= Typhoon Paka =

Typhoon Paka , known in the Philippines as Typhoon Rubing , was the last tropical cyclone in the 1997 Pacific Ocean hurricane and typhoon season , and was among the strongest Pacific typhoons in the month of December . Paka , which is the Hawaiian name for Pat , developed on November 28 from a trough well to the southwest of Hawaii . The storm tracked generally westward for much of its duration , and on December 7 it crossed into the western Pacific Ocean . Much of its track was characterized by fluctuations in intensity , and on December 10 the cyclone attained typhoon status as it crossed the Marshall Islands . On December 16 , Paka struck Guam and Rota with winds of 230 km / h (145 mph) , and it strengthened further to reach peak winds on December 18 over open waters . Subsequently , it underwent a steady weakening trend , and on December 23 Paka dissipated .

Typhoon Paka first impacted the Marshall Islands , where it dropped heavy rainfall and left US $ 80 million in damages . Later , it passed just north of Guam , where strong winds destroyed about 1 @,@ 500 buildings and damaged 10 @,@ 000 more ; 5 @,@ 000 people were left homeless , and the island experienced a complete power outage following the typhoon . Damage on the island totaled US $ 500 million , which warranted the retirement of its name . Paka also caused minor damage in the Northern Mariana Islands , and overall the typhoon caused no reported fatalities .

= = Meteorological history = =

As the weather synoptics of the northern Pacific Ocean transitioned into a late @-@ fall to early winter @-@ type pattern , convection from the monsoon trough extended to the east of the International Date Line . During late November , a westerly disturbance developed into twin troughs on opposite sides of the equator ; the one in the Southern Hemisphere ultimately developed into Tropical Cyclone Pam , while the one in the Northern Hemisphere formed into an area of convection about 2000 km (1240 mi) southwest of Hawaii . The disturbance gradually organized as it drifted north @-@ northeastward , and on November 28 it developed into Tropical Depression Five @-@ C about 465 km (290 mi) west @-@ northwest of Palmyra Atoll . Operationally , the Central Pacific Hurricane Center (CPHC) did not begin issuing warnings on the system until December 2 .

The tropical depression continued drifting north @-@ northeastward , and failed to strengthen significantly . It turned to the west on December 1 , due to the presence of a strong anticyclone to its north with a ridge extending westward past the International Date Line . On December 2 , based on satellite estimates , the CPHC upgraded the depression to Tropical Storm Paka while located about 1000 km (625 mi) south @-@ southeast of Johnston Atoll . Due to the presence of high clouds across the area , forecasters had difficulty at times in locating the low @-@ level circulation . After becoming a tropical storm , Paka remained nearly stationary for about two days before resuming a slow motion to the west @-@ southwest . It steadily intensified due to warm water temperatures , and on December 3 the storm attained winds of 105 km / h (65 mph) . The next day , however , it encountered dry air and began weakening ; by December 6 , the winds had decreased to minimal tropical storm status for about 12 hours . Subsequently , Paka began to re @-@ intensify , and on December 7 the storm crossed the International Date Line into the western North Pacific Ocean with winds of 80 km / h (50 mph) .

Upon entering the western North Pacific Ocean , tropical cyclone warning duties transferred from the CPHC to the Japan Meteorological Agency (JMA) , and the JMA first assessed Paka as a 65 km (40 mph) storm . The Joint Typhoon Warning Center (JTWC) unofficially assumed warning duties for interests in the United States Department of Defense . Paka continued to intensify after crossing the date line , and from late on December 7 through early the following day it remained a strong tropical storm . However , upper @-@ level wind shear increased , and it again weakened . At 1200 UTC on December 9 , the JTWC assessed Paka as an 85 km / h (50 mph) tropical storm and forecast it to continue weakening . By December 10 , the shear had begun to decrease as the storm moved through the Marshall Islands , and that night the JTWC upgraded Paka to typhoon status . Paka officially attained typhoon status when JMA classified it with winds of 120 km / h (75

mph) at 0000 UTC on December 11 .

