= 1990 ? 91 South @-@ West Indian Ocean cyclone season =

The 1990 ? 91 South @-@ West Indian Ocean cyclone season was fairly quiet , although activity began early and the final named storm formed at a record late date . There were seven named storms classified by the Météo @-@ France office (MFR) on Réunion , as well as three depressions ; an additional depression was classified by the Joint Typhoon Warning Center (JTWC) , an unofficial warning agency . The JTWC tracked storms in both September and October , although neither affected land . In late November , another short @-@ lived depression formed in the northeastern portion of the basin . Activity remained minimal until January , when Tropical Storm Alison formed in the eastern portion of the basin . Later in the month , Cyclone Bella became the strongest storm of the season , reaching 10 ? minute maximum sustained winds of 155 km / h (100 mph) . It passed near the island of Rodrigues , becoming the worst cyclone there in 20 years and killing half of the population of one endangered species . Bella also likely caused a cargo ship to go missing with 36 people on board .

Three storms developed in short succession in the second half of February . Cyclone Cynthia developed rapidly in the Mozambique Channel on February 16 and struck western Madagascar , killing 36 people and ruining local rice harvests . A residual trough after Cynthia dissipated spawned Tropical Storm Debra , which looped in the Mozambique Channel . Toward the end of the month , Tropical Storm Elma exited the basin into the adjacent Australian region , only to re @-@ enter the south @-@ west Indian Ocean and dissipate . Long @-@ lived Cyclone Fatima originated in the Australian basin in late March and changed directions before becoming extratropical . On April 2 , a tropical depression struck eastern Madagascar , killing 18 people . The final storm , Gritelle , was named on June 10 , the latest on record .

= = Seasonal summary = =

During the season , the Météo @-@ France office (MFR) on Réunion island issued warnings in tropical cyclones within the basin . The agency estimated intensity through the Dvorak technique , and warned on tropical cyclones in the region from the coast of Africa to 90 ° E , south of the equator . Beginning in November 1990 , MFR utilized a high resolution picture transmission station in conjunction with its satellite imagery . This allowed for improved Dvorak ratings , allowing for zooming and adjusting the satellite pictures . The Joint Typhoon Warning Center (JTWC) , which is a joint United States Navy ? United States Air Force task force , also issued tropical cyclone warnings for the southwestern Indian Ocean . In addition to the named storms , the MFR also tracked four tropical depressions , named A1 , A2 , A3 , and G1 .

In general , the monsoon was weaker than normal within the basin , which provided less flow across the equator to spawn tropical cyclones . As a result , there was a marked decrease in overall activity compared to the 1989 ? 90 season . The MFR issued 198 cyclone bulletins during the season , a 40 % decrease over the previous year . Many of the storms formed at the edge of satellite coverage .

= = Storms = =

= = = Severe Tropical Storm Alison = = =

A southward @-@ moving anticyclone influenced the monsoon trough to spawn a tropical disturbance on January 8 , located east of Diego Garcia . The system moved to the east without much organization , turning to the southwest on January 11 around a ridge . On the next day , the JTWC classified the system as Tropical Cyclone 07S , the same day that the MFR upgraded the depression to Tropical Storm Alison . Conditions favored further strengthening , and Alison gradually intensified to peak 10 ? minute sustained winds of 115 km / h (70 mph) on January 15 , according to the MFR . On the same date , the JTWC assessed peak 1 ? minute winds of 120 km / h (75 mph

) , equivalent to a minimal hurricane . By that time , the storm had turned more to the south @-@ southeast , and began to weaken on January 16 . Two days later , Alison weakened to tropical depression status and dissipated .

