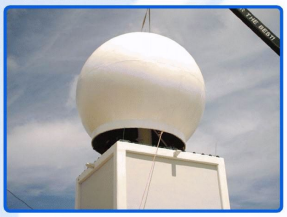
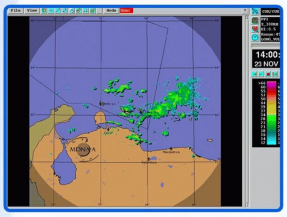
Meteorological Service Netherlands Antilles & Aruba





Annual climatological report 2004

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COVER : Images of the WSR-74S weather radar equipment, located in Curaçao, before and after its upgrading.

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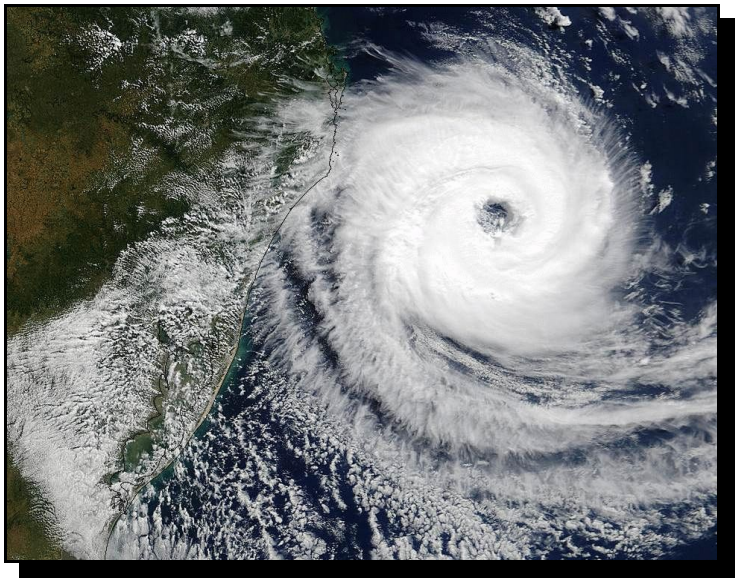
Introduction and brief 2004 overview

In 2004 the global surface mean temperature was 0.44°C above the climatological normal of 1961-1990. Accordingly, this positive anomaly places 2004 as the fourth warmest year since the instrumental records started in 1861. 1998 Remains the warmest year with a surface mean temperature anomaly of 0.54°C above the climatological normal. The past ten years (1995-2004), with the exception of 1996, are among the warmest ten years on record.
Exceptional widespread winter storms affected Jordan, Syria, Greece and Turkey in February. Approximately 60 cm of snow was measured in Jordan. In February, an intense and widespread heat wave affected Eastern Australia, as maximum temperatures got higher than 45°C, breaking many temperature records in several cities. In March, severe heat waves affected Northern regions of India. Furthermore, heat waves with maximum temperatures reaching 40°C affected Portugal, Southern Spain and Romania during June and July. Severe cold conditions and snow in June and July affected the high-altitude areas of the Andes in Southern Peru, Southern Chile and Argentina.
Drought conditions affected Somalia, Kenya, Southern and Eastern Australia and Western USA during most part of 2004. Heavy rains and flooding in Northeastern Brazil in January and February left thousands of people homeless and caused 160 deaths. The Asian summer monsoon displaced millions of residents in the Northeastern Indian states of Assam and Bihar and also in Bangladesh during heavy rains and flooding from June through October. An active frontal system and two typhoons brought heavy rainfall to Japan in October. In Tokyo a total of 780 mm was measured during the month of October, which is a new record since 1876.



Hurricane Catarina as it was approaching the Brazilian coast.

A very rare Tropical Cyclone in the South Atlantic Ocean
In the South Atlantic Ocean, sea surface temperatures and atmospheric conditions are normally unfavorable for the formation of tropical cyclones. Nevertheless, the first documented hurricane, since the satellite records began in 1966, developed in March. Hurricane ***Catarina*** made landfall in the state of *Catarina*, along the Southeastern coast of Brazil on March 28. This system caused great damage and killed fifteen people.

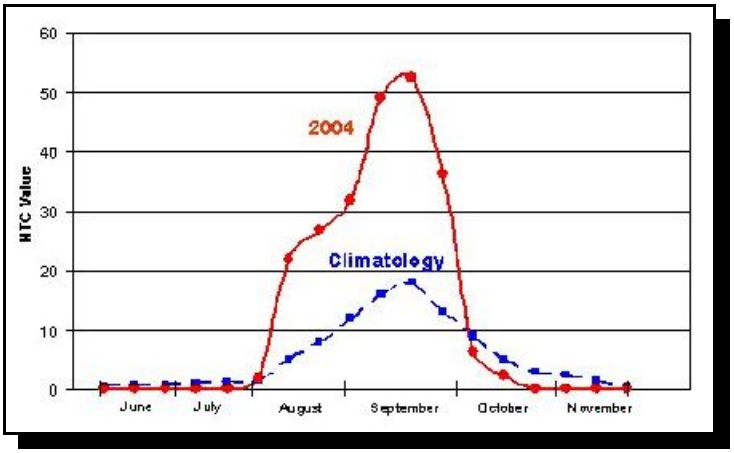
Earthquake/Tsunami strikes countries in the Indian Ocean
On Sunday December 26, 2004 07:58:50 hours Indonesian local time (Saturday December 25, 20:58:50 hours Antillean local time), a very strong earthquake occurred just off the West coast of Sumatra. The magnitude of this event was 9.3 on the scale of Richter and the epicenter was located at a depth of 10 km at 3.3 degrees North and 95.8 degrees East. As result of this major earthquake, an enormous tsunami was generated, affecting most of the countries in the Indian Ocean.

The last reports indicate that approximately 300,000 people in Sri Lanka, India, Indonesia, Thailand, Malaysia, Somalia and Bangladesh were killed by this event. This tsunami also affected the coasts of the Maldives and Cocos Island. This earthquake was also felt in Bangladesh, India, Malaysia, Myanmar, Singapore and Thailand.
Tsunami is a Japanese word and can be translated into English as, "harbor wave." The two characters, "tsu," means harbor and "nami," means "wave." The scientific community sometimes referred to tsunamis as "seismic sea waves". "Seismic" implies an earthquake-related generation mechanism, but a tsunami can also be generated by a non-seismic event, such as a landslide or meteorite impact. The world's largest recorded earthquakes occur where one tectonic plate subducts beneath another. The December 2004 earthquake is now the second largest earthquake in the world since 1900. The largest earthquake occurred in Chile in 1960, with a magnitude 9.5, Alaska in 1964 and 1957 with a magnitude 9.2 and 9.1 and Kamchatka in 1952 with a magnitude 9.0.

Caribbean Area
It is well established that anomalies in the sea surface temperature (SST) in the oceans and seas can be accountable for rainfall anomalies in different parts of the world. In order to give a realistic explanation of the Caribbean rainfall and the activity of the hurricane season, the SST in the Caribbean Sea and the Northern Tropical Atlantic were explored. The El Niño event, which is a SST phenomenon in the equatorial Pacific Ocean too, is connected with the Caribbean Area through the atmosphere (teleconnection) and therefore can influence the amount and frequency of the rainfall and the activity of the hurricane season in the Atlantic Basin. The year 2004 began with a warm Caribbean Sea and Northern Tropical Atlantic Ocean (0.5-0.8°C above normal), which persisted until May. During the months June, July and August the SST were normal in the Caribbean Sea but stayed warm in the Northern Tropical Atlantic Ocean (about 0.6°C above normal). From September on, the SST gradually warmed up in both the Caribbean Sea and Northern Tropical Atlantic Ocean (0.5-1.0°C above normal). The SST and the atmospheric pattern in the equatorial Pacific Ocean reflected a neutral El Niño in the first half of 2004. As the SST gradually warmed up in the second half of 2004, a weak El Niño began to develop. Because of the lack of strength of this weak warm event, the atmospheric unfavorable conditions in the Caribbean, which go along with a warm event, were not observed at all.
In May torrential rains in Haiti and the Dominican Republic caused heavy floods and landslides and affected thousands of residents, killing more than 2000 people. Additionally in October heavy rainfall along with tropical storm *Jeanne* produced disastrous flooding and claimed more than 3000 lives in Haiti.

Hurricane season 2004
The 2004 Atlantic hurricane season was a very active one with fifteen named storms (average 1950-2000: 9.6), nine hurricanes (5.9), six major hurricanes (3.0), 23 major hurricane days (5.0), and a Net Tropical Cyclone Activity (NTC) of 228% (100%). There was one additional tropical depression.
For several reasons this hurricane season was very exceptional. Six major hurricanes (*Alex, Charley, Frances, Ivan, Jeanne* and *Karl*) formed, twice the climatological averaged, equalizing with 1961 and 1996. Only 1950 had more (seven) major hurricanes. There were in September more hurricane days (17.8) than any September on record.
The ABC Islands had a close encounter with a major hurricane and where the state of Florida in the U.S.A. was struck by four hurricanes, three of those major ones, within two months. The strongest hurricane was *Ivan* which reached category five status several times; the first time while its center was located rather close to the North of Aruba. This hurricane also

broke the record of major hurricane days (10.0) putting the Miami hurricane of 1926 in second place.
Five tropical cyclones, *Bonnie, Charley, Earl, Ivan* and *Jeanne* moved through parts of the Caribbean Area. *Charley* hit Western Cuba while *Ivan* hit Grenada and had significant impact on Jamaica, Grand Cayman and (again) Western Cuba. *Jeanne* hit the Dominican Republic as a hurricane and Puerto Rico as a strong tropical storm. Six hurricanes, *Alex*, *Charley*, *Frances*, *Gaston*, *Ivan* and *Jeanne* struck the United States in 2004. Three tropical storms also hit the U.S.A.



Net Tropical Cyclone activity during 2004

The favorable atmospheric and oceanic conditions for tropical cyclone development during the 2004 hurricane season were: warm SST in the Northern Tropical Atlantic Ocean and Caribbean Sea and low atmospheric vertical wind shear. Furthermore, the strength and the phase of the El Niño event, which normally suppresses the development of tropical cyclones in the Atlantic Basin, was not adequate to influence negatively the atmosphere in the Caribbean and Tropical Atlantic.

General conditions for the Netherlands Antilles and Aruba

Aruba, Bonaire and Curaçao

The rainfall season of 2004 can be considered as very wet. The rainfall totals for the year 2004 at the main rainfall stations were: Queen Beatrix Airport - 908 mm, Flamingo Airport - 810 mm and Hato Airport - 932 mm.
Especially November was a very wet month with monthly totals reaching between 450 and 550 mm at the various rainfall stations.
The islands were somewhat threatened by tropical storms *Bonnie*, *Charlie* and *Earl* but these did not have any significant influence on the weather over the ABC Islands.
It was hurricane *Ivan* that just missed the islands on September 8, 2004. The eye passed about 130 km to the North moving in a westerly direction. So big was the threat that a **Hurricane Warning** was issued for these islands on September 7.
Hurricane *Ivan* caused very rough seas in Aruba, Bonaire and Curaçao causing extensive coastal damage. Rain from spiral bands from hurricane *Ivan* caused heavy flooding on the island of Aruba. During six hours more than 160 mm of rain fell on sections of the island.

St. Maarten, St. Eustatius and Saba

Climatologically the year 2004 can be considered as normal for the SSS Islands. The rainfall was slightly above normal. Exceptionally high amounts of rainfall were recorded in May and November bringing the total rainfall for 2004 to above normal for the Leeward Islands. The conditions which caused this rainfall in November were because of an interaction of a low pressure area and an upper level trough from November 10 through 13 producing a large area of scattered to locally numerous heavy showers. For St. Maarten the total for this period was 397.6 mm. St. Eustatius and Saba experienced the same type of conditions.

No tropical cyclone affected the Leeward Islands directly during the hurricane season of 2004. Tropical storm warnings were issued twice during the hurricane season but in both cases the storms, *Frances* and *Jeanne*, passed well away from the islands.

Weather Radar

September 18, 2004 marks the day on which the Curaçao Weather Surveillance Radar (WSR) became operational again after several years of being out of commission. About two months later the official inauguration, by Traffic and Transport Secretary Ms. Omayra Leeflang, took place on November 25, 2004.

Official inauguration of the EEC WSR74S radar. From left to right Head Instrumentation Division of KNMI, Ir. G. Laagland, our director, BSc. A.J. Dania, Traffic and Transport Secretary, Ms. O. Leeflang and our Chief Technical affairs, BSc. H. Pieter. Picture by Ken Wong.

The radar system consists of a completely refurbished EEC *WSR74S* weather radar, which was originally installed in 1984 at Seru Spelonk, about 800 meters to the East of the weather office at Seru Mahuma. The modernized radar is located at the same site as the original weather radar.

