= Typhoon Tip =

Typhoon Tip , known in the Philippines as Typhoon Warling , was the largest and most intense tropical cyclone ever recorded . The nineteenth storm and twelfth typhoon of the 1979 Pacific typhoon season , Tip developed out of a disturbance from the monsoon trough on October 4 near Pohnpei . Initially , a tropical storm to the northwest hindered the development and motion of Tip , though after it tracked farther north Tip was able to intensify . After passing Guam , Tip rapidly intensified and reached peak winds of 305 km / h (190 mph) and a worldwide record @-@ low sea @-@ level pressure of 870 mbar (870 @.@ 0 hPa ; 25 @.@ 69 inHg) on October 12 . At its peak strength , it was also the largest tropical cyclone on record with a wind diameter of 2 @,@ 220 km (1 @,@ 380 mi) . Tip slowly weakened as it continued west @-@ northwestward and later turned to the northeast in response to an approaching trough . The typhoon made landfall in southern Japan on October 19 , and became an extratropical cyclone shortly thereafter .

U.S. Air Force aircraft flew 60 weather reconnaissance missions into the typhoon , making Tip one of the most closely observed tropical cyclones . Rainfall from Tip indirectly led to a fire that killed 13 Marines and injured 68 at Combined Arms Training Center , Camp Fuji in the Shizuoka Prefecture of Japan . Elsewhere in the country , the typhoon caused widespread flooding and 42 deaths ; offshore shipwrecks left 44 people killed or missing .

= = Meteorological history = =

Three circulations developed within the monsoon trough that extended from the Philippines to the Marshall Islands in October 1979 . A disturbance to the southwest of Guam developed into Tropical Storm Roger on October 3 , and later on the same day the tropical disturbance which would later become Typhoon Tip formed south of Pohnpei . Strong flow from across the equator was drawn into the Roger 's wind circulation , initially preventing significant development of the precursor disturbance to Tip . Despite the unfavorable air pattern , the disturbance gradually organized as it moved westward . Due to the large @-@ scale circulation pattern into Tropical Storm Roger , it moved erratically and slowly executed a cyclonic loop to the southeast of Chuuk . A reconnaissance aircraft flight into the system late on October 4 confirmed the existence of a closed low @-@ level circulation , and early on October 5 the Joint Typhoon Warning Center (JTWC) issued its first warning on Tropical Depression Twenty @-@ Three .

While executing a loop near Chuuk , the tropical depression intensified into Tropical Storm Tip , though the storm failed to organize significantly due to the influence of Tropical Storm Roger . Reconnaissance aircraft provided the track of the surface circulation , since satellite imagery estimated the center was located about 60 km (37 mi) from its true position . After drifting erratically for several days , Tip began a steady northwest motion on October 8 . By that time , Tropical Storm Roger had become an extratropical cyclone , resulting in the southerly flow to be entrained into Tip . An area of a tropical upper tropospheric trough moved to the north of Guam at the time , providing an excellent outflow channel north of Tip . Initially , the storm was predicted to continue northwestward and make landfall on Guam , though it turned to the west early on October 9 , passing about 45 km (28 mi) south of the island . Later that day , Tip intensified to attain typhoon status .

Owing to very favorable conditions for development , Typhoon Tip rapidly intensified over the open waters of the western Pacific Ocean . Late on October 10 , the typhoon attained wind speeds equal to Category 4 strength on the Saffir ? Simpson Hurricane Scale , and it became a super typhoon the next day . The central pressure dropped by 92 mbar (92 @.@ 0 hPa ; 2 @.@ 72 inHg) from October 9 to 11 , during which the circulation pattern of Typhoon Tip expanded to a record diameter of 2 @,@ 220 km (1 @,@ 380 mi) . The typhoon continued to intensify further , and early on October 12 reconnaissance aircraft recorded a worldwide record @-@ low pressure of 870 mbar (870 @.@ 0 hPa ; 25 @.@ 69 inHg) with winds of 305 km / h (190 mph) , when Tip was located about 840 km (520 mi) west @-@ northwest of Guam . In its best track , the Japan Meteorological Agency listed Tip as peaking with 10 @-@ minute sustained winds of 160 mph (260 km / h) . At the

time of its peak strength , its eye was 15 km (9 @.@ 3 mi) wide . Tip crossed the 135th meridian east on the afternoon of October 13 , prompting the Philippine Weather Bureau to issue warnings on Typhoon Tip , assigning it the local name Warling .

