

= Typhoon Sarah (1989) =

Typhoon Sarah , known in the Philippines as Typhoon Openg , was a powerful typhoon that caused extensive damage along an erratic path across the Western Pacific in September 1989 . Originating from a disturbance within a monsoon trough in early September , Sarah was first classified as a tropical depression near the Mariana Islands on September 5 . Moving quickly westward , the depression soon strengthened into Tropical Storm Sarah . On September 8 , the storm abruptly turned southward and temporarily attained typhoon status . Following a series of interactions with secondary areas of low pressure , the storm turned northward the following day . By September 11 , Sarah entered a region favoring development and underwent a period of explosive intensification . At the end of this phase , the storm attained its peak intensity as a Category 4 ? equivalent typhoon on the Saffir ? Simpson Hurricane Scale . The typhoon subsequently weakened rapidly and made two landfalls in Taiwan by September 12 . After moving over the Taiwan Strait , Sarah made its final landfall in Eastern China on September 13 before dissipating the following day .

While the typhoon meandered near the Philippines , it brought several days of heavy rain to much of Luzon , triggering extensive flash flooding . At least 44 people perished across the country and another 200 @, @ 000 were left homeless . Striking Taiwan as a strong typhoon , Sarah caused widespread wind damage that left approximately 840 @, @ 000 residents without power . Excessive rainfall associated with the storm triggered flooding that washed away highways and inundated about 40 @, @ 500 hectares (100 @, @ 000 acres) of farmland . Throughout the island , Sarah was responsible for 19 fatalities and at least \$ 171 million USD (4 @. @ 38 billion New Taiwan dollars) in damage . Four deaths also took place on the Got? Islands . Additionally , four deaths took place offshore and another seventeen people were listed as missing .

= = Meteorological history = =

In early September 1989 , a monsoon trough became established across the western Pacific . By September 3 , a disturbance formed within the trough approximately 1 @, @ 100 km (685 mi) southeast of the Japanese island of Minamitorishima . Initially , a tropical upper tropospheric trough (TUTT) to the northwest inhibited convective development ; however , " complex interactions " , according to Lt. Cdr . Nicholas D. Gural , later occurred between the TUTT cell , the initial disturbance , and a second disturbance , which resulted in favorable conditions for tropical cyclogenesis . Due to the improved environment , the Joint Typhoon Warning Center (JTWC) issued two Tropical Cyclone Formation Alerts on the system on September 5 . By this time , the Japan Meteorological Agency (JMA) began monitoring the system as a tropical depression . Ultimately , the JTWC issued their first advisory on Tropical Depression 22W early on September 6 , at which time the depression was situated northwest of the Mariana Islands .

Initially , the depression tracked west @- @ southwestwards and gradually intensified ; however , after being upgraded to Tropical Storm Sarah late on September 6 , the system turned northwestward and accelerated towards Okinawa . By September 8 , Sarah decelerated as it underwent a binary interaction with a secondary area of convection to the southwest . This interaction caused the cyclone to abruptly turn southwestward towards the Philippines before nearly stalling on September 9 . During this time , the storm temporarily attained typhoon status , having estimated winds of 120 km / h (75 mph) . Coinciding with Sarah 's time as a typhoon , a new area of low pressure , classified as a " lee side low " , developed along the west coast of Luzon . Due to the cyclone 's proximity to the Philippines , the Philippine Atmospheric , Geophysical and Astronomical Services Administration also monitored the storm and assigned it with the local name Openg .

Later on September 9 , Sarah turned sharply northward as the lee side low rapidly tracked northeast . Reintensification gradually took place as the storm moved away from the Philippines , with the storm reaching typhoon status by September 10 . Tracking generally towards the north @- @ northwest , Sarah entered a favorable region for development and underwent a period of explosive intensification on September 11 . Over a six @- @ hour span , the storm 's winds

increased from 140 km / h (85 mph) to 215 km / h (135 mph) . A powerful typhoon , Sarah featured a well @-@ defined eye and multiple outflow channels . The storm reached its peak strength later that day as a Category 4 ? equivalent typhoon on the Saffir ? Simpson Hurricane Scale with winds of 230 km / h (145 mph) . The JMA assessed Sarah to have been somewhat weaker , estimating peak ten @-@ minute sustained winds of 150 km / h (90 mph) along with a barometric pressure of 950 mbar (hPa ; 28 @.@ 05 inHg) .