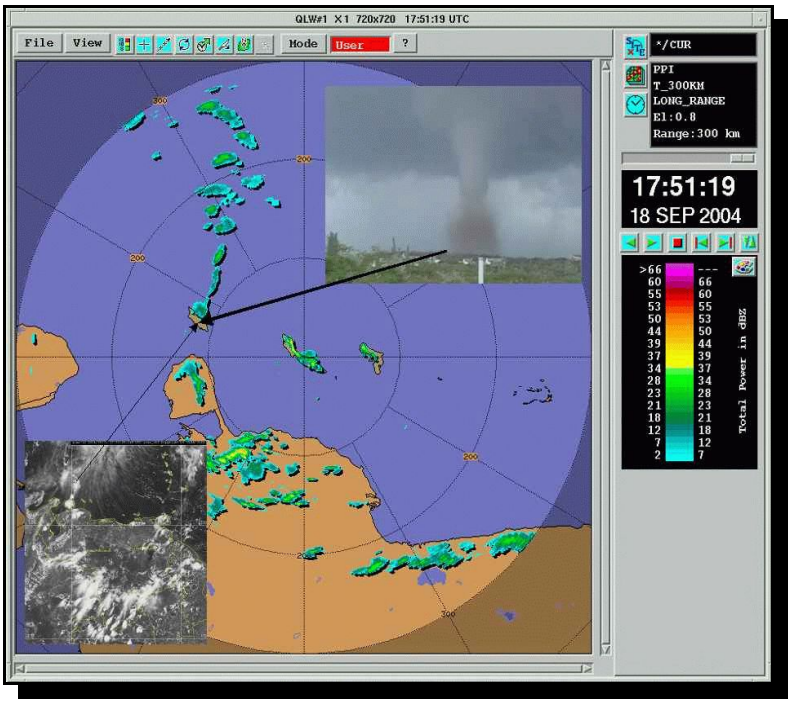
Technicians at the Dutch Meteorological Service (KNMI) not only refurbished the original radar completely, they also modernized the equipment and transformed the WSR74S into an automated and digitized system on a par with other systems in the 21st century. The software and hardware needed to operate and maintain the radar was produced and installed by SIGMET Inc., a company specialized in doing this type of work. The project was executed as a form of close cooperation between KNMI experts and experts of the Meteorological Service of the Netherlands Antilles and Aruba.

Because of severe financial restraints, a number of years ago it was decided to refurbish and modernize the original EEC S-band radar instead of buying a completely new system.

The refurbishment of the Curaçao weather radar was part of a project financed by the Dutch government named MOWENA (*MO*dernisation *WE*ather radar *N*etherlands *A*ntilles). In 2005, work will start on an identical type of weather radar for the international airport in St. Maarten within the framework of the same MOWENA project.

The S-band weather radar in Curaçao has a maximum effective range of 450 kilometers covering effectively the islands of Curaçao, Bonaire and Aruba and also Northwestern

Venezuela. It provides automatic production of radar images for use by the forecasters at the Meteorological Watch Office at Seru Mahuma in Curaçao. Certain radar images are also exported automatically to the web site of the Meteorological Service of the Netherlands Antilles for general use.



The first images taken by the weather radar coincided with the occurrence of a funnel cloud over Aruba (top right).

Rainfall and Hurricane outlook for 2005

The outlook for the global SST indicates a warm to extremely warm condition (0.7-1.2°C) in the Caribbean Sea and the Northern Tropical Atlantic for 2005. On the other hand, the outlook also shows that in the equatorial Pacific Ocean the SST will begin to cool slowly in the beginning of 2005, which will reflect a near neutral to La Niña condition for 2005. Consequently, the oceanic and atmospheric conditions will be favorable for the development of deep convection in the Caribbean Area and the adverse atmospheric conditions, which normally go along with an El Niño event, will be low. Therefore rainfall for 2005 is expected to be normal to above normal for the islands of the Netherlands Antilles and Aruba. Moreover, based on these oceanic and atmospheric conditions, the 2005 Atlantic hurricane season is once again expected to have above normal activity. Dr. William Gray of the Colorado State University expects an above average 2005 season with eleven named storms of which six should become hurricanes and three, major hurricanes. The long term averages are respectively 9.6, 5.9 and 3.0. Dr. Gray will update his season outlook several times later in the year as more useful information becomes available.

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Hurricane Season 2004

The 2004 Atlantic tropical cyclones were directly responsible for more than 3000 deaths. The vast majority of these were in Haiti due to torrential rainfall from *Jeanne*. Unadjusted property damage in the United States is estimated at more than 42 billion U.S. dollars making 2004 the costliest hurricane season on record. *Charley* is the second costliest U.S. hurricane (after *Andrew* in August 1992) on record while *Ivan* is the third costliest.
Below follows a summary of the 2004 tropical cyclones over the Atlantic Basin.

Late Start of an Active Season

Alex originated from a low pressure area and became a tropical depression off the Northeast Florida coast on July 31. It drifted erratically for two days, became a tropical storm on August 1 and on the next day began to move Northeastward along the Southeastern coast of the U.S. It became a hurricane on August 3 and the center passed within about 15 kilometers of Cape Hatteras, North Carolina that afternoon with maximum winds near 160 km/h. Thus *Alex* is considered a hurricane strike in North Carolina but did not technically make landfall. This system then accelerated Northeastward across the Western North Atlantic. It reached its peak intensity of 195 km/h, category three, on August 5 as it was passing a few hundred kilometers South of the Canadian maritime provinces. *Alex* became extratropical in the far North Atlantic the next day. The hurricane brought category one conditions to the outer banks of North Carolina and rip currents associated with the storm resulted in one death off the coast near Nags Head, North Carolina. Damage is estimated to be less than US$5 million.

Bonnie formed from a tropical wave and became a tropical depression on August 3 over the tropical Atlantic several hundred kilometers East of the Lesser Antilles. The depression moved across the central Lesser Antilles the next day and then degenerated into a tropical wave. The wave moved westward to Northwestward for several days and redeveloped into a tropical storm on August 9, just North of the Yucatan peninsula in the Gulf of Mexico. *Bonnie* turned Northward and Northeastward on August 10 and 11 and its winds reached 105 km/h.
Thereafter, *Bonnie* gradually weakened but moved inland near Apalachicola in the Florida panhandle as a tropical storm on August 12. As a depression, *Bonnie* moved Northeastward across the Eastern United States and finally became a remnant low just South of Cape Cod, Massachusetts on August 14. There were three deaths in North Carolina from a tornado spawned by *Bonnie*.

Charley lashes Florida

Charley originated from a tropical wave and became a tropical depression on August 9 a short distance South Southeast of Barbados. It moved quickly West Northwestward across the Caribbean and gradually strengthened. During the morning of August 10, its center was located just approximately 170 km North of Bonaire while still a weak tropical storm. *Charley* moved just South of Jamaica on August 11, shortly after it became a hurricane and it passed just North of Grand Cayman the next day. The hurricane then turned toward the North Northwest and its eye passed just East of *Isla de la Juventud* (Isle of Youth), early on August 13. The hurricane made landfall near *Playa del Cajío* with category three winds of 195 km/h and then crossed Western Cuba. *Charley* weakened some over the lower Straits of Florida. Turning Northward, the hurricane passed over the Dry Tortugas as a category two hurricane. *Charley* then turned North Northeastward and accelerated toward the Southwest coast of Florida, intensifying rapidly just prior to landfall. It made landfall on the Southwest coast of Florida near Cayo Costa, during the evening of August 13, with maximum sustained winds

near 240 km/h, category four intensity. Shortly thereafter the eyewall impacted Punta Gorda and neighboring Port Charlotte with devastating results. The hurricane traversed the Central Florida peninsula, resulting in a swath of destruction across the state.
The center passed near Kissimmee and Orlando early on August 14 by which time the maximum sustained winds had decreased to around 135 km/h. *Charley* was still of hurricane intensity when the center re-emerged over water near Daytona Beach.
After moving into the Atlantic, *Charley* came ashore again near Cape Romain, South Carolina midday on August 14 with highest winds of about 130 km/h. The center then moved just offshore and made another landfall at North Myrtle Beach with winds near 120 km/h. *Charley* soon weakened to a tropical storm over Southeastern North Carolina.
On August 15, *Charley* became extratropical over Virginia while embedded in a frontal zone. Its extratropical remnants moved rapidly Northeastward and were absorbed by the frontal zone near Southeastern Massachusetts.

Charley was directly responsible for ten deaths in the United States; nine in Florida and one in Rhode Island. There were also four direct deaths in Cuba and one in Jamaica. An additional twenty U.S. deaths are indirectly attributable to *Charley*. The Property Claims Service in the U.S.A. reported insured damages of 6.755 billion dollars in Florida, 25 million dollars in North Carolina and 20 million dollars in South Carolina for a total of 6.8 billion dollars in insured losses. The Insurance Information Institute reported an estimated total of 7.4 billion dollars in insured losses. A rough estimate of the total damage is 14 billion dollars. This makes *Charley* the second costliest tropical cyclone in U.S. history, behind only hurricane *Andrew* of 1992.

Danielle developed from a tropical wave into a depression about 385 kilometers South Southeast of the Cape Verde Islands on August 13. It became a tropical storm later that day. *Danielle* moved West Northwestward and became a hurricane the following day. It spent the rest of its existence over the open waters of the far Eastern Atlantic, reaching a peak intensity of 170 km/h before dissipating on August 21 about 1375 kilometers West Southwest of the Azores.

Earl was a short-lived tropical storm that formed from a tropical wave on August 13 over the central tropical Atlantic Ocean. It moved quickly westward, became a tropical storm on August 14 and then crossed the Caribbean Windward Islands in the vicinity of Grenada on August 15 with brief but heavy rains and winds up to 80 km/h. *Earl* degenerated to an open tropical wave later that day over the Eastern Caribbean Sea, at about 170 kilometers Northeast of Bonaire.

Florida gets hit again
Frances formed from a tropical wave and became a tropical depression over the far Eastern tropical Atlantic Ocean early on August 25. Moving generally Westward, the depression became a tropical storm later that day, a hurricane on August 26 and a major hurricane on August 27 over the central tropical Atlantic.
As it approached the Northeastern Caribbean Area, a **Tropical Storm Watch** was issued for the SSS Islands during the afternoon of August 29. This was upgraded to a **Tropical Storm Warning** later that same evening while a **Small Craft Warning** was also issued. *Frances* turned Westward on August 30 and passed about 215 kilometers North of St. Maarten on August 31. The actual impact of this hurricane on the SSS Islands was mainly in the form of rough seas and the warnings were discontinued during the morning of August 31.
Frances then turned West Northwestward on September 1. This brought the hurricane near

the Southeastern Bahamas and the Turks and Caicos Islands on September 2. Maximum sustained winds reached 235 km/h on August 31 and September 2, category four on the Saffir-Simpson hurricane scale. Frances turned Northwestward and weakened to a category three hurricane as it passed over San Salvador later on September 2. It moved slowly West Northwestward through the Northwestern Bahamas on September 3 and 4 while weakening to a category two hurricane. The center of Frances reached the Florida East coast over the Southern end of Hutchinson Island early on September 5, then moved West Northwestward across the central Florida peninsula to the Northeastern Gulf of Mexico by early on September 6. *Frances* weakened to a tropical storm over Florida and it made its final landfall in the Florida panhandle near the mouth of the Aucilla River on September 6.
Frances moved generally Northeastward across the Eastern United States, becoming extratropical over West Virginia on September 9 and dissipating over Southeastern Canada the next day. Frances is directly responsible for seven deaths, six in the U.S. and one in the Bahamas. It left a broad trail of damage through the Bahamas and Florida into the Southeastern United States.

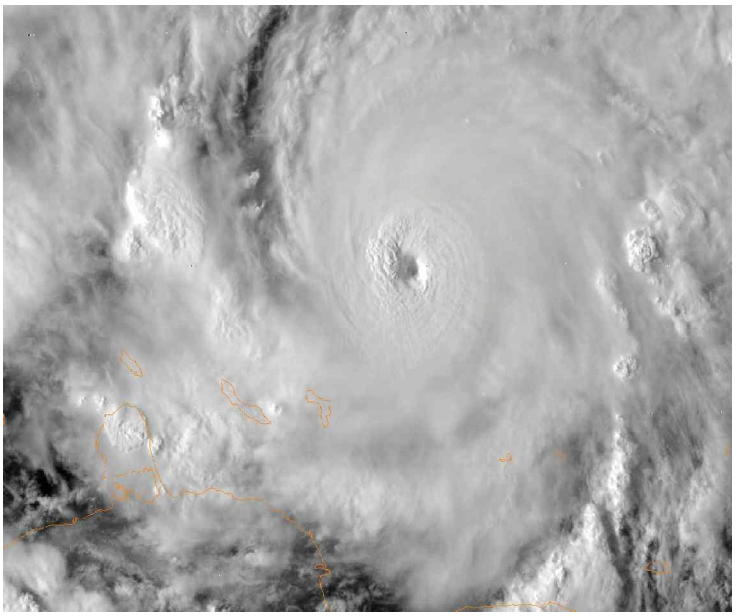
Gaston developed slowly from an area of low pressure associated with a decaying frontal zone and became a tropical depression on August 27 about 210 kilometers East Southeast of Charleston, South Carolina.
Drifting erratically, the depression became a tropical storm the next day and continued to strengthen as it began to move toward the coast. *Gaston* reached hurricane strength just before making landfall on the morning of August 29 between Charleston and McClellanville, South Carolina with maximum winds of 120 km/h.
Gaston weakened as it moved across Northeastern South Carolina, becoming a tropical depression late in the day. *Gaston* moved Northeastward over North Carolina and across the Delmarva peninsula on August 30 and late in the day restrengthened to a tropical storm as it moved back over water. *Gaston* accelerated East Northeastward and became extratropical on September 1, South of the Canadian maritime provinces. *Gaston* produced widespread flooding across South Carolina, North Carolina and Virginia with rainfall totals exceeding 300 mm in the Richmond area. Flash floods in Richmond killed eight people. Total U.S. damage is estimated to be near $130 million.

Hermine formed on a frontal zone on August 27 over the Western North Atlantic about 370 kilometers South of Bermuda. It moved West Northwest and then Northward over the next couple of days and reached its peak intensity of 95 km/h on August 30. Thereafter, *Hermine* weakened and reached the Southern coast of Massachusetts near New Bedford as a minimal 65 km/h tropical storm on August 31. It continued Northward and became extratropical later on that day.

