

# 2024-25 SOUTHWEST PACIFIC TROPICAL CYCLONE OUTLOOK

New Zealand's National Institute of Water & Atmospheric Research (NIWA) was the lead author of this tropical cyclone outlook, which was contributed to by the Meteorological Service of New Zealand (MetService), the University of Newcastle, the Australian Bureau of Meteorology, MétéoFrance, and meteorological services across the Pacific Islands

[Pacific Islands](#)   [New Zealand](#)   [El Niño-Southern Oscillation](#)   [Consensus outlook](#)   [Background](#)

## Tropical cyclone outlook summary for the Pacific Islands

- The NIWA and MetService assessment of tropical cyclone<sup>1</sup> (TC) activity for the coming season indicates normal to below normal activity.
- Six to 10 named TCs could occur in the Southwest Pacific from November 2024-April 2025. The long-term average number of named TCs per season is around nine.
- TCs have a significant impact across the Southwest Pacific, with the season starting in November and lasting through April. For the coming season, significant differences are expected between the western and eastern halves of the basin.
- The risk of impact from a TC is expected to be higher near the Coral Sea, Solomon Islands, and Papua New Guinea, as illustrated in [Figure 1](#). Normal to reduced risk is anticipated in the central and eastern part of the basin.

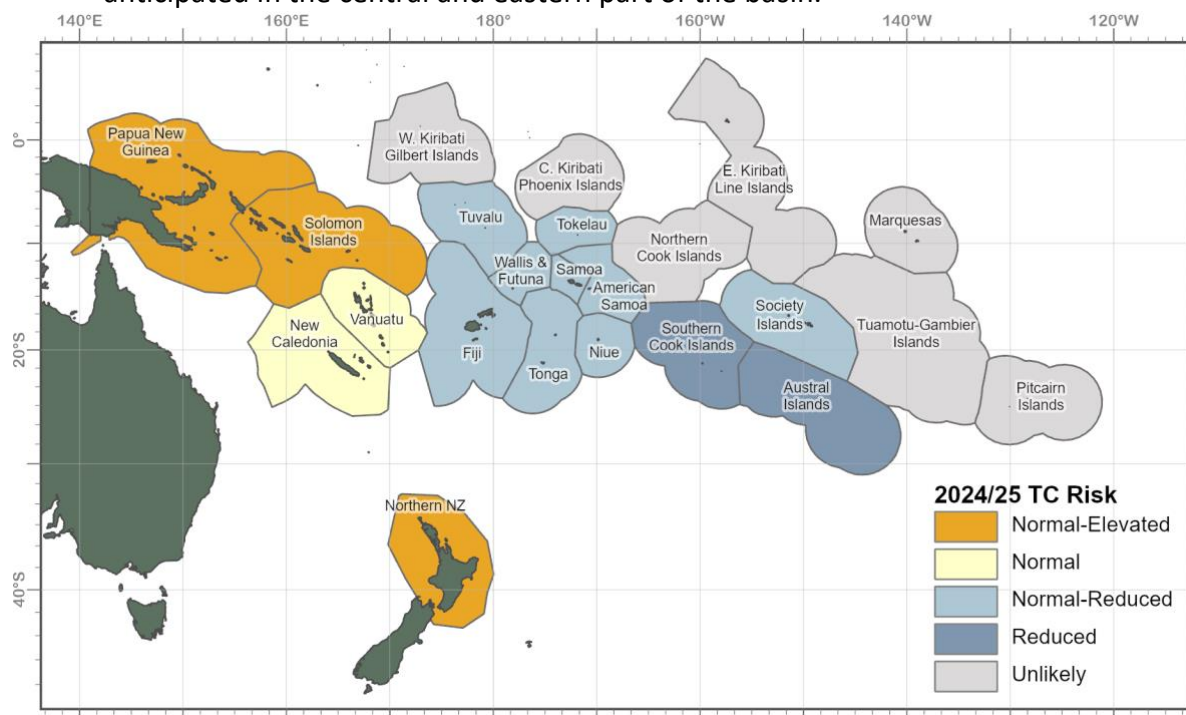


Figure 1: Tropical cyclone risk for the 2024-25 season

- Vanuatu and New Caledonia typically experience the greatest TC activity with an average of two or three TCs passing nearby each year.
- **Normal or elevated activity:** Papua New Guinea, Solomon Islands, and Northern New Zealand.
- **Near normal activity:** Vanuatu and New Caledonia.

<sup>1</sup> Tropical cyclones are categorised in strength from 1 to 5, with 5 being most intense. Tropical cyclones that reach category 3 or higher are classified as severe, with mean (10 minute) wind speeds of at least 119 km/h.

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- **Normal or reduced activity:** Tuvalu, Tokelau, Niue, Wallis & Futuna, Samoa, American Samoa, Society Islands, Fiji, and Tonga.
- **Reduced activity:** Southern Cook Islands and Austral Islands.
- **Activity unlikely:** Marquesas, Kiribati, Northern Cook Islands, Tuamotu Archipelago, and Pitcairn Islands.
- Between 3-4 severe TCs reaching category 3 or higher may occur anywhere across the region, so all communities should remain prepared.

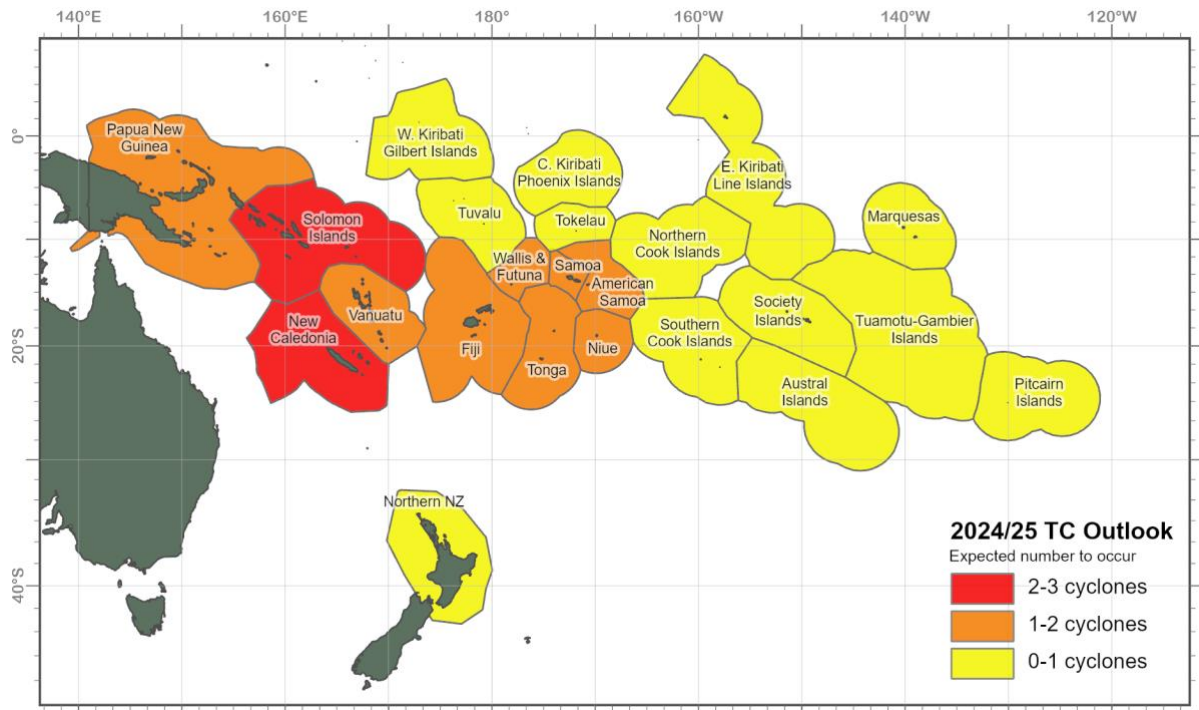


Figure 2: Number of predicted named tropical cyclones interacting with an island group for the 2024-25 season

- Past seasons with similar conditions to the present, called “analogue years”, suggest multiple TCs could intensify to at least category 3 strength.
- Category 5 strength TCs<sup>2</sup>, in which sustained winds are 200 km/h or greater, are associated with a majority of the analogue years.
- Despite the official season running from November through April, TCs sometimes occur out-of-season.
- It does not take a direct hit or severe TC to cause considerable damage or life-threatening weather. When dangerous weather is forecast, please heed the advice of your local meteorological service, civil defence, or disaster management office.

### Tropical cyclone outlook summary for New Zealand

- On average, at least one ex-TC passes within 550 km of New Zealand each year. This season, the risk is considered **normal-elevated**.
- If an ex-TC tracks close to the country, there is a near-equal probability of it tracking to the east or west of the North Island based on historical climate data.

<sup>2</sup> Since quality observations began in the early 1970s, there has been a trend toward fewer but stronger TCs.

- Two out of five analogue years considered in this outlook had at least one ex-TC passing within 550 km of the country.
- Analogue years suggest that a decaying ex-TC entering the New Zealand region could affect maritime and coastal areas around the North Island, but an interaction with the South Island cannot be ruled out.
- Significant rainfall, extreme winds, hazardous marine conditions, and coastal damage are all possible leading up to and during ex-TC events.
- The effects of ex-TCs can also be spread over a large area, particularly if the decaying ex-TC interacts with mid-to-high latitude weather systems.

