= 2002 ? 03 South @-@ West Indian Ocean cyclone season =

The 2002 ? 03 South @-@ West Indian Ocean cyclone season was one of the longest lasting and the second @-@ most active season in the South @-@ West Indian ocean . Storms during the season impacted the Mascarene Islands , Seychelles , Madagascar , and countries in southeastern Africa . The season began early when an unnamed tropical storm struck Seychelles in September , becoming the most damaging storm there in 50 years . The next system , Atang , was the first named storm of the season , but was only a tropical depression ; it was named due to the threat to an outer island of Mauritius . Atang later struck Tanzania in a climatologically unusual area in November , resulting in unconfirmed deaths of fishermen . The first named storm to reach tropical storm intensity was Boura , which brushed the Mascarene Islands with gusty winds and rainfall . In December , Cyclone Crystal threatened to strike Mauritius but instead veered eastward , and later , Tropical Storm Delfina lasted from late December through early January 2003 . Delfina damaged or destroyed thousands of houses in Mozambique and Malawi , killing 54 people .

In January 2003 , Severe Tropical Storm Ebula continued the steady activity , forming in the eastern portion of the basin . Later , Tropical Storm Fari crossed southern Madagascar with heavy rains , causing flooding and mudslides that left 3 @,@ 400 people homeless . In February , there were four simultaneous tropical cyclones in the Indian Ocean , three of which in the basin . Cyclone Gerry formed first and the farthest west , passing just east of Mauritius and killing one person there . Cyclone Hape formed shortly thereafter , and Tropical Storm Isha formed farther east , having originated from the Australian basin . Cyclone Japhet struck southern Mozambique and produced widespread flooding in southeastern Africa , killing 25 people . In March , Cyclone Kalunde was the strongest storm of the season , reaching 10 @-@ minute sustained winds of 215 km / h (135 mph) . It struck Rodrigues while weakening , damaging 1 @,@ 600 houses and causing an island @-@ wide power outage . About a month later , a subtropical cyclone named Luma intensified southeast of Madagascar and developed an eye . Lastly , Cyclone Manou was only the sixth May tropical cyclones on record , making a rare landfall in southeastern Madagascar , killing 89 people and destroying thousands of houses .

= = Season summary = =

Météo @-@ France 's meteorological office in Réunion (MFR) is the official Regional Specialized Meteorological Center for the South @-@ West Indian Ocean , tracking all tropical cyclones from the east coast of Africa to 90 ° E. At the beginning of the season , the MFR moved the tropical cyclone year from August 1 to July 1 . The Joint Typhoon Warning Center (JTWC) , which is a joint United States Navy ? United States Air Force task force that issues tropical cyclone warnings for the region , also issued advisories for storms during the season .

During the season , MFR issued advisories on 16 systems , of which 13 intensified to reach tropical storm force winds , meaning conditions were generally favorable for tropical cyclogenesis . The 13 systems with tropical storm force winds is only one short of the most such storms since the beginning of satellite @-@ tracking in the 1967 ? 68 season , set in the 1993 ? 94 season . This is four more than the average of nine named storms . In this season , there were 24 days on which tropical cyclones were active , slightly above normal , but only one storm ? Kalunde ? remained at that intensity for more than three days . By contrast , there were 68 days in which a tropical storm was active in the basin , which is 15 days above normal . The season began early and ended late ; only four seasons began earlier and four ended later than this season since the start of satellite @-@ coverage in the basin .

In addition to the named storms and an unnamed tropical storm in September , there was one non @-@ developing tropical depression . On December 25 , Tropical Depression 05 developed in the northeastern portion of the basin . It moved to the south and later southeast , crossing into the Australian region on December 27 . A day later , the JTWC issued its last advisory .