Close encounter for ABC Islands

Ivan was a classic long-lived Cape Verde hurricane that reached category five strength three times. *Ivan* developed from a vigorous tropical wave that moved across the West coast of Africa on August 31. The system quickly strengthened and became a tropical depression on September 2, a tropical storm the next day, a hurricane early on September 5 and a major hurricane later that same Saturday. *Ivan* moved Westward for the next several days and passed over the Southern Lesser Antilles where it caused considerable damage and loss of life with Grenada being particularly hard hit. *Ivan* then moved West Northwestward across the Southern Caribbean Sea, passing just North of Venezuela and the ABC Islands. It was the

first time on record that a category four or five hurricane had moved that far South in the Eastern Caribbean Area. A Hurricane Warning was issued for the ABC Islands on September 7 since, at that time, the center of Ivan was projected to pass close to our islands. *Ivan* finally started to make the anticipated move toward the West Northwest during the morning of September 8 and the sustained tropical storm force winds associated with this monster just missed hitting the ABC Islands later that day and the early morning of September 9 during the closest approach (130 kilometers) of its center. All three islands however experienced very rough seas on their coasts caused by large swells generated by the hurricane. Several constructions on our coasts suffered significant damage as a result of these swells.



Ivan, while its center was located Northeast of the ABC Islands (left below center of picture) on September 8 at 4:15 P.M. Notice how these islands were all covered by dense, rain producing clouds.

A spiral band with very heavy rain and thundershowers accompanying the hurricane dissipated just before it was expected to move over Bonaire and Curaçao but Aruba was not as lucky. During the evening of September 9 and especially the early morning of the next day, a spiral band redeveloped near and over Aruba. It produced a deluge which caused serious flash flooding over several sections of the island. That resulted consequently in at least two million Aruban florins of damage. More than 160 mm of rain was recorded within six hours over some sections of this island.

The swells generated by Ivan caused huge breaking waves at Baby Beach in Aruba which even swallowed a car. Picture courtesy of Diario di Aruba.

Ivan reached category five strength while located about 150 km North of Aruba early on September 9 but weakened back to category four before passing just South of Jamaica on September 11 and just South of Grand Cayman the next day. *Ivan* moved through the Northwestern Caribbean with its strength oscillating between categories four and five and passed through the Yucatan channel on September 14.

For the next three days, *Ivan* moved Northwestward and then Northward over the Gulf of Mexico and slowly weakened until it made landfall near Gulf Shores, Alabama as a category

three hurricane early on September 16.
After landfall, *Ivan* gradually weakened moving Northeastward over the Southeastern U.S. and emerging off the Delmarva peninsula on September 19 as an extratropical low. A portion of this circulation then moved Southwestward just off the Southeastern U.S. coast and passed over South Florida and into the Gulf of Mexico on September 21. This remnant of *Ivan* became a tropical storm again on September 23 and the born-again storm made a second landfall over extreme Southwestern Louisiana on September 24. Ivan finally dissipated inland over East Texas later that day.
Ivan is directly blamed for 95 deaths including 39 in Grenada and 26 in the United States. Damage in the United States is estimated to be US$13 billion.

Bonaire's West coast also got its share of swells and wind waves generated by Ivan. Picture courtesy of Royal Dutch Navy.

U.S. President George W. Bush being briefed by National Hurricane Center director Max Mayfield at the NHC in Miami on September 8, 2004 during one of his several visits to hurricane weary Florida. Courtesy White House.

Tropical depression ***Ten*** formed from an area of disturbed weather associated with a tropical wave that crossed the coast of Western Africa on August 29. The system moved in a generally West Northwestward track for several days under strong vertical shear conditions before eventually turning Northeastward over the Eastern Atlantic. On September 7, the disturbed area formed into a tropical depression about 1165 kilometers Southwest of the Westernmost Azores.
The cyclone moved Northeastward for the next couple of days and did not strengthen significantly. On September 9, the motion became slow and erratic while vertical shear reduced the system to a remnant low. The cyclone turned Southeastward before dissipating later that day, about 485 kilometers Southwest of the Azores.

Killer *Jeanne*

Jeanne originated from a tropical wave and became a tropical depression on September 13 while located over the tropical Atlantic Ocean just East of Guadeloupe. Although still a tropical depression, a Tropical Storm Watch was issued on that afternoon for the SSS Islands and a Tropical Storm Warning on the next morning. Since *Jeanne* stayed rather South of these islands, the warning was discontinued later on that same 14th.

Jeanne moved West Northwestward over the Northeastern Caribbean Area while strengthening to a tropical storm. It moved slowly over the Virgin Islands and Puerto Rico on the 15th and then slowly over the Dominican Republic and Haiti on September 16 and 17, accompanied by torrential rains and winds to near hurricane force. *Jeanne* briefly was a hurricane over the Mona Passage but then weakened while interacting with the high terrain of Hispaniola. *Jeanne* turned Northward on September 18 and moved over the Southeastern Bahamas as a tropical storm. *Jeanne* drifted Northward and strengthened becoming a hurricane on September 20 while located about 640 kilometers East of Freeport in the Bahamas. The hurricane moved along a slow clockwise loop for several days and strengthened to a category two hurricane. The loop was completed by September 23 and Jeanne began a track just North of due Westward. On September 25, *Jeanne* directly hit Abacos Island and then Grand Bahama Island in the Northwestern Bahamas while strengthening to a category three hurricane. Early on September 26, *Jeanne* made landfall on the East coast of Florida near Stuart as a category three hurricane. It is notable that hurricane *Frances* made landfall at this same location just three weeks earlier and also moved over the same islands in the Northwestern Bahamas.

Jeanne weakened to a tropical storm over central and Northwestern Florida while turning Northward. *Jeanne* weakened to a depression over Georgia on September 27. Still accompanied by heavy rain, the depression moved over South and North Carolina, Virginia and the Delmarva peninsula. It merged with a frontal zone and became extratropical on September 29 while moving Eastward off of the U.S. Mid-Atlantic coast. The death totals in the Dominican Republic and Haiti may never be known precisely. At least 3000 deaths are believed to have occurred in Haiti from inland flooding. One direct death was reported in Puerto Rico, two in Florida, one in South Carolina and one in Virginia for a total of five direct U.S. deaths. The U.S. damage estimate is U.S.$6.5 billion.

Another major but harmless hurricane

Karl developed from a tropical wave, becoming a depression about 660 kilometers Southwest of the Southern Cape Verde Islands on September 16. Initially moving Westward, the cyclone turned West Northwestward as it became tropical storm *Karl* on September 17. *Karl* then moved generally West Northwestward to Northwestward on September 18-20 becoming a hurricane on September 18 and a major hurricane the next day. Maximum sustained winds reached an estimated 235 km/h on September 21 as *Karl* turned North Northwestward. *Karl* turned Northward on September 22 and Northeastward the next day while showing fluctuations in strength. It then turned Northward and lost tropical characteristics about 1215 kilometers Northwest of the Western Azores early on September 25.

Lisa developed from a tropical wave, becoming a depression on September 19 about 835 kilometers West Southwest of the Cape Verde Islands.

The depression became a tropical storm the next day. *Lisa* moved Westward for a couple of days and then interacted with another tropical wave disturbance approaching *Lisa* from the East. The disturbance and *Lisa* looped about each other on September 22 and 23 until

the disturbance was absorbed into *Lisa's* circulation. *Lisa* then continued Westward on September 24 before turning Northward in the central Atlantic. Its strength oscillating, *Lisa* moved slowly Northward for nearly a week before turning Northeastward ahead of a strong upper level trough on October 1. *Lisa* strengthened briefly maintaining minimal hurricane intensity on October 2 before weakening back to a tropical storm that afternoon due to very cold waters and increasing vertical shear. *Lisa* became extratropical early on October 3 about 1850 kilometers East of Cape Race, Newfoundland and was absorbed by a larger extratropical low pressure system shortly thereafter.

Trop. Depr. Nr.	Name	Period	Lowest Air Pressure	Maximum sustained winds
1	Hur. Alex	July 31 - August 6	957 hPa	195 km/h
2	TS Bonnie	August 3 - 13	1001 hPa	100 km/h
3	Hur. Charley	August 9 - 14	941 hPa	240 km/h
4	Hur. Danielle	August 13 - 21	964 hPa	175 km/h
5	TS Earl	August 13 - 15	1009 hPa	85 km/h
6	Hur. Frances	August 25 - September 8	935 hPa	230 km/h
7	Hur. Gaston	August 27 - September 1	985 hPa	120 km/h
8	TS Hermine	August 27 - 31	1002 hPa	95 km/h
9	Hur. Ivan	September 2 - 26	910 hPa	260 km/h
11	Hur. Jeanne	September 13 - 28	950 hPa	195 km/h
12	Hur. Karl	September 16 - 24	938 hPa	230 km/h
13	Hur. Lisa	September 19 - October 3	987 hPa	120 km/h
14	TS Matthew	October 8 - 10	997 hPa	75 km/h
15	STS Nicole	October 10 - 11	986 hPa	85 km/h
16	TS Otto	November 29 - December 3	995 hPa	85 km/h

Quiet October and November

Matthew formed on October 8 about 360 kilometers Southeast of Brownsville, Texas from the interaction of a tropical wave with an upper level trough. The depression strengthened into a tropical storm later that day and reached its peak intensity of 70 km/h on October 9.

The cyclone moved East to East Northeastward but then gradually turned to the Northeast and North and made landfall just West of Cocodrie early on the 10th with 65 km/h winds. *Matthew* weakened to a tropical depression shortly after moving inland and then was absorbed by a frontal system on October 11. In Terrebone Parish, about 20 homes were flooded by the combination of rain and storm surge.

Nicole was a short-lived subtropical cyclone that developed from an extratropical low pressure system with gale force winds. The low meandered near Bermuda for a couple of days before acquiring enough thunderstorm activity to be declared a subtropical storm early on October 10 about 225 kilometers Southwest of Bermuda. Little change in intensity occurred as *Nicole* moved slowly Northward and then Northeastward, passing about 155 kilometers Northwest of Bermuda late on October 10. By early October 11, *Nicole* came under the influence of a strong upper level trough approaching from the West and accelerated Northeastward. The subtropical storm was absorbed later that day by a larger extratropical low while located about 645 kilometers South Southeast of Halifax, Nova Scotia in Canada.

Otto formed over the Western North Atlantic Ocean from a non-tropical area of low pressure on November 30, the last day of the official hurricane season, at about 1290 kilometers East of Bermuda. The strongest sustained winds of about 80 km/hour were observed during that same day. During the next two days, it weakened gradually while moving slowly Southeastward and dissipated on December 3.

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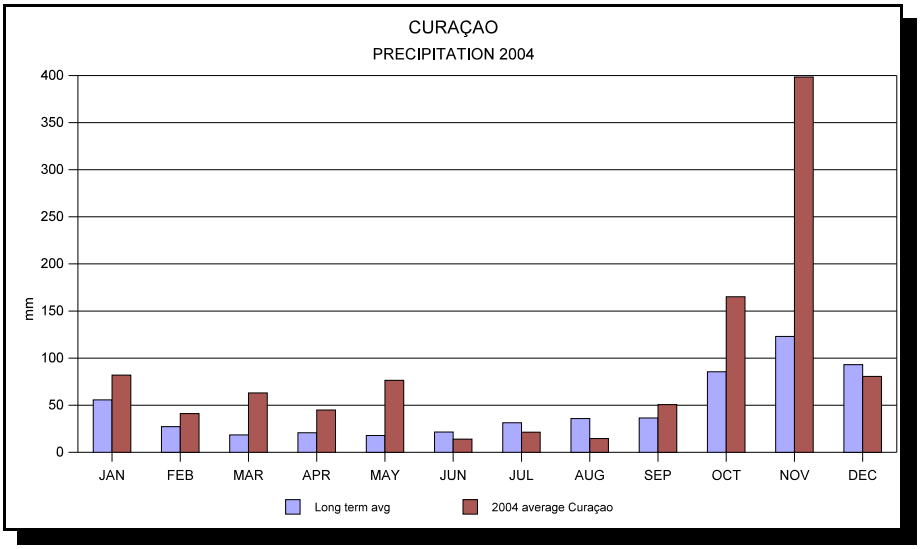
ABC-Islands

Curaçao

PRECIPITATION
The island average rainfall for 2004 was 1118.4 mm. This is about 99% above the long-term average of 562.1 mm. When analyzing the individual data from the rain gauge network, the rainfall station at Tera Kòrá measured the highest annual total over 2004 with a sum of 1477.1 mm. The maximum 24-hour rainfall total for Curaçao was 174 mm and was measured at rainfall station San Juan on November 17. The highest monthly amount for 2004 was 551.2 mm, measured in November, also at rainfall station San Juan. The rainfall station at Tera Kòrá had the highest total of rain days with 114 days (days with rainfall greater than or equal to 1.0 mm).



