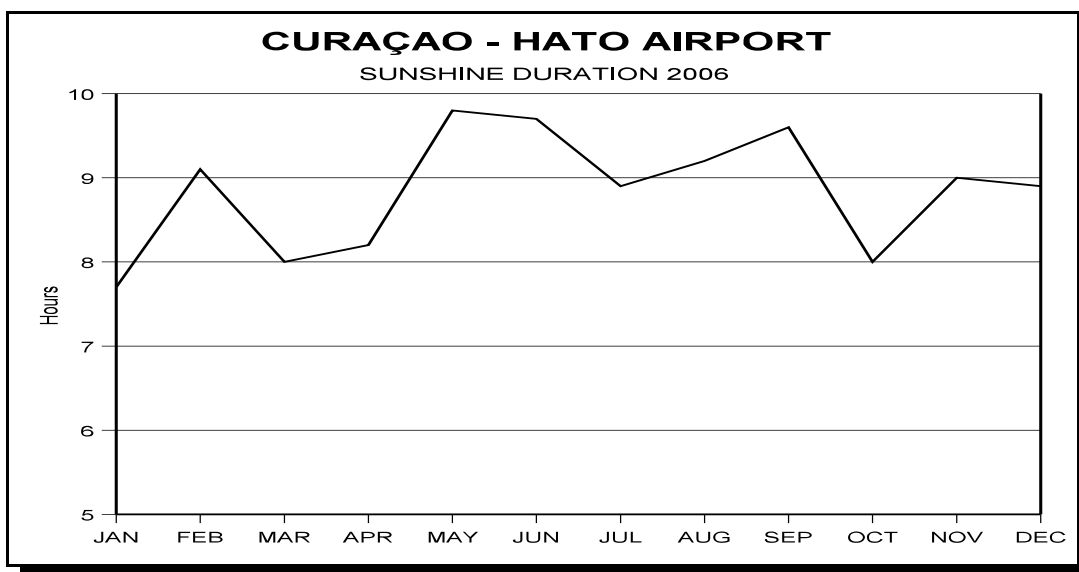
ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Hato Airport over the year 2006 was 1012.5 hPa. The maximum atmospheric pressure of 1019.0 hPa was recorded on February 14, 2006 while the minimum 1005.8 hPa was recorded on October 19.



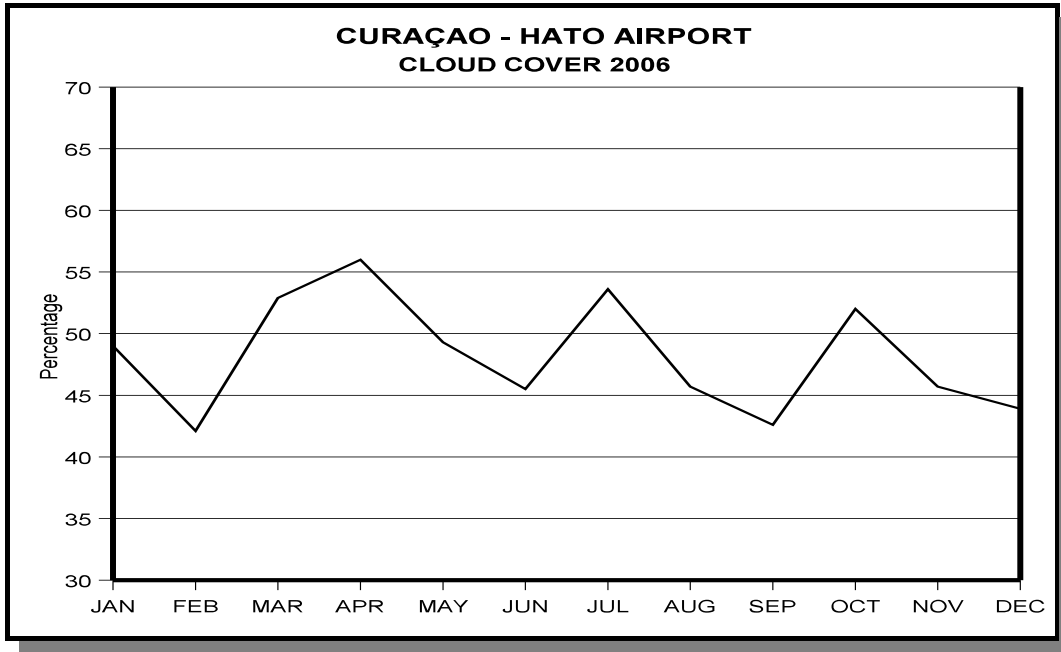
SUNSHINE DURATION

The total sunshine duration for the year 2006 was 3224.6 hours, 72.8 % of the maximum possible duration (4428 hrs). The average daily sunshine duration was 8 hours and 48 minutes. The sunniest month was August with a daily average sunshine duration of 9 hours and 46 minutes while the month with the least sunshine was January with a daily average of 7 hours and 42 minutes. The day with the maximum sunshine duration, 11 hours and 30 minutes, was August 2, 2006.



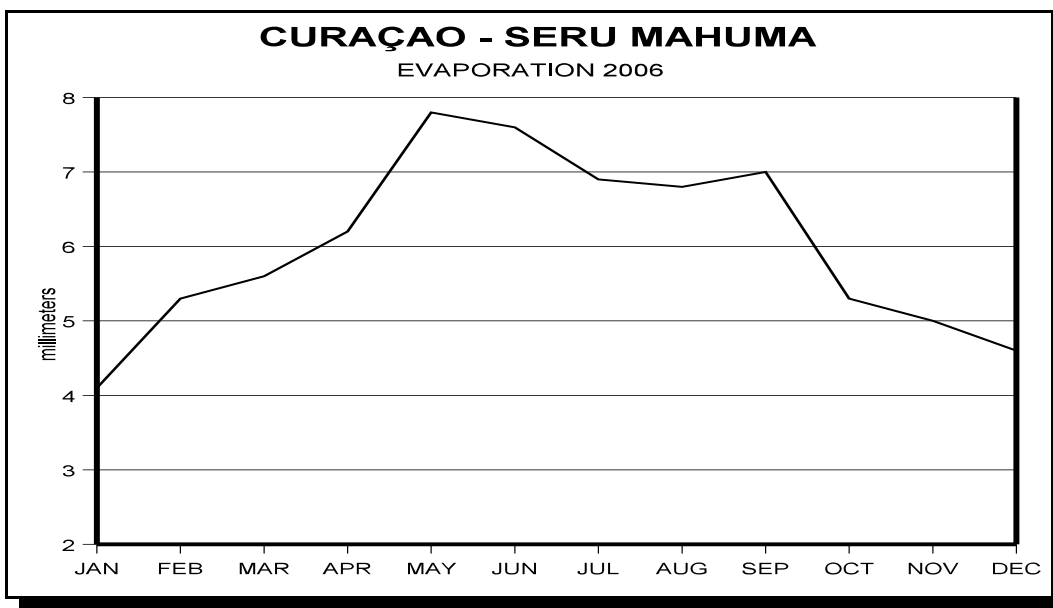
CLOUD COVERAGE

The average cloud cover for the year 2006 was 48.2%. The highest total cloud coverage per month, 56% was observed in March and the lowest total cloud coverage for 2006 42.1% was observed in February.



EVAPORATION

The site of the evaporation pan is located near the Meteorological Service building at Seru Mahuma. The daily average evaporation for the year 2006 was 6.0 mm per day. May had the highest monthly average evaporation of 7.8 mm while January had the lowest monthly average evaporation value of 2006 with 4.1 mm.

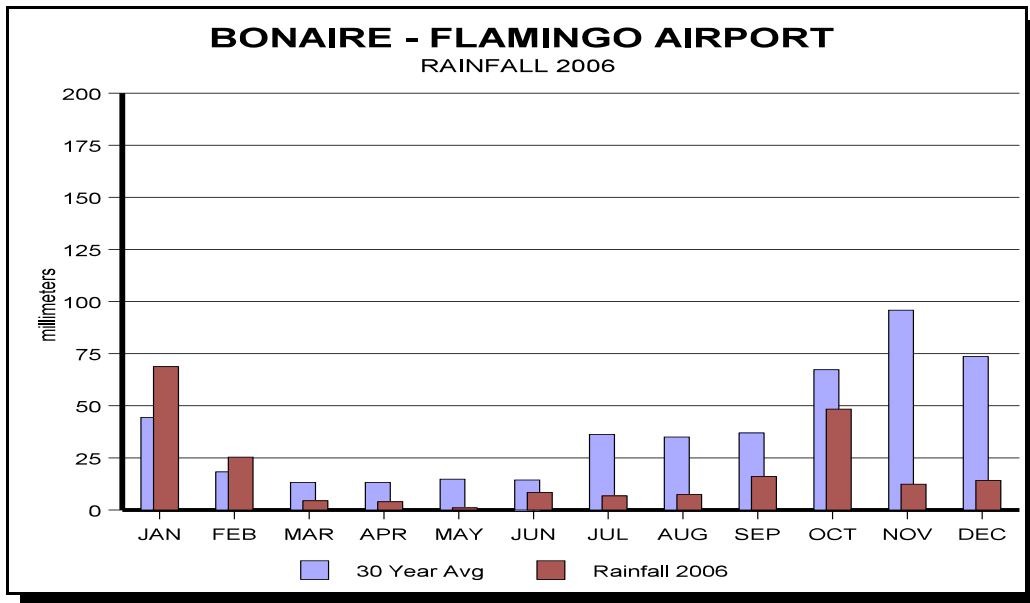


Bonaire

PRECIPITATION

The rainfall total, over the year 2006, as recorded at the Flamingo Airport of Bonaire was 217.2 mm, 47% below normal (normal 1971-2000 is 463.3 mm). Under the influence of a sudden El Niño, the rainfall for October through December (rainy season) was 69% below normal.

