

= Cyclone Ivy =

Severe Tropical Cyclone Ivy (Fiji Meteorological Service designation : 05F , Joint Typhoon Warning Center designation : 13P) was a tropical cyclone that affected about 25 % of the population of Vanuatu in February 2004 . It was first classified as a tropical disturbance on February 21 between Vanuatu and Fiji . The system tracked northwestward , gradually organizing and intensifying . After attaining tropical storm status on February 23 , Ivy strengthened more quickly as it turned southwestward toward Vanuatu . It attained peak winds of 165 km / h (105 mph) while moving over Vanuatu , making it an intense Category 4 cyclone on the Australian Region Tropical Cyclone Intensity Scale . By the time it passed through Vanuatu , Ivy had turned southeastward , and it gradually weakened while accelerating . After becoming extratropical on February 28 , it passed just east of New Zealand and eventually dissipated on March 2 .

The third significant cyclone in 14 months to affect the region , Ivy produced heavy rainfall and high winds in Vanuatu . Due to advance warning , only two people were killed , and several people were injured . The high winds damaged about 11 @, @ 000 houses , leaving many people homeless . The cyclone passed very close to the Vanuatu capital city of Port Vila , forcing the evacuation of about 2 @, @ 000 people and shutting down the main port . Cyclone Ivy also affected the Solomon Islands and New Caledonia with rainfall , and later it produced high waves in New Zealand that killed two people . Because of its severe damage on Vanuatu , the name Ivy was retired following its usage .

= = Meteorological history = =

In the middle of February 2004 , a monsoon trough formed in the southwest Pacific Ocean during the middle of a Madden ? Julian oscillation pulse . A low pressure area developed along the trough , and the Fiji Meteorological Service (FMS) designated it Tropical Disturbance 5F on February 21 about halfway between Vanuatu and Fiji . Initially , the system was moving little and had a circulation that was detached from the primary area of convection . On February 22 after the thunderstorms increased , the Joint Typhoon Warning Center (JTWC) initiated advisories on the disturbance with the designation Tropical Cyclone 13P . Shortly thereafter , the FMS reported that the disturbance developed into a tropical depression , although the convection was transient and displaced from the circulation . The system tracked west @-@ northwestward , due to a ridge located to its south . With low wind shear and good outflow , the system gradually organized , with the circulation becoming situated underneath the convection . At 0300 UTC on February 23 , the FMS upgraded it to a tropical cyclone and gave it the name Ivy while the storm was about 510 km (315 mi) northeast of Port Vila , Vanuatu .

After being named , Ivy quickly intensified after its convection was drawn into the circulation . Late on February 23 , the JTWC upgraded Ivy to the equivalent of a Category 1 hurricane on the Saffir @-@ Simpson scale , and the FMS followed suit the following day by upgrading Ivy to a severe tropical cyclone as continued favorable conditions allowed for rapid deepening . On February 24 the cyclone began a turn to the southwest as it moved around the ridge , and the next day it turned to the south toward Vanuatu as an approaching shortwave trough passed to the south and created a weakness in the ridge . A nearby upper @-@ level low temporarily cut off outflow , although once it moved further away the low enhanced ventilation . Strengthening continued and , late on February 25 , the FMS reported that Ivy attained peak 10 ? minute sustained winds of 165 km / h (105 mph) over the Vanuatu archipelago ; this made it a Category 4 on the Australian Region Tropical Cyclone Intensity Scale . Around the same time , the JTWC estimated peak 1 ? minute sustained winds of 195 km / h (120 mph) , after a 19 km (12 mi) eye developed .

After passing slowly through Vanuatu , Ivy began accelerating to the southeast and its eye passed very close to the capital city of Port Vila , after moving over the island of Epi . As the cyclone moved away from the island group , it underwent an eyewall replacement cycle . In addition , the combination of cooler water temperatures , greater wind shear , less outflow , and land interaction with Vanuatu caused gradual weakening . Late on February 27 , Ivy entered the area of warning responsibility of the Wellington Regional Specialized Meteorological Center . The convection rapidly

diminished and left the circulation exposed , and Ivy transitioned into an extratropical cyclone on February 28 . It remained strong and maintained a well @-@ defined circulation as it passed just east of East Cape , New Zealand . Continuing southeastward , the extratropical remnants crossed the International Dateline on February 29 , and Ivy dissipated about 1800 km (1100 mi) southeast of New Zealand on March 2 .