Forecasters at the JTWC initially projected the storm to track north of Taiwan on September 12 and merge with an approaching frontal system . Contrary to this , Sarah moved south of the expected path and quickly weakened as it interacted with the mountainous terrain of Taiwan . The storm eventually struck the island with winds of 165 km / h (105 mph) late on September 11 . Unexpectedly , the typhoon executed a counterclockwise loop and briefly moved offshore before making a second landfall 12 hours later along the northeastern coast of Taiwan as a tropical storm . Sarah failed to reorganize as it moved over the Taiwan Strait and later made its final landfall in Zhejiang , China as a minimal tropical storm on September 13 . The storm was last noted the following day as dissipating over Eastern China .

= = Impact = =

= = = Philippines = = =

Although the storm did not make landfall in the Philippines , its close proximity brought several days of heavy rain to Luzon , leading to widespread flash floods and mudslides . Landslides across the region isolated many cities , including Baguio . Rivers began exceeding their banks on September 10 and flooded surrounding areas . In the province of Ilocos Sur , ten people were killed in a single town after flood waters swept away many homes overnight . In many areas , waters were waist @-@ deep and officials advised residents in low @-@ lying areas to move to higher ground . Tropical storm force winds , recorded up to 88 km / h (55 mph) at the John Hay Air Base , also impacted the country . In Zambales Province , a tornado spawned by the typhoon injured three people and caused approximately \$ 90 @,@ 000 worth of damage . Another tornado struck the Clark Air Base , uprooting trees and damaging buildings . Losses from this tornado reached \$ 150 @,@ 000 .

At least 44 people were killed in various incidents related to Typhoon Sarah in the Philippines while another three were reported missing . A total of 1 @,@ 157 homes were destroyed and another 24 @,@ 638 sustained damage , leaving approximately 200 @,@ 000 people homeless . Damage from the storm was placed at \$ 4 @.@ 3 million . In light of the severity of damage caused by Sarah , a state of calamity was declared for northern provinces . Less than a week after the storm , additional rains in areas affected by Sarah triggered landslides that killed at least 16 people . Officials blamed the landslides on rocks loosened by the typhoon 's rains .

= = = Taiwan = = =

On September 10 , meteorologists across Taiwan warned residents of torrential rain across the country , especially in mountainous areas where more than 1 @,@ 000 mm (39 in) could fall . The Central Weather Bureau also advised vessels in the Bashi Channel to be cautious of rough seas associated with the typhoon . Most flights to and from the island were canceled by September 11 for the duration of the storm ; however , rail service continued for another day . Approximately 10 @,@ 000 volunteer firefighters were placed on alert and city police were called in to organize evacuation centers .

Striking Taiwan as a powerful typhoon , destructive winds battered coastal areas near where the center moved ashore . According to officials in Taiwan , winds were recorded up to 174 km / h (108 mph) with gusts to 208 km / h (129 mph) . These winds downed thousands of trees and power lines , leaving an estimated 840 @,@ 000 residents without electricity . A total of 272 @,@ 000

telephone lines were damaged or destroyed by the storm . Excessive rainfall triggered widespread flash flooding that inundated agricultural areas and paralyzed transportation as roads and bridges were washed away . On September 11 , the Suhua Highway was shut down due to landslides . In Hualien City , flood waters reached a depth of 1 @. @ 2 m (3 @. @ 9 ft) and several homes were destroyed , leaving roughly 100 people homeless . Across the island , 28 homes were destroyed and another 41 sustained damage . At least 19 people perished in Taiwan and another 14 were reported missing . At least 40 @, @ 500 hectares (100 @, @ 000 acres) of farmland was submerged by flood waters . Agricultural losses related to Typhoon Sarah reached \$ 171 million USD (4 @. @ 38 billion New Taiwan dollars) .

Offshore , a 12 @, @ 800 ton Panamanian freighter , the Lung Hao , broke in two amidst rough seas produced by the typhoon . Twenty @- @ one people were rescued by police after the vessel drifted 1 km (0 @. @ 62 mi) to shore ; however , four people were listed as missing . After two days of search and rescue efforts , officials deemed their chance of survival to be very slim and the four missing crew members were declared dead on September 14 .

= = = Elsewhere = = =

Heavy rains from the outer bands of Sarah also affected much of southwestern Japan . In the Got? Islands , 476 mm (18 @. @ 7 in) of rain triggered several landslides , one of which destroyed a two @- @ story home and killed four people . Additional rains , ranging from 30 to 200 mm (1 @. @ 2 to 7 @. @ 9 in) , fell in parts of Fujian and Zhejiang Provinces in China . No known damage resulted from the rainfall in China .