After attaining typhoon status , Paka strengthened fairly quickly , and by December 12 it reached sustained winds of 150 km / h (90 mph) for a ten @-@ minute (10 min) duration , or 215 km / h (135 mph) over a one @-@ minute (1 min) duration . Subsequently , it briefly weakened as its forward motion increased . However , Paka again re @-@ intensified , and at 1200 UTC on December 14 it attained the unofficial ranking of super typhoon status while over the open Pacific Ocean . At the same time , the JMA classified it with 10 min sustained winds of 175 km / h (110 mph) . After reaching its initial peak intensity , Typhoon Paka began to weaken as it approached the southern Mariana Islands ; the NEXRAD Doppler weather radar from Guam revealed the presence of a primary eyewall of 74 km (46 mi) in diameter , with a fragmented inner wall cloud of 19 km (11 mi) in diameter . Additionally , satellite imagery indicated an eyewall mesovortex within the eye of the typhoon . It slowed and began to re @-@ intensify as it continued westward , and at 0530 UTC on December 16 the northern portion of the outer eyewall of Paka passed over the island of Rota ; 20 minutes later , the southern portion of the inner wall cloud moved across northern Guam . As it tracked through the Rota Channel , the center of Paka passed about 8 km (5 mi) north of the northern tip of Guam , its closest approach to the island .

Typhoon Paka continued to steadily intensify after passing the Marianas Islands , and late on December 17 it reached its peak intensity of 185 km / h (115 mph 10 min sustained) while located 440 km (275 mi) west @-@ northwest of Guam . Early on December 18 , the JTWC assessed it as attaining peak winds of 295 km / h (185 mph 1 min winds) . On December 19 , it entered the area of responsibility of the Philippine Atmospheric , Geophysical and Astronomical Services Administration , or PAGASA , and was named Rubing . Shortly thereafter , Paka moved through an area of progressively increasing wind shear , which resulted in a steady weakening trend . By December 21 , winds decreased to tropical storm status . The next day , it degenerated into a tropical depression before it dissipated on December 23 .

= = Preparations and impact = =

= = = Marshall Islands = = =

Prior to the typhoon passing through the Marshall Islands , several hundred residents on the island of Ebeye fled to safer structures . The threat of Paka prevented Continental Micronesia from flying in or out of the area .

Paka entered the Marshall Islands between Mili and Majuro as a tropical storm on December 10 , and after strengthening into a typhoon , it left the archipelago on December 14 . The cyclone affected several islands in the nation , and the Majuro and Kwajalein atolls reported wind gusts in excess of 75 km / h (45 mph) . On Jaluit Atoll , the typhoon dropped 217 mm (8 @.@ 54 in) of precipitation in six hours , with a total of about 300 mm (11 @.@ 8 in) recorded in 30 hours . Strong waves inundated low @-@ lying islands , which flooded crops with salt water . The combination of the wind and flooding caused severe damage to banana , papaya , and lime trees across the territory . Typhoon Paka damaged 70 % of the houses on Ailinglaplap Atoll , and most of the coconut trees on the atoll were left toppled or damaged . Strong winds left large portions of Ebeye island without electricity or telephone . The typhoon caused no reported deaths or injuries in the region , and damage was estimated at US $ 80 million .

= = = Guam = = =

The Guam National Weather Service issued a typhoon watch on December 14 , which was upgraded to a typhoon warning the next day . The Antonio B. Won Pat International Airport was closed during the passage of Paka , with only emergency flights permitted .

Passing a short distance north of the island , Typhoon Paka produced strong winds across northern Guam , though reliable wind reports are incomplete due to the long duration and intensity of the

winds . The highest reading believed to be reliable was at Apra Harbor . There , a station recorded a wind gust of 277 km / h (171 mph) before the sensor failed as winds shifted to the southwest ; since the winds from the southwest were stronger and of greater duration , officials believe gusts there reached 297 km / h (184 mph) . Additionally , Andersen Air Force Base recorded a peak wind gust of 381 km / h (236 mph) , which at the time was considered the highest wind speed on record , surpassing the 1934 world record of 372 km / h (231 mph) on Mount Washington in New Hampshire . However , a subsequent wind survey of the area discarded the reading at the base , as it was considered unreliable . As microbarographs are less exposed than wind sensors , pressure readings on the island are considered accurate ; the lowest reading on the island was 948 hPa (27 @.@ 99 inHg) at Andersen Air Force Base . In two days , the typhoon dropped about 533 mm (21 in) of precipitation on the northern portion of the island , or about 89 % of the monthly rainfall total . Waves along northern Guam reached about 11 m (35 ft) in height .