### El Niño-Southern Oscillation outlook

- The El Niño Southern Oscillation (ENSO), comprised of La Niña, neutral, and El Niño phases, plays an important role in year-to-year regional TC development and spatial coverage and is a key factor in this outlook.
- As of early October 2024, sea surface temperatures across the eastern and central equatorial Pacific Ocean are below average and close to La Niña thresholds.
- Atmospheric circulation patterns related to ENSO over French Polynesia and northern Australia indicate neutral ENSO conditions as of early October 2024.
- Oceanic and atmospheric forecasts for ENSO suggest La Niña, of weak-to-moderate intensity, has a 60-70% chance of emerging by December 2024. La Niña conditions, should they develop, are likely to persist through the back half of the TC season in February-April.
- The progress of ENSO and TC activity will continue to be tracked with an update to this guidance in January 2025 if needed.

### For comment, please contact:

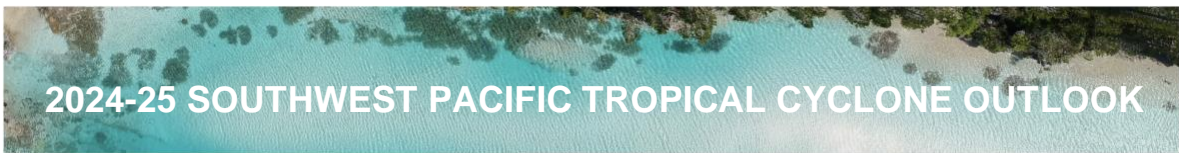
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In the Pacific Islands, please contact your local national meteorological service for information about how this guidance should be interpreted. In Australia and the associated offshore islands, please contact the Australian Bureau of Meteorology. In French Polynesia, Wallis & Futuna, and New Caledonia please contact Météo-France.

For the latest issue of the tropical cyclone outlook and a video presentation discussing expected regional tropical cyclone activity, head to <https://niwa.co.nz/climate/southwest-pacific-tropical-cyclone-outlook>.



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## Island Climate Update consensus outlook

Table 1: Island Climate Update (ICU) consensus outlook for November 2024-April 2025 tropical cyclone activity based on combining NIWA analogue model, international dynamical climate model, and TCO-SP deterministic statistical model outlook results. Indications for seasonal TC activity based on these joint methods are stated in the “ICU consensus” column and are also shown in [Figure 1](#). Expected TC numbers are based on the NIWA analogue method (see [Table 2](#)) and supported by the TCO-SP deterministic method.

TC activity 2024/25	NIWA Analogue	International Dynamical		TCO-SP Deterministic	ICU Consensus	Outlook Confidence
<b>SP Basin</b>	Normal-Reduced	Normal	*	Normal	Normal-Reduced	Moderate-high
<b>Solomon Is.</b>	Normal-Elevated	Normal	1	Normal	Normal-Elevated	Moderate-high
<b>Papua New Guinea</b>	Elevated	Normal		Normal-Elevated	Normal-Elevated	Moderate
<b>N. New Zealand</b>	Normal-Elevated	Normal		Normal	Normal-Elevated	Moderate-high
<b>Vanuatu</b>	Normal	Normal-Reduced		Normal	Normal	High
<b>New Caledonia</b>	Normal	Normal		Normal	Normal	High
<b>Tonga</b>	Normal	Reduced		Normal	Normal-Reduced	Moderate-high
<b>Fiji</b>	Normal-Reduced	Reduced		Normal-Reduced	Normal-Reduced	Moderate-high
<b>Wallis &amp; Futuna</b>	Normal-Reduced	Normal	2	Normal	Normal-Reduced	Moderate-high
<b>Tokelau</b>	Reduced	Normal		Normal	Normal-Reduced	Moderate-high
<b>Tuvalu</b>	Normal-Reduced	Normal		Normal	Normal-Reduced	Moderate-high
<b>Niue</b>	Normal	Reduced	3	Normal	Normal-Reduced	Moderate-high
<b>Samoa</b>	Normal-Reduced	Normal-Reduced		Normal	Normal-Reduced	High
<b>American Samoa</b>	Reduced	Reduced		Normal	Normal-Reduced	Moderate-high
<b>Austral Is.</b>	Reduced	Normal-Reduced	4	Reduced	Reduced	High
<b>Society Is.</b>	Normal	Normal-Reduced		Reduced	Normal-Reduced	Moderate
<b>S. Cooks</b>	Reduced	Reduced		Reduced	Reduced	High
<b>N. Cooks</b>	Unlikely	Unlikely	5	Reduced	Unlikely	Moderate-high
<b>Tuamotu</b>	Unlikely	Unlikely		Reduced	Unlikely	Moderate-high
<b>W. Kiribati</b>	Unlikely	Unlikely		Reduced	Unlikely	Moderate-high
<b>Marquesas</b>	Unlikely	Unlikely		Reduced	Unlikely	Moderate-high
<b>Pitcairn</b>	Unlikely	Unlikely		Reduced	Unlikely	Moderate-high
<b>C. Kiribati</b>	Unlikely	Unlikely		Reduced	Unlikely	Moderate-high
<b>E. Kiribati</b>	Unlikely	Unlikely		Reduced	Unlikely	Moderate-high

\*TCO-SP model area of focus:

1. Island scale model
2. Northern SW Pacific region
3. Central SW Pacific region
4. Southeast SW Pacific region
5. Northeast SW Pacific region

## Background information – summary of analogue, dynamical, and deterministic guidance for the ICU TC outlook

Analogue, dynamical and deterministic model guidance for the SW Pacific show good agreement for the coming season ([Table 1](#)). The ICU consensus column is based on the

combined outcomes for the three types of seasonal outlook information. The consensus forms the basis for the full season (November-April) outlook for Southwest Pacific TC activity (and risk) for the 2024/25 season. It should be noted that there are only very minor differences in terms of the TC risk that are ascribed using the consensus method relative to previous years that used the analogue guidance supported by the dynamical guidance. Future work will evaluate (and validate) the outcome of each individual model vs the consensus-based approach.

### Modern analogue guidance

TCs in the Southwest Pacific usually develop between November and April, occasionally develop in October and May, and very rarely develop between June-August. An analysis of past TC tracks in the SW Pacific indicate they are exceptionally unlikely in September, although systems in the past have formed during this time. Peak TC activity in the SW Pacific Basin is usually between January to March; however, severe TCs can occur at any time during the season.

Based on past seasons with similar background climate conditions to the present, TC activity in the coming season is expected to be elevated near and around the northern Coral Sea. Elevated activity is expected for Papua New Guinea and normal-to-elevated for the Solomon Islands. On average, nearly half of the TCs that developed since the 1969/70 season have reached at least Category 3 cyclones with mean wind speeds of at least 64 knots (119 km/h).

To find past analogues that describe the climate state leading into the upcoming TC season, the conditions for May 2024 through to the beginning of October 2024 were examined for the tropical Pacific. Similar situations from 1969 to the present were then identified from the historical record. For late autumn through early austral winter (May-June) El Niño conditions prevailed for the central-western equatorial Pacific Ocean while the atmospheric conditions were neutral. By mid-to-late winter (July-August) conditions for the Pacific had moved to a neutral ENSO state. During that time, southwest Pacific regional climate patterns also showed signs of La Niña forming, which was reinforced by observations during September and early October. There is no evidence of the building ENSO event retrograding to El Niño conditions.

NIWA's monitoring of sea surface temperature anomalies in the Niño 3.4 region (central-western equatorial Pacific Ocean) shows the relative Niño3.4 index was  $-0.81^{\circ}\text{C}$  as of late September. This reflects the central equatorial Pacific being cooler than the average of the global tropics and within the range of La Niña. The subsurface equatorial Pacific was  $3^{\circ}\text{C}$  to  $5^{\circ}\text{C}$  cooler than average between 50m and 100m depth in the east-central part of the basin. The West Pacific Warm Pool continued to recharge and was  $0.5^{\circ}\text{C}$  to  $1.5^{\circ}\text{C}$  warmer than average at the end of September.

The available information from international forecasting centres that issue global climate outlooks and ENSO diagnostics support this outlook, and they are integrated by NIWA's National Climate Atmosphere and Hazards Centre. The collective guidance summarised by



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NIWA suggests La Niña is building and will most likely emerge early in the TC season during 2024, with a 60-70% chance the event will develop by December. However, atmospheric indicators across the tropics continue to be reflective of an ENSO neutral state. As such, an additional element used to hone the historic analogues for the upcoming TC season included years when ENSO conditions during November-April were reminiscent of an ocean-dominated La Niña in the early and late season.

To help identify past ENSO conditions for the selection of analogue seasons, we used an ENSO index that combines the Southern Oscillation Index (SOI) with the most widely used oceanic index of sea surface temperature anomalies in the equatorial central-western Pacific (NINO3.4). This joint ENSO index is described in Gergis and Fowler (2005) as the “Coupled ENSO Index” (CEI) but employing a five-month average for NINO3.4 and a three-month average for the SOI when computing this ENSO index. Using the CEI, we selected four analogue TC seasons for the 2024/25 outlook, highlighting seasons when the equatorial SSTs and the SOI were indicative of neutral conditions by mid-winter and early spring, and either ocean-dominant La Niña conditions at the start official TC season start in November. We also tempered our selection of analogues with knowledge that there will be a continuation of La Niña during summer and into autumn.