= = = Tropical Cyclone Bella = = =

Similar to Alison , Bella originated on January 18 from a surge in the monsoon trough to the southwest of Sumatra . For several days , the system remained weak as it moved generally west @-@ southwestward . On January 25 , it intensified to tropical storm status , but Bella took three more days to intensify to tropical cyclone status , or with 10 ? minute maximum sustained winds of 120 km / h (75 mph) . The cyclone attained peak intensity on January 29 , officially reaching winds of 155 km / h (100 mph) . The JTWC unofficially estimated winds of 240 km / h (150 mph) , the highest the agency estimated for any storm in the Southern Hemisphere in the year . Bella later turned to the southeast and weakened , passing about 50 km (30 mi) west of Rodrigues on January 31 . The storm turned to the south @-@ southwest and back to the southeast again , becoming extratropical on February 4 .

While passing near Rodrigues , Bella produced strong winds and high tides , the latter of which caused flooding in the capital Port Mathurin . The storm was considered the worst on the island in 20 years . About 1 @,@ 500 homes were damaged or destroyed , leaving 1 @,@ 000 people homeless . Bella also severely damaged crops , roads , and the power grid on Rodrigues . The storm killed about half of the Rodrigues flying fox , a critically endangered species . Elsewhere , Bella was believed to have sunk a Madagascar cargo ship , with its 36 people on board .

= = = Tropical Cyclone Cynthia = = =

For several days beginning on February 9 , an area of convection persisted in the Mozambique Channel off the southeast coast of Mozambique , between the towns of Beira and Quelimane . On February 15 , deep convection increased greatly , leading to a tropical disturbance forming at 06 : 00 UTC the next morning . Also on February 16 , the JTWC initiated advisories on Tropical Cyclone 10S . Moving southeastward , the convection quickly organized around the center , aided by warm sea surface temperatures and convergence . Late on February 16 , the system intensified into Tropical Storm Cynthia while it was passing near Juan de Nova Island . Continuing to rapidly intensify , Cynthia attained tropical cyclone status on February 17 , reaching peak winds of 125 km / h (75 mph) . Shortly thereafter , the storm made landfall on western Madagascar just north of Morondava . It rapidly weakened over land as it shifted to the south and later southwest . Early on February 19 , Cynthia emerged into the Mozambique Channel as a tropical disturbance , and the circulation dissipated shortly thereafter .

Making landfall in western Madagascar , Cynthia produced peak winds of 157 km / h (98 mph) at Maintirano , with gusts to 185 km / h (115 mph) . The city also recorded 420 @.@ 1 mm (16 @.@ 54 in) of rainfall . In some locations , the rainfall from Cynthia was heavier than the average annual precipitation . In some villages , the storm destroyed upwards of 98 % of houses , leaving 125 @,@ 000 people homeless nationwide . The cyclone also wrecked crops and killed livestock , with over 20 @,@ 000 tons of rice destroyed that had been readied for harvest . Cynthia destroyed an irrigation canal in Morondava , flooding 10 @,@ 000 ha (25 @,@ 000 acres) of rice fields . Flooding washed away or heavily damaged several roads and bridges in southwestern Madagascar . The Morondava River , which empties into the Mozambique Channel at Morondava , eroded greatly during the storm . Cynthia killed 36 people , mostly in Toliara . Heavy rains from the storm also spread into Tanzania , causing flooding that destroyed 90 houses and washed away two bridges .

Following the storm , the Malagasy government appealed for international aid . In response , the United States Agency for International Development (USAID) provided $ 25 @,@ 000 (USD) toward rebuilding damaged roofs and placing a temporary pontoon bridge where a bridge had been washed out . Due to the damaged rice harvest , the Food for Peace program via USAID provided 15

@,@ 000 tons of rice to Madagascar at the cost of $ 7 @.@ 5 million (USD) . The French government bought 130 tons of rice seed to be distributed to affected farmers . Local governments in Madagascar provided 6 @,@ 000 farmers with rice seed to replant the ruined crop . In addition , the Swiss government provided money toward a reforestation project to discourage slash @-@ and @-@ burn practices .