= = Preparations and impact = =

While Ivy was reaching peak intensity , it passed through Vanuatu , becoming the third major cyclone in 14 months to affect the region , after Cyclone Zoe and Cyclone Gina . Its threat prompted over 2 @,@ 000 people in Port Vila to evacuate . While Ivy moved through the country , a station on Anatom island recorded winds of 130 km / h (80 mph) , which were the highest sustained winds observed in the nation . In addition , the cyclone dropped heavy rainfall , reaching 254 @.@ 4 mm (10 @.@ 02 in) at Bauerfield International Airport in Port Vila . The central area of deep convection moved across every island in the archipelago .

As the cyclone moved through Vanuatu , it cut off communications between the various islands , and also knocked Radio Vanuatu offline . Overall there was widespread moderate damage , with small areas of heavier damage . The cyclone affected more than 54 @,@ 000 people ? about 25 % of the population ? on various islands , including Paama , Epi , Ambrym , eastern Malekula , northern Aoba , and northern Maewo . On Ambrym island , the winds wrecked the roofs of houses and downed trees and vegetables . Overall , about 11 @,@ 000 houses were damaged , and a large proportion of the 24 @,@ 000 people in Ivy 's path became homeless due to the destruction of their houses , with many buildings made of iron and bamboo wrecked . In addition , the winds downed trees and power lines .

Heavy damage occurred in the capital city of Port Vila , where flooding washed out small bridges . Strong waves wrecked the main port there and also capsized two boats . High winds downed trees and blocked roads across the capital , with 70 % of the nation 's roads affected . Several people were injured due to flying debris , and one person was severely injured due to the storm . The high winds affected 80 % of the nation 's food crops , including the loss of much of the mango and banana crops as well as the ruination of about 75 % of the coconut and cocoa crops . The latter loss was significant due to its status as a cash crop . The cyclone damaged 90 % of the water facilities across the archipelago . It also damaged about 60 % of the health centers , as well as 112 schools , some of which were completely destroyed . Monetary damage was estimated at VT427.6 million (2004 VUV , \$ 3 @.@ 8 million 2004 USD) . Due to advance warning , there were only two deaths in Vanuatu , including one when a landslide killed a woman on Malakula island .

In addition to affecting Vanuatu , Ivy produced heavy rainfall in Tikopia and Anuta , two small islands in the southeastern Solomon Islands . Later , intense rainbands spread across the Loyalty Islands in New Caledonia . Along the Bay of Plenty in New Zealand , the extratropical remnants of Ivy produced high waves that killed two people in Whakatane . The storm produced a 1 in 10 year storm surge as it passed the country that peaked at 1 @.@ 04 m (3 @.@ 4 ft) at Omaio . The surge , in combination with waves , reached about 5 m (16 ft) at Papamoa , based on the position of debris on the beach . Wind gusts reached 79 @.@ 7 km / h (49 @.@ 5 mph) at the Whakatane Airport , and the combination of winds and waves produced beach erosion along the coast .

= = Aftermath = =

The local Red Cross offices in Port Vila and Luganville prepared general relief supplies before the storm 's arrival , including tents , tool kits , and first aid units . By four days after the cyclone 's passage , the main wharf in Port Vila was re @-@ opened and the two sunken boats were removed . Additionally , the evacuees were allowed to return to their homes , and communications between the various islands were restored . The Red Cross distributed various relief supplies to the affected citizens , including candles , matches , water , and blankets . By about two weeks after the storm , about 30 @,@ 000 household relief packages were distributed . The Vanuatu government allocated

VT25 million (2004 VUV , \$ 236 @,@ 000 2004 USD) for the affected citizens . Overall , the cyclone severely affected the daily lives of the Vanuatu citizens . On Tanna island , the cyclone 's passage produced a malaria outbreak .

In the immediate aftermath , the New Zealand Red Cross provided \$ 10 @,@ 000 (2004 NZD) for essential relief supplies . In addition , the New Zealand government provided \$ 70 @,@ 000 for assistance in the most affected areas , after the country 's Air Force dispatched a plane over Vanuatu to determine the extent of damage . The Government of Australia similarly sent a helicopter reconnaissance mission to determine damage , as well as two planes with \$ 200 @,@ 000 (2004 AUD) in relief supplies , including 2 @,@ 400 tarps , 2 @,@ 600 water containers , and 5 @,@ 200 packets of water purification tablets . The French government also sent a helicopter and assistance as per the 1992 FRANZ Agreement between New Zealand , Australia , and France .

Due to the severity of damage wrought by the cyclone , the World Meteorological Organization retired the name Ivy following its usage and replaced it with Irene . Ivy was retired along with earlier Cyclone Heta ; the two were the only named storms to form within the basin that season .