= = Storms = =

= = = Moderate Tropical Storm 01 = = =

In late August , a weak low @-@ level circulation persisted near Diego Garcia . It was associated with a trough near the equator , and initially remained disorganized due to high wind shear . The disturbance was located at a low latitude near the equator , and a ridge extending from the eastern coast of Africa imparted a general west @-@ southwest movement . The system was organized enough to be classified by MFR on September 4 at 2 @.@ 5 ° S. Subsequently , the system developed more convection as its circulation became better defined . Operationally , MFR began issuing warnings on September 5 on Tropical Disturbance 01 , and the next day upgraded it to a tropical depression . Post analysis from MFR indicated that the system reached peak winds of 65 km / h (40 mph) on September 6 , the same day that the Joint Typhoon Warning Center (JTWC) initiated advisories on it as Tropical Cyclone 01S . The storm developed banding features , but the thunderstorms were sheared away from the circulation . On September 7 , the storm moved through Seychelles ? an island nation in the southern Indian Ocean ? before weakening . MFR discontinued advisories on September 8 , and the JTWC followed suit the next day .

While moving through Seychelles , the storm produced a microburst that last for two hours across several islands , producing wind gusts up to 130 km / h (81 mph) on Praslin . Heavy rainfall affected Praslin , La Digue , and particularly Mahé , which reported 327 @.@ 1 mm (12 @.@ 88 in) in a 24 ? hour period . Damage on Mahé was limited to landslides and some flooding . On Praslin , high winds damaged the roofs of over 50 houses and destroyed six homes , while the airport was also damaged . The winds damaged 50 power lines , causing an island @-@ wide power outage . High winds also downed about 30 @,@ 000 trees , which blocked roads but were quickly removed . Due to widespread tree damage , Cousin Island ? a nature preserve ? was closed for about two weeks , accounting for about $ 50 @,@ 000 (2002 USD , SR250,000 rupees) in damage . Nationwide , the storm left 375 families homeless and damaged crop fields , becoming the most damaging in the country in 50 years .

= = = Tropical Depression Atang = = =

Convection persisted near a broad circulation on November 3 to the west of Diego Garcia . The system moved westward and organized due to generally favorable conditions . MFR classified it as Tropical Disturbance 02 on November 4 . Two days later , the agency upgraded it to Tropical Depression 2 , and shortly thereafter the JTWC initiated advisories on Tropical Cyclone 02S . At that time , the storm was moving to the southwest toward the Mauritius outer island of Agaléga , developing improved outflow . To emphasize the threat , the Meteorological Service of Mauritius named the system Atang , despite it only being a tropical depression . Late on November 6 , JTWC estimated peak winds of 85 km / h (50 mph) , around the same time that Atang began a slow motion to the southwest . The next day , the depression resumed a westward motion and became disorganized , with several circulations , and the JTWC and MFR both discontinued advisories . The remnants of Atang again turned to the southwest and re @-@ intensified , prompting JTWC and MFR to re @-@ issue advisories on November 9 . By that time , the outflow improved , although it maintained multiple circulations . Atang passed near the north coast of Madagascar on November 10 after turning to the west , and that day the JTWC again discontinued advisories . After another period of re @-@ organization , the agency again re @-@ issued advisories on Atang on November 11 over the Mozambique Channel . The next day , the system moved inland in southeastern Tanzania , and dissipated shortly thereafter .

In northern Mozambique , Atang produced moderate but beneficial rainfall in Cabo Delgado Province . The landfall area does not usually experience tropical cyclones , and damage in Mozambique was minimal . In Tanzania , there were unofficial reports that Atang killed several fishermen and caused heavy rainfall with wind gusts to 148 km / h (92 mph) .

= = = Tropical Cyclone Boura = = =

A strong area of winds near the equator developed an area of convection on November 14 to the east @-@ northeast of Diego Garcia . It quickly developed outflow and a distinct circulation , becoming a tropical depression late on November 14 . Early on November 15 , MFR upgraded the system to Tropical Storm Boura , and later that day the JTWC initiated advisories on Tropical Cyclone 03S . With a ridge to the southeast , the storm moved quickly southwestward . Easterly wind shear prevented significant intensification until the circulation became established beneath the convection . On November 17 , Boura intensified to reach 10 @-@ minute winds of 120 km / h (75 mph) , making it a tropical cyclone . The JTWC upgraded Boura to the same intensity that day but in 1 @-@ minute winds , or the equivalent of a minimal hurricane . The cyclone intensified slightly further to peak winds of 130 km / h (80 mph) .