January was the wettest month of the year with a total of 68.8 mm. The 24-hour maximum was 33.2 mm recorded on October 17, 2006. The number of days with precipitation greater than or equal to 1.0 mm totaled 33.

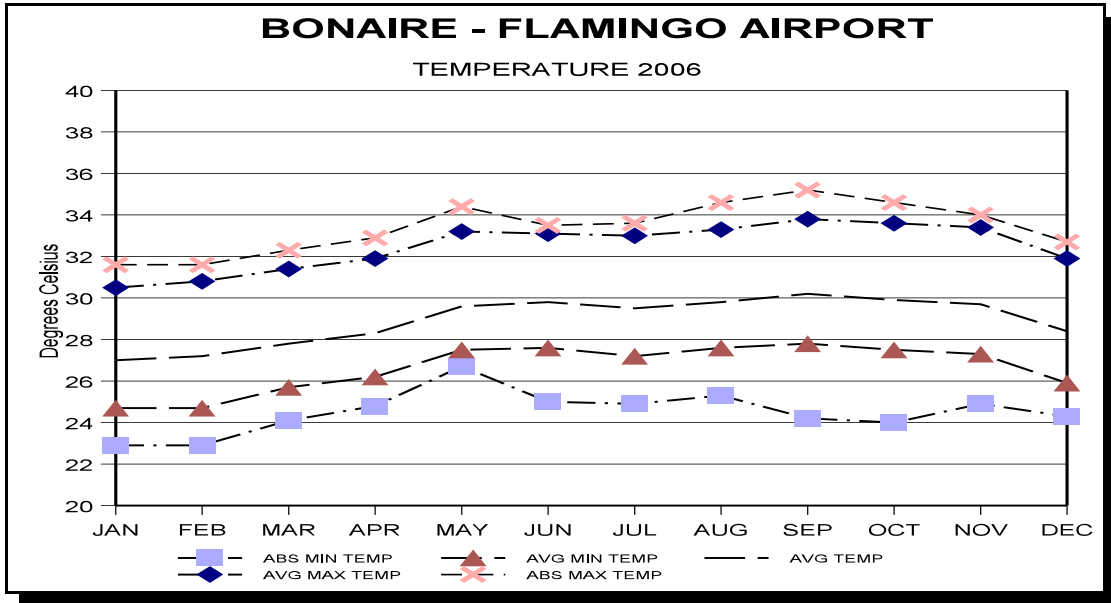


TEMPERATURE

The average air temperature recorded at the Flamingo Airport of Bonaire over the year 2006 was **28.9°C** (normal 28.0). The month of September was the warmest month with an average temperature of **30.2°C**. September had the highest value for the average maximum temperature of **33.8°C**. The absolute maximum temperature of the past year was **35.2°C** and was recorded on September 8 at 12:03 local time. The warmest day of 2006 was September 8 with a 24-hour average temperature of **30.9°C**.

With an average temperature of **27.0°C**, January had the lowest monthly average temperature for 2006. The lowest monthly average minimum temperature **24.7°C** was recorded during January and February. The absolute minimum temperature of **22.9°C** was recorded on January 5, 2006 at 05:45 and on February 15 at 12:13 hours.

The lowest 24-hour average temperature **25.4°C** was recorded on January 3, 2006.



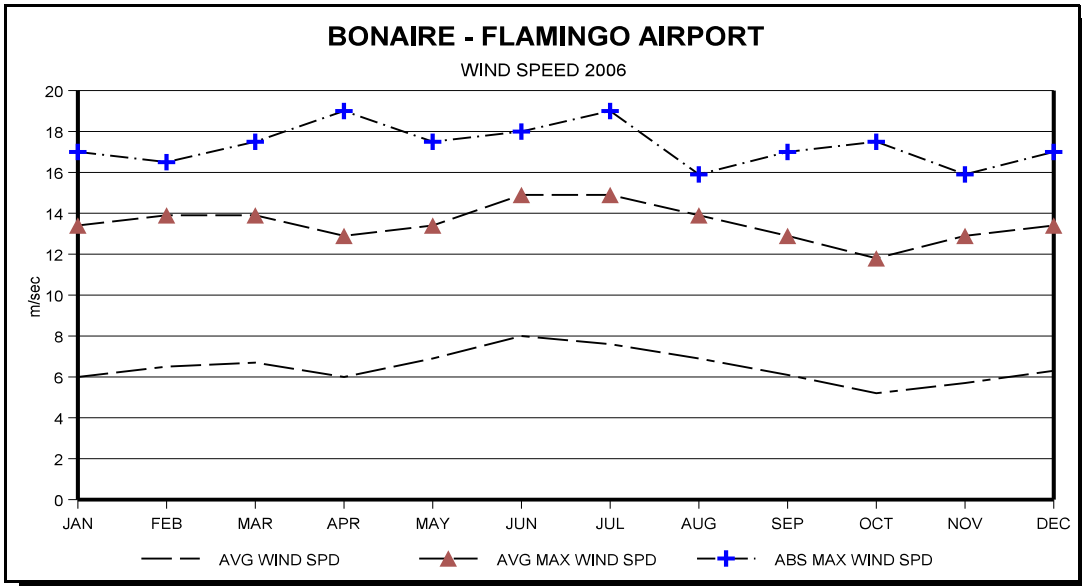
WIND

The average wind speed of 2006 recorded at the Flamingo Airport was 6.5 m/sec (23.4 km/hr) at 10 meter height. June had the highest average wind speed 8.0 m/sec (28.8 km/hr).

November had the lowest average wind speed of 5.2 m/sec (18.7 km/hr).

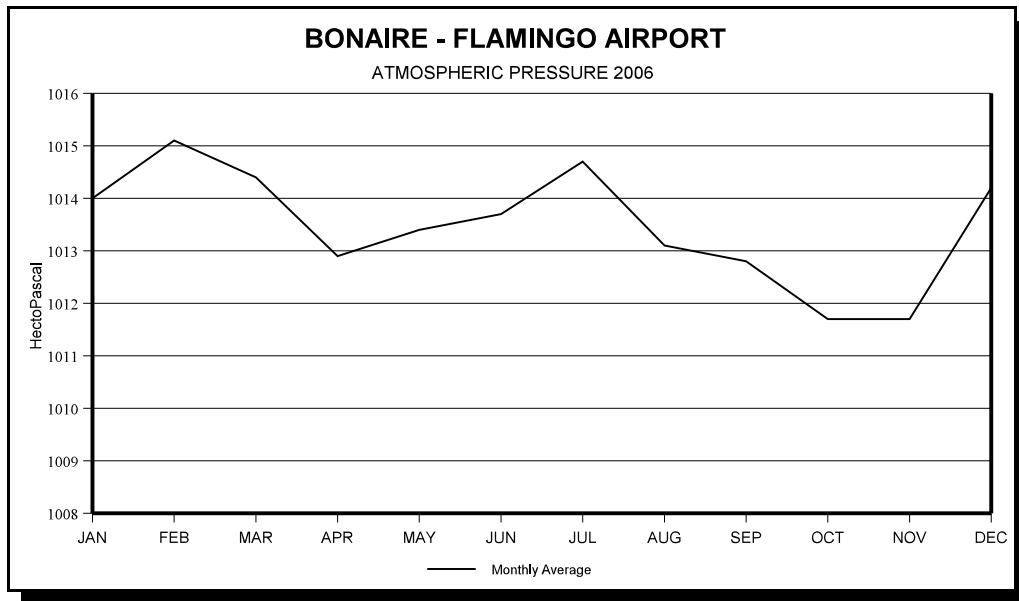
The day with the highest 24-hour average wind speed was July 11 with an average of 10.4m/sec (37.5 km/hr).

The highest wind gust 19.0 m/sec (68.4 km/hr) was recorded on July 1 at 11:55 hours.



ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Flamingo Airport over the year 2006 was 1013.5 hPa. The maximum atmospheric pressure of 1019.0 hPa was observed on February 14 while the minimum atmospheric pressure of 1007.3 hPa was recorded on October 19, 2006.