NIWA selected four analogue TC seasons (1983/84; 1995/96; 2005/06; 2017/18) that typified the antecedent ENSO conditions during austral early spring. Note that the selection of analogue seasons in this step of the outlook relates to the high-quality TC data period in the satellite era beginning in 1969/70 (54 seasons, for which TC track data are current only to the end of the 2022/23 season), and the limited number of similar analogues to this season (including rejected analogues, which may include some past seasons with similar antecedent conditions but not similar to what is forecast for ENSO). These selected analogues also encapsulate, for the most part, a lead into the season with neutral conditions transitioning to moderate La Niña conditions during the full, early and late season. These analogues closely align with the expected ENSO outlook.

NIWA’s SW Pacific TC outlook spans four areas of responsibility overseen by international monitoring and forecast agencies (RSMC Nadi, TCWC Melbourne, TCWC Port Moresby, and TCWC Wellington). We used a high-quality set of past TC tracks from the International Best Tracks Archive for Climate Stewardship (IBTrACS) which covers 135°E to 120°W longitude to draw on past TC track patterns for the seasonal outlook. The domain for the seasonal outlook encompasses a basin that is defined by climatological properties of TC occurrences rather than geopolitical or meteorological service administrative boundaries (Diamond et al., 2012). Based on the selection of analogues, there is an expectation of normal to reduced TC activity across the Southwest Pacific Basin for the 2024/25 season. Elevated TC risk is expected for Pacific Islands located in direct proximity to the Coral Sea, in particular Papua New Guinea, and normal-to-elevated risk is expected for the Solomon Islands. Normal risk is expected for Vanuatu, New Caledonia, Tonga, Niue and the Society Islands. Normal-to-reduced risk is expected for Fiji, Wallis and Futuna, Tuvalu and Samoa. Reduced risk is expected for Tokelau, American Samoa, the Austral Islands and the Southern Cook Islands

(See [Table 1](#) and [Table 4](#); [Figure 1, 3 & 4](#)). Island groups that usually experience quiescent TC activity including the Marquesas, the Tuamotu Archipelago, Kiribati, and Pitcairn Island are expected to not experience TC activity. The outlook for the region indicates increased overall risk for TC tracks transiting the area to the west of the International Date Line (See [Table 1](#) and [Table 4](#); [Figure 1, 3 & 4](#)).

The main TC genesis region for the coming season is expected to lie within the latitudinal band between 10 – 16°S and west of 170°E where a majority of the historic tracks associated with the analogue seasons showed storm formation. There is a clear signal for an elevated risk of tropical cyclones developing and tracking over waters located west of the International Date Line during both the early and late season. All analogue seasons had multiple Category 3 or greater strength, storms and all the analogue seasons (4 of 4) experienced at least one Category 4 or greater strength cyclone. Based on historic analogues, we suggest at least 40-50% of named storms that form during this season will transform into at least a Category 3 TC system, with strong possibilities that we will see multiple storms of Category 4 or greater strength. A total of 8 named cyclones are expected during this coming season (spread of 6-10 based on past analogues), which equates to normal or below normal activity relative to an average of nine named storms that have occurred each season in the southwest Pacific basin between 1991-2020. None of the selected analogues had out of season TCs that formed beyond the end of April, however all communities should remain vigilant even beyond the traditional end of the TC season.

A split of the analogue TC seasons into early (November – January) and late (February – April) periods suggests TC activity may be elevated along the northwestern Coral Sea and to the northwest of and over Fiji as well as to the east of the International Date Line during the early TC season ([Figure 3](#)). In general, TC activity is expected to increase greatly during the late season.

Previous TC research has indicated cyclone track sinuosity decreases during La Niña (Malsale, 2011). Many of the TC track trajectories in the analogues identified for the coming season suggest ‘wandering’ and long-lived storms are possible. TC intensity is partly related to how long developing cyclonic systems reside in the tropics and gain support for their growth from underlying warm waters. Nevertheless, lower strength TCs that have wandering tracks can still produce significant impacts on island communities and TCs of all strength should be monitored closely. In addition, the subtropical jet and South Pacific Convergence Zone (SPCZ<sup>3</sup>) interact and contribute to shear (which can disorganise cyclone systems) during extra-tropical transition (ETT). Hemispheric winds that help to steer storms exiting the tropical Pacific as well as the SPCZ are expected to be displaced north of normal, and the former may lead to increased shear and reduced retention of cyclone strength in the subtropics. The outcomes from the regional ocean-atmosphere patterns may also include weaker ex-TC impacts for northern New Zealand, however marine and coastal impacts from a decaying system could still be prominent.

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<sup>3</sup> The South Pacific convergence zone (SPCZ) is an extensive Southern Hemisphere atmospheric circulation feature that contains one of Earth’s most expansive and persistent convective cloud bands.

The interplay of hemispheric-scale atmospheric circulation with the timing of short-term Madden-Julian Oscillation (MJO) activity on a 30 to 50-day cycle has significant bearing on regional TC activity. Increased frequency and more intense TC activity can be expected during the MJO 6-7 paired phase (Diamond and Renwick, 2015). Weekly statistical forecasts of TC genesis and TC activity for the SW Pacific basin are produced by MétéoFrance based on phasing of the MJO (Leroy and Wheeler, 2008). This guidance is useful for sub-seasonal regional TC guidance (see <https://www.meteo.nc/nouvelle-caledonie/cyclone/coin-des-experts>). Real-time MJO monitoring is also available from the Australian Bureau of Meteorology at <http://www.bom.gov.au/climate/mjo/> and NOAA at [https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/clivar\\_wh.shtml](https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/clivar_wh.shtml).

TC tracks that have previously undergone ETT at 25°S latitude (Diamond et al., 2013) cover a wide area spanning east and west of the International Date Line (~165°E – 165°W). For the historical TC tracks that occurred in the four selected analogue seasons, a vast majority underwent ETT to the west of the International Date Line. This presents a view of significantly elevated risk related to the presence of TCs and ex-TCs in the Southwest Pacific Ocean for the maritime region between 25°S - 35°S and 160°E to the International Dateline (south of New Caledonia, Vanuatu and Fiji). Extra caution for vessels navigating maritime waters in that remote area is warranted.

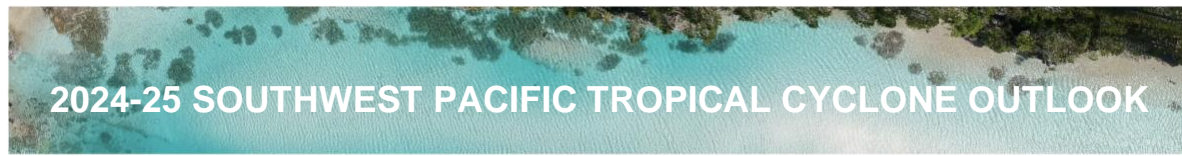
Previous work indicates New Zealand interacts with at least one ex-tropical cyclone passing within 550 km of the country every year on average (Lorrey et al., 2014). Some years there are none, while in other years there are more than one. For the coming TC season, the risk for New Zealand is normal to above normal. We identified six ex-tropical cyclones using four analogue seasons in this outlook that passed close to New Zealand, demonstrating interactions with an ex-TC during La Niña years have an increased probability. The historic TC seasons for this outlook with storms that passed close to New Zealand indicate an increased likelihood of decaying ex-tropical cyclones tracking offshore to the east of the North Island (see Figure 4). However, deteriorating storms that stalled north of the country as well as those that entered the Tasman Sea and made landfall on the South Island also occurred.

### **Dynamical climate model guidance summary**

A synthesis of atmospheric and sea surface temperature (SST) guidance favours near or below average tropical cyclone (TC) activity for the 2024/25 SW Pacific TC season. Multi-model ensemble (MME) guidance is in good agreement with the expectations of a weak-to-moderate La Niña event in the central and eastern Pacific that is likely to emerge and exist for most of the upcoming TC season (Figure 6 and Figure 7).

Dynamical forecast guidance from the Copernicus Climate Change Service (C3S), a multi-model ensemble of seasonal predictions from various international centres, is considered in this section.





Through the austral summer, mean sea level pressure (MSLP) is forecast to be below normal for much of the western and southwest sections of the Southwest Pacific basin ([Figure 7](#)), with above normal MSLP forecast east of the Date Line and north of 20° south latitude. This is likely indicative of the SPCZ being displaced southwest of normal, a typical impact of La Niña, and one that can cause below normal rainfall for many near-equator island groups as well as islands located to the east of the International Date Line. For island nations and territories that are located farther from the equator, particularly near and south of 10° S to the east of the International Date Line, drier than normal conditions are expected to elevate the risk of drought as a result of the SPCZ moving southwest of normal ([Figure 6](#)). However, the nearby passage of a single tropical storm could counter that situation.

A reduction in wind shear is forecast to emerge over the Coral Sea as the season progresses. This would provide a more favourable atmospheric environment for tropical cyclone development. If reduced atmospheric wind shear co-exists with other favourable environmental conditions, such as above average SSTs, then the odds for increased TC activity (e.g., occurrence, intensity) and extended longevity of a storm system after ETT may be elevated.

### **Deterministic statistical model summary**

The Long-Range Tropical Cyclone Outlook for the Southwest Pacific (TCO-SP) product has been incorporated into the ICU outlook since the 2020/21 season to provide support for a consensus-based ensemble of TC risk. TCO-SP is based on a different method than the analogue and dynamical approaches. The TCO-SP method is calibrated using the IBTrACS data set and several key climate indices for the Southern Hemisphere (see Magee et al., 2020 and the supplementary material for more details). For the coming Southwest Pacific TC season, the deterministic TCO-SP outlook suggests 9 named TCs may form (probable range of 7-11), indicating near normal activity for the basin when compared with the 1991-2020 average of 8.7 TCs ([Table 1](#), [Table 4](#), and [Figure 8](#)). This TC count range agrees with the analogue guidance.