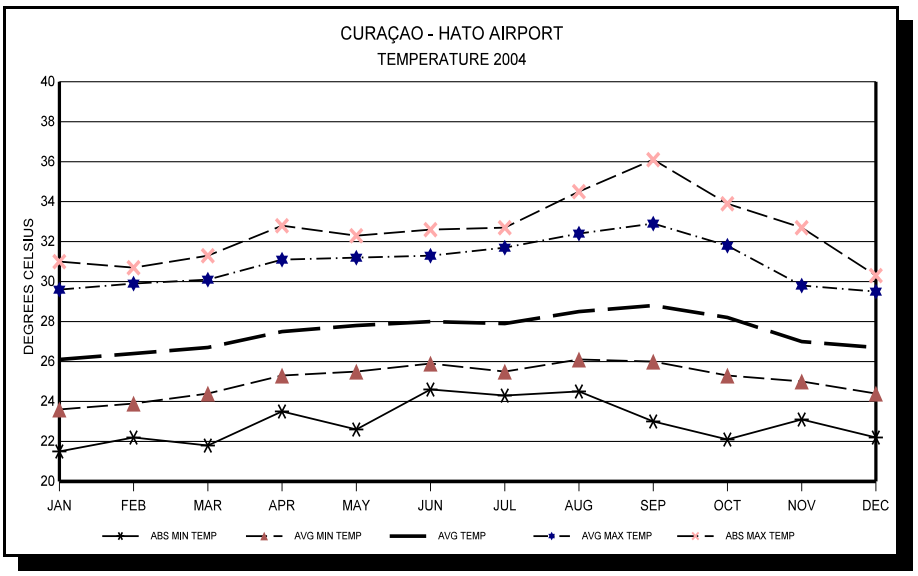
Rainfall data from Hato Airport
The annual rainfall total for Hato in 2004 was 932.4 mm. This is 68% higher than the 30 year average (1971-2000) of 553.4 mm. Especially the second half of May was very wet and the sum at the end of the month is the second highest on record since 1944 (101.6 mm). A new record was established in November when the total rainfall reached 374.2 mm. With 97% above the 30 year average (October through December) we can consider the rainy season of 2004 to be a wet one. The total rainfall for the rainy season of 2004 was 551 mm.
The 24 hour maximum of 77.4 mm was recorded on October 30. The one hour maximum of 57.4 mm was also recorded on October 30 between 11:00 and 12:00 hours. The maximum intensity per minute for 2004 (3.6 mm) was recorded on December 2.
The number of days with precipitation greater than or equal to 1.0 mm totaled 155 (average is 70.4). The maximum rainfall duration (in minutes) was 102 minutes and was recorded on October 30. The number of days with thunder was 26 (normal 23 days).

TEMPERATURE

The average air temperature as recorded at Hato International Airport over the year 2004 was **27.5**˚C (normal 27.8˚). September was the warmest month with a daily average temperature of 28.8˚C (normal 28.9˚C). This month also had the highest average maximum temperature of 32.9˚C (normal 31.9˚C). The absolute maximum temperature of 36.1˚C was the third highest at this station and was recorded on September 17, 2004 at 14:10 hours (The absolute maximum record of 38.3˚C was established in 1996 and the second highest of 36.5˚C in 1998). The hottest day of 2004 was September 17 with a 24 hour average temperature of 29.9˚C.

January was the coolest month with a daily average temperature of 26.1˚C and was also the month with the lowest average minimum temperature of 23.6˚C.

The coolest day of the year was January 27 with a 24 hour average temperature of 24.7˚C. The absolute minimum temperature of 21.5˚C was recorded on January 23, 2004 at 05:16 hours.

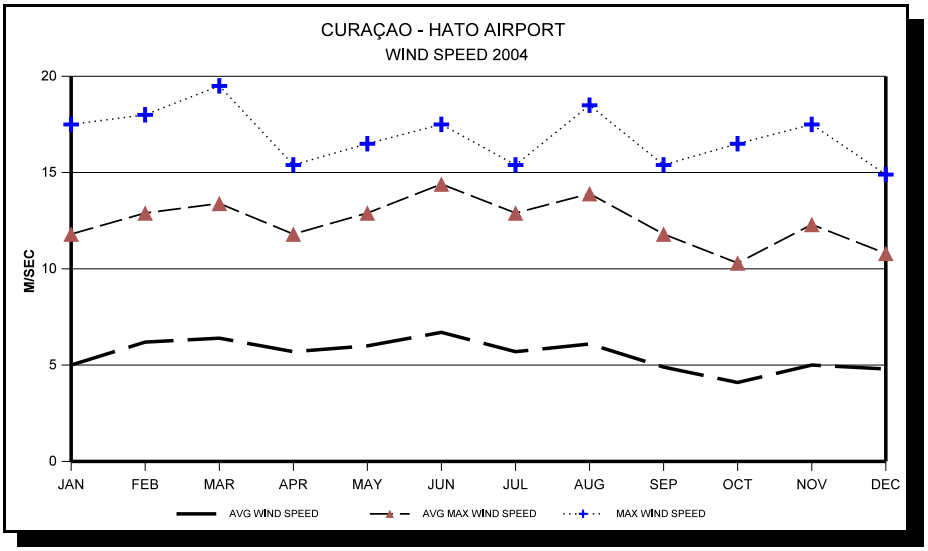


WIND

The average wind speed for the year 2004 was 5.6 m/s (20.2 km/h), normal 6.6 m/s (23.8 km/h), at a height of 10 meters and the average wind direction was 94˚.

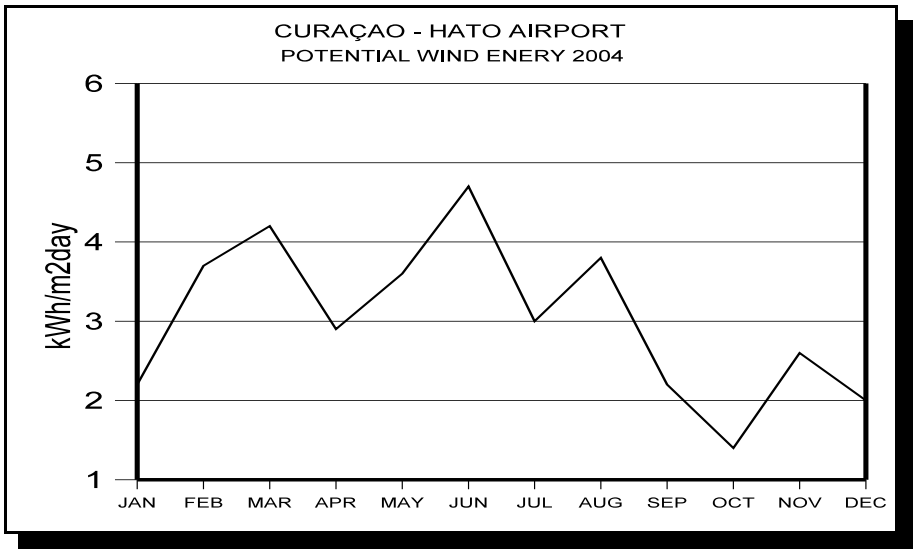
June was the month with the highest average wind speed of 6.7 m/s (24.1 km/h) and October was the month with the lowest average wind speed 4.1 m/s (14.8 km/h).

The day with the highest 24 hour average wind speed of 8.4 m/s (30.2 km/h) was recorded on March 22, 2004. The day with the lowest 24 hour average wind speed of 2.2 m/s (8.0 km/h) was recorded on November 10, 2004. The highest wind gust 19.5 m/s (70.2 km/h) was recorded on March 6 at 04:01 hours.



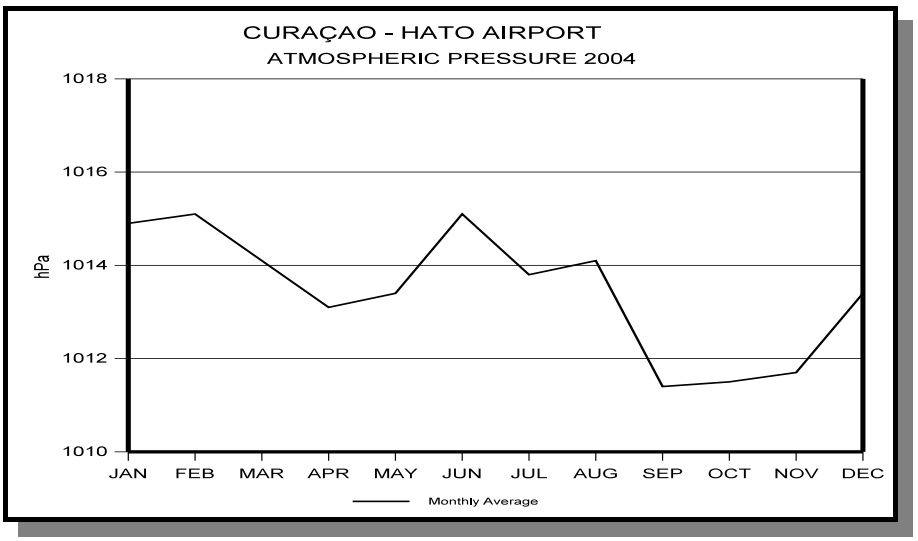
POTENTIAL WIND ENERGY

The total potential wind energy (at 10m height and wind speeds ≥4 m/s) for the year 2004 was 1098 kWh/m^2 (average: 1830.9 kWh/m^2). The daily average was 3.0 kWh/m^{2}day.



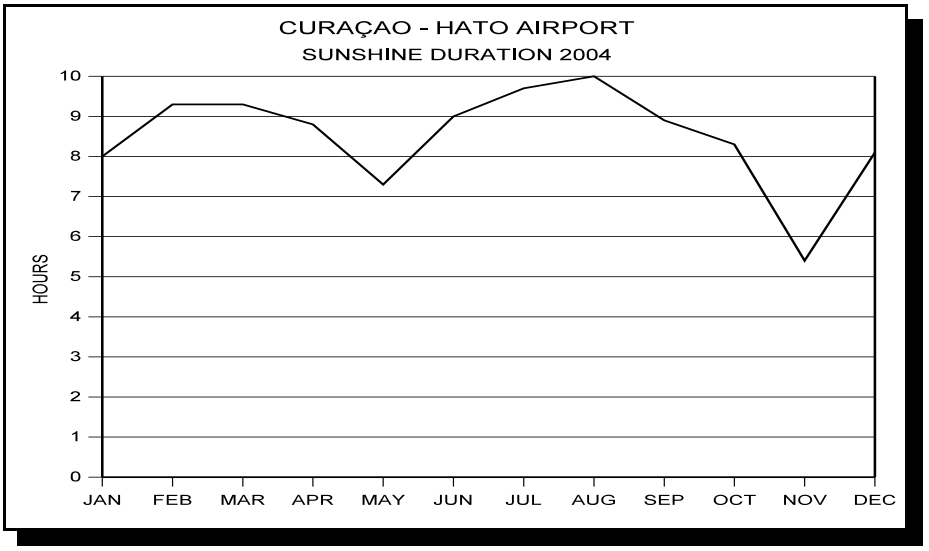
ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Hato Airport over the year 2004 was 1013.5 hPa. The maximum atmospheric pressure of 1019.2 hPa was recorded on February 17, 2004 while the minimum of 1004.7 hPa was recorded on September 8 (during the passage of hurricane *Ivan*).



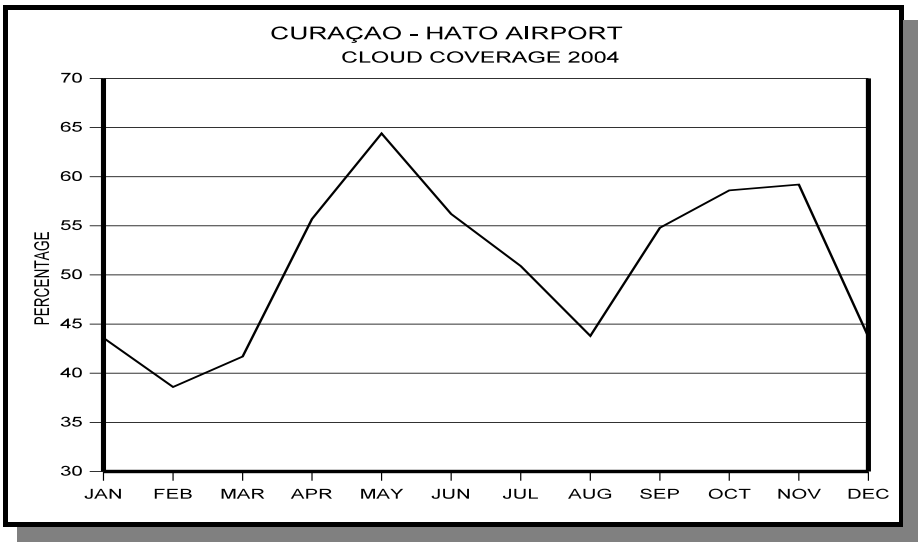
SUNSHINE DURATION

The total sunshine duration for the year 2004 was 3115.6 hours (average is 3114.9 hours). This is 70.4 % of the maximum possible duration (4428 hrs). The average daily sunshine duration was 8 hours and 30 minutes. The sunniest month, August, had a daily average sunshine duration of 10 hours while the month with the least sunshine was November, with a daily average of 5 hours and 24 minutes. The day with the maximum sunshine duration, 11 hours and 48 minutes, was July 31 2004. There were several days without sunshine in among others May (1), September (1) and November (3).



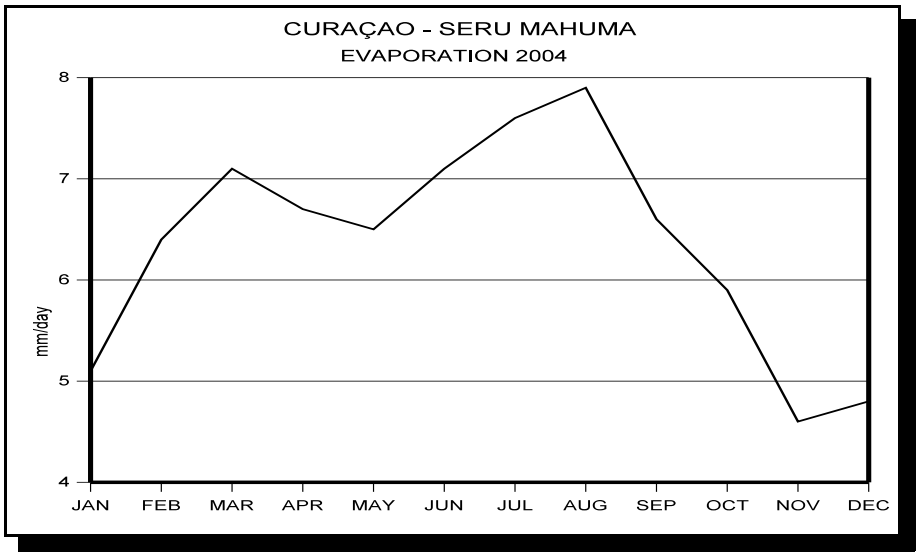
CLOUD COVERAGE

The average cloud cover for the year 2004 was 50.9%. The highest total cloud coverage per month, 64.4%, was observed in May. The lowest, 38.6%, 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 2004 was 6.4 mm. August had the highest daily average evaporation of 7.9 mm while November had the lowest daily average evaporation value of 2004 with 4.6 mm.