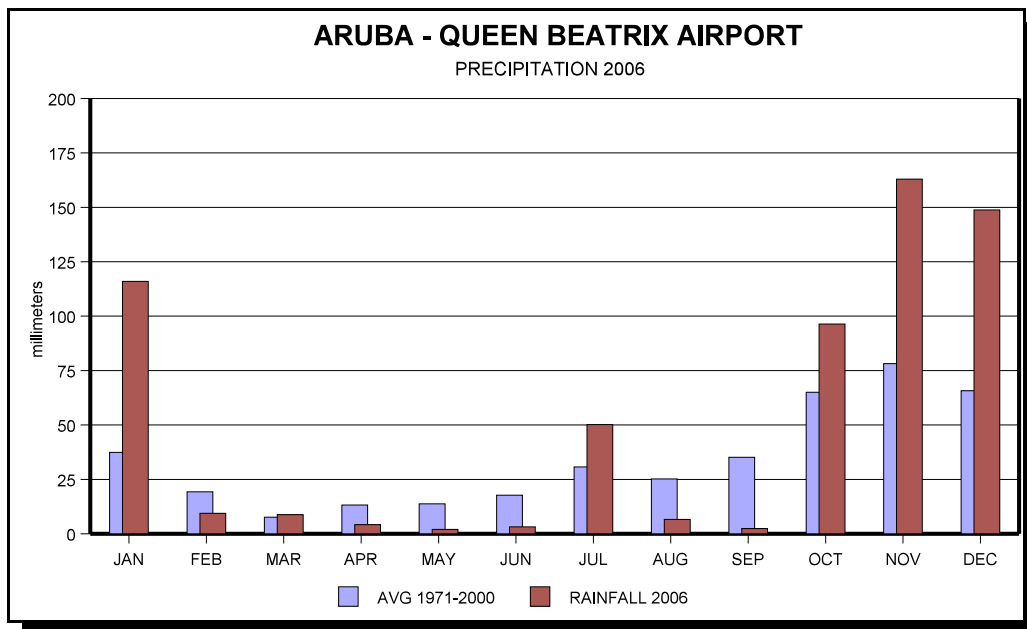


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Aruba

PRECIPITATION

The rainfall total, recorded at the Queen Beatrix Airport, for the year 2006 was, with 611.0 mm, 49% above normal (409 mm). Isolated cell formation caused several times heavy rainfall on the island of Aruba during the rainy season. The wettest month was November with a total rainfall of 162.8 mm. A new 24-hour rainfall record (126.0 mm) was established on November 16, 2006. The number of days with precipitation greater than or equal to 1.0 mm was 61 days.

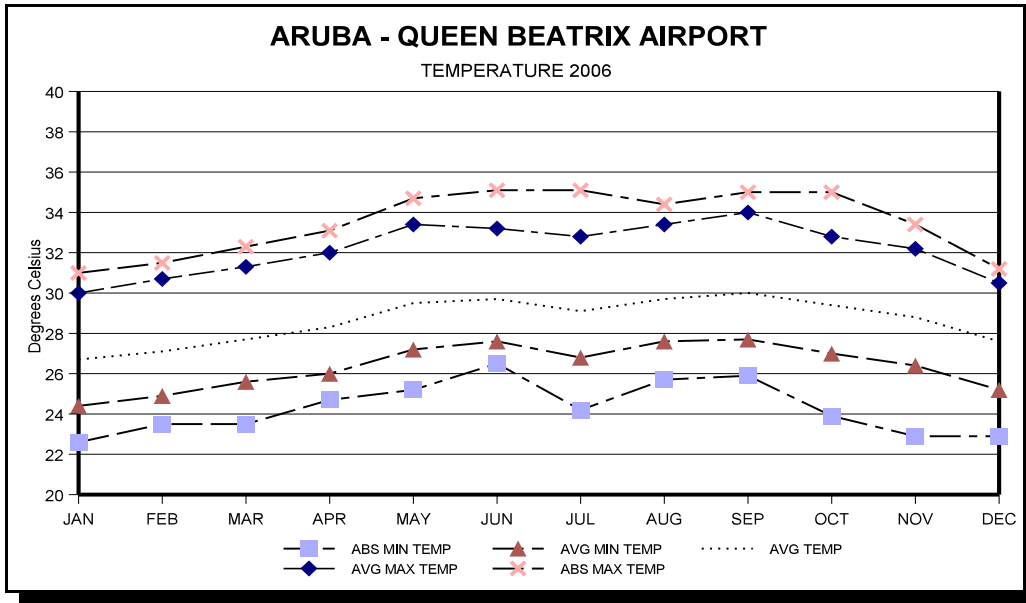


TEMPERATURE

The average air temperature as recorded at Queen Beatrix Airport over the year 2006 was **28.6°C** (normal 27.8°). September was the hottest month with a monthly average temperature of **30.0°C** and was also the month with the highest average maximum temperature of **34.0°C**.

The hottest day of 2006 was September 24 with an average temperature of 30.6 °C. The absolute maximum temperature of **35.0°C** was recorded on September 10 at 13:17 hours local time.

January was the coolest month with an average temperature of **26.7°C** and was also the month with the lowest average minimum temperature of **24.4°C**. The coolest day of 2006 was January 7 with an average temperature of 25,6°C. The absolute minimum temperature was **22.6°C** and was recorded on January 9 at 06:32 hours local time.

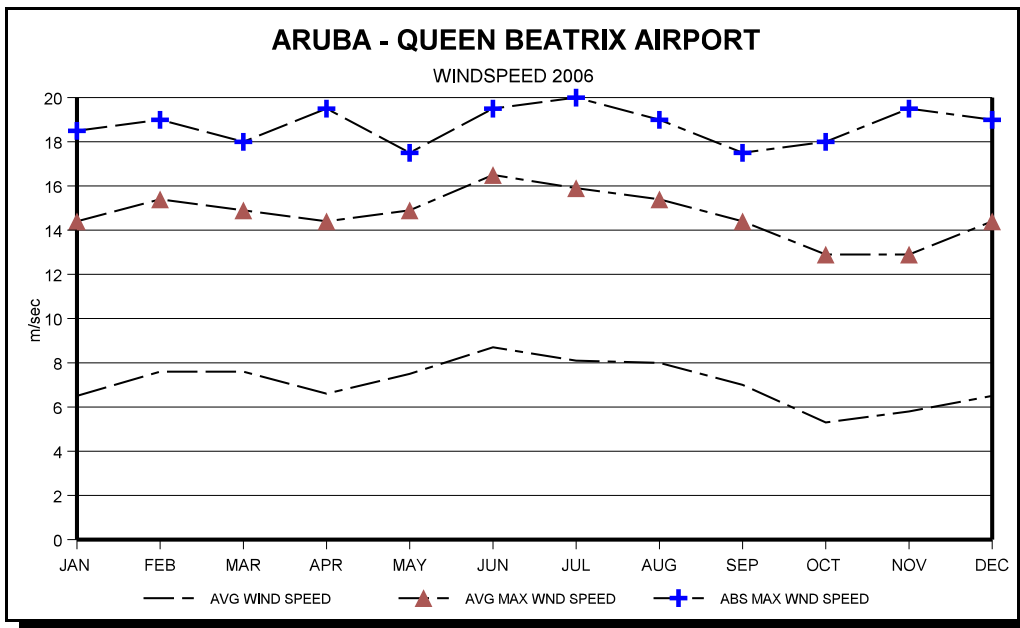


WIND

The average wind speed, at 10 m height, for the year 2006, as recorded at Queen Beatrix Airport, was 7.1 m/sec (25.6 km/hr).

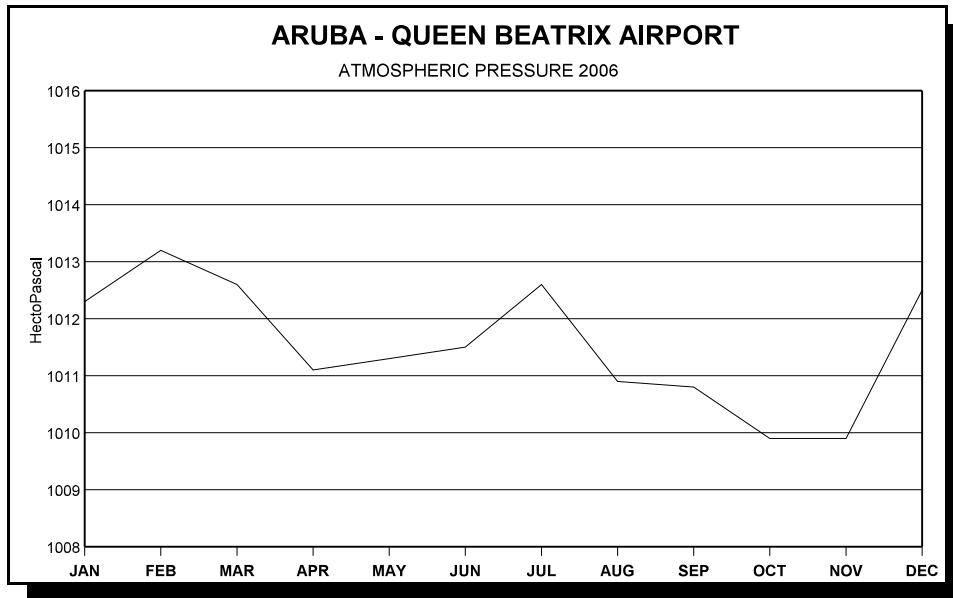
June was the month with the highest average wind speed of 8.0 m/sec (28.8 km/hr) and October had the lowest average wind speed 5.3 m/sec (19.1 km/hr).