## References

Gergis, J., and A. M. Fowler, 2005. Classification of synchronous oceanic and atmospheric El Niño–Southern Oscillation (ENSO) events for palaeoclimate reconstruction. *International Journal of Climatology*, **25**: 1541–1565.

Diamond, H.J., and J.A. Renwick, 2015. The climatological relationship between tropical cyclones in the southwest Pacific and the Madden-Julian Oscillation. *International Journal of Climatology*, **35**: 676–686. doi: 10.1002/joc.4012.

Diamond, H.J., A.M. Lorrey, K.R. Knapp, and D.H. Levinson, 2012. Development of an enhanced tropical cyclone tracks database for the southwest Pacific from 1840–2011. *International Journal of Climatology*, **32**: 2240–2250. doi:10.1002/joc.2412.

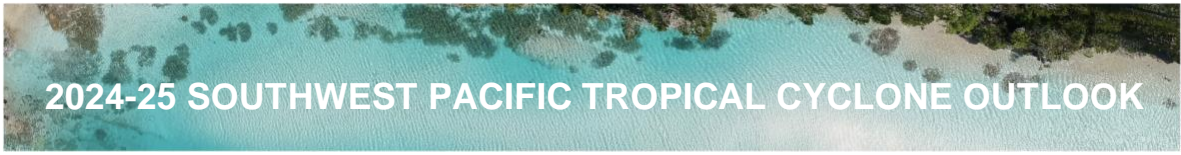
Diamond, H.J., A.M. Lorrey, and J.A. Renwick, 2013. A Southwest Pacific tropical cyclone climatology and linkages to the El Niño–Southern Oscillation. *Journal of Climate*, **26**(1): 3–25. doi:10.1175/JCLI-D-12-00077.1.

Leroy, A., and M.C. Wheeler, 2008. Statistical prediction of weekly tropical cyclone activity in the Southern Hemisphere. *Monthly Weather Review*, **136**: 3637–3654.

Lorrey, A.M., G. Griffiths, N. Fauchereau, H.J. Diamond, P.R. Chappell, and J. Renwick, 2014. An ex-tropical cyclone climatology for Auckland, New Zealand. *International Journal of Climatology*, **34**: 1157–1168. doi: 10.1002/joc.3753.

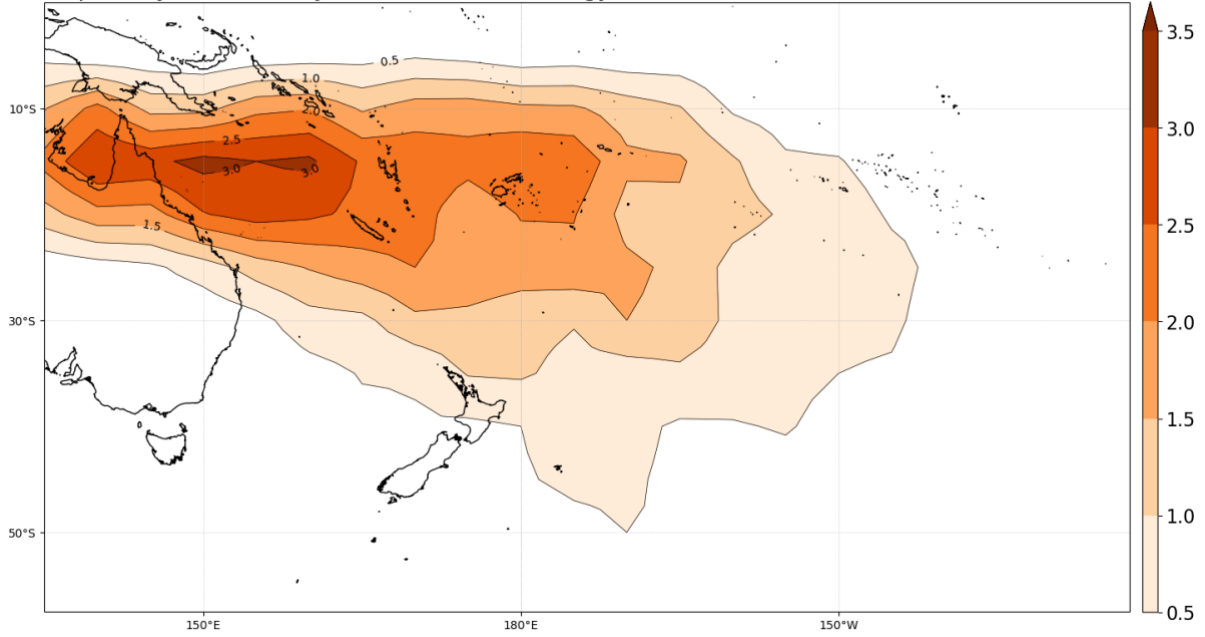
Magee, A.D., Lorrey, A.M., Kiem, A.S., Colyvas, K. 2020. A new island-scale tropical cyclone outlook for southwest Pacific nations and territories. *Scientific Reports*, **10**, 11286, <https://doi.org/10.1038/s41598-020-67646-7>

Malsale, P. 2011. Analysis of tropical cyclone track sinuosity in the South Pacific region using ARCGIS. Unpublished MSc Thesis, University of the South Pacific, 155 Pages

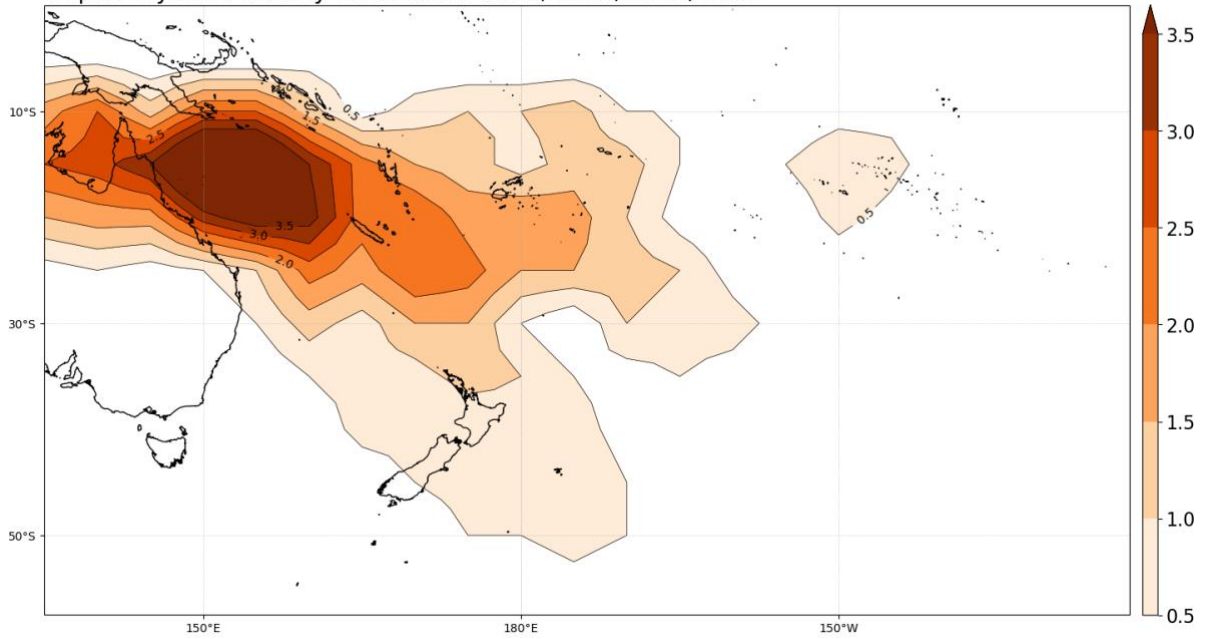


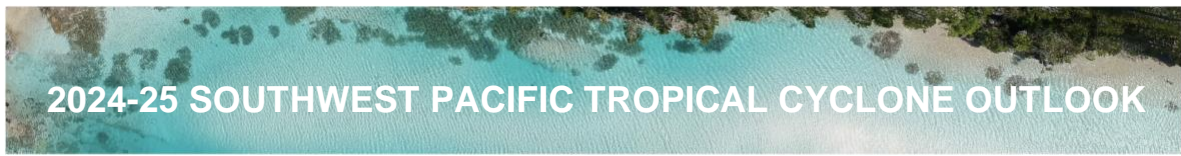
# 2024-25 SOUTHWEST PACIFIC TROPICAL CYCLONE OUTLOOK

