

= 1989 Atlantic hurricane season =

The 1989 Atlantic hurricane season featured the costliest tropical cyclone in the Atlantic basin at the time , Hurricane Hugo . The season officially began on June 1 , and ended on November 30 . It was a near average season with 11 named storms . The first storm , Tropical Depression One , developed on June 15 , and dissipated two days later without effects on land . Later that month , Tropical Storm Allison caused severe flooding , especially in Texas and Louisiana . Tropical Storm Barry , Tropical Depressions Six , Nine , and Thirteen , and Hurricanes Erin and Felix caused negligible impact . Hurricane Gabrielle and Tropical Storm Iris caused light effects on land , with the former resulting in nine fatalities from rip currents offshore the East Coast of the United States and Atlantic Canada , while the latter produced minor flooding in the United States Virgin Islands .

The most notable storm of the season was Hurricane Hugo , a Category 5 hurricane that caused at least \$ 10 billion ( 1989 USD ) in damage and 88 fatalities as it ravaged the Lesser Antilles and the United States , especially the state of South Carolina . Hugo ranked as the costliest Atlantic hurricane until Hurricane Andrew in 1992 , and has since fallen further due to destructive storms in the 2000s and early 2010s . Few other storms in 1989 caused significant damage ; hurricanes Chantal and Jerry both resulted in flooding and wind impacts in Texas . Hurricane Dean also caused light damage in Bermuda and the Canadian province of Newfoundland . Tropical Storm Karen , the final storm of the season , brought heavy rainfall and a tornado to Cuba , before dissipating on December 4 . Overall , the storms of the season collectively caused 124 fatalities and at least \$ 10 @. @ 54 billion in damage .

= = Season summary = =

= = = Pre @-@ season forecasts = = =

Forecasts of hurricane activity are issued before each hurricane season by noted hurricane experts such as Dr. William M. Gray and his associates at Colorado State University ( CSU ) . A normal season as defined by the National Oceanic and Atmospheric Administration ( NOAA ) , has eleven named storms , of which six reach hurricane strength and two of those become major hurricanes . On May 31 , 1989 , the CSU forecast that there would be seven named storms , four of which would intensify into a hurricane ; there was no prediction of the number of major hurricanes . Prior to the season , the Weather Research Center ( WRC ) in Houston , Texas also issued a forecast , which called for ten named storms and six hurricanes .

= = = Season activity = = =

The Atlantic hurricane season officially began on June 1 , 1989 . It was an above average season in which 15 tropical depressions formed . Eleven depressions attained tropical storm status , and seven of these attained hurricane status . Two hurricanes further intensified into major hurricanes . The season was above average most likely because of relatively small amounts of dust within the Saharan Air Layer . Four hurricanes and one tropical storm made landfall during the season and caused 124 deaths and at least \$ 10 @. @ 54 billion in damage . The last storm of the season , Tropical Storm Karen , dissipated on December 4 , four days after the official end of the season on November 30 .

Tropical cyclogenesis in the 1989 Atlantic hurricane season began with a tropical depression developing on June 16 . Later that month , another tropical depression developed , and intensified , eventually becoming Tropical Storm Allison . After June , the month of July was slightly more active with three tropical depressions developing ; however , the latter two ( Hurricane Chantal and Hurricane Dean ) did not form until extremely late in the month . August was the most active month of the season , with a total of seven tropical cyclones either existing or developing in that period . Although September is the climatological peak of hurricane season , only two tropical cyclones

developed in that month , which later become Hurricane Hugo and Tropical Storm Iris . Two tropical cyclones also developed in October , and the latter one in that month eventually became Hurricane Jerry . Finally , one tropical cyclone developed in November ; it eventually became Tropical Storm Karen and lasted until December 4 .

The season 's activity was reflected with a cumulative accumulated cyclone energy ( ACE ) rating of 135 , which is classified as " above normal " . ACE is , broadly speaking , a measure of the power of the hurricane multiplied by the length of time it existed , so storms that last a long time , as well as particularly strong hurricanes , have high ACEs . It is only calculated for full advisories on tropical systems at or exceeding 39 mph ( 63 km / h ) , which is tropical storm intensity .