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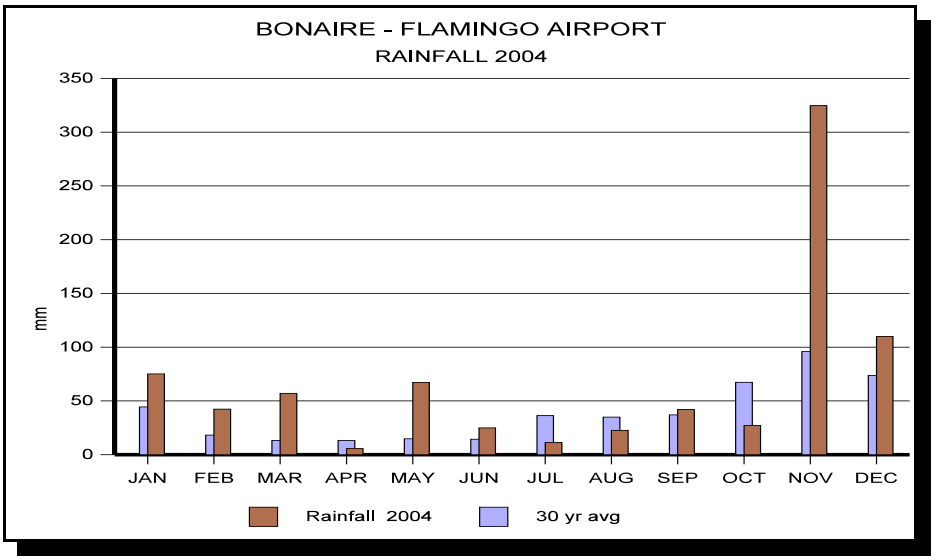
Bonaire

PRECIPITATION

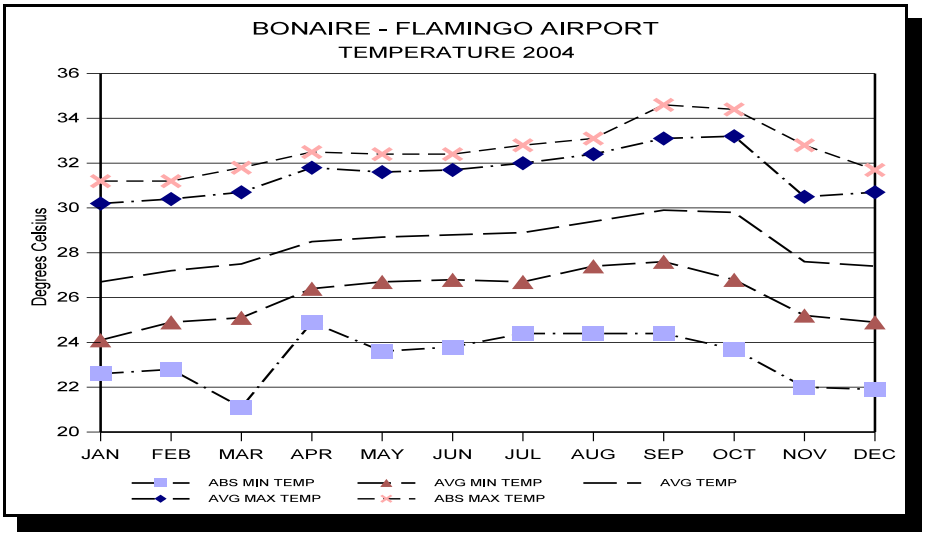
The rainfall total, over the year 2004, as recorded at the Flamingo Airport of Bonaire was 810.0 mm which is 75% above the climatological normal of 463.3 mm. In March, a new record was established for this month with a rainfall total of 57.0 mm. November was the wettest month of the year with a new record sum of 324.6 mm (old record of 289.4 mm in 1984).



The 24-hour maximum was 93.4 mm recorded on November 19. The number of days with precipitation greater than or equal to 1.0 mm totaled 78 (average is 67.3).
The rainfall station at BOPEC with a total of 991.0 mm of rainfall for 2004 was the highest for Bonaire. The maximum 24 hour rainfall (155.5 mm) for Bonaire was also measured at BOPEC on November 17.

TEMPERATURE

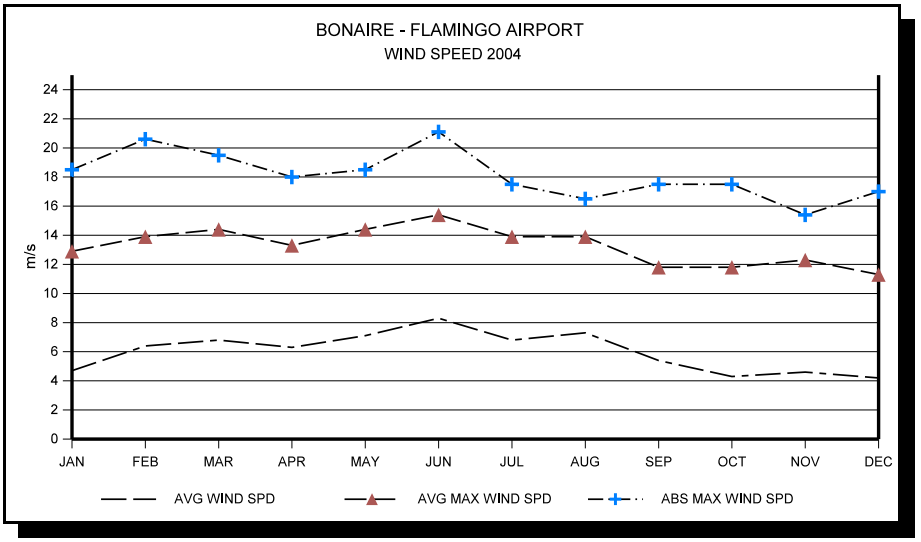
The average air temperature recorded at the Flamingo Airport of Bonaire over the year 2004 was 28.4˚C (normal 28.0). The months of September and October were the warmest with an average temperature of 29.9˚C. September and October also had the highest value for the average maximum temperature of 33.3˚C. The absolute maximum temperature of the past year was 34.6˚C. It was recorded on September 15 at 15:32 hours local time. The warmest day of 2004 was September 2 with a 24 hour average temperature of 30.9˚C.
With an average temperature of 26.7˚C, January had lowest monthly average temperature for 2004. The lowest average minimum temperature 24.1˚C was also recorded in January. The absolute minimum temperature of 21.1˚C was recorded on March 7 at 02:34 hours. The coolest day of 2004 was March 4 with a 24 hour average temperature of **25.2**˚C.



WIND

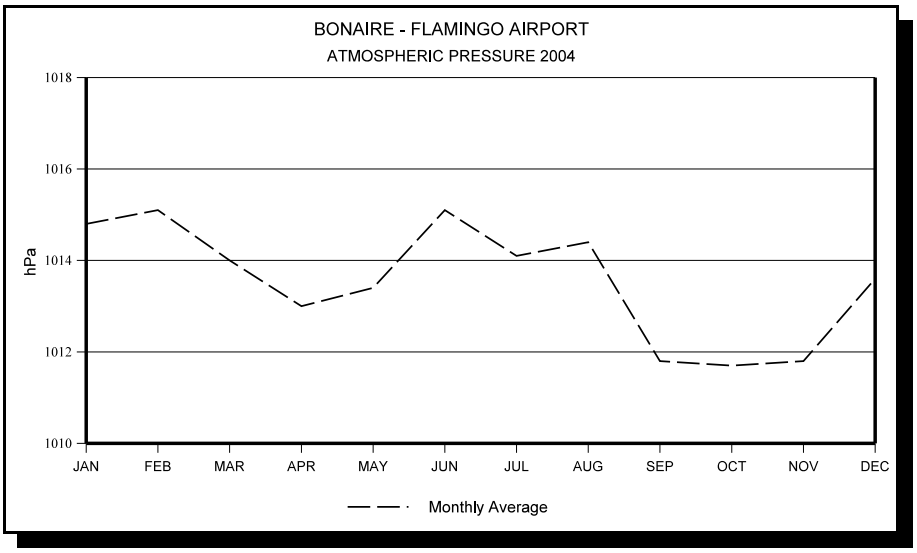
The average wind speed of 2004 recorded at the Flamingo Airport was 6.0 m/s (21.6 km/h) at 10 m height.

June was the month with the highest average wind speed of 8.3 m/s (30 km/h). The lowest monthly average of 4.2 m/s (15.1 km/h) was recorded during December. The day with the highest average wind speed 10.3 m/s (37.2 km/h) was June 23. The lowest 24 hour average wind speed of 2.0 m/s (7.2 km/h) was recorded on November 10. The highest wind gust 21.1 m/s (76.0 km/h) was recorded on June 4 at 12:48 hours local time.



ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Flamingo Airport over the year 2004 was 1013.6 hPa. The maximum atmospheric pressure of 1018.8 hPa was observed on February 18 while the minimum atmospheric pressure of 1006.1 hPa was recorded on November 11.



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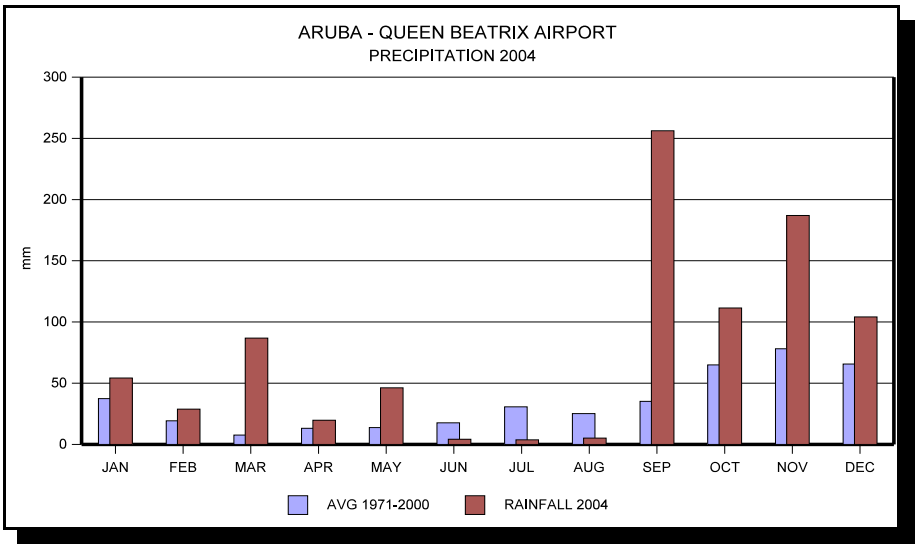
Aruba

PRECIPITATION

The rainfall total, recorded at the Queen Beatrix Airport, for the year 2004 was 907.8 mm which is 122% above the average. Aruba experienced a very wet year. New rainfall records were established for March with the total rainfall and the 24 hour maximum of respectively 68.8 mm and 59.0 mm. On the other hand, the amount of recorded rainfall days in July (1) were the lowest on record since 1956. The wettest month was September with a rainfall

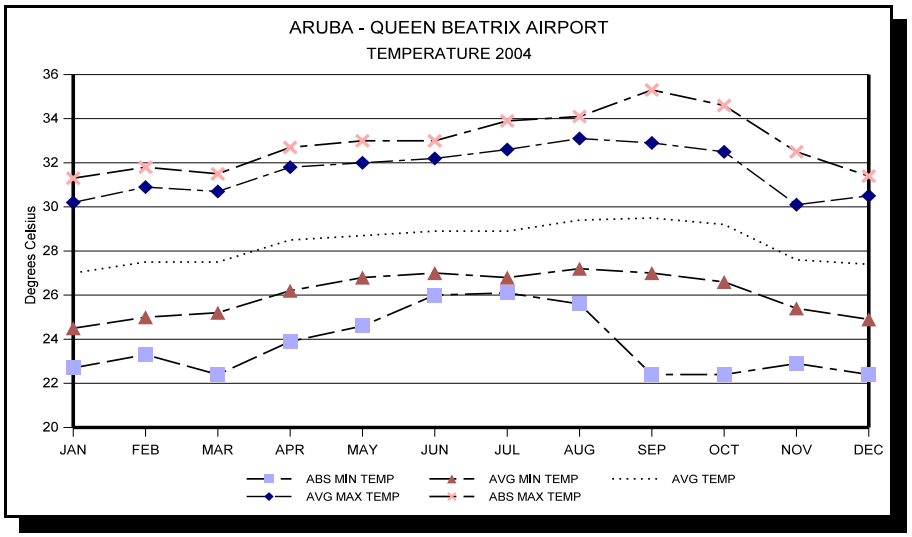


total of 256.2 mm (normal 35.2 mm). Most of this rain fell during a period of 24 hours as a result of the presence of a spiral band of hurricane *Ivan* and resulted in considerable flooding in several sections of the island.

For Aruba a new 24-hour maximum record, 196.6 mm, was established on September 10. The former record of 90.7 mm was measured on October 19, 1988. The number of days with precipitation greater than or equal to 1.0 mm was 81 (61.6).