The day with the highest 24 hour average wind speed of 10.8 m/sec (38.9 km/hr) was recorded on July 1, 2006. The highest wind gust of 20 m/sec (72 km/hr) was recorded on July 1, 2006 at 15:23 local time.



ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Queen Beatrix Airport over the year 2006 was 1011.6 hPa. The maximum atmospheric pressure of 1017.5 hPa was observed on February 14 while the minimum atmospheric pressure of 1005.2 hPa was recorded on October 3.



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SSS ISLANDS

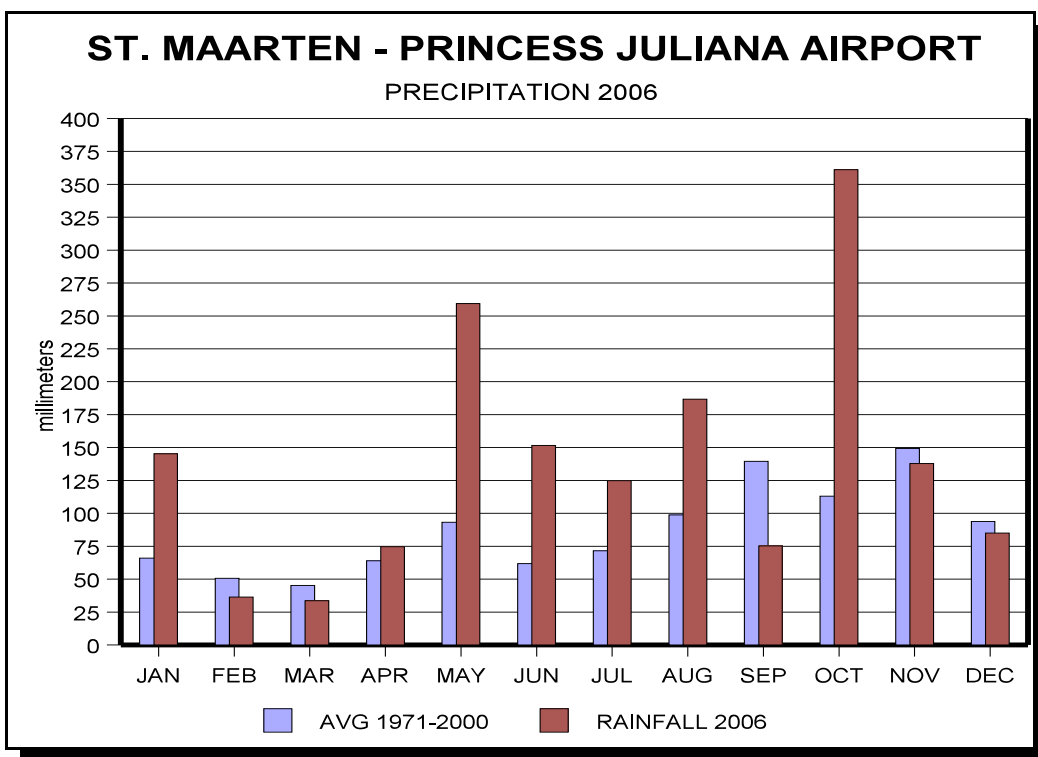
St. Maarten

PRECIPITATION

The total rainfall for 2006, as recorded at the Princess Juliana Airport was 1671.6 mm about 60% above normal (1971-2000 of 1047.1 mm). October was the wettest month with a monthly total of 361.2 mm. This total is a new record for the month of October since 1953. The old record was established in the year 1985 with a monthly total of 259.9 mm.

The 24-hour maximum was 192.8 mm and occurred on October 20, 2006. This is a new 24 hour maximum rainfall total for the month of October. The old record was established in October 1999 on the 22nd with 122.4 mm.

The number of days with precipitation greater than or equal to 1.0 mm was 237. This also a new record. The old record was established in 1888 with 174 days greater than or equal to 1.0 mm.



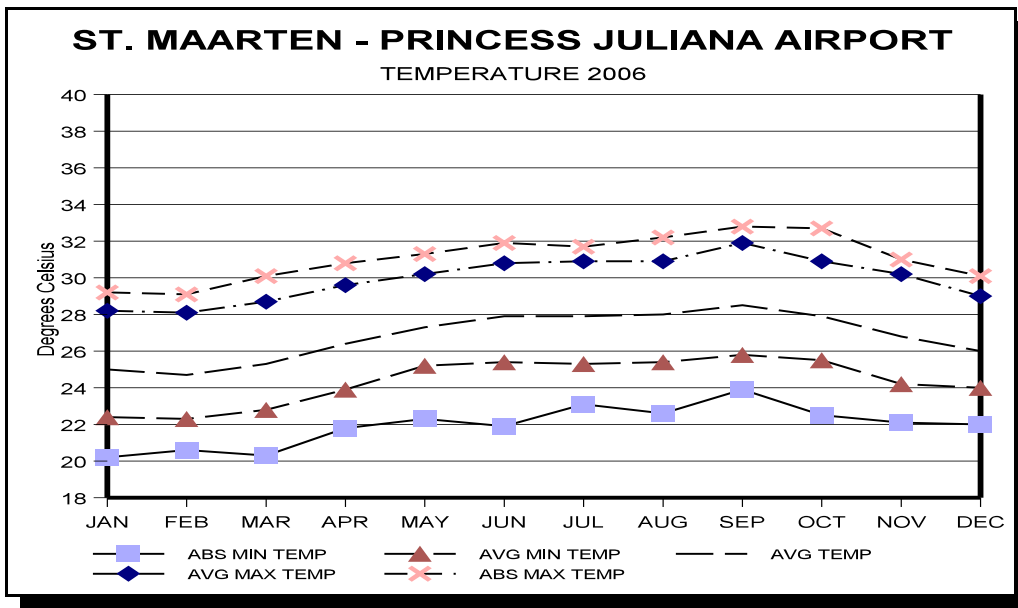
TEMPERATURE

The average air temperature as recorded at Princess Juliana Airport over the year 2006 was **26.8°C** (normal 27.2°). September was the warmest month with a monthly average temperature of **28.5°C** and was also the month with the highest monthly average maximum temperature of **31.9°C**.

The absolute maximum temperature was **32.8°C** and was recorded on September 17 at 12:26 local time. The hottest day of 2006 was recorded on August 23 with a 24-hour average temperature of **29.2°C**.

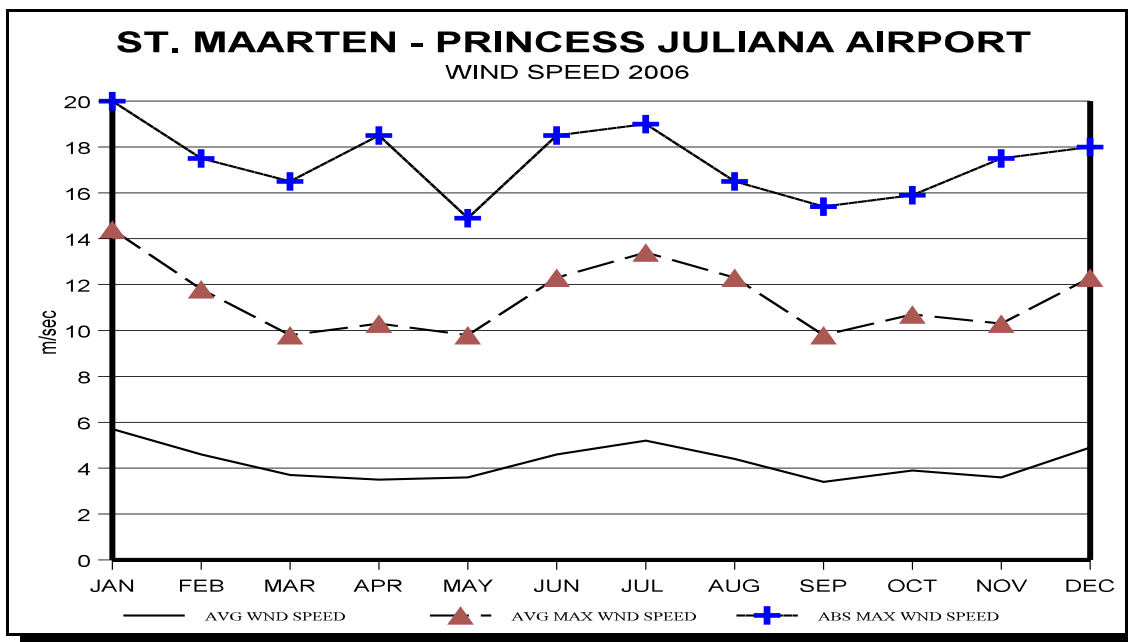
February was the month with the lowest monthly average temperature of **24.7°C** and was also the month with the lowest average minimum temperature of **22.3°C** for 2006.