== Timeline of events ==

== Storms ==

== Tropical Depression One ==

A frontal system developed into Tropical Depression One at 1800 UTC on June 15 , while located about 160 miles ( 260 km ) northeast of Veracruz , Veracruz . The depression initially headed northeastward , before curving southward on June 16 . It peaked with winds of 30 mph ( 45 km / h ) . Early on June 17 , the depression dissipated about 85 miles ( 140 km ) northeast of Coatzacoalcas , Veracruz .

== Tropical Storm Allison ==

The second tropical depression developed on June 24 in the northwestern Gulf of Mexico , from the interaction of a tropical wave and the remnants of eastern Pacific Hurricane Cosme . Heading northward , it slowly intensified , becoming Tropical Storm Allison early on June 26 . Allison continued to slowly intensify , and made landfall near Freeport with winds of 50 mph ( 80 km / h ) on the following day . Moving inland , Allison rapidly weakened over eastern Texas , and transitioned into an extratropical storm on June 28 . Although it rapidly became extratropical over land , the remnants of Allison meandered over the Southern United States and reached as far north as Indiana . The remnants turned south and then west @-@ northwest after reaching Mississippi , before finally dissipating over Arkansas on July 7 .

Allison caused significant flooding in several states , especially Louisiana and Texas . Precipitation from the storm peaked at 25 @. 27 inches ( 642 mm ) in Winnfield , Louisiana . As a result , more than 1 @, 200 structures in Louisiana were flooded and over 430 @, 000 acres of crops were ruined , mostly soybeans and cotton . Three drowning fatalities were also reported . Several tornadoes were spawned in the state , the worst occurred in Ouachita Parish . It destroyed 5 homes , severely damaged 10 others , and inflicted minor impact on 100 houses . In Texas , flooding was more severe . More than 6 @, 200 homes received water damage , forcing hundreds of residents to evacuate and stranding thousands of other people . Three deaths occurred in Texas , all of which were teenage boys that drowned . In Mississippi , the storm caused \$ 60 million in losses and five drowning deaths . Widespread , but mostly minor flooding was reported elsewhere in the Eastern United States . Overall , damage was estimated to have reached \$ 360 ? 560 million and there 11 fatalities .

== Tropical Storm Barry ==

A tropical wave emerged into the Atlantic Ocean from the west coast of Africa on July 7 . The wave quickly developed a low @-@ level circulation by July 9 and was designated Tropical Depression Three at 1800 UTC , while located about midway between Africa and the Lesser Antilles . The

depression moved northwestward in response to an area of high pressure located north of the Azores . The depression strengthened and was upgraded to Tropical Storm Barry on July 11 . It slowly intensified and reached its peak intensity of 50 mph ( 85 km / h ) the next day . By July 13 , Barry weakened back to a depression and dissipated shortly after while located 545 miles ( 880 km ) northeast of the Lesser Antilles .

= = = Hurricane Chantal = = =

In late July , a tropical disturbance within the intertropical convergence zone ( ITCZ ) was first observed near Trinidad and Tobago . The disturbance later reached the Gulf of Mexico and developed into a tropical depression on July 30 . While heading north @-@ northwestward , the depression intensified and was upgraded to Tropical Storm Chantal on the following day . Thereafter , Chantal quickly strengthen and became a hurricane on August 1 . After intensifying slightly further , it made landfall near High Island , Texas later that day . The storm quickly weakened upon moving inland and fell to tropical storm intensity a few hours after landfall . Early on August 2 , Chantal weakened to a tropical depression and dissipated over Oklahoma by August 4 .

While making landfall in Texas , the storm produced relatively small tides , with most locations reporting waves less than 4 feet ( 1 @.@ 2 m ) in height . However , some locations experienced extensive beach erosion . In addition , there were numerous rescues made by the U.S. Coast Guard . Due to both rainfall and high winds at least 3 @, @ 000 homes were damaged , and numerous trees and sign were knocked down . Two tornadoes were reported , with one wrecking a shed in Crystal Beach , Texas , and the other knocking over several trees and mobile homes in Iota , Louisiana . Elsewhere , Chantal and its remnants brought light to moderate rainfall to several other states , although affects were minor in other states . Overall , 13 fatalities occurred , all of which due to drowning , and at least \$ 100 million in damage was reported .