TEMPERATURE

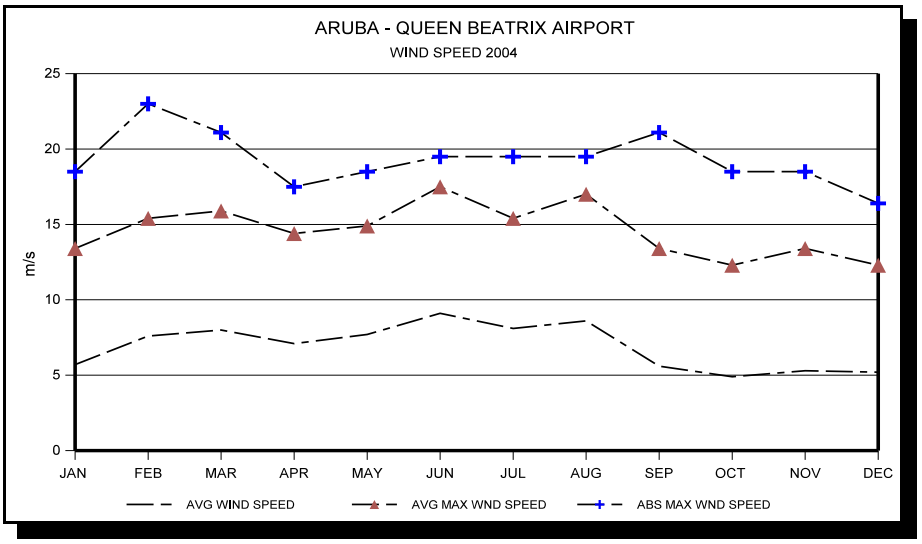
The average air temperature, as recorded at Queen Beatrix Airport over the year 2004, was 28.3˚C (normal 27.8˚). September was the hottest month with a monthly average temperature of 29.5˚C and was the month with the highest average maximum temperature of 33.8˚C .



The absolute maximum temperature 35.3˚C, was recorded on September 1 at 14:13 hours local time.
January was the coolest month with an average temperature of 27.0˚C and it was also the month with the lowest average minimum temperature of 24.5˚C .
The absolute minimum temperature was 22.4˚C and was recorded on four occasions during 2004.

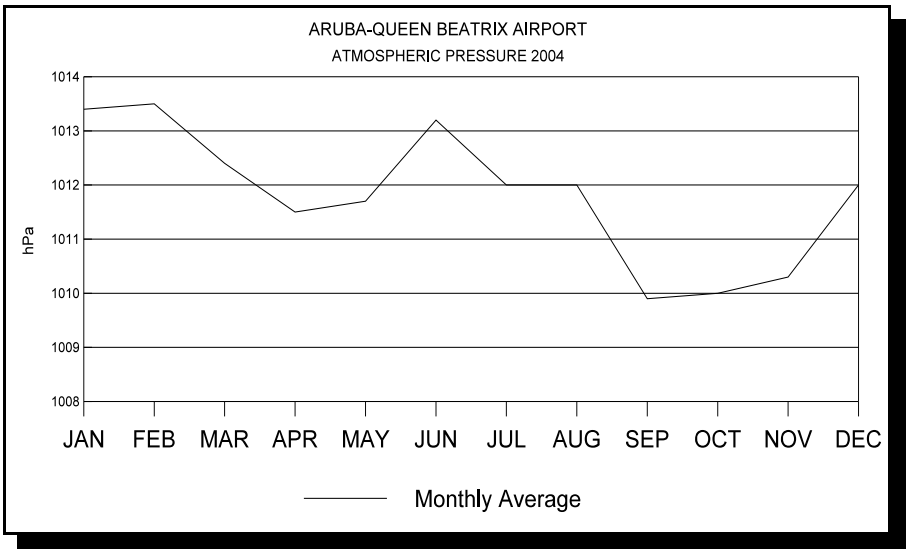
WIND

The average wind speed, at 10 m height, for the year 2004, as recorded at Queen Beatrix Airport was 6.9 m/s (24.8 km/h).
June was the month with the highest average wind speed 9.1 m/s (32.8 km/h) and December had the lowest average wind speed 5.2 m/s (18.7 km/h). The highest 24 hour average wind speed of 10.8 m/s (38.9 km/h) was recorded on August 8 and the day with the lowest 24 hour average of 1.3 m/s (4.8km/h) was recorded on September 18 and October 26. The highest wind gust 23 m/s (82.8 km/h) was recorded on February 23 at 15:56 local time.



ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Queen Beatrix Airport over the year 2004 was 1011.8 hPa. The maximum atmospheric pressure of 1017.2 hPa was observed on March 5 while the minimum atmospheric pressure of 1002.2 hPa was recorded on September 9 (*Ivan*).



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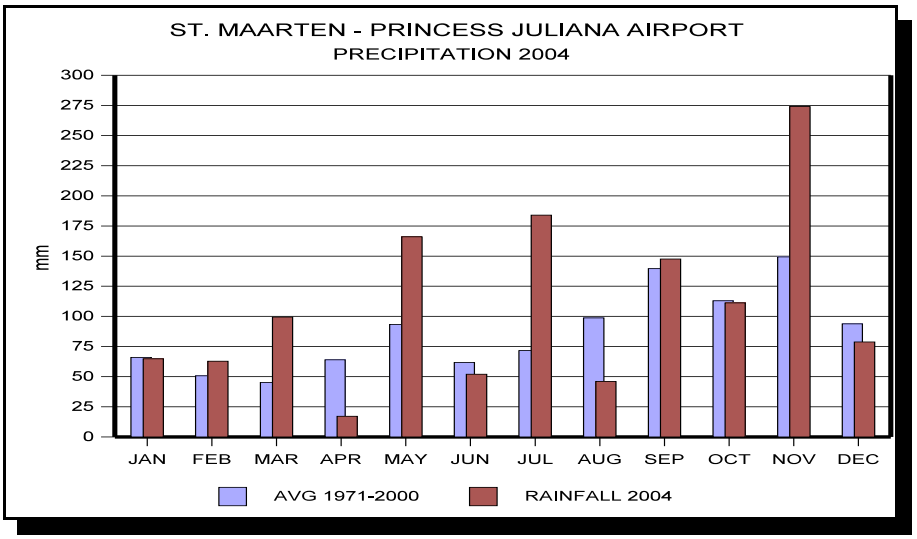
SSS ISLANDS

St. Maarten

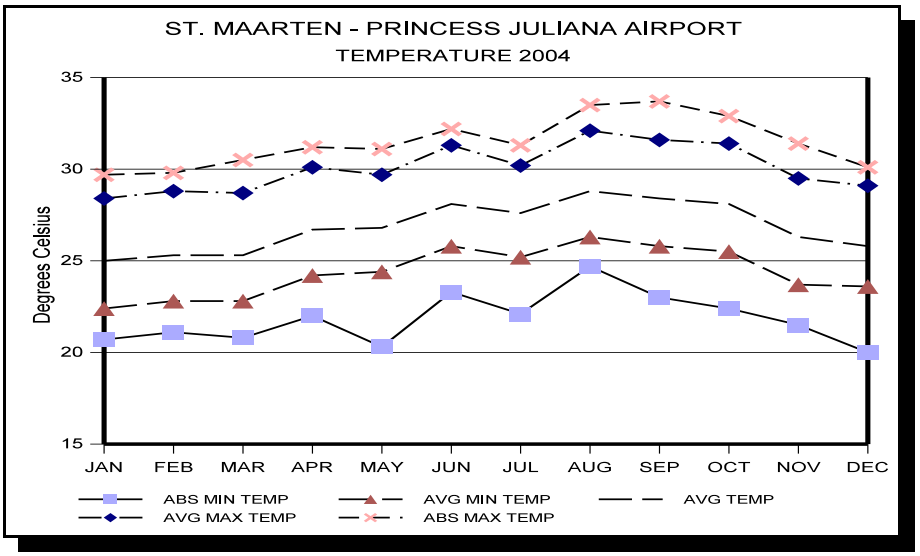
PRECIPITATION

The total rainfall for 2004, recorded at the Princess Juliana Airport was 1303.8 mm, about 25% above the normal of 1047.1 mm. The total rainfall for November was 274 mm, making it the wettest month for the year 2004.
Very dry conditions were experienced during April 2004 with 17.2 mm (normal 64.0 mm). In July on the other hand, the highest rainfall sum for this month (184.0 mm) was recorded at the Juliana Airport.
The 24-hour maximum was 113.6 mm and occurred on November 10. The number of days with precipitation greater than or equal to 1.0 mm was 158 days (normal 142).



TEMPERATURE

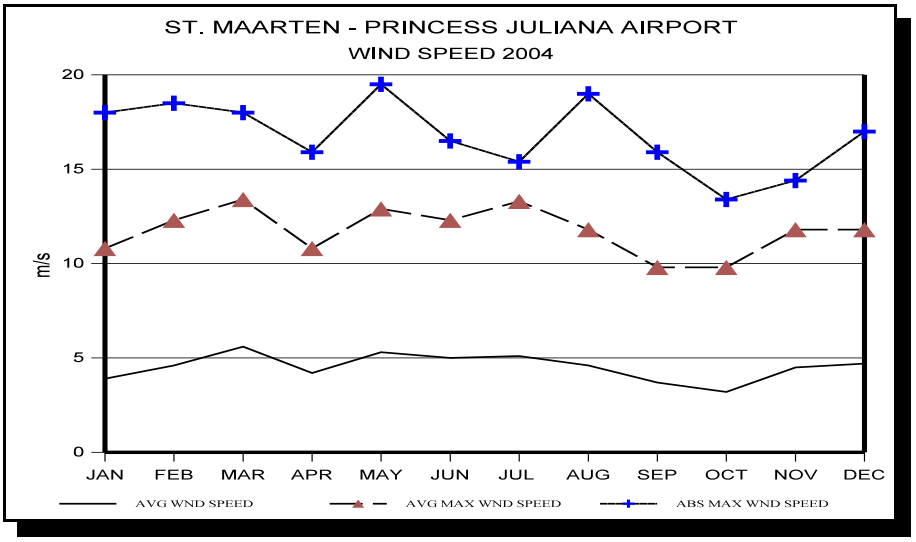
The average air temperature as recorded at Princess Juliana Airport over the year 2004 was 26.9˚C (normal 27.2˚). August was the warmest month with a monthly average temperature of 28.8˚C and was also the month with the highest monthly average maximum temperature of 32.1˚C of 2004. The absolute maximum temperature was 33.7˚C and was recorded on September 10 at 12:07 hours local time. August 22 and October 11 were the



hottest days with a 24 hour average temperature of 29.4˚C.
January was the month with the lowest monthly average temperature of 25.0˚C. December had the lowest average minimum temperature of 23.6˚C for 2004. The absolute minimum temperature was 20.0˚C and was recorded on December 1 at 06:43 local time. The coolest day of 2004 was February 6 with an average temperature of 24.2˚C

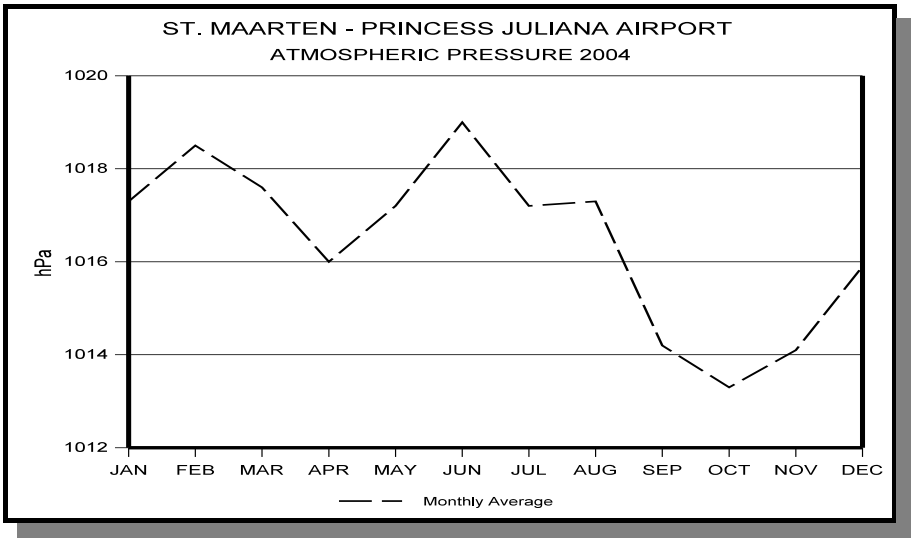
WIND

The average wind speed of 2004, as recorded at the Princess Juliana Airport, was 4.5 m/s (16.2 km/h) at 10m height. March had the highest average wind speed of 5.6 m/s (20.2 km/h) while October had the lowest average wind speed of 3.2 m/s(11.5 km/h). The highest 24 hour average wind speed was 9.2 m/s (33.1 km/h) and was recorded on March 2 and the lowest daily average wind speed of 1.1 m/s (3.9 km/h) was on October 8. The highest wind gust of 19.5 m/s (70.2 km/h) was recorded on May 16 at 12:52 hours local time.