The absolute minimum temperature **20.2°C** was recorded on January 16 at 02:14 hours local time. The coolest day of 2006 was January 28 with an average temperature of 23.4°C



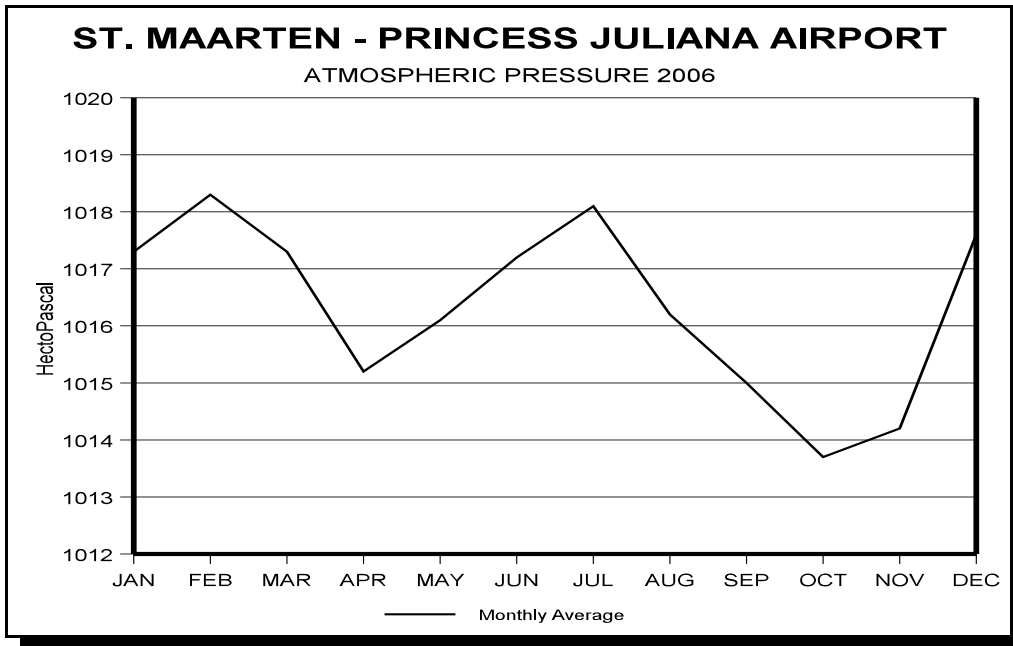
WIND

The average wind speed in 2006 as recorded at the Princess Juliana airport, was 4.3 m/sec (15.5 km/hr) at 10m height. January had the highest average wind speed of 5.7 m/sec (20.5 km/hr) while September had the lowest average wind speed of 3.4 m/sec (12.2 km/hr). January 20 was the day with the highest 24-hour average wind speed of 9.1 m/sec (32.8 km/hr) The highest wind gust 20 m/sec (72 km/hr) was recorded on January 22 at 10:41 local time.



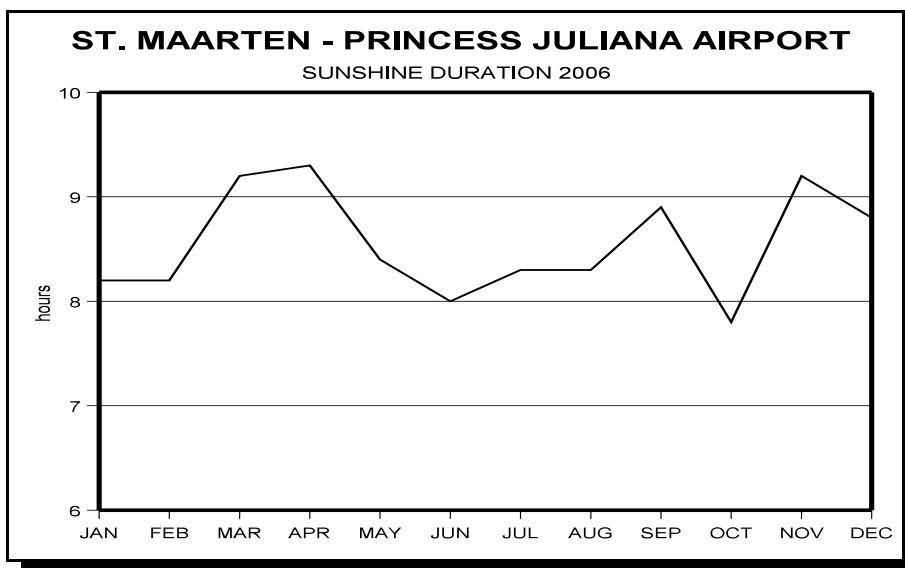
ATMOSPHERIC PRESSURE

The average atmospheric pressure, recorded at Princess Juliana Airport, during the year 2006 as 1016.4 hPa. The maximum atmospheric pressure of 1022.6 hPa was recorded on July 6, while the minimum atmospheric pressure of 1007.9 hPa was recorded on October 19.



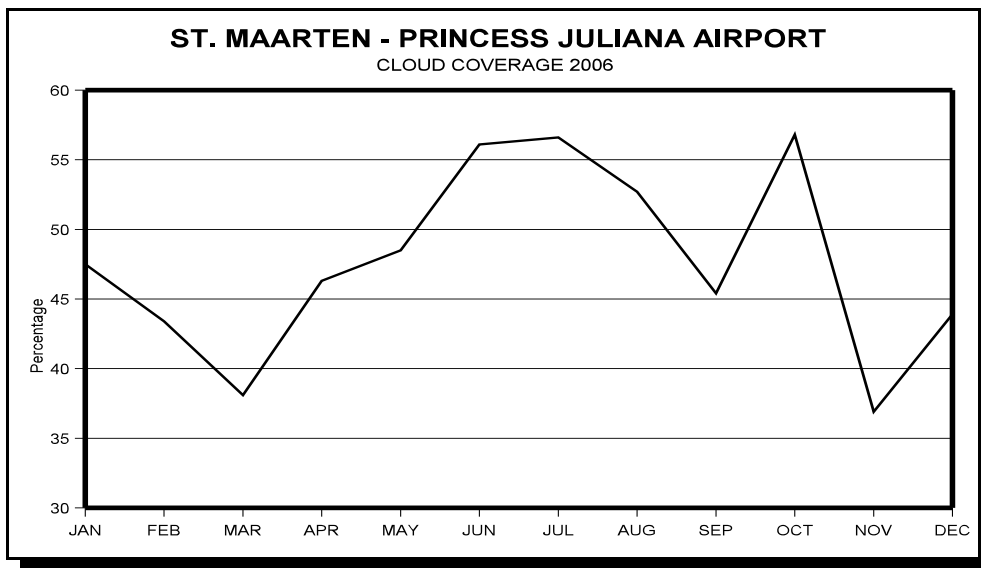
SUNSHINE

The total sunshine duration for 2006 as recorded at the Princess Juliana airport was 3121.3 hrs, about normal(3009 hrs) and 70.4% of the maximum annual possible duration (4431.3 hrs). The daily average sunshine duration in 2006 was 8 hours and 36 minutes. This was just above the long-term average daily sunshine duration (8 hours and 16 minutes). The sunniest month was April with a daily average sunshine duration of 9 hours and 18 minutes. The month with least sunshine during 2006 was October with a daily average of 7 hours and 48 minutes. The maximum daily sunshine duration for the past year was 12 hours and 6 minutes recorded on June 23 2006.