= = = Hurricane Dean = = =

A tropical wave developed into Tropical Depression Five on July 31 , while situated about half way between Cape Verde and the Lesser Antilles . The following day , the depression intensified into Tropical Storm Dean . Heading generally west @-@ northwestward , Dean intensified into a hurricane on August 2 . The storm remained a Category 1 hurricane as it curved northward , bypassing the Lesser Antilles . Tracking northward , Dean accelerated and intensified into a Category 2 hurricane while bypassing Bermuda late on August 6 . Thereafter , Dean turned northeastward and weakened to a tropical storm , before making landfall in southern Newfoundland on August 8 . The storm continued in the northeast direction and lost tropical characteristics south of Greenland on the following day .

As Dean approached the Lesser Antilles , heavy rainfall and strong winds were reported in Antigua and Barbuda . However , no damage was reported . In Bermuda , winds gusted up to 113 mph ( 182 km / h ) and 3 ? 5 inches ( 76 @.@ 2 ? 127 mm ) of precipitation fell . Although Dean caused no fatalities , 16 people were injured . According to insurance claims , the storm damaged 648 buildings , 72 boats , 36 vehicles , and one pier . Additionally , strong winds downed power lines , leaving 65 @, @ 000 people without electricity . Overall , damage on the island was approximately \$ 8 @.@ 9 million , with \$ 3 @.@ 9 million incurred at the Naval Air Station Bermuda Annex. Storm surge up to 1 @.@ 7 feet ( 0 @.@ 52 m ) occurred in North Carolina , though no significant erosion was reported . In Atlantic Canada , light to moderate rainfall was reported , and tropical storm force winds were observed in some areas . Furthermore , waves at 26 ft ( 7 @.@ 92 m ) were reported on Sable Island .

= = = Tropical Depression Six = = =

A tropical wave developed into Tropical Depression Six on August 8 , while located about 125 miles ( 200 km ) east of easternmost islands of Cape Verde . While approaching the Lesser Antilles , a

tropical storm watch was issued . However , an upper @-@ level low increased wind shear on the system . As a result , the depression degenerated into a tropical wave on August 17 . The wave eventually split in two , with the southern part eventually becoming Hurricane Lorena in the eastern Pacific Ocean .

= = = Hurricane Erin = = =

An organized tropical wave emerged into the Atlantic Ocean from the west coast of Africa on August 16 . Convection diminished due to cooler sea surface temperatures , but a small , well @-@ defined low @-@ level circulation remained . The convection later redeveloped , and the system became a tropical depression early on August 18 , while located just southeast of Cape Verde . Thereafter , the interaction between the tropical depression , a tropical wave , and a subtropical system caused it to move north @-@ northwestward . The depression strengthened and was upgraded to Tropical Storm Erin at 1800 UTC on August 19 .

Erin continued to move north @-@ northwestward , until curving northward on August 21 . The storm intensified into a hurricane on August 22 , after being in the northeastern quadrant of an upper @-@ level low , which caused the flow aloft to become more divergent . It slowed and began to move northwestward while northeast of the upper @-@ level low . However , shortly thereafter , a wave moving westward forced Erin to move north and eventually north @-@ northeastward . Early on August 24 , the storm strengthened into a Category 2 hurricane . Later that day , Erin peaked with sustained winds of 105 mph ( 165 km / h ) . The storm then began to weaken and degenerated into a tropical storm on August 27 . Shortly thereafter , Erin transitioned into an extratropical cyclone over the far northern Atlantic .

= = = Hurricane Felix = = =

A tropical wave was observed over northwestern Africa on August 24 . By the following day , the system moved into the Atlantic Ocean near Dakar , Senegal . It immediately began organized and became Tropical Depression Eight at 0000 UTC on August 26 . The depression initially headed west @-@ northwestward and strengthened into Tropical Storm Felix later that day . Shortly thereafter , the storm grazed Cape Verde , with some islands reporting sustained winds near 35 mph ( 55 km / h ) . Between August 27 and August 29 , Felix drifted north @-@ northwestward in response to a persistent upper @-@ level trough . Southwesterly winds sheared away much of the deep convection , causing Felix to weaken back to a tropical depression on August 29 .