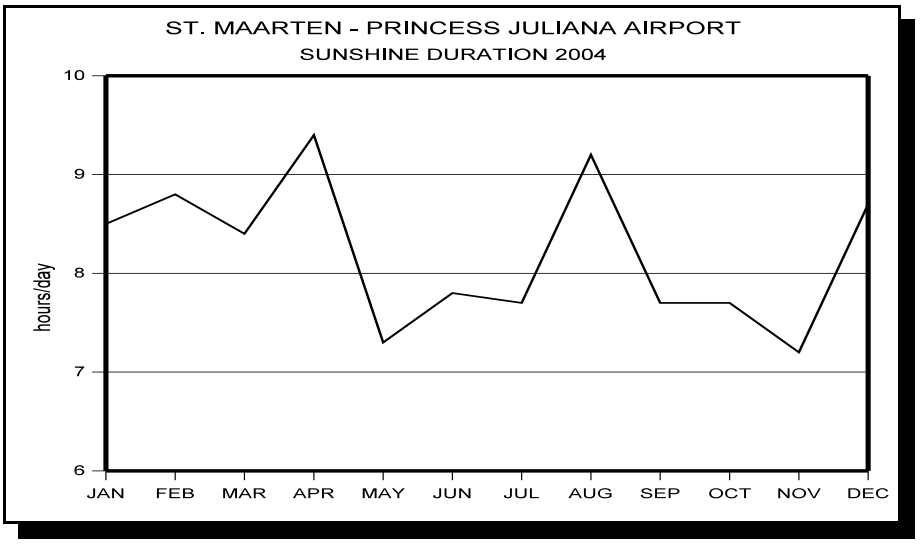
ATMOSPHERIC PRESSURE

The average atmospheric pressure, recorded at Princess Juliana Airport, over the year 2004 was 1016.5 hPa. The maximum atmospheric pressure of 1023.2 hPa was recorded on February 9, while the minimum atmospheric pressure of 1005.8 hPa was recorded on November 12.



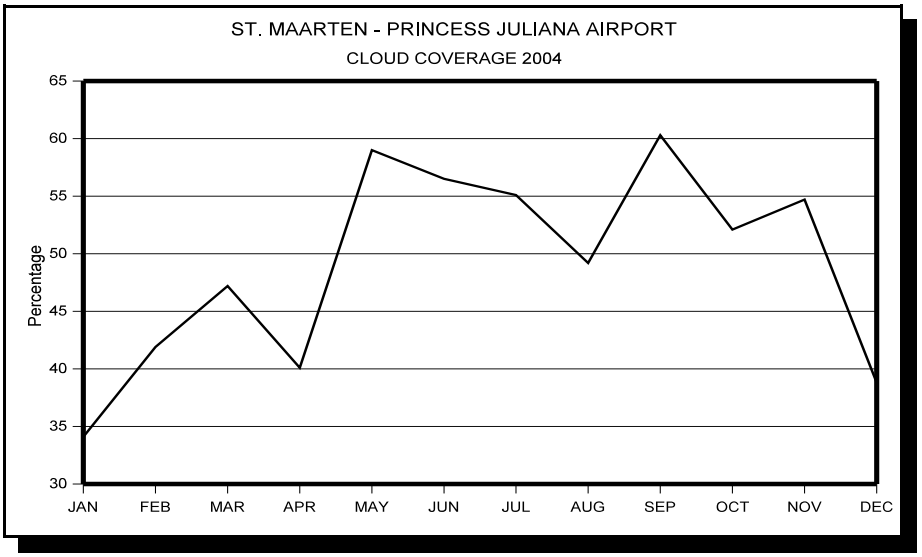
SUNSHINE

The total sunshine duration for 2004 as recorded at the Princess Juliana Airport, was 2998 hours (normal 3009.4). This is 67.7% of the maximum annual possible duration (4431.3 hours). The daily average sunshine duration in 2004 was 8 hours and 12 minutes. This was just below 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 36 minutes. The month with the least sunshine in 2004 was November with a daily average of 7 hours and 12 minutes. The maximum daily sunshine duration for the past year was 11 hours and 30 minutes and was recorded on three occasions: April 1, July 18 and August 18.



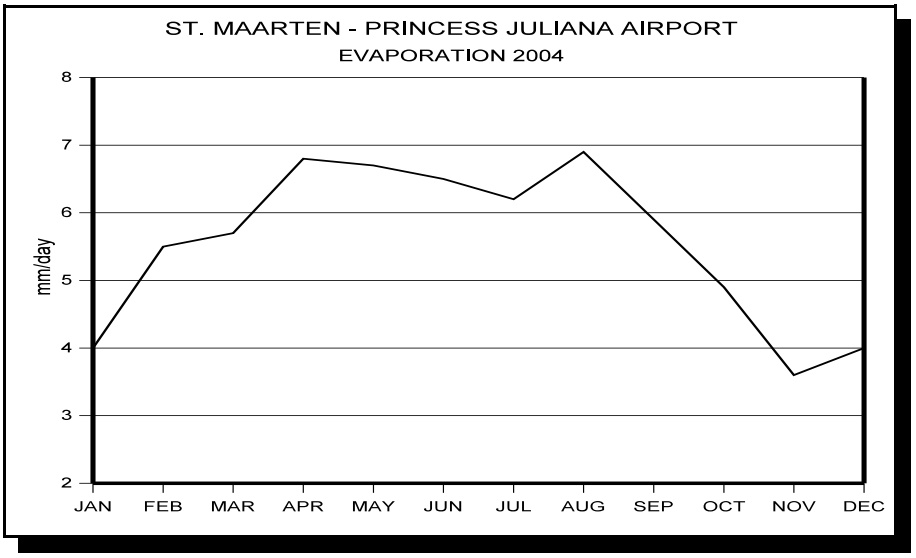
CLOUD COVER

The daily average cloud coverage for St. Maarten over the year 2004, as recorded at Princess Juliana Airport, was 49.1%. The highest monthly average cloud cover of 60.3% was observed in September while January had the lowest cloud coverage value of 34.1%.



EVAPORATION

The average daily evaporation, measured at the Princess Juliana Airport, over the year 2004 was 5.6 mm. August had the maximum average evaporation value for 2004 of 6.9 mm while November had the lowest value of 3.6 mm.



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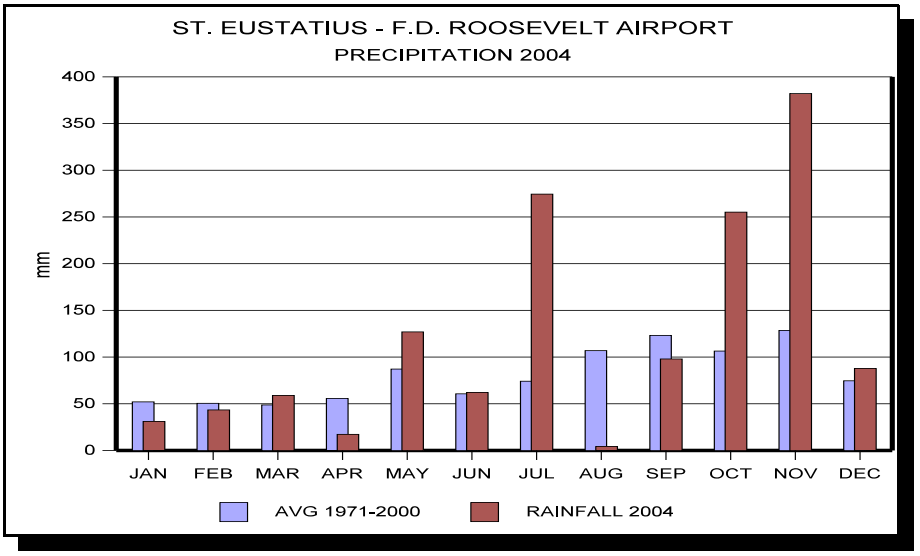
St. Eustatius

PRECIPITATION

The total rainfall amount, recorded at the Roosevelt Airport, for 2004 was 1441.4 mm. This amount is 48.8% above the 30-year average which is 968.6 mm. The 24-hour maximum rainfall, 102.8 mm, was recorded on October 21. The number of days with precipitation greater than or equal to 1.0 mm was 120 days (125.4). November was the wettest month of 2004 with a monthly total of 382.2 mm and the driest month was August with 4.2 mm.

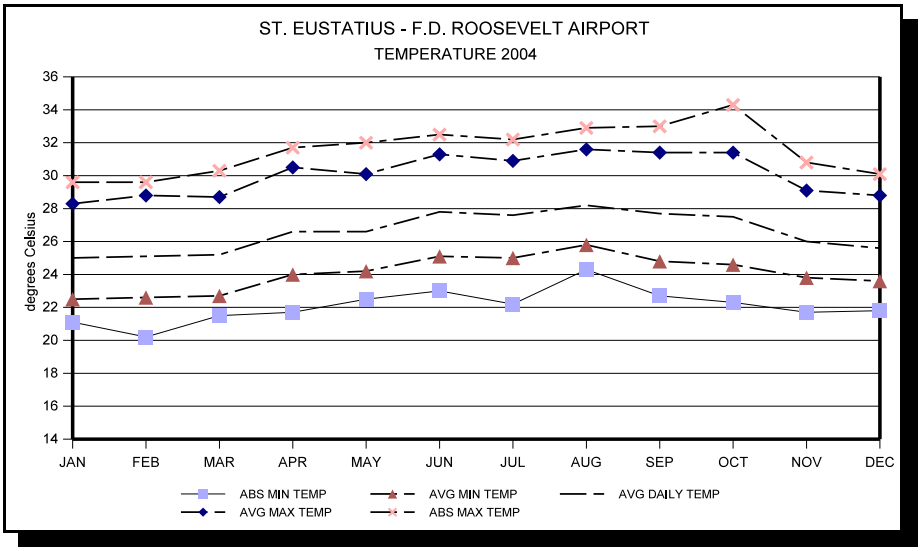


TEMPERATURE

The average air temperature as recorded at Roosevelt Airport over the year 2004 was 26.6˚C (normal 26.9˚). August was the warmest month with an average temperature of 28.2˚C and an average maximum temperature of 31.6˚C. The absolute maximum temperature, 34.3˚C, was recorded on October 9. The warmest day of 2004 was October 9 with a 24 hour average temperature of 29.3˚C.

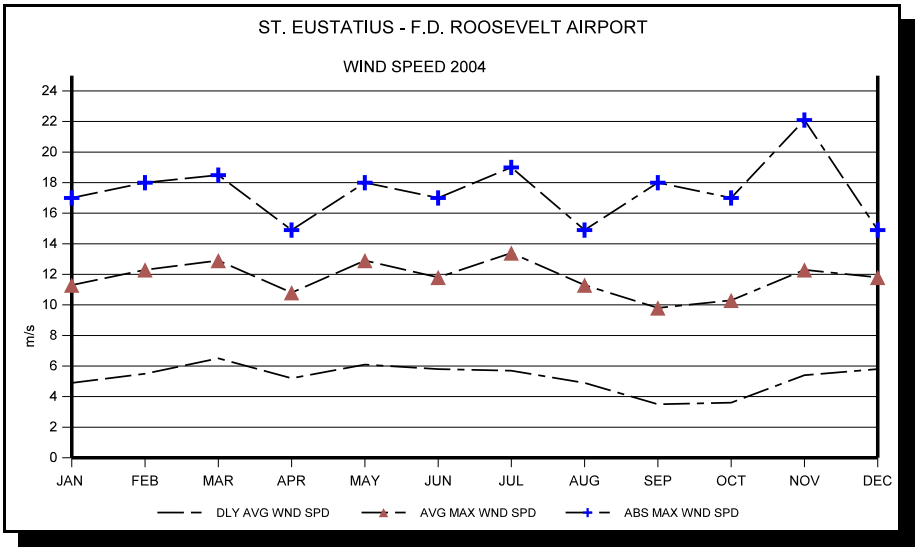
January was the coolest month with an average temperature of 25.0˚C and an average minimum temperature of 22.5˚C. The absolute minimum temperature was 20.2˚C and was recorded on February 8 at 03:22 local time.

The coolest day of 2004 was March 2 with an average temperature of 23.6˚C.



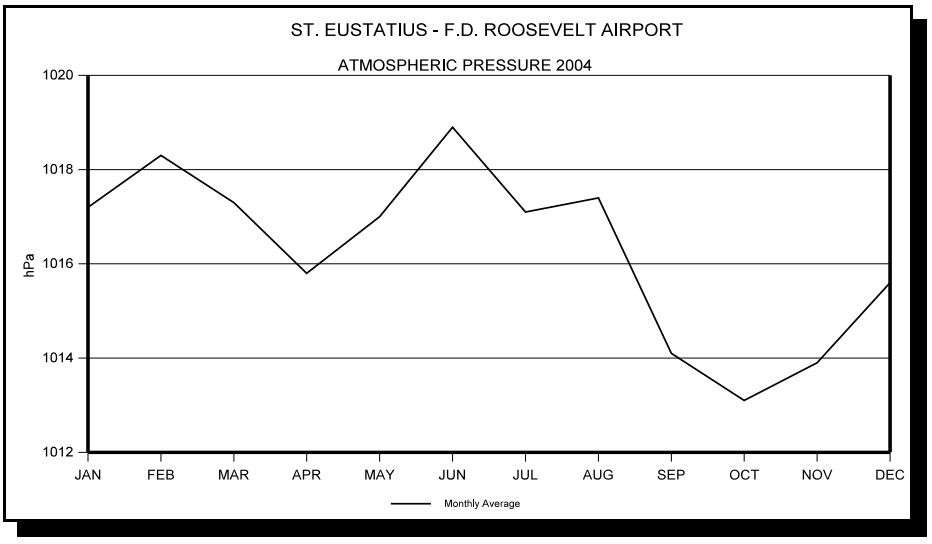
WIND

The average wind speed for 2004, at 10m height, recorded at the Roosevelt Airport was 5.2 m/s (18.7 km/h). March was the month with the highest average wind speed 7.0 m/s (23.4 km/h). September had the lowest average wind speed 3.5 m/s (12.6 km/h).
The highest 24-hour average wind speed, 11.4 m/s (40.9 km/h), was recorded on March 2.
The highest wind gust 22.1 m/s (79.6 km/h) was recorded on November 1.



ATMOSPHERIC PRESSURE

The average atmospheric pressure recorded at Roosevelt Airport the year 2004 was 1016.3 hPa. The maximum atmospheric pressure of 1022.4 hPa was recorded on January 10 while the minimum atmospheric pressure of 1007.8 hPa was recorded on November 11.