= = = Severe Tropical Storm Debra = = =

After Cynthia dissipated , a residual trough persisted in the Mozambique Channel , spawning a tropical disturbance on February 22 about halfway between Madagascar and Mozambique . The interaction between cool air from the south and warm monsoonal air to the north fueled deep convection . After initially moving to the south , the system turned more to the southwest toward Mozambique on February 24 , developing an eye feature in the center . The JTWC initiated advisories that day as Tropical Cyclone 12S , although the MFR initially maintained the system as a tropical depression . The MFR upgraded the depression to tropical storm status on February 25 , by which time the JTWC already estimated winds of 140 km / h (85 mph) . That day , the storm approached the coast of Mozambique within 100 km (60 mi) before turning to the east @-@ northeast . On February 26 , the MFR named the system Debra , and later that day estimated peak 10 ? minute winds of 115 km / h (70 mph) . In contrast , the JTWC estimated peak 1 ? minute winds of 165 km / h (105 mph) . While moving to the northeast , Debra passed within 200 km (125 mi) of Europa Island on February 27 . The storm subsequently executed a counterclockwise loop to the south , during which it began weakening . By February 28 , Debra had weakened to minimal tropical storm status while accelerating to the southeast , although it briefly re @-@ intensified the next day . On March 4 , an approaching cold front absorbed the storm .
While near Europa Island , Debra produced gusts of 63 km / h (39 mph) and sustained winds of 48 km / h (30 mph) .

= = = Severe Tropical Storm Elma = = =

On February 26 , a tropical disturbance formed in the northeastern portion of the basin , well to the east @-@ southeast of Diego Garcia . It originated from the monsoon trough , and moved generally to the south @-@ southeast while quickly intensifying . Late on February 26 , the MFR upgraded the depression to Tropical Storm Elma , around the same time the JTWC began tracking it as Tropical Cyclone 17S . On February 27 , the JTWC estimated Elma attained peak 1 ? minute winds of 110 km / h (70 mph) , before assessing the storm as weakening . In contrast , the MFR estimated Emla continued to slowly intensify to a 10 ? minute peak strength of 105 km / h (65 mph) on March 1 . Shortly thereafter , the storm crossed 90 ° E into the Australian region , where the Bureau of Meteorology estimated that Elma entered at tropical cyclone status . Steady weakening commenced due to the influence of a trough and cooler waters . Elma weakened to the equivalent of tropical depression status by March 3 before turning back to the west . On March 5 , the system recrossed 90 ° E into the south @-@ west Indian Ocean , dissipating shortly thereafter .

= = = Tropical Cyclone Fatima = = =

A surge in the monsoon trough spawned what would become Cyclone Fatima to the southwest of Sumatra . On March 21 , the MFR identified a tropical disturbance in the Australian region , which crossed into the south @-@ west Indian Ocean on the next day . Also on March 22 , the MFR upgraded the storm to Tropical Storm Fatima , and the JTWC tracked the system as Tropical Cyclone 17S . The storm moved southwestward due to a ridge to the northwest , and gradually intensified . On March 25 , the JTWC upgraded Fatima to the equivalent of a minimal hurricane , although the MFR only estimated 10 ? minute winds of 95 km / h (60 mph) at that time . Due to a break in the ridge , Fatima turned toward the south on March 26 , around the time that the JTWC estimated peak 1 ? minute winds of 165 km / h (105 mph) . The storm later turned more to the

southeast , although it shifted back to the southwest on March 29 . On the next day , the MFR upgraded Fatima to tropical cyclone status and estimated peak 10 ? minute winds of 135 km / h (85 mph) . Fatima turned back to the southeast on March 31 and accelerated , weakening to tropical storm status due to upper @-@ level wind shear . As it was approaching 90 ° E , Fatima became extratropical on April 1 .