After peaking intensity , Tip weakened to 230 km / h (140 mph) and remained at that intensity for several days as it continued west @-@ northwestward . For five days after its peak strength , the average radius of winds stronger than 55 km / h (34 mph) extended over 1 @,@ 100 km (684 mi) . On October 17 , Tip began to weaken steadily and decrease in size , recurving northeastward under the influence of a mid @-@ level trough the next day . After passing about 65 km (40 mi) east of Okinawa , the typhoon accelerated to 75 km / h (47 mph) . Tip made landfall on the Japanese island of Honsh? with winds of about 130 km / h (81 mph) on October 19 . It continued rapidly northeastward through the country and became an extratropical cyclone over northern Honsh? a few hours after moving ashore . The extratropical remnant of Tip proceeded northeastward and gradually weakened , crossing the International Date Line on October 22 . It was last observed near the Aleutian Islands of Alaska .

= = Impact = =

The typhoon produced heavy rainfall early in its lifetime while passing near Guam , including a total of 23 @.@ 1 cm (9 @.@ 09 in) at Andersen Air Force Base . The outer rainbands of the large circulation of Tip produced moderate rainfall in the mountainous regions of the Philippine island of Luzon .

Heavy rainfall from the typhoon breached a flood @-@ retaining wall at Camp Fuji , a training facility for the United States Marine Corps near Yokosuka . Marines inside the camp weathered the storm inside huts situated at the base of a hill which housed a fuel farm . The breach led to hoses being dislodged from two rubber storage bladders , releasing large quantities of fuel . The fuel flowed down the hill and was ignited by a heater used to warm one of the huts . The resultant fire killed 13 Marines , injured 68 , and caused moderate damage to the facility . The facility 's barracks were destroyed , along with fifteen huts and several other structures . The barracks were rebuilt , and a memorial was established for those who lost their lives in the fire .

During recurvature , Typhoon Tip passed about 65 km (40 mi) east of Okinawa . Sustained winds reached 72 km / h (44 mph) , with gusts to 112 km / h (69 mph) . Sustained wind velocities in Japan are not known , though they were estimated at minimal typhoon strength . The passage of the typhoon through the region resulted in millions of dollars in damage to the agricultural and fishing industries of the country . Eight ships were grounded or sunk by Tip , leaving 44 fishermen dead or unaccounted for . A Chinese freighter broke in half as a result of the typhoon , though its crew of 46 were rescued . The rainfall led to over 600 mudslides throughout the mountainous regions of Japan and flooded more than 22 @,@ 000 homes ; 42 people died throughout the country , with another 71 missing and 283 injured . River embankments broke in 70 places , destroying 27 bridges , while about 105 dikes were destroyed . Following the storm , at least 11 @,@ 000 people were left homeless . Tip destroyed apple , rice , peach and other crops . Five ships sank in heavy seas off the coast and 50 @-@ story buildings swayed in the capital , Tokyo . Transportation in the country was disrupted ; 200 trains and 160 domestic flights were canceled . Tip was described as the most severe storm to strike Japan in 13 years .

= = Records and meteorological statistics = =

Typhoon Tip was the largest tropical cyclone on record , with a diameter of 1 @,@ 380 mi (2 @,@ 220 km) ? almost double the previous record of 700 mi (1 @,@ 130 km) set by Typhoon Marge in August 1951 . At its largest , Tip was nearly half the size of the contiguous United States . The temperature inside the eye of Typhoon Tip at peak intensity was 30 ° C (86 ° F) and described as exceptionally high . With 10 @-@ minute sustained winds of 160 mph (260 km / h) , Typhoon Tip is the strongest cyclone in the complete tropical cyclone listing by the Japan Meteorological Agency .

The typhoon was also the most intense tropical cyclone on record , with a pressure of 870 mbar (

25 @.@ 69 inHg) , 6 mbar (0 @.@ 18 inHg) lower than the previous record set by Super Typhoon June in 1975 . The records set by Tip still technically stand , though with the end of routine reconnaissance aircraft flights in the western Pacific Ocean in August 1987 , modern researchers have questioned whether Tip indeed remains the strongest . After a detailed study , three researchers determined that two typhoons , Angela in 1995 and Gay in 1992 , registered higher Dvorak numbers than Tip , and concluded that one or both of the two may have therefore been more intense . Other recent storms may have also been deeper than Tip at its peak ; for instance , satellite @-@ derived intensity estimates for Typhoon Haiyan of 2013 indicated that its core pressure may have been as low as 858 mbar (25 @.@ 34 inHg) . Due to the dearth of direct observations into these cyclones , conclusive data are lacking . Also , the peak intensity of Hurricane Patricia in 2015 was estimated to be a pressure of 872 mbar (25 @.@ 75 inHg) and winds of 215 mph (345 km / h) , officially making it the second most intense tropical cyclone in world history , and the strongest by wind speed . However , in the NHC 's report on Patricia , it was noted that Patricia may have , in fact , reached a lower pressure than Tip for a brief period of time . If confirmed , this would make Patricia the most intense tropical cyclone on record .

Despite the typhoon 's intensity and damage , the name Tip was not retired and was reused in 1983 , 1986 , and 1989 .