 The strong winds from Paka left around 1 @,@ 500 buildings destroyed on the island , of which 1 @,@ 160 were single @-@ family homes . A further 10 @,@ 000 buildings sustained damage to some degree , with 60 % of the homes on the island reporting major damage . In all , about 5 @,@ 000 people were left homeless due to the typhoon . Additionally , an estimated 30 ? 40 % of the public buildings received major damage . Buildings on the island made of reinforced concrete fared well , as opposed to light metal @-@ frame structures , which more often than not were destroyed . Large tourist hotels near Hagåtña , on which Guam is dependent , received generally minor damage , such as broken windows and damaged power generators .

 A complete island @-@ wide power outage followed the typhoon ; damage to the main electrical transmission and distribution system was estimated at USD16 million . Following the passage of the typhoon , 25 % of the homes on Guam were left without water . Telephone service remained working after the storm , due to most lines being underground . Strong waves washed away a few coastal roads in the northern portion of the island , leaving them temporarily closed . The waves surpassed the seawall at Apra Harbor , damaging the road and infrastructure of the seaport ; many boats were washed ashore after breaking from their moorings . Strong winds damaged a radar system and lights along the runway of the Antonio B. Won Pat International Airport , though most airport facilities received light damage . Andersen Air Force Base also sustained heavy damage , with hundreds of downed trees and many facilities left damaged . Across Guam , damage was estimated at USD500 million . About 100 people were injured , but the typhoon caused no deaths on the island .

= = = Northern Mariana Islands = = =

 A typhoon watch was issued for Rota , Tinian , and Saipan on December 14 , which was upgraded to a typhoon warning the next day . Because Paka was intensifying while passing to the south of Rota , the first wind , or northeast through east winds , was less severe than the second wind from the southeast . Sustained winds on the island reached 145 km / h (90 mph) , with gusts reaching 185 km / h (115 mph) . Many trees in the mountainous portion of the island were left defoliated , which limited nesting and foraging sites for the endangered bridled white @-@ eye bird . While passing to the south of the island , Paka dropped 250 ? 300 mm (10 ? 12 in) of rain . Damage on the island totaled $ 4 @.@ 4 million (1997 USD , $ 6 @.@ 4 million 2015 USD) . The typhoon also produced above @-@ normal precipitation on Saipan .

= = Aftermath = =

 Following the passage of the typhoon in the Ailinglaplap Atoll in the Marshall Islands , residents experienced severe food shortages due to damaged crops and little rainfall . Experts estimated the entire redevelopment of its fauna would require more than a decade . As a result of the crop shortage , large @-@ scale evacuations of the islands ' residents were considered . Officials in the nation requested assistance from the Federal Emergency Management Agency of the United States , and on March 20 , 1998 , the area was declared a disaster area ; the declaration allowed for the

usage of emergency funds .

On December 17 , 1997 , President Bill Clinton declared Guam a federal disaster area , making it eligible for federal assistance . One week later , a disaster declaration was ordered for the Northern Mariana Islands . Ultimately , FEMA received 14 @,@ 770 Individual Assistance Applications from residents on Guam . In turn , FEMA provided the residents with over $ 27 million in assistance (1997 USD , $ 39 million 2015 USD) . The entire island of Guam was left without power after Paka . Water and sewage systems on Guam were directly affected minimally by the typhoon . With the usage of power generators , most areas of the island had water pumping capabilities within a few days after the typhoon . The Antonio B. Won Pat International Airport was partially reopened to daytime flights a day after the typhoon , and by a week after the passage of Paka the airport was fully re @-@ opened .

= = = Retirement = = =

Due to the heavy damage from the typhoon , the Central Pacific Hurricane Center requested the retirement of the name in April 2006 ; the name Paka was replaced with Pama .