Boura maintained its peak winds for about 18 hours , during which wind shear began to increase . The cyclone weakened as it curved more to the west , a change due to a ridge to the south . The JTWC estimated that Boura maintained peak winds of 140 km / h (85 mph) . Initially , the storm retained good outflow and convection , and Boura passed just north of St. Brandon on November 19 , producing 54 @.@ 5 mm (2 @.@ 15 in) of rainfall and wind gusts of 106 km / h (66 mph) . While the storm turned to the west and northwest , it interacted with the ridge to the south to produce wind gusts of 118 km / h (74 mph) and 111 km / h (69 mph) on Mauritius and Réunion , respectively . The convection gradually diminished , and on November 22 Boura weakened to tropical depression status while the JTWC discontinued advisories . The circulation continued to the northwest , devoid of convection . After turning to the northeast on November 25 , Boura dissipated a day later north of Madagascar .

= = = Tropical Cyclone Crystal = = =

For several days in mid @-@ December , tropical cyclone forecast models anticipated a storm to form to the southwest of Diego Garcia , which was proven true when an area of convection formed in that area , becoming a tropical disturbance on December 21 , the fourth of the season . On December 23 , MFR upgraded the disturbance to a tropical depression , and later that day to Tropical Storm Crystal . The storm moved southwestward toward Mauritius due to a ridge to the southeast . Strengthening was gradual , and the JTWC upgraded Crystal to the equivalent of a minimal hurricane late on December 24 . The next day , an eye developed , although dry air initially prevented much further intensification . MFR upgraded Crystal to tropical cyclone status on December 26 , and that day the cyclone passed just east of St. Brandon . Subsequently , Crystal intensified quickly after the eye became clearer , reaching peak winds of 150 km / h (90 mph) on December 27 . Around that time , the storm passed east of Mauritius as it turned to the south while rounding the ridge . After maintaining peak winds for about 18 hours , Crystal weakened , gradually undergoing extratropical transition . The convection diminished over the center , and Crystal weakened to tropical storm status on December 28 . The next day , the JTWC and MFR discontinued advisories , labeling the storm as extratropical . The remnants continued to the southeast , dissipating on January 3 after crossing into the Australian region .

While passing just east of St. Brandon , Crystal produced wind gusts of 91 km / h (56 mph) . The storm initially threatened to strike Mauritius , but effects were minimal due to the island being on the dry southwest quadrant of the storm . Crystal produced wind gusts of 91 km / h (56 mph) . Rainfall reached 58 @.@ 8 mm (2 @.@ 31 in) , although minimal precipitation occurred in northern Mauritius .

= = = Severe Tropical Storm Delfina = = =

In late December , a tropical disturbance rapidly formed off the northwest coast of Madagascar . By late on December 30 , MFR classified it as a tropical disturbance . The system quickly intensified while moving westward , becoming a strong tropical storm before hitting northeastern Mozambique

on December 31 . Delfina weakened while moving inland , and it was no longer classifiable as a tropical cyclone by January 1 . However , its remnants moved across the country and into Malawi , later looping around and crossing back over Mozambique . When the remnants reached the Mozambique Channel , they were reclassified as Tropical Disturbance 07 , which moved southward over waters . It re @-@ intensified into a tropical storm on January 8 before weakening the next day , becoming extratropical . The remnants persisted for several days , dissipating on January 14 .

In both Mozambique and Malawi , Delfina dropped heavy rainfall that caused flooding . In the former country , over 18 @,@ 000 houses were severely damaged or destroyed , leaving thousands homeless . The storm damaged roads and bridges , which disrupted relief efforts in the aftermath , and floods destroyed widespread areas of crops in the midst of an ongoing food shortage . Lingering flooding caused an outbreak of cholera and malaria in Mozambique , and 47 people were killed by Delfina . In Malawi , flooding was not widespread , although the storm destroyed about 3 @,@ 600 houses . Delfina killed eight people in the country . Only two months after the storm struck , however , Cyclone Japhet left damage and deaths in many of the same areas that Delfina affected .