Tropical Cyclone Density Full Season Climatology



Tropical Cyclone Density Full Season: 1983, 1995, 2005, 2017





# 2024-25 SOUTHWEST PACIFIC TROPICAL CYCLONE OUTLOOK

Tropical Cyclone Density Anomalies, Full Season: 1983, 1995, 2005, 2017

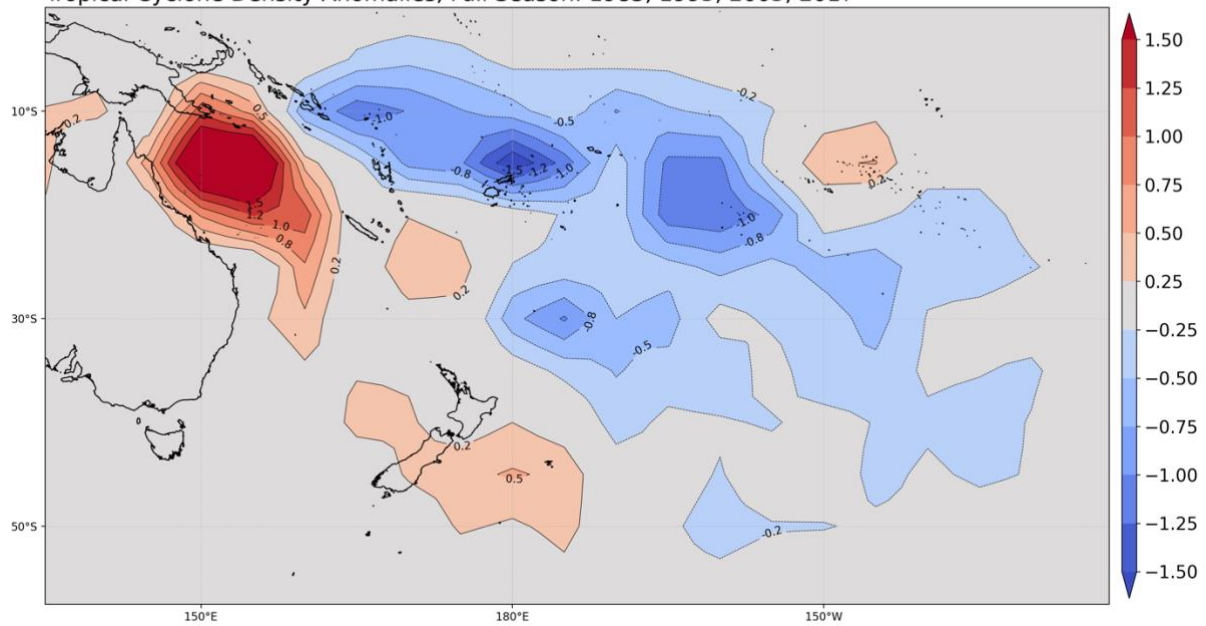
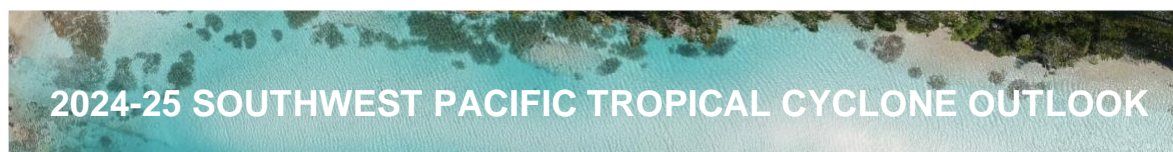


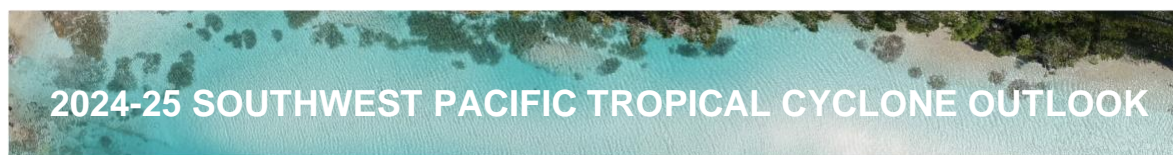
Figure 3: Number of TCs occurring for the main development season (November – April) in the Southwest Pacific (135°E to 120°W): (top panel) average number during 1991 to 2020 (normal); (centre panel) average number over selected four analogue seasons ([Table 3](#)); (bottom panel) departure from normal for the analogue seasons (difference between count in centre and top panels). For each year noted, that represents the start of the main development season (i.e. 1983 = November 1983-April 1984)



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Table 2: The average number of TCs passing close to the main South Pacific Island groups between November and April based on analogue guidance but contains subjective assessments in some cases to be consistent with the wishes of the national meteorological services involved in generating this regional outlook. In addition, subjective qualification of activity (and associated risk) also recognises the small differences between the actual TC counts for the analogue composites and climatological values. The table is therefore only generally indicative of how many cyclones might be expected for any given island group for the coming season. This information feeds into the final outlook for the season as in [Table 1](#).

Country / Territory	Climatology	Analogue seasons	Anomaly	% normal	Risk
New Caledonia	2.3	2.4	0.1	105	Normal
Solomon Is.	1.7	2.0	0.3	120	Normal-Elevated
Papua New Guinea	0.8	1.8	1.0	225	Elevated
Vanuatu	2.3	1.8	-0.5	80	Normal
Tonga	2.0	1.7	-0.3	85	Normal
Wallis & Futuna	2.1	1.4	-0.7	70	Normal-Reduced
Fiji	2.2	1.2	-1.0	55	Normal-Reduced
Samoa	1.7	1.1	-0.6	65	Normal-Reduced
American Samoa	1.6	1.1	-0.5	70	Reduced
Niue	1.4	1.1	-0.3	80	Normal
N. New Zealand	0.8	0.9	0.1	115	Normal-Elevated
Tuvalu	1.4	0.9	-0.5	65	Normal-Reduced
Society Is.	0.7	0.7	0.0	100	Normal
Tokelau	1.3	0.5	-0.8	40	Reduced
S. Cooks	1.2	0.2	-1.0	20	Reduced
Austral Is.	0.7	0.2	-0.5	30	Reduced
Tuamotu	0.1	0.1	0.0	N/A	Unlikely
W. Kiribati	0.1	0.1	0.0	N/A	Unlikely
Marquesas	0.1	0.1	0.0	N/A	Unlikely
N. Cooks	0.4	0.0	-0.4	N/A	Unlikely
Pitcairn	0	0.0	0.0	N/A	Unlikely
C. Kiribati	0	0.0	0.0	N/A	Unlikely
E. Kiribati	0	0.0	0.0	N/A	Unlikely



## 2024-25 SOUTHWEST PACIFIC TROPICAL CYCLONE OUTLOOK

Table 3: Previous analogue seasons and intensity of TCs that occurred in the Southwest Pacific during the November-April TC season. Categorisation of TCs aligns to the Australian Bureau of Meteorology (BoM) scale. *Italicised figures for category totals are the mean of the count for that category instead of the expected total. Expected totals account for the long-term decline in named tropical cyclone counts using the analogue selection method.*

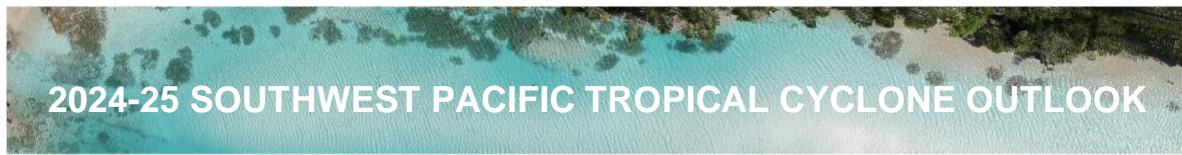
Season	Number of storms Cat 1 or higher	Right: TC category (BoM scale)	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
1983/84	11		4	2	4	0	1
1995/96	9		5	1	1	2	0
2005/06	8		1	2	3	1	1
2017/18	8		2	1	3	1	1
Average	9		<i>3.0</i>	<i>1.5</i>	<i>2.8</i>	<i>1.0</i>	<i>0.8</i>
Expected total	8		2	2	2	1	1

### Analogue guidance summary

Based on the guidance from the NIWA analogue method, a conservative range of 6 – 10 named TCs could be expected during the 2024/25 season for the Southwest Pacific basin (135° E – 120° W). The spread for the estimated cyclone activity comes from the variation between four selected analogue seasons. The historic long-term seasonal average is just under nine named TCs for the SW Pacific basin. Most of the analogue seasons indicate a total number of cyclones that are at or below the long-term average. The long-term regional trend for TC occurrence in the SW Pacific has seen a decreasing number of named storms. The spread of the historical analogues and rounded total that is expected for the coming season encapsulates that trend.

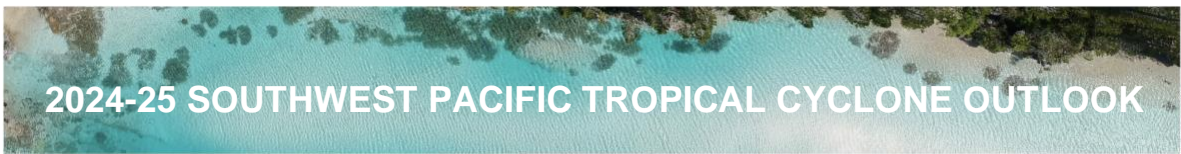
About half (40-50%) of the named storms that are expected to form this coming season (e.g. between 3 – 4 named tropical cyclones out of eight total) may reach severe Category 3 or higher status. All the historic analogues selected for the 2024/25 outlook have at least three severe TCs, indicating a strong likelihood of multiple named storm systems reaching Category 3 or higher in the SW Pacific. All of the historic analogue seasons indicate at least one cyclone that reached at least Category 4 strength. This provides confidence in the statistical outlook for expected cyclone strengths and supports a conservative range of 3 – 4 severe tropical cyclones for the coming season. The seasons selected for NIWA's analogue outlook also contain multiple Category 5 cyclones (see Table 3). Despite a notable trend toward fewer named storms and stronger TCs in the SW Pacific over the past five decades, the agreement of the analogues raises the possibility that at least one severe storm during the upcoming season could transform into a Category 5 system.