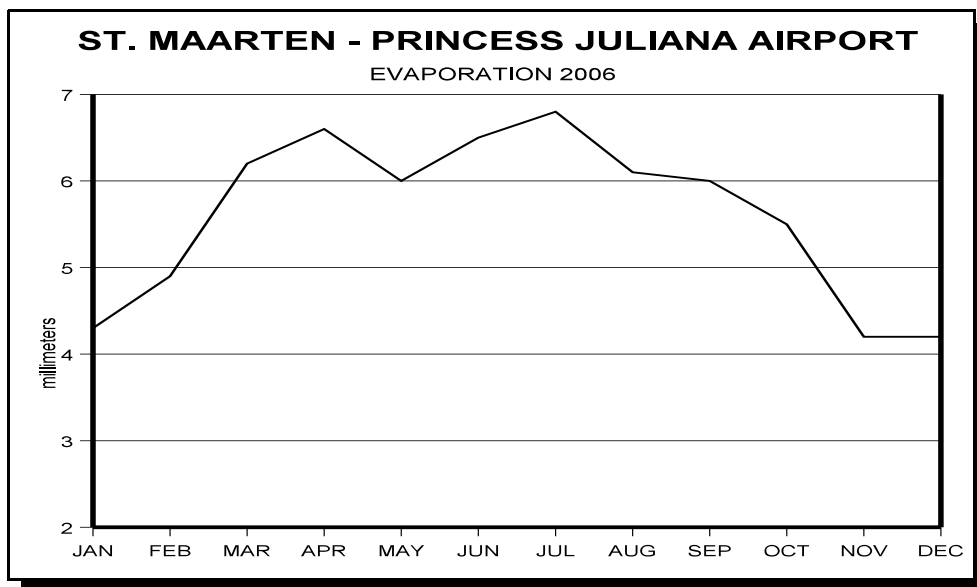
CLOUD COVER

The daily average cloud coverage for St. Maarten over the year 2006 as recorded at Princess Juliana Airport was 47.7%. The highest monthly average cloud cover of 56.8% was observed in October while November had the lowest cloud coverage value of 36.9%.



EVAPORATION

The average daily evaporation, measured at the Princess Juliana Airport, over the year 2006 was 5.6 mm per day. July had the maximum average evaporation value for 2006 of 6.8 mm per day while November and December had the lowest value of 3.2 mm per day.



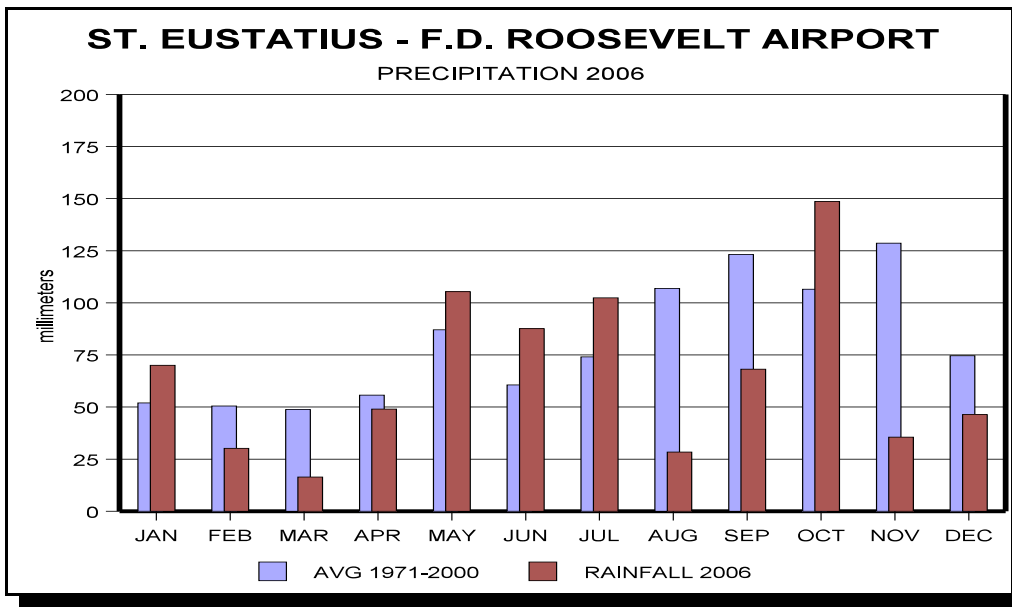
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Sint Eustatius

PRECIPITATION

The total rainfall amount, recorded at the Roosevelt Airport, for 2006 was 788.2 mm. This amount is 18.6% below the 30-year average (1971-2000) which is 968.6 mm. The wettest month was October with 148.6 mm. The driest month of 2006 was March with 16.4 mm. The 24-hour maximum rainfall 69.4 mm was recorded on October 20.

The number of days with precipitation greater than or equal to 1.0 mm was 114.

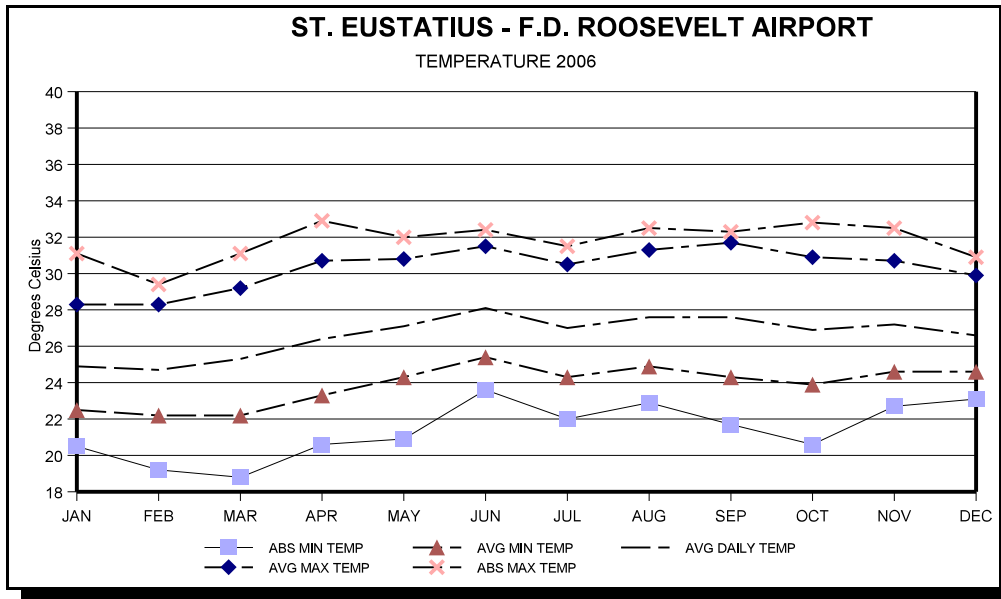


TEMPERATURE

The average air temperature as recorded at Roosevelt Airport over the year 2006 was **26.6°C** (normal 26.9°). June was the warmest month with an average temperature of **28.1°C**. September had the highest average maximum temperature of **31.7°C**. The absolute maximum temperature, **32.9°C**, was recorded on April 20 at 12:54 hours. The warmest day of 2006 was June 5 with a 24-hour average temperature of **28.8°C**.

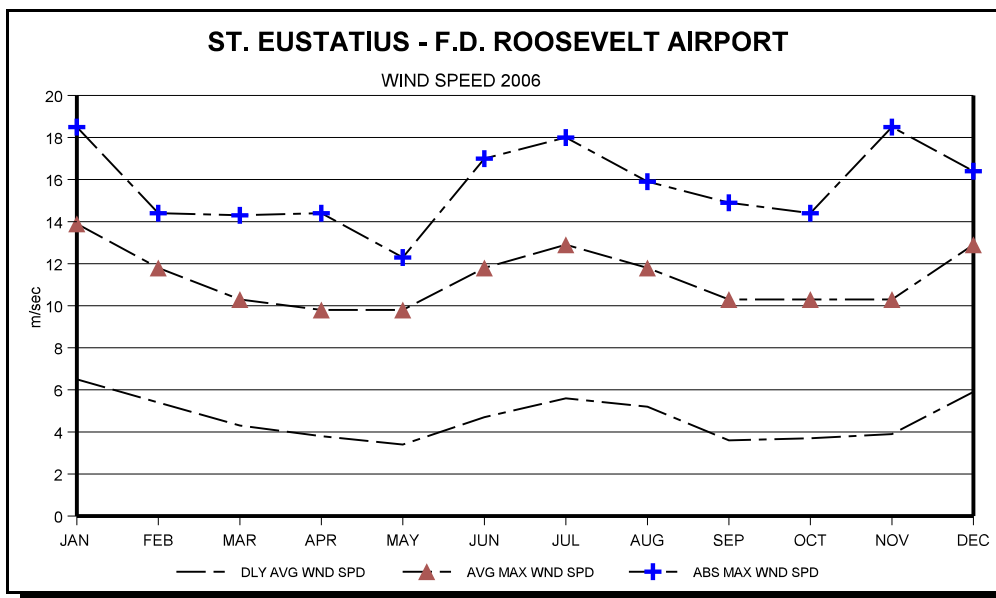
February was the coolest month with an average temperature of **24.7°C**. The lowest monthly average minimum temperature of **21.9°C** was recorded in February and March. The absolute minimum temperature was **18.8°C** and was recorded on March 26 at 06:08 hours local time.

The coolest day of 2006 was March 9 with an average temperature of **23.2°C**.