= = = Severe Tropical Storm Ebula = = =

An area of convection persisted on January 6 to the southwest of Diego Garcia with an associated circulation . It moved generally southward southwest within an area of generally favorable conditions , becoming Tropical Disturbance 08 on January 7 . Thunderstorms increased , and the JTWC initiated advisories on Tropical Cyclone 09S early on January 8 . The next day , MFR upgraded it to Tropical Storm Ebula . Outflow became more pronounced and the storm continued to intensify . On January 10 , the JTWC upgraded Ebula to the equivalent of a minimal hurricane , and estimated peak winds of 115 km / h (75 mph) , just shy of tropical cyclone status . Subsequently , increased wind shear imparted weakening . After having spent much of its duration moving generally southward , Ebula turned to the southeast on January 11 due to a ridge to the south moving farther east . The thunderstorms diminished , and the JTWC discontinued advisories on January 12 . That day , MFR declared that Ebula became extratropical , and the remnants dissipated on January 15 .

= = = Severe Tropical Storm Fari = = =

An area of convection persisted on January 20 to the east @-@ southeast of Diego Garcia , quickly developing outflow due to minimal wind shear . It moved to the southwest and its circulation became better defined . On January 23 , the MFR initiated advisories on Tropical Disturbance 09 , and later that day the JTWC issued a TCFA . Subsequently , the MFR upgraded the disturbance to a tropical depression and the JTWC initiated advisories on Tropical Cyclone 11S . Shortly thereafter , the system weakened and the circulation became exposed from the deep convection . The JTWC discontinued advisories on January 24 , but MFR continued tracking the disturbance as it moved to the west . After reaching an area of low wind shear , thunderstorms again increased over the center , and the JTWC re @-@ issued advisories on January 28 . By that time , the system was nearing eastern Madagascar , and later that day MFR upgraded the system to Tropical Storm Fari . Early on January 29 , MFR estimated peak winds of 95 km / h (60 mph) , making Fari a moderate tropical storm . Shortly thereafter , the storm made landfall on Madagascar just south of Mahanoro . Fari quickly weakened into a tropical depression while crossing the country , emerging into the Mozambique Channel early on January 30 . After the storm turned to the south , the MFR and JTWC declared Fari extratropical on January 31 , and the remnants dissipated on February 2 .

Tropical Storm Fari struck Madagascar after the country had experienced weeks of heavy rainfall , causing widespread flooding . In the area where it moved ashore , the storm flooded crop fields that damaged most of the banana and fruit trees . The storm left landslides that isolated Marolambo and caused damage in other towns . Fari left 3 @,@ 400 people homeless and caused an outbreak of conjunctivitis and diarrhea .

= = = Intense Tropical Cyclone Gerry = = =

On February 5 , MFR began tracking a tropical disturbance to the east of Madagascar 's northern coast . The system moved to the southwest before turning to the north on February 7 . By that day , the system had persistent convection around a weak circulation , located in an area of low wind shear . On February 8 , the JTWC initiated advisories on Tropical Cyclone 16S , although initially the circulation was broad and exposed from the thunderstorms . The next day , MFR upgraded the depression to tropical storm status , and the Meteorological Services of Mauritius named the system Gerry . The storm turned to the south toward Mauritius and steadily intensified . On February 12 , the JTWC upgraded Gerry to the equivalent of a minimal hurricane , and shortly thereafter MFR upgraded the storm to a tropical cyclone . Around that time , Gerry began undergoing rapid deepening , becoming an intense tropical cyclone early on February 13 while developing a well @-@ defined eye and outflow . That day , the cyclone passed about 120 km (75 mi) east of Mauritius . At that time , the JTWC estimated peak 1 minute winds of 195 km / h (120 mph) , and MFR estimated peak 10 minute winds of 165 km / h (105 mph) . Subsequently , Gerry began weakening due to increasing wind shear , with the eye becoming disorganized . Later , the convection separated from the deepest convection , and the cyclone weakened to tropical storm status on February 14 . The next day , JTWC discontinued advisories , and on February 16 MFR declared Jerry extratropical . The remnants dissipated two days later .

Early in its duration , Gerry passed just west of Tromelin Island , producing tropical storm force winds and gusts to 111 km / h (69 mph) . The cyclone originally threatened to strike Mauritius directly , but due to a more east @-@ southeasterly motion , Gerry passed more to the east . The storm forced the closure of Sir Seewoosagur Ramgoolam International Airport , along with schools and government offices . Wind gusts on Mauritius reached 144 km / h (90 mph) . Gerry dropped heavy rainfall , peaking at 139 @.@ 2 mm (5 @.@ 48 in) at Mare aux Vacoas , and it produced high waves along the northern coast . One person was killed who was electrocuted during the storm 's passage .