For the selected analogues, three seasons show at least one ex-tropical cyclone came within 550 km of New Zealand. One of the seasons had no ex-tropical cyclone interactions (1983/84), while others had multiple interactions (1995/96; 2017/18). Some past decaying



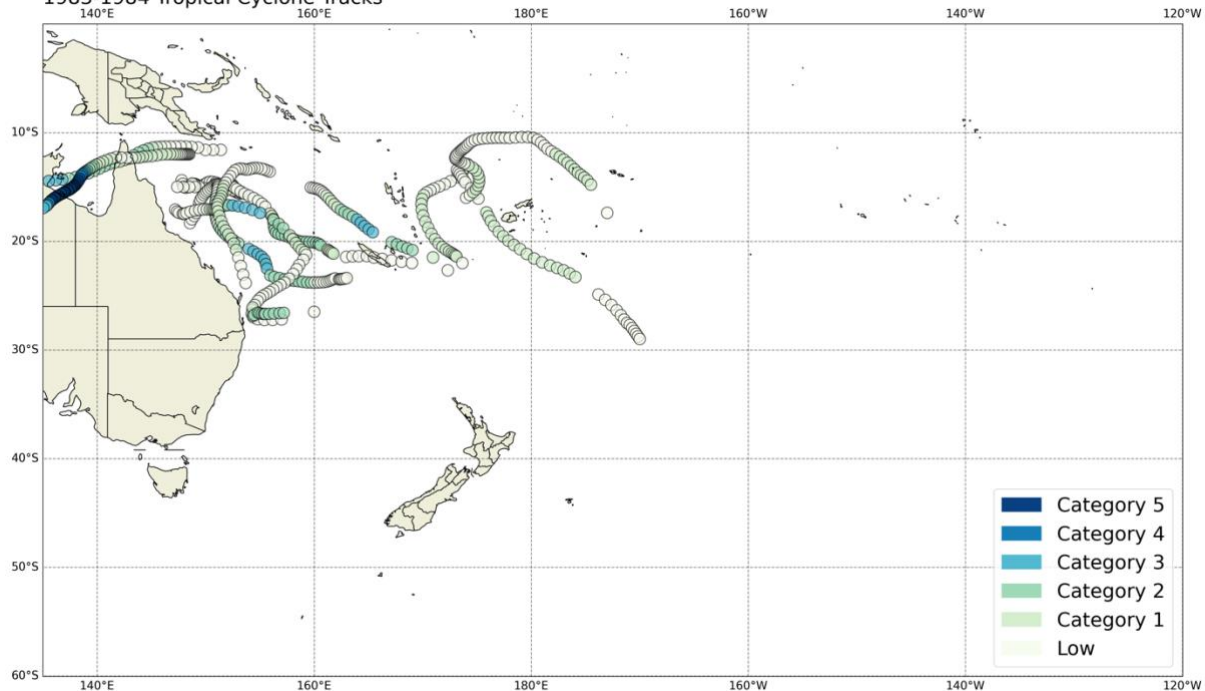
## 2024-25 SOUTHWEST PACIFIC TROPICAL CYCLONE OUTLOOK

ex-tropical cyclone systems have been associated with high rainfall, damaging winds and amplified coastal wave conditions. Because the analogues have identified multiple years with an ex-tropical cyclone system interacting with the New Zealand Exclusive Economic Zone (EEZ), the risk of an interaction for the country (where at least one cyclone approaches within 550 km of land) for the 2024/25 season is normal-elevated. More of the ex-tropical cyclones that interacted with New Zealand during the historical analogue seasons either deteriorated or transited Pacific Ocean waters to the east of New Zealand. As such, there is a slightly higher probability of a decaying ex-tropical cyclone tracking to the east of the North Island based on historic track data ([Figure 4](#)).