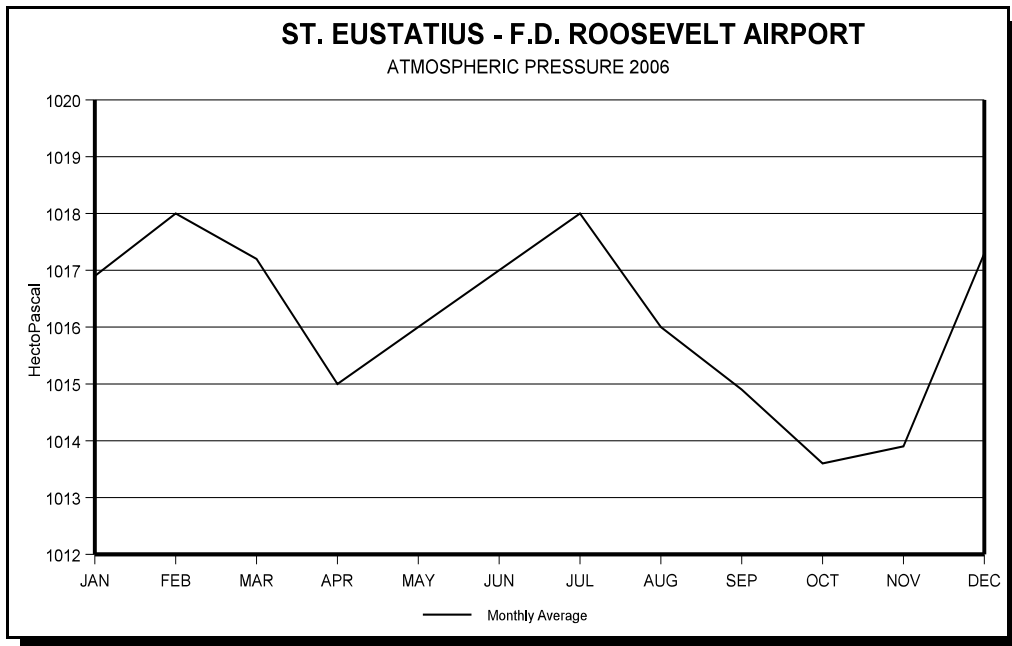
WIND

The average wind speed for 2006, at 10 m height, recorded at the Roosevelt airport was 4.7 m/sec (18.9 km/hr). January was the month with the highest average wind speed 6.6 m/sec (23.4 km/hr). May had the lowest average wind speed of 3.4 m/sec (12.2 km/hr). The day with the highest 24-hour average wind speed, 0.5 m/sec (37.8 km/hr), was recorded on January 21. The highest wind gust 18.5 m/sec (66.6 km/hr) was recorded on January 20.



ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Roosevelt Airport the year 2006 was 1016.2 hPa. The maximum atmospheric pressure of 1022.3 hPa was recorded on the June 5 while the minimum atmospheric pressure of 1007.6 hPa was recorded on October 28.



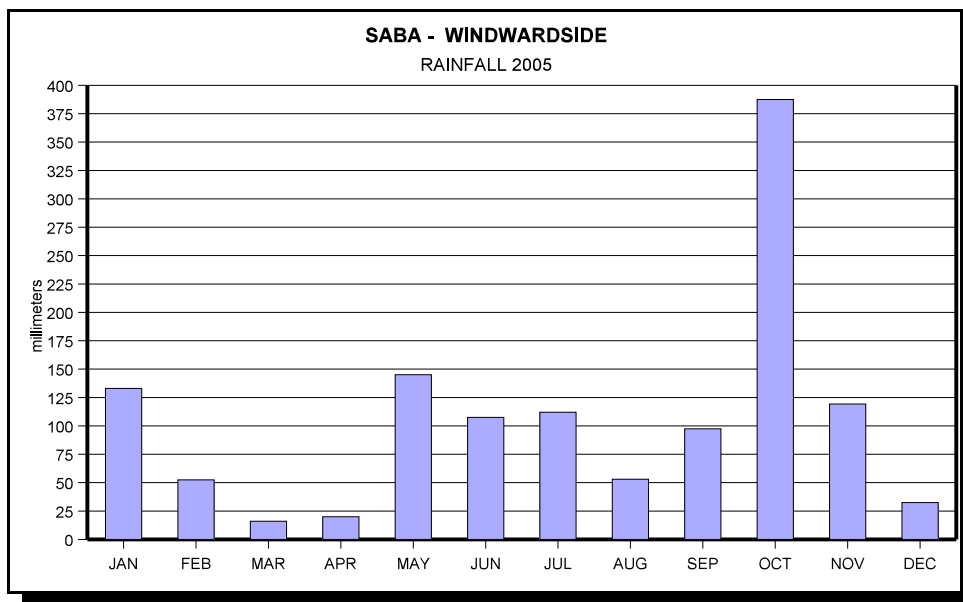
Saba

PRECIPITATION

The rainfall total recorded at Windwardside, for the year 2006 was 1284.0 mm 22.2% above the long term average of 1050.4 mm.

October was the wettest month with a total of 387.5 mm while March was the driest month with a total of 16.0 mm. The 24 hour maximum for 2006 was 180.0 mm measured on October 19.

The number of days with rainfall 1.0 mm or more was 57.



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**METEOROLOGICAL SERVICE NETHERLANDS ANTILLES & ARUBA
CLIMATOLOGICAL DATA 2006**

Abs. Min. Temp. (°C)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CURAÇAO	22.7	22.0	23.2	23.4	25.1	22.4	23.4	25.2	24.3	23.3	24.9	23.5
SINT MAARTEN	20.2	20.6	20.3	21.8	22.3	21.9	23.1	22.6	23.9	22.5	22.1	22.0
BONAIRE	22.9	22.9	24.1	24.8	26.7	25.0	24.9	25.3	24.2	24.0	24.9	24.3
SINT EUSTATIUS	20.5	19.2	18.8	20.6	20.9	23.6	22.0	22.9	21.7	20.6	22.7	23.1
ARUBA	23.9	23.5	23.5	24.7	25.2	26.5	24.2	25.7	25.9	23.9	22.9	22.9

Avg. Minimum Temp. (°C)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CURAÇAO	23.8	23.7	24.8	24.8	26.0	26.2	25.7	26.3	26.4	26.6	26.2	25.3
SINT MAARTEN	22.4	22.3	22.8	23.9	25.2	25.4	25.3	25.4	25.8	25.5	24.2	24.0
BONAIRE	24.7	24.7	25.7	26.2	27.5	27.6	27.2	27.6	27.8	27.5	27.3	25.9
SINT EUSTATIUS	22.5	22.2	22.2	23.3	24.3	25.4	24.3	24.9	24.3	23.9	24.6	24.6
ARUBA	27.0	24.9	25.6	26.0	27.2	27.6	26.8	27.6	27.7	27.0	26.4	25.2

Average Temp. (°C)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CURAÇAO	25.9	26.0	26.7	27.7	28.5	28.7	28.3	28.7	29.1	29.0	28.4	27.6
SINT MAARTEN	25.0	24.7	25.3	26.4	27.3	27.9	27.9	28.0	28.5	27.9	26.8	26.0
BONAIRE	27.0	27.2	27.8	28.3	29.6	29.8	29.5	29.8	30.2	29.9	29.7	28.4
SINT EUSTATIUS	24.9	24.7	25.3	26.4	27.1	28.1	27.0	27.6	27.6	26.9	27.2	26.6
ARUBA	29.4	27.1	27.7	28.3	29.5	29.7	29.1	29.7	30.0	29.4	28.8	27.6

Avg. Max. Temp. (°C)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CURAÇAO	29.0	29.4	30.0	31.2	32.5	32.6	32.3	32.6	33.0	32.7	31.8	30.9
SINT MAARTEN	28.2	28.1	28.7	29.6	30.2	30.8	30.9	30.9	31.9	30.9	30.2	29.0
BONAIRE	30.5	30.8	31.4	31.9	33.2	33.1	33.0	33.3	33.8	33.6	33.4	31.9
SINT EUSTATIUS	28.3	28.3	29.2	30.7	30.8	31.5	30.5	31.3	31.7	30.9	30.7	29.9
ARUBA	32.8	30.7	31.3	32.0	33.4	33.2	32.8	33.4	34.0	32.8	32.2	30.5

Abs. Max. Temp. (°C)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CURAÇAO	30.7	30.8	30.8	33.4	36.1	34.7	34.5	34.5	35.8	34.4	33.3	32.3
SINT MAARTEN	29.2	29.1	30.1	30.8	31.3	31.9	31.7	32.2	32.8	32.7	31.0	30.1
BONAIRE	31.6	31.6	32.3	32.9	34.4	33.5	33.6	34.6	35.2	34.6	34.0	32.7
SINT EUSTATIUS	31.1	29.4	31.1	32.9	32.0	32.4	31.5	32.5	32.3	32.8	32.5	30.9
ARUBA	35.0	31.5	32.3	33.1	34.7	35.1	35.1	34.4	35.0	35.0	33.4	31.2