The storm then headed northwestward , until a weak frontal trough turned Felix northward on September 1 . Wind shear decreased , allowing Felix to become a tropical storm again on September 3 . The storm continued to strengthen while moving west @-@ northwestward and by early on September 5 , it became a hurricane . Later that day , Felix peaked with winds of 85 mph ( 140 km / h ) . Drifting north @-@ northeastward , the storm eventually began to accelerate , after weakening back to a tropical storm on September 7 , due to colder sea surface temperatures and increasing wind shear . At 1200 UTC on September 9 , Felix became extratropical while located well east of Cape Race , Newfoundland . The remnants later curved east @-@ southeastward and then dissipated on September 10 .

= = = Tropical Depression Nine = = =

Tropical Depression Nine developed from a tropical wave 490 mi ( 790 km ) east of Barbados on August 27 . However , on the following day , a reconnaissance aircraft did not indicate a low @-@ level circulation . Thus , the depression degenerated back into a tropical wave . Tropical Depression Nine did not re @-@ develop in the Atlantic or the Caribbean Sea , although the remnants entered the Pacific and regenerated into Hurricane Octave on September 8 .

= = = Hurricane Gabrielle = = =

The tenth tropical depression of the season developed from a tropical wave on August 30 . The depression quickly intensified into Tropical Storm Gabrielle on the following day . Gabrielle moved generally westward , but curved slightly west @-@ northwestward after intensifying into a hurricane on September 1 . Further intensification continued , and Gabrielle eventually peaked as a moderately strong Category 4 hurricane on September 5 . After peaking with sustained winds of 145 mph ( 230 km / h ) , Gabrielle slowly curved nearly due north . Gabrielle significantly weakened while heading northward , with sustained winds dropping from a low @-@ end Category 4 hurricane to a strong Category 2 hurricane within 12 hours on September 7 . While weakening as it headed northward , Gabrielle bypassed the island of Bermuda early on September 8 .

Gabrielle further weakened to a Category 1 hurricane late on September 8 , and became nearly stationary roughly almost halfway between Bermuda and Cape Race , Newfoundland . Gabrielle then weakened to a tropical storm and headed due westward on September 10 . Thereafter , the storm made a sharp turn to the northeast on September 11 and weakened to a tropical depression on the following day . By September 13 , the depression merged with a storm developing off Newfoundland . Although it never approached land , Gabrielle was an extremely large and powerful storm that generated swells up to 20 ft ( 6 m ) all the way from the Lesser Antilles to Canada . On Dominica , severe erosion occurred on the east and north coasts . Large waves responsible for eight deaths on the East Coast of the United States ; almost all of the fatalities occurred in New England . In Nova Scotia , waves reached a height of 30 ft ( 9 m ) . In addition , one fatality was reported in Canada , when a man drowned near Ketch Harbor , Nova Scotia .

= = = Hurricane Hugo = = =

A westward moving tropical wave developed into Tropical Depression Eleven on September 10 , while located southeast of Cape Verde . It headed generally westward and intensified into Tropical Storm Hugo on September 11 . Hugo became a hurricane by September 13 . After becoming a major hurricane early on September 15 , rapid intensification commenced , and less than 24 hours later , Hugo peaked as a Category 5 hurricane as winds of 160 mph ( 260 km / h ) and a minimum barometric pressure of 918 mbar ( 27 @.@ 1 inHg ) . Six hours later , Hugo weakened back to a Category 4 hurricane . After weakening on September 17 , Hugo entered the Caribbean Sea after passing between Guadeloupe and Montserrat with winds near 140 mph ( 230 km / h ) and later made landfall on St. Croix at the same intensity . Hugo was further downgraded to a Category 3 hurricane , before landfall on eastern Puerto Rico . The storm weakened to a Category 2 hurricane on September 18 , after re @-@ emerging into the Atlantic . As Hugo accelerated to the northwest , re @-@ intensification occurred , and it eventually reached a secondary peak intensity as a low @-@ end Category 4 hurricane . Early on September 22 , Hugo made landfall near Charleston , South Carolina with winds of 140 mph ( 225 km / h ) . After landfall , Hugo rapidly weakened as it turned to the northeast , and transitioned into an extratropical cyclone in northwestern Pennsylvania on September 23 . The remnants continued rapidly northeastward , and dissipated on September 25 near Greenland .