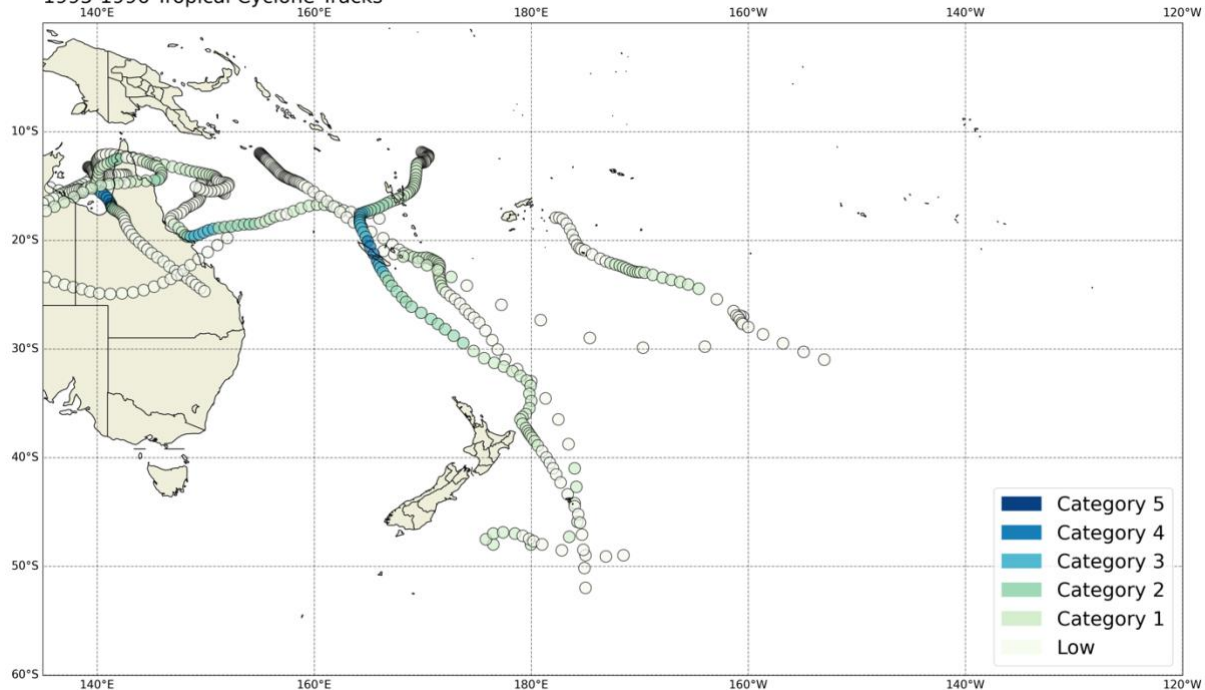


# 2024-25 SOUTHWEST PACIFIC TROPICAL CYCLONE OUTLOOK

1983-1984 Tropical Cyclone Tracks



1995-1996 Tropical Cyclone Tracks





# 2024-25 SOUTHWEST PACIFIC TROPICAL CYCLONE OUTLOOK

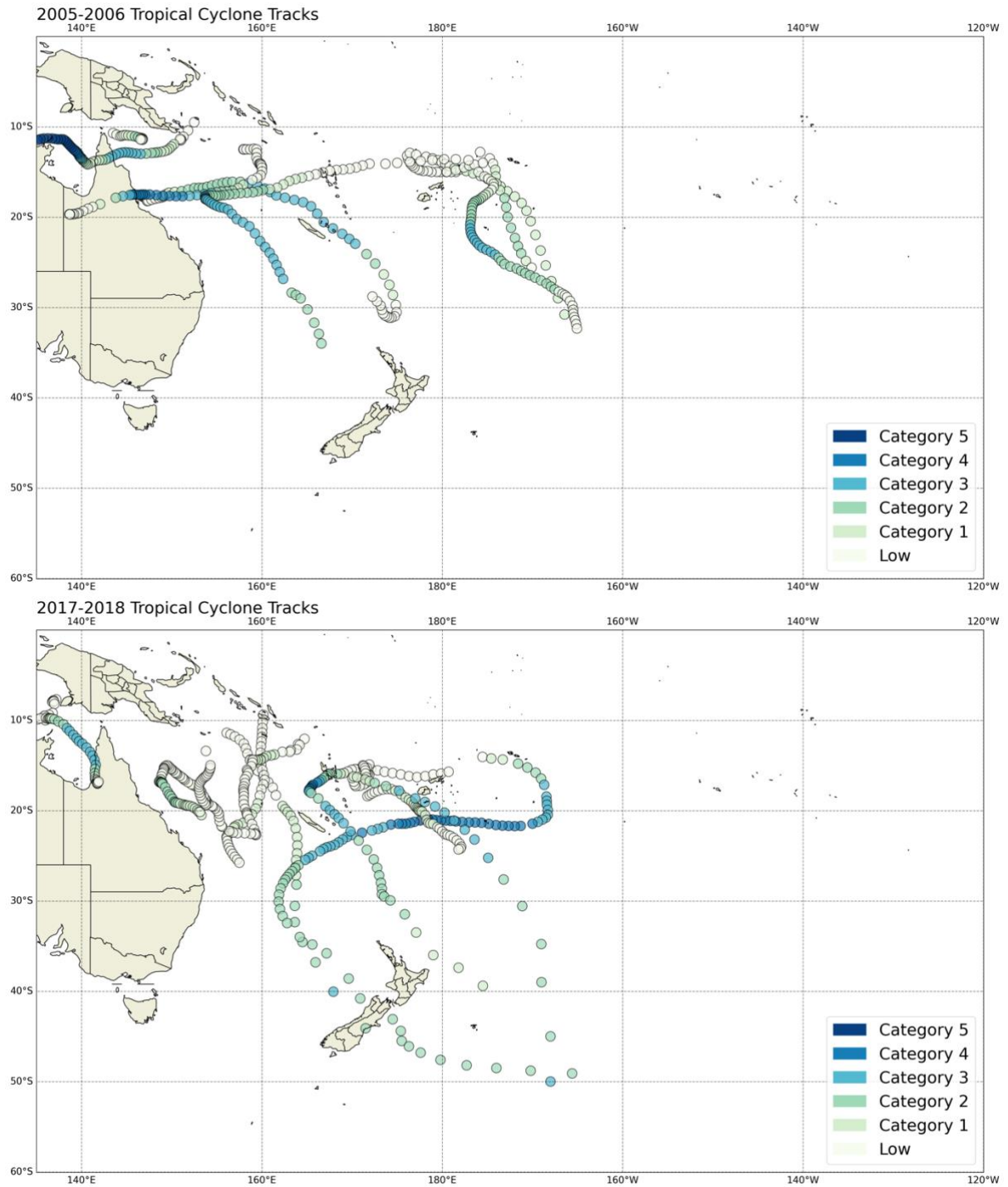
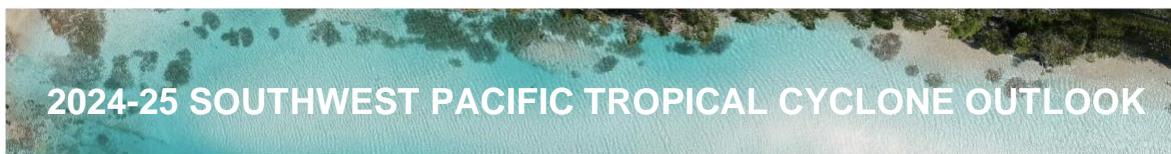
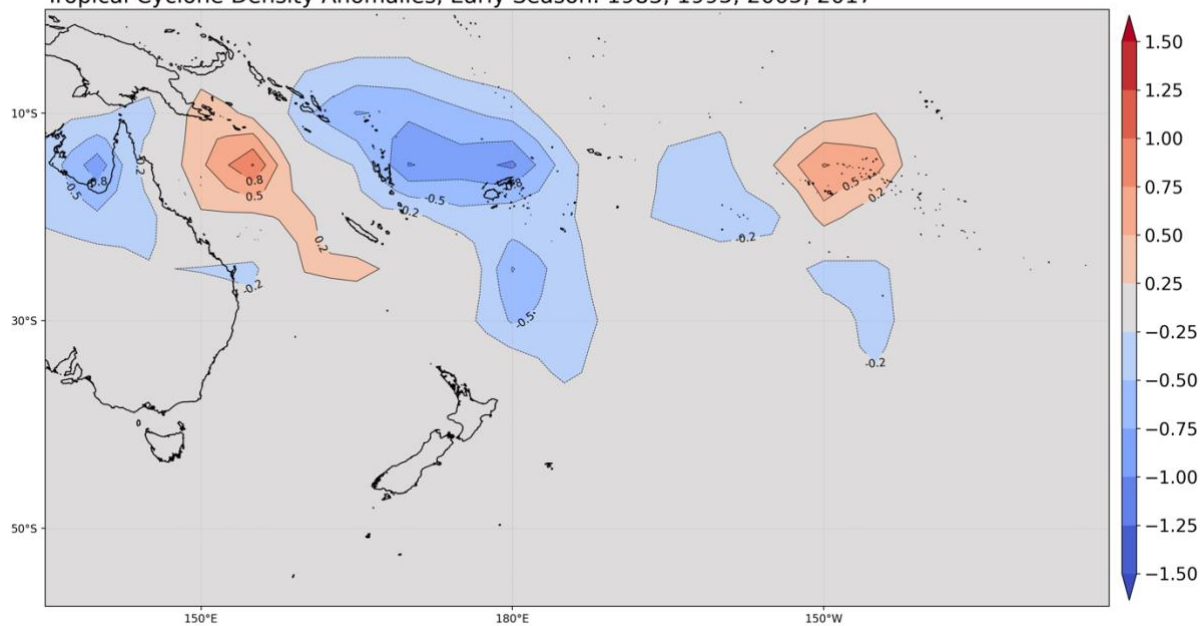


Figure 4: Plots of TC tracks and major tropical lows that were monitored for analogue seasons used in the 2024/25 seasonal forecast for the full season (November - April). Track data are courtesy of International Best Tracks Archive for Climate Stewardship (IBTRaCS)



# 2024-25 SOUTHWEST PACIFIC TROPICAL CYCLONE OUTLOOK

Tropical Cyclone Density Anomalies, Early Season: 1983, 1995, 2005, 2017



Tropical Cyclone Density Anomalies, Late Season: 1983, 1995, 2005, 2017

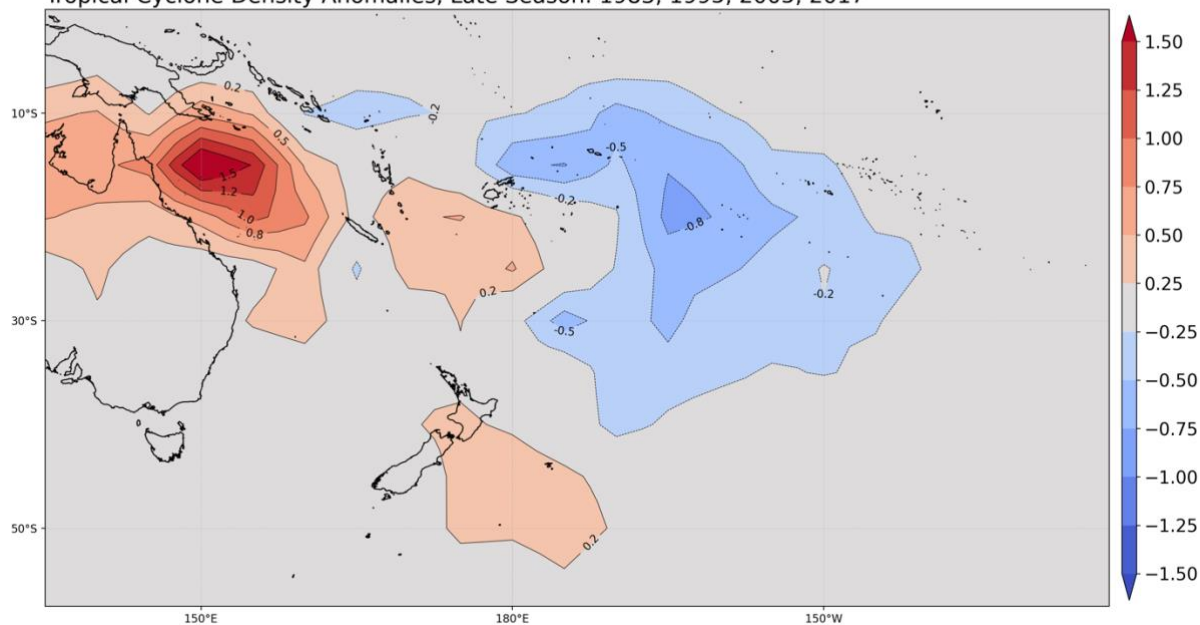


Figure 5: Early season (November to January; top panel) and late season (February to April; bottom panel) anomaly plots for selected TC analogue seasons (data courtesy of International Best Tracks Archive for Climate Stewardship (IBTrACS)). The year label notes the first month in the analogue year selection (i.e. for the early TC season “1983” = November 1983, December 1983, January 1984; and for the late TC season “1983” = February – April 1984).

## Dynamical Guidance Summary

A synthesis of model atmospheric and SST guidance favour near average TC activity across the Southwest Pacific basin for the 2024/25 season. However, there is likely to be regional variability with an overall reduction of TC activity near and east of the International Dateline as well as the potential for above normal storm occurrences near the Gulf of Carpentaria, Papua New Guinea, and parts of the Coral Sea.

## ECMWF seasonal guidance, November 2024-April 2025

The Accumulated Cyclone Energy, or ACE forecast: September 2024 ECMWF seasonal guidance indicates that below normal seasonal ACE (70% of normal) is most likely for the Southwest Pacific region (160°E-120°W) and that near normal ACE (100% of normal) is most likely for the Australian region (90°E-160°E). ACE is a metric derived from tropical cyclone intensity and duration, averaged across the basin.

Tropical storm (cyclone) density anomaly is forecast to be near normal or below normal in the central and eastern part of the basin. More specifically, a zone of reduced activity is forecast from near Vanuatu to Fiji, extending eastward toward the southern Cook Islands. An area of enhanced activity is indicated in the Coral Sea, west of New Caledonia.

Tropical storm (cyclone) and hurricane frequency (Category 3 or higher):  
For the Southwest Pacific region, ECMWF seasonal guidance indicates that the number of tropical cyclones is most likely to be below normal (about 70% of normal). Guidance suggests that the frequency of severe TCs will also be below normal (about 70% of normal).

For the Australian region, ECMWF seasonal guidance indicates a near normal number of tropical cyclones (about 105% of normal) and severe TCs (about 110% of normal). For the region as a whole, this guidance supports a near normal to below number of TCs and severe TCs for the 2024/25 tropical cyclone season. However, the dynamical guidance indicates regional variability; western areas of the basin are likely to be more active than eastern parts of the basin.

The ECMWF Southwest Pacific forecast domain for ACE is from 160° E to 120° W. NIWA's outlook covers 135° E to 120° W, therefore the forecast generated by NIWA extends 25° westward relative to the ECMWF forecast domain.