Rainfall (mm)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CURAÇAO	80.6	54.0	20.8	0.6	3.4	38.2	26.2	13.0	16.0	65.4	49.2	32.6
SINT MAARTEN	145.2	36.4	33.6	74.6	259.4	151.6	124.8	186.8	75.2	361.2	137.8	85.0
BONAIRE	68.8	25.4	4.4	4.0	1.0	8.4	6.8	7.4	16.0	48.4	12.4	14.2
SINT EUSTATIUS	70.0	30.2	16.4	49.0	105.4	87.6	102.4	28.4	68.2	148.6	35.6	46.4
ARUBA	116.0	9.4	8.8	4.2	2.0	3.2	50.2	6.6	2.4	96.4	163.0	148.8

METEOROLOGICAL SERVICE NETHERLANDS ANTILLES & ARUBA
CLIMATOLOGICAL DATA 2006

Average Air Pressure (hPa)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
CURAÇAO	1013.9	1014.9	1014.3	1012.4	1012.1	1012.5	1013.4	1011.7	1011.5	1010.4	1010.4	1013.0	1012.5
ST. MAARTEN	1017.3	1018.3	1017.3	1015.2	1016.1	1017.2	1018.1	1016.2	1015.0	1013.7	1014.2	1017.6	1016.4
BONAIRE	1014.0	1015.1	1014.4	1012.9	1013.4	1013.7	1014.7	1013.1	1012.8	1011.7	1011.7	1014.2	1013.5
ST. EUSTATIUS	1016.9	1018.0	1017.2	1015.0	1016.0	1017.0	1018.0	1016.0	1014.9	1013.6	1013.9	1017.3	1016.2
ARUBA	1012.3	1013.2	1012.6	1011.1	1011.3	1011.5	1012.6	1010.9	1010.8	1009.9	1009.9	1012.5	1011.6

Average Wind Speed 10m height (in m/sec)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
CURAÇAO	5.8	6.2	6.2	5.0	5.8	6.4	5.8	5.8	5.4	4.6	5.0	5.6	5.6
ST. MAARTEN	5.7	4.6	3.7	3.5	3.6	4.6	5.2	4.4	3.4	3.9	3.6	4.9	4.3
BONAIRE	6.0	6.5	6.7	6.0	6.9	8.0	7.6	6.9	6.1	5.2	5.7	6.3	6.5
ST. EUSTATIUS	6.5	5.4	4.3	3.8	3.4	4.7	5.6	5.2	3.6	3.7	3.9	5.9	4.7
ARUBA	6.5	7.6	7.6	6.6	7.5	8.7	8.1	8.0	7.0	5.3	5.8	6.5	7.1

Average Maximum Wind Speed 10m height (in m/sec)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
CURAÇAO	13.4	13.4	12.3	11.8	12.9	14.4	13.9	12.9	12.3	11.3	11.8	12.9	12.8
ST. MAARTEN	14.4	11.8	9.8	10.3	9.8	12.3	13.4	12.3	9.8	10.7	10.3	12.3	11.4
BONAIRE	13.4	13.9	13.9	12.9	13.4	14.9	14.9	13.9	12.9	11.8	12.9	13.4	13.5
ST. EUSTATIUS	13.9	11.8	10.3	9.8	9.8	11.8	12.9	11.8	10.3	10.3	10.3	12.9	11.3
ARUBA	14.4	15.4	14.9	14.4	14.9	16.5	15.9	15.4	14.4	12.9	12.9	14.4	14.7

Absolute Maximum Wind Speed (in m/sec)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
CURAÇAO	16.5	17.0	15.9	15.9	18.0	18.5	18.5	15.4	17.5	16.4	14.9	16.5	16.8
ST. MAARTEN	20.0	17.5	16.5	18.5	14.9	18.5	19.0	16.5	15.4	15.9	17.5	18.0	17.4
BONAIRE	17.0	16.5	17.5	19.0	17.5	18.0	19.0	15.9	17.0	17.5	15.9	17.0	17.3
ST. EUSTATIUS	18.5	14.4	14.3	14.4	12.3	17.0	18.0	15.9	14.9	14.4	18.5	16.4	15.8
ARUBA	18.5	19.0	18.0	19.5	17.5	19.5	20.0	19.0	17.5	18.0	19.5	19.0	18.8

Potential Wind Energy (in KWhr/m/day)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
CURAÇAO	3.1	3.8	3.5	2.4	3.0	4.0	3.3	3.1	2.5	1.9	2.1	3.0	3.0

Sunshine Duration (in hours)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
CURAÇAO	7.7	9.1	8.0	8.2	9.8	9.7	8.9	9.2	9.6	8.0	9.0	8.9	8.8
ST. MAARTEN	8.2	8.2	9.2	9.3	8.4	8.0	8.3	8.3	8.9	7.8	9.2	8.8	8.6

Cloud Coverage (in %)

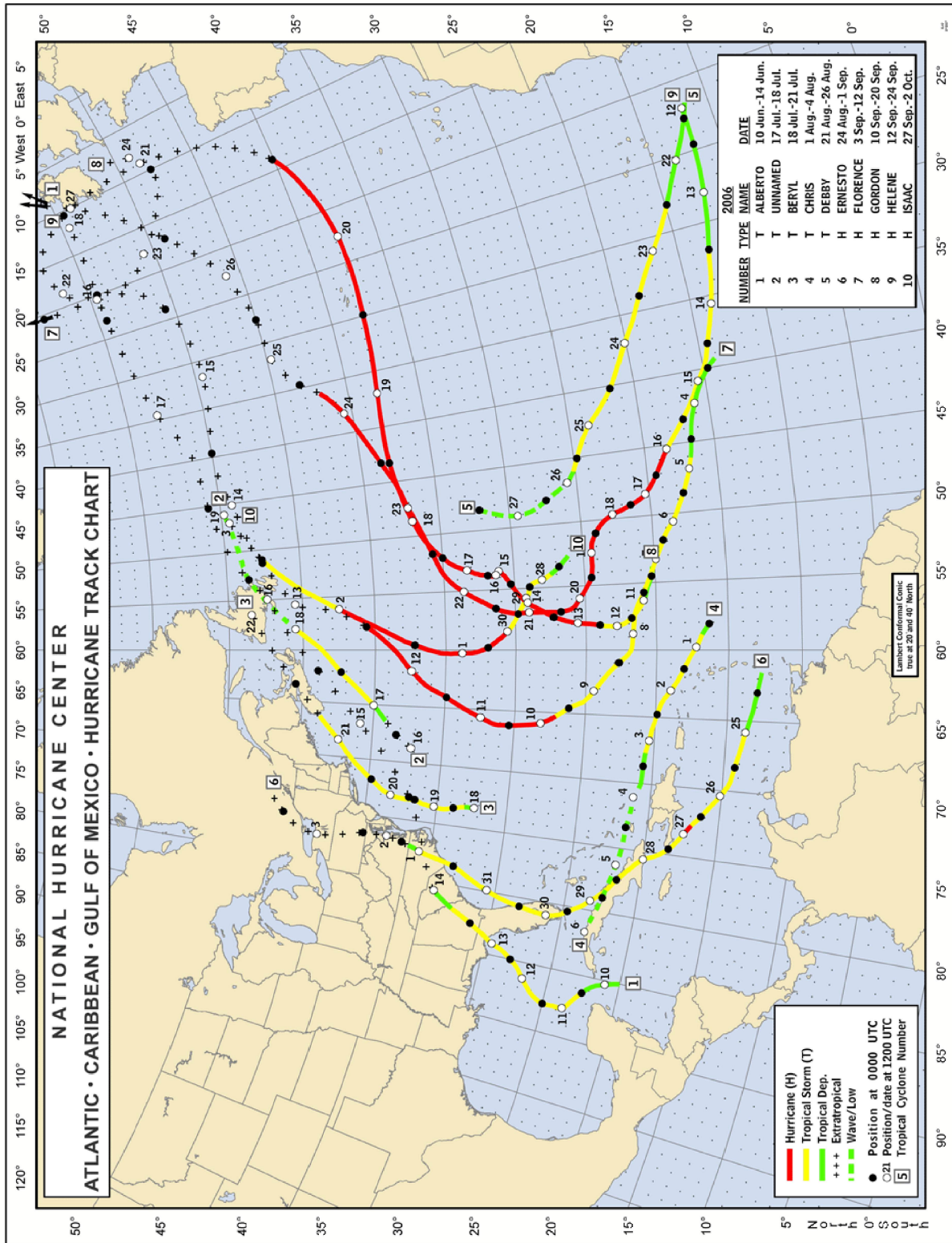
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
CURAÇAO	49.0	42.1	52.9	56.0	49.3	45.5	53.6	45.7	42.6	52.0	45.7	43.9	48.2
ST. MAARTEN	47.5	43.4	38.1	46.3	48.5	56.1	56.6	52.7	45.4	56.8	36.9	43.9	47.7

Evaporation (in mm)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
CURAÇAO	4.1	5.3	5.6	6.2	7.8	7.6	6.9	6.8	7.0	5.3	5.0	4.6	6.0
ST. MAARTEN	4.3	4.9	6.2	6.6	6.0	6.5	6.8	6.1	6.0	5.5	4.2	4.2	5.6

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Track Map of 2006 Atlantic Tropical Cyclones



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