= = = Tropical Cyclone Hape = = =

Around the same time that Tropical Storm Gerry was developing , another area of convection to its east was organizing . On February 7 , the system became a tropical disturbance , and initially moved to the north . Operationally , MFR first began issuing advisories on February 9 for Tropical Disturbance 11 , when the system had a small center and accompanying convection . By that time , the disturbance had turned to the south , and favorable conditions allowed for gradual development . MFR upgraded the system to tropical storm status late on February 9 , although the system was not named Hape until 36 hours later . On February 10 , the JTWC initiated advisories on Tropical Cyclone 17S . An eye developed on February 11 , suggesting quick intensification . At 1800 UTC that day , the JTWC and MFR upgraded Hape to the equivalent of a minimal hurricane and to tropical cyclone status , respectively . By that time , the cyclone had turned to the east @-@ northeast due to a weakness in a ridge to the north . MFR estimated that Hape reached peak 10 @-@ minute winds of 150 km / h (90 mph) on February 12 , and the next day the JTWC estimated 1 @-@ minute winds of 165 km / h (105 mph) . Later , the storm weakened , and it turned to the southeast when the ridge re @-@ intensified . Outflow decreased due to interaction with Cyclone Gerry to the west , and Hape weakened to tropical storm status on February 13 . On February 15 , the JTWC discontinued advisories once the circulation was exposed from the deep convection . The next day , MFR followed suit after the circulation dissipated .

= = = Moderate Tropical Storm Isha = = =

Widespread convection in the monsoon trough persisted across the southeastern Indian Ocean in early February . One area was tracked by the JTWC on February 3 in the Australian basin , southwest of Indonesia . The system moved westward without development , crossing into the basin on February 8 . The next day , MFR began tracking the system as a tropical disturbance . On

February 11 , the system turned to the southeast , due to a ridge to the north . That day , JTWC started issuing advisories on Tropical Cyclone 18S . Initially , the storm failed to intensify much due to a nearby upper @-@ level ridge . On February 12 , MFR upgraded the system to a tropical storm , and the next day the system was named Isha . Outflow became more pronounced due to minimal wind shear . The JTWC briefly estimated peak 1 minute winds of 85 km / h (50 mph) , but the MFR never estimated winds above 65 km / h (40 mph) . Isha weakened late on February 13 due to cooler waters , dry air , and stronger shear . On February 14 , the JTWC discontinued advisories once there was little convection left , and the MFR estimated Isha dissipated the next day .

= = = Intense Tropical Cyclone Japhet = = =

Cyclone Japhet developed on February 25 near the southwest coast of Madagascar , and initially moved to the northwest before turning to the southwest . With favorable conditions for development , Japhet quickly intensified in the Mozambique Channel , reaching maximum winds of 175 km / h (110 mph) , sustained over 10 minutes . This made it an intense tropical cyclone , only the sixth to occur in the channel in 24 years . After stalling briefly , the cyclone turned to the northwest , weakening slightly before striking Mozambique just south of Vilankulo on March 2 . Japhet slowly weakened while progressing inland , dissipating over Zambia on March 6 .

Along its path , Japhet dropped heavy rainfall that caused widespread river flooding . The rains occurred after an extended drought , although excessive precipitation caused heavy crop damage , notably around where the storm moved ashore . In two provinces in Mozambique , the cyclone damaged or destroyed 25 @,@ 000 houses , leaving at least 23 @,@ 000 people homeless . Flooding in Zambia caused rivers to rise in Mozambique several days after the storm 's passage . There were 17 deaths in Mozambique . Further inland , remnant rainfall destroyed a bridge and several houses in Zimbabwe , killing eight people .

= = = Intense Tropical Cyclone Kalunde = = =

Kalunde formed on March 3 from an area of convection southeast of Diego Garcia . The system slowly intensified while drifting to the west , becoming a moderate tropical storm on March 5 . Its intensification rate increased as it began a steady southwest movement . Kalunde underwent rapid deepening and developed an eye , reaching peak intensity on March 8 . Around that time , MFR estimated a minimum pressure of 910 mbar (27 inHg) with winds of 215 km / h (135 mph) , and the JTWC estimated peak winds of 260 km / h (160 mph) ; this made Kalunde the strongest cyclone of the year in the basin . It weakened after undergoing an eyewall replacement cycle , and on March 12 Kalunde passed near Rodrigues island as a weakening cyclone . Around that time , the storm turned to the south , weakening to a tropical storm on March 14 before becoming extratropical the next day . The remnants of Kalunde dissipated on March 16 .