Information about the dynamical models used: information on ECMWF model skill can be found here for: [tropical cyclones](#), [severe tropical cyclones](#), and [ACE](#). An overview of the multi-model ensemble used to create the rainfall and air pressure plots can be found [here](#).

# 2024-25 SOUTHWEST PACIFIC TROPICAL CYCLONE OUTLOOK

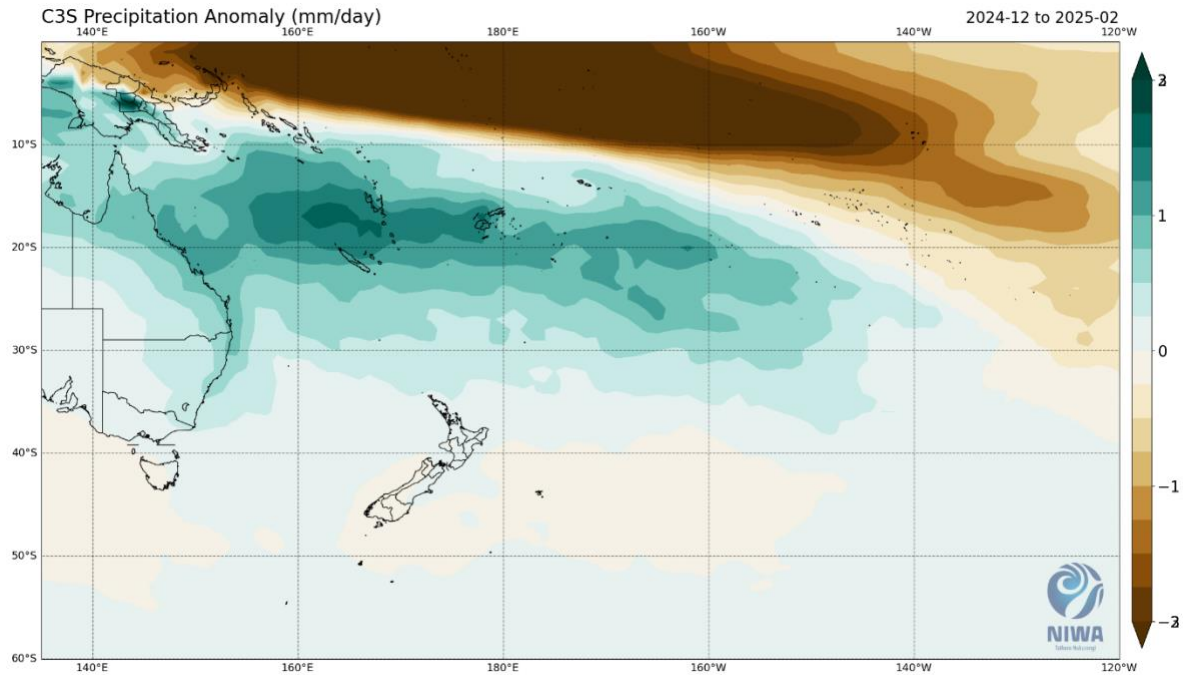


Figure 6: Multi-model ensemble forecast rainfall anomaly (mm/day), December 2024-February 2025; green (brown) shades indicate above (below) normal forecast rainfall

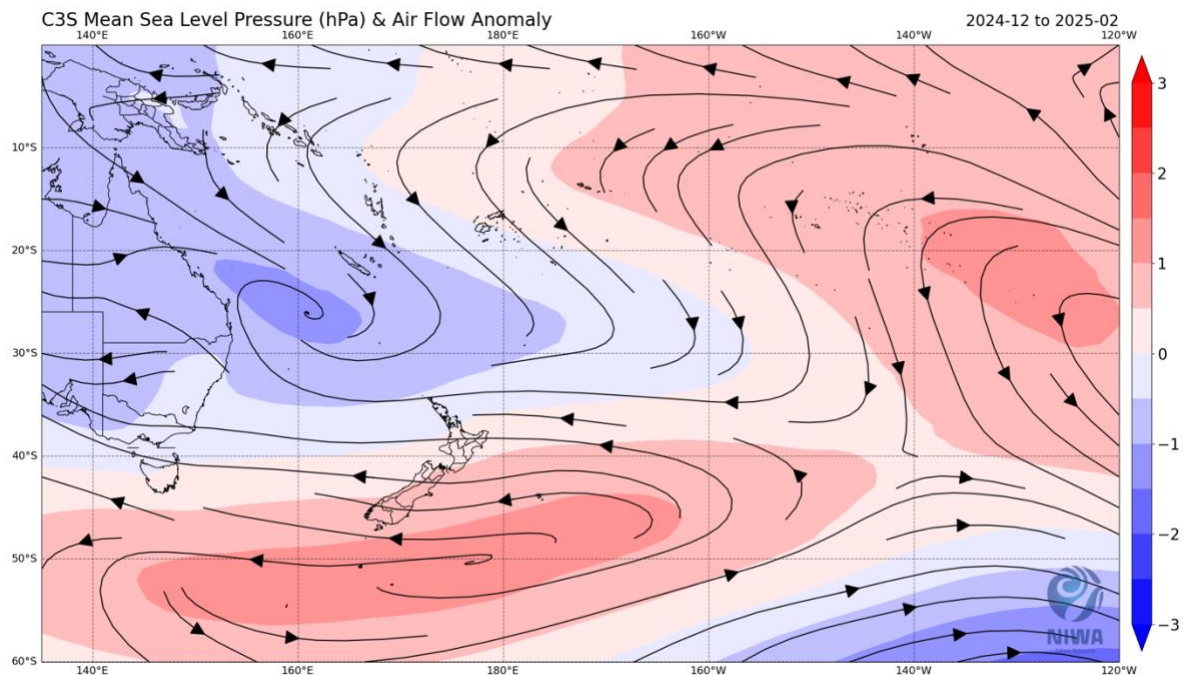
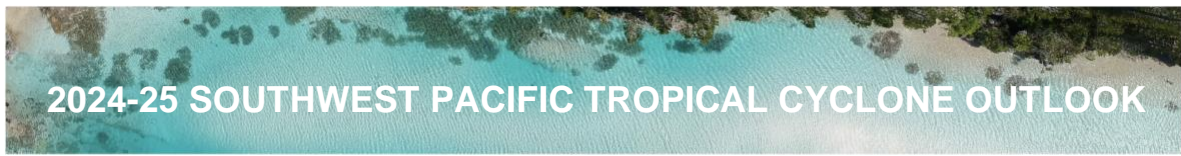


Figure 7: Multi-model ensemble forecast air pressure anomaly (hPa), December 2024-February 2025; red (blue) shades indicate above (below) normal air pressure; areas of below normal pressure in the tropics can indicate an increased potential for tropical cyclone genesis



## TCO-SP (University of Newcastle) deterministic model summary

TCO-SP is a long-range tropical cyclone outlook based on a multivariate statistical method generated using Poisson Regression (Magee et al., 2020) published in [Scientific Reports](#). This is the fifth year the product is available, and we have continued to incorporate it into the ICU outlook because it provides a different view from analogue and dynamical approaches. For the coming 2024/25 season, the deterministic TCO-SP outlook for Southwest Pacific TC season suggests nine named TCs may form (probable range of 7-11), indicating normal activity for the basin when compared with the 1991-2020 average of 8.7 TCs ([Table 4](#) and [Figure 8](#)). See <https://tcoutlook.com/swpacific/> for more details related to this part of the outlook.

For the SW Pacific basin, the multi-model average based on the 10 models used in TCO-SP indicates about nine TCs are expected (see [Figure 8](#)). The majority of the models indicate normal or below normal activity for the basin. The skill score of the model for the basin-wide outlook (which has been selected using an objective convention) is the highest of the group of 10 models employed in the TCO-SP guidance. The expected TC count (8.5 TCs) for the SWP domain is similar to the average TC count (8.7 TCs). The near-normal risk profile for this region considers the percentage difference between the normal and forecast TC numbers (8.5 vs 8.7 = 2% decrease). Overall, the spatial pattern for the TCO-SP outlook displays similarities to both the analogue and dynamical guidance, with more similarities to the analogues in the far eastern and western parts of the basin and greater similarities to the dynamical guidance in the western and central part of the basin.

Table 4: Expected TC counts including expected range (95% confidence intervals (CI)) for the 2024/25 Southwest Pacific tropical cyclone season (September 2024 update), difference from long term average TC count (1991-2020).

		Long-term average TC count (1991-2020 <sup>b</sup> )	Expected TC Count (Probable TC count range: 95% CI)	Difference between expected and long-term average (TC)
Island Scale Models	Southwest Pacific	8.7	8.5 (6.7 – 10.7)	▼-0.2
	Fiji	2.5	1.9 (1.2 – 3.0)	▼-0.6
	Solomon Islands	2.5	2.1 (1.0 – 4.1)	▼-0.4
	New Caledonia	2.3	2.3 (1.4 – 3.6)	0
	Vanuatu	2.0	1.9 (1.0 – 3.5)	▼-0.1
	Tonga	2.0	1.8 (0.9 – 3.6)	▼-0.2
	Papua New Guinea	1.6	2.1 (0.5 – 2.4)	▲+0.5
Northern New Zealand	0.7	0.6 (0.2 – 2.4)	▼-0.1	
Subregional models <sup>a</sup>	<b>N SWP</b> (Tuvalu, Wallis & Futuna, Tokelau)	1.8	1.7 (0.8 – 3.7)	▼-0.1
	<b>C SWP</b> (Samoa, American Samoa, Niue)	1