The storm caused significant damage in Guadeloupe due to winds of 140 mph ( 230 km / h ) . Eleven fatalities and 107 injuries were reported , while 10 @,@ 000 homes were destroyed , leaving 35 @,@ 000 people homeless . Crop losses were extreme , with the storm wiping out 100 % of the banana crop , 50 % of the sugar cane crop , and nearly all coconut crops . Ten people were killed on Montserrat , while 89 others were injured . Damage on the island topped \$ 260 million . In Antigua , one person was killed and 30 % of the homes damaged . Dominica suffered the loss of 80 % of its banana crop , and landslides cut off many towns for days . Two people were killed , 80 were injured , and 90 % of the buildings were damaged or destroyed on Saint Croix . About 3 @,@ 500 people were left homeless . Damage estimates for Saint Croix exceeded \$ 1 billion . Damage from erosion and crop losses in St. Kitts reached \$ 43 million and one fatality was reported . In Puerto Rico , the storm downed thousands of trees in the El Yunque National Forest and caused near complete destruction of coffee and damage crops . Extreme damage also occurred at Ceiba ,

Culebra , Fajardo , and Luquillo . Additionally , 28 @,@ 000 people were left homeless , 12 deaths were reported , and losses exceeded \$ 1 billion . In South Carolina alone , the Red Cross estimates that 3 @,@ 307 single family homes were destroyed , 18 @,@ 171 were inflicted major damage , and 56 @,@ 580 sustained minor impact . Additionally , more than 12 @,@ 600 mobile homes and 18 @,@ 000 multi @-@ family houses were either damaged or destroyed . There were 35 deaths and about \$ 5 @.@ 9 billion in damage in the state . The most significant impact elsewhere in the United States occurred in North Carolina , where 205 structure were destroyed , 1 @,@ 149 suffered major damage , and 2 @,@ 638 were inflicted minor impacts . There was one fatality and damaged reached \$ 1 billion . Overall , Hugo caused at least 88 fatalities and \$ 10 billion in losses , making it the costliest hurricane in the Atlantic basin , at the time .

#### = = = Tropical Storm Iris = = =

A tropical wave exited the west coast of Africa and entered the Atlantic Ocean on September 12 . After undergoing tropical cyclogenesis , a tropical depression developed around 18 : 00 UTC on September 16 , while located about halfway between the Windward Islands and the Cape Verde islands . It slowly strengthened and intensified into Tropical Storm Iris early on September 18 . Thereafter , the storm turned north @-@ northwestward and paralleled the Leeward Islands . Initially , there was uncertainty in its path due to potential for a Fujiwhara interaction with Hugo .

While passing east of the Lesser Antilles , Iris produced 7 @.@ 53 in ( 191 mm ) of rainfall on Saint John in the U.S. Virgin Islands , resulting in flooding . There were few reports of winds or precipitation on other islands , as Hugo destroyed observation stations a few days prior . On September 19 , Iris attained its maximum sustained wind speed of 70 mph ( 110 km / h ) . Thereafter , the storm weakened due to increased wind shear from Hugo . On September 21 , the winds decreased below tropical storm force , after the center became exposed from the convection . The next day , Iris dissipated while approaching the Bahamas , though a remnant circulation persisted and tracked toward southern Florida .

#### = = = Tropical Depression Thirteen = = =

A tropical wave developed into Tropical Depression Thirteen on October 2 , while located a few hundred miles east of the Lesser Antilles . Although the depression was predicted to intensify to near hurricane status by October 5 , a mid @-@ latitude trough increased wind shear , inducing weakening . Later on October 3 , the National Hurricane Center began to forecast weakening of the depression . The depression continued weakening and dissipated on October 5 .