When the cyclone passed Rodrigues , it produced wind gusts estimated up to 210 km / h (130 mph) , which caused an island @-@ wide power outage . Many roads were washed out , and about 80 percent of the drinking water was contaminated . During the storm 's three @-@ day passage of the island , a total of 329 @.@ 1 mm (12 @.@ 96 in) of rain fell . A total of 1 @,@ 600 homes were damaged , and total losses across the island amounted to $ 3 @.@ 15 million (2003 USD , ? 3 @.@ 4 million) .

= = = Subtropical Depression Luma = = =

A large low @-@ level circulation persisted off the southwest coast of Madagascar on April 6 . On April 8 , it became a subtropical depression according to MFR , and moved to the southwest before turning sharply to the southeast . That day , the JTWC briefly assessed a fair potential for development . The circulation became exposed on April 9 , but when it began quickly intensifying the next day , MFR initiated advisories on Subtropical Depression Luma . By that time , the JTWC classified the system as extratropical ; however , the system developed convection near the center

and became more of a tropical cyclone . On April 11 , Luma developed an eye in the center of the thunderstorms , prompting MFR to upgrade the storm to peak winds of 130 km / h (80 mph) . At that time , the storm was in an area of weak wind shear , although increasing shear caused rapid weakening and for the eye to dissipate . Early on April 12 , Luma became extratropical as it merged with an approaching cold front .

= = = Tropical Cyclone Manou = = =

Late in the season in April , an area of convection formed southwest of Diego Garcia . It gradually organized , and there was a companion system to the west that also showed signs of development . The eastern system was declared Tropical Disturbance 16 on May 2 , and with a ridge to the southeast it moved generally to the southwest . Early in its duration , the system affected St Brandon and Mauritius with gusty winds . On May 4 it intensified into Tropical Storm Manou on May 4 . After an initial strengthening phase , the storm weakened but later re @-@ intensified as it approached Madagascar . Manou developed a well @-@ defined eye and reached peak winds only 19 km (12 mi) from the eastern Madagascar coastline . It reached tropical cyclone status , at the time only one of six in the month since 1968 . For about 12 hours , the cyclone stalled before turning to the south and weakening . After becoming extratropical on May 10 , Manou dissipated three days later .

Manou struck Madagascar a year after Cyclone Kesiny hit the country in May 2002 , representing the first known occurrence of May tropical cyclone impacts in consecutive years . When Manou struck Madagascar , it produced gusts as strong as 211 km / h (131 mph) and heavy rainfall reaching 227 mm (8 @.@ 9 in) in a 15 ? hour period , both at Vatomandry . Damage in the country was heaviest there , where 85 % of buildings were destroyed and 23 people were killed . Manou destroyed about 24 @,@ 500 houses nationwide , leaving 114 @,@ 480 people homeless . The storm destroyed large areas of crops and disrupted transportation , including damaging the road between Vatomandry and Brickaville . Manou injured 85 and killed 89 people throughout Madagascar .

= = Storm names = =

A tropical disturbance is named when it reaches moderate tropical storm strength . If a tropical disturbance reaches moderate tropical storm status west of 55 ° E , then the Sub @-@ regional Tropical Cyclone Advisory Centre in Madagascar assigns the appropriate name to the storm . If a tropical disturbance reaches moderate tropical storm status between 55 ° E and 90 ° E , then the Sub @-@ regional Tropical Cyclone Advisory Centre in Mauritius assigns the appropriate name to the storm . A new annual list is used every year so no names are retired .

= = Season effects = =

This table lists all of the tropical cyclones and subtropical cyclones that were monitored during the 2002 ? 2003 South @-@ West Indian Ocean cyclone season . Information on their intensity , duration , name , areas affected , primarily comes from RSMC La Reunion . Death and damage reports come from either press reports or the relevant national disaster management agency while the damage totals are given in 2003 USD .