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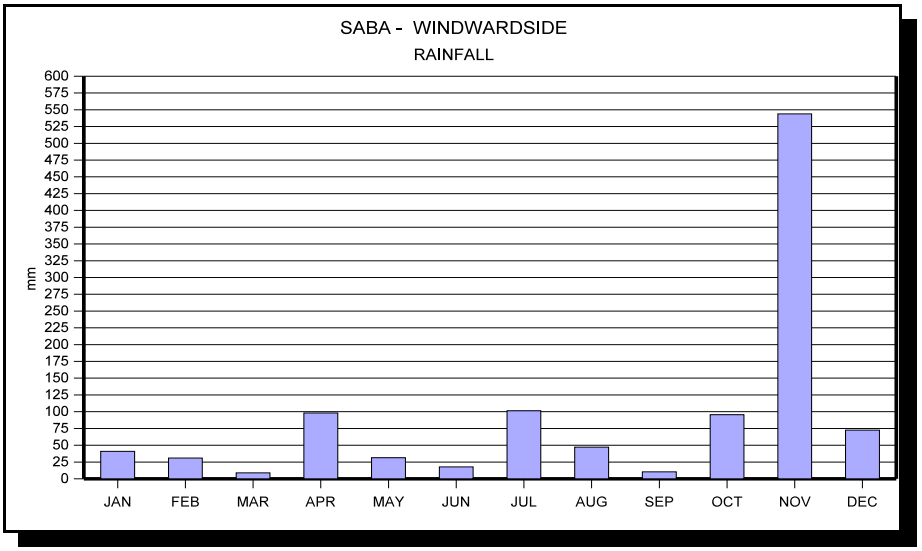
Saba

PRECIPITATION

The rainfall total recorded at Windwardside for the year 2004 was 1099.3 mm. That's just above the long term average of 1050.4 mm.
November was the wettest month with a total of 543.9 mm while March was the driest month with a total of only 8.9 mm.



No data is available from the Juancho Yrausquin Airport at Saba during 2004.

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METEOROLOGICAL SERVICE NETHERLANDS ANTILLES & ARUBA
CLIMATOLOGICAL DATA 2004

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Abs. Min. Temp. °˚C												
CURAÇAO	21.5	22.2	21.8	23.5	22.6	24.6	24.3	24.5	23.0	22.1	23.1	22.2
SAINT MAARTEN	20.7	21.1	20.8	22.0	20.3	23.3	22.1	24.7	23.0	22.4	21.5	20.0
BONAIRE	22.6	22.8	21.1	24.9	23.6	23.8	24.4	24.4	24.4	23.7	22.0	21.9
SAINT EUSTATIUS	21.1	20.2	21.5	21.7	22.5	23.0	22.2	24.3	22.7	22.3	21.7	21.8
ARUBA	22.7	23.3	22.4	23.9	24.6	26.0	26.1	25.6	22.4	22.4	22.9	22.4

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Avg. Min. Temp. °˚C												
CURAÇAO	23.6	23.9	24.4	25.3	25.5	25.9	25.5	26.1	26.0	25.3	25.0	24.4
SAINT MAARTEN	22.4	22.8	22.8	24.2	24.4	25.8	25.2	26.3	25.8	25.5	23.7	23.6
BONAIRE	24.1	24.9	25.1	26.4	26.7	26.8	26.7	27.4	27.6	26.8	25.2	24.9
SAINT EUSTATIUS	22.5	22.6	22.7	24.0	24.2	25.1	25.0	25.8	24.8	24.6	23.8	23.6
ARUBA	24.5	25	25.2	26.2	26.8	27	26.8	27.2	27	26.6	25.4	24.9

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average Temp. °˚C												
CURAÇAO	26.1	26.4	26.7	27.5	27.8	28.0	27.9	28.5	28.8	28.2	27.0	26.7
SAINT MAARTEN	25.0	25.3	25.3	26.7	26.8	28.1	27.6	28.8	28.4	28.1	26.3	25.8
BONAIRE	26.7	27.2	27.5	28.5	28.7	28.8	28.9	29.4	29.9	29.8	27.6	27.4
SAINT EUSTATIUS	25.0	25.1	25.2	26.6	26.6	27.8	27.6	28.2	27.7	27.5	26	25.6
ARUBA	27.0	27.5	27.5	28.5	28.7	28.9	28.9	29.4	29.5	29.2	27.6	27.4

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Avg. Max. Temp. °˚C												
CURAÇAO	29.6	29.9	30.1	31.1	31.2	31.3	31.7	32.4	32.9	31.8	29.8	29.5
SAINT MAARTEN	28.4	28.8	28.7	30.1	29.7	31.3	30.2	32.1	31.6	31.4	29.5	29.1
BONAIRE	30.2	30.4	30.7	31.8	31.6	31.7	32.0	32.4	33.1	33.2	30.5	30.7
SAINT EUSTATIUS	28.3	28.8	28.7	30.5	30.1	31.3	30.9	31.6	31.4	31.4	29.1	28.8
ARUBA	30.2	30.9	30.7	31.8	32.0	32.2	32.6	33.1	32.9	32.5	30.1	30.5

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Abs. Max. Temp. °˚C												
CURAÇAO	31.0	30.7	31.3	32.8	32.3	32.6	32.7	34.5	36.1	33.9	32.7	30.3
SAINT MAARTEN	29.7	29.8	30.5	31.2	31.1	32.2	31.3	33.5	33.7	32.9	31.4	30.1
BONAIRE	31.2	31.2	31.8	32.5	32.4	32.4	32.8	33.1	34.6	34.4	32.8	31.7
SAINT EUSTATIUS	29.6	29.6	30.3	31.7	32.0	32.5	32.2	32.9	33.0	34.3	30.8	30.1
ARUBA	31.3	31.8	31.5	32.7	33.0	33.0	33.9	34.1	35.3	34.6	32.5	31.4

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Rainfall in mm												
CURAÇAO	81.8	40.0	52.2	45.4	101.6	9.2	19.0	3.8	28.4	127.4	347.2	76.4
SAINT MAARTEN	64.8	62.8	99.4	17.2	166.0	52.0	184.0	46.0	147.6	111.2	274.0	78.8
BONAIRE	75.2	42.4	57.0	5.6	67.2	25.0	11.2	22.6	42.0	27.2	324.6	110.0
SAINT EUSTATIUS	31.0	43.4	59.0	17.2	127.0	62.0	274.4	4.2	98.0	255.2	382.2	87.8
ARUBA	54.2	28.8	86.8	19.8	46.2	4.2	3.8	5.2	256.2	111.4	187.0	104.2

METEOROLOGICAL SERVICE NETHERLANDS ANTILLES & ARUBA

CLIMATOLOGICAL DATA 2004

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Avg. Wind Speed 10m height (in m/sec)												
CURAÇAO	5.0	6.2	6.4	5.7	6.0	6.7	5.7	6.1	4.9	4.1	5.0	4.8
SAINT MAARTEN	3.9	4.6	5.6	4.2	5.3	5.0	5.1	4.6	3.7	3.2	4.5	4.7
BONAIRE	4.7	6.4	6.8	6.3	7.1	8.3	6.8	7.3	5.4	4.3	4.6	4.2
SAINT EUSTATIUS	4.9	5.5	6.5	5.2	6.1	5.8	5.7	4.9	3.5	3.6	5.4	5.8
ARUBA	5.7	7.6	8.0	7.1	7.7	9.1	8.1	8.6	5.6	4.9	5.3	5.2

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Avg. Max Wind Speed 10m height (in m/sec)												
CURAÇAO	11.8	12.9	13.4	11.8	12.9	14.4	12.9	13.9	11.8	10.3	12.3	10.8
SAINT MAARTEN	10.8	12.3	13.4	10.8	12.9	12.3	13.3	11.8	9.8	9.8	11.8	11.8
BONAIRE	12.9	13.9	14.4	13.3	14.4	15.4	13.9	13.9	11.8	11.8	12.3	11.3
SAINT EUSTATIUS	11.3	12.3	12.9	10.8	12.9	11.8	13.4	11.3	9.8	10.3	12.3	11.8
ARUBA	13.4	15.4	15.9	14.4	14.9	17.5	15.4	17.0	13.4	12.3	13.4	12.3

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Abs. Max Wind Speed 10m height (in m/sec)												
CURAÇAO	17.5	18.0	19.5	15.4	16.5	17.5	15.4	18.5	15.4	16.5	17.5	14.9
SAINT MAARTEN	18.0	18.5	18.0	15.9	19.5	16.5	15.4	19.0	15.9	13.4	14.4	17.0
BONAIRE	18.5	20.6	19.5	18.0	18.5	21.1	17.5	16.5	17.5	17.5	15.4	17.0
SAINT EUSTATIUS	17.0	18.0	18.5	14.9	18.0	17.0	19.0	14.9	18.0	17.0	22.1	14.9
ARUBA	18.5	23.0	21.1	17.5	18.5	19.5	19.5	19.5	21.1	18.5	18.5	16.4

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Potential Wind Energy (in Kwhr/m²/day)												
CURAÇAO	2.2	3.7	4.2	2.9	3.6	4.7	3.0	3.8	2.2	1.4	2.6	2.0

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Sunshine Duration (in hours)												
CURAÇAO	8.0	9.3	9.3	8.8	7.3	9	9.7	10.0	8.9	8.3	5.4	8.1
SAINT MAARTEN	8.5	8.8	8.4	9.4	7.3	7.8	7.7	9.2	7.7	7.7	7.2	8.7

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Cloud Coverage (in %)												
CURAÇAO	43.6	38.6	41.7	55.7	64.4	56.2	50.9	43.8	54.8	58.6	59.2	43.7
SAINT MAARTEN	34.1	41.9	47.2	40.1	59.0	56.5	55.1	49.2	60.3	52.1	54.7	38.8

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Evaporation (in mm)												
CURAÇAO	5.1	6.4	7.1	6.7	6.5	7.1	7.6	7.9	6.6	5.9	4.6	4.8
SAINT MAARTEN	4	5.5	5.7	6.8	missing	6.5	6.2	6.9	5.9	4.9	3.6	4.0

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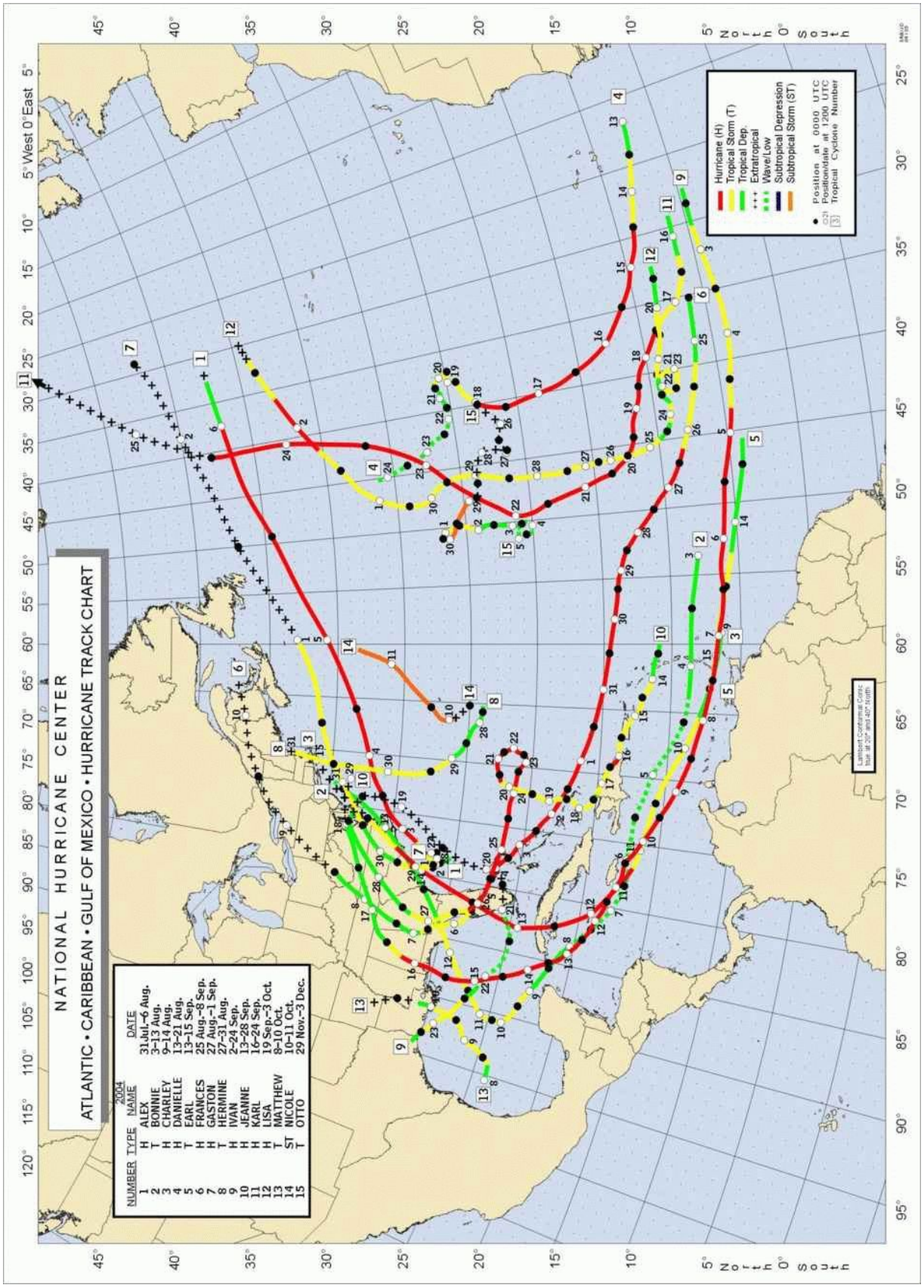

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