#### = = = Hurricane Jerry = = =

A tropical wave emerged into the Atlantic Ocean from the west coast of Africa on September 23 . Only minimal development occurred as the wave crossed the Atlantic and Caribbean Sea . However , after crossing the Yucatán Peninsula and emerging into the Bay of Campeche on October 12 , it developed into a tropical depression . The system quickly intensified into Tropical Storm Jerry on the following day . Jerry tracked generally northward while intensifying and reached hurricane status on October 15 . After intensifying slightly more , Jerry made landfall near Jamaica Beach , Texas with winds of 85 mph ( 140 km / h ) . Jerry rapidly weakened after moving inland , and dissipated by October 16 . The remnants moved through the Tennessee Valley ahead of a frontal zone and eventually offshore the coast of the Mid @-@ Atlantic states .

Storm surge and rough surf along the coast of Texas destroyed a 20 mile ( 32 km ) section of Texas State Highway 87 , which was never repaired . Due to strong winds , about 52 @,@ 000 homes and businesses were left without electricity , most of them in the Galveston area . Many homes , businesses , and buildings were inflicted damage because of strong winds and three tornadoes spawned by the storm . Despite the issuance of a hurricane warning just eight hours prior to landfall , Jerry caused only three fatalities in Texas , possibly due to the storm 's small size ; a car fell over

the Galveston Seawall , killing its three occupants . Minor wind and coastal flood damage was reported in Louisiana . Jerry and its remnants brought flash flooding to portions of the Upland South , particularly in the states of Kentucky , Virginia , and West Virginia . In eastern Kentucky , hundreds of homes were flooded and many bridges , culverts , and roads were washed out ; this left hundreds of residents stranded . Damage in Kentucky reached at least \$ 5 million . Similar impact occurred in Virginia , with \$ 3 @. @ 4 million in damage in Buchanan County . In West Virginia , overflowing rivers in the western portions of the state forced hundreds to evacuate . Throughout the United States , Jerry resulted in about \$ 70 million in damage .

= = = Tropical Storm Karen = = =

A tropical wave moved off the coast of Africa on November 13 and failed to organize until reaching the western Caribbean Sea . Favorable conditions allowed convection to concentrate around a developing low @-@ level circulation . On November 28 , satellite imagery and reconnaissance aircraft indicated the development of a tropical depression just north of Honduras . The depression moved northwestward then northeastward , intensifying into Tropical Storm Karen on November 30 , while located southwest of Isla de la Juventud , Cuba . Within 12 hours of reaching tropical storm intensity , Karen peaked with maximum sustained winds of 60 mph ( 95 km / h ) . Around that time , a building ridge in the Gulf of Mexico forced the storm southeastward .

While Karen was threatening landmasses in the northwestern Caribbean Sea , tropical storm watches and warnings were issued for Cozumel on the Yucatán Peninsula , Isle de la Juventud , and western Cuba . The storm dropped heavy rainfall in Cuba , reaching over 15 in ( 380 mm ) on Isle de la Juventud . Wind gusts reached 60 mph ( 97 km / h ) , and there were reports of a tornado , but no damage or fatalities were reported . After affecting Cuba , Karen turned to the southwest while steadily weakening . It briefly threatened Belize , prompting a tropical storm watch , but the storm turned to the southeast and dissipated on December 4 ; its remnants later moved over Nicaragua . Karen was the last tropical cyclone to exist in December until Hurricane Nicole in 1998 .

= = Storm names = =

The following names were used for named storms that formed in the north Atlantic in 1989 . The names not retired from this list were used again in the 1995 season . This is the same list used for the 1983 season except for Allison , which replaced Alicia . Storms were named Allison , Erin , Felix , Gabrielle , Hugo , Iris , Jerry , and Karen for the first time in 1989 . The World Meteorological Organization retired one name in the spring of 1990 : Hugo . It was replaced in the 1995 season by Humberto . Names that were not assigned are marked in gray .

= = Season effects = =

The following table lists all of the storms that have formed in the 1989 Atlantic hurricane season . It includes their duration , names , landfall ( s ) ( in parentheses ) , damages , and death totals . Deaths in parentheses are additional and indirect ( an example of an indirect death would be a traffic accident ) , but were still related to that storm . Damage and deaths include totals while the storm was extratropical , a wave , or a low , and all of the damage figures are in 1989 USD .