= = = Tropical Depression G1 = = =

On March 30 , an area of convection spawned a small tropical disturbance about 310 km (190 mi) east of Toamasina off the eastern coast of Madagascar . Classified as Tropical Disturbance G1 , the system initially moved to the west @-@ northwest and had poorly @-@ organized convection . On April 1 , the disturbance turned back to the southeast and organized more due to an increase in convection . Later that day it turned back to the west toward Madagascar . On April 2 , the disturbance intensified into a tropical depression , reaching peak winds of 50 km / h (30 mph) . At 09 : 00 UTC that day , the system made landfall about 30 km (20 mi) north of Toamasina . It quickly weakened over land , dissipating on April 3 .

The depression brought heavy rainfall to eastern Madagascar that resulted in flooding . Taomasina reported 228 @.@ 2 mm (8 @.@ 98 in) of rainfall , as well as wind gusts to 90 km / h (56 mph) . The floods killed 18 people in the country .

= = = Moderate Tropical Storm Gritelle = = =

On June 5 , the near @-@ equator trough spawned a tropical disturbance to the east @-@ southeast of Diego Garcia . The system moved to the southwest and later to the west , influenced by a trough to the south . Initially it failed to intensify much , although an anticyclone provided favorable conditions for development , as did warm water temperatures . On June 7 , the system passed south of the Chagos Archipelago , and on the next day the JTWC classified it as Tropical Cyclone 22S , the final of the season . When the system reached the MFR area of satellite coverage on June 10 , it appeared as a well @-@ developed system ; as a result , the agency upgraded the depression to Tropical Storm Gritelle , estimating peak 10 ? minute winds of 85 km / h (50 mph) . On June 11 , Gritelle began weakening due to increased wind shear , deteriorating to tropical depression status on June 12 . Over the subsequent two days , the system executed a loop , maintaining its status as a tropical depression or disturbance . On June 15 , Gritelle passed about 425 km (265 mi) east of Rodrigues while moving to the south . It accelerated to the southeast , dissipating on June 16 .

The storm formed was very late in the cyclone season , making Gritelle the strongest June storm in 20 years , as well as the latest in the cyclone year that a storm was properly named . Tropical Depression Fely in 1983 formed later but was wrongly named , and Cyclone Odette in 1971 formed in July when the cyclone year ended on July 31 . The end of the tropical cyclone year shifted from July 31 to June 30 in 2003 .

= = = Other storms = = =

On September 19 , the JTWC began monitoring a system near the Chagos Archipelago . The system tracked westward , organizing enough that the JTWC classified it as Tropical Cyclone 01S on September 21 . Despite predictions that it would strengthen into a tropical storm , the system failed to intensify beyond winds of 55 km / h (35 mph) , and dissipated on September 25 .

Similar to the previous system , the JTWC began monitoring a disturbance on October 15 . After an initial movement to the southwest , the system turned to the north and later to the west . The JTWC classified the system as Tropical Cyclone 02S on October 18 , estimating peak winds of 55 km / h (35 mph) . Two days later , the agency declared the system as dissipated .

On November 29 , the JTWC tracked a system to the east @-@ southeast of Diego Garcia , which originated in the monsoon trough . The system moved to the southwest and was classified by MFR

as Tropical Disturbance A2 on November 30 . On December 2 , the disturbance intensified into a tropical depression as it curved to the southeast . On that day , the MFR estimated peak winds of 55 km / h (35 mph) , based on the distinct appearance on satellite imagery . On the next day , the JTWC classified the system as Tropical Cyclone 04S , and assessed the storm as intensifying to a peak of 100 km / h (65 mph) ; the intensification was aided by an anticyclone aloft . However , an increase in wind shear caused marked weakening . The JTWC discontinued advisories on December 4 , although the MFR continued tracking the system until December 7 , when the depression had curved back to the southwest for a final time .

= = Season effects = =

= = Contemporary seasons = =

Atlantic hurricane seasons : 1990 , 1991
Pacific hurricane seasons : 1990 , 1991
Pacific typhoon seasons : 1990 , 1991
North Indian Ocean cyclone seasons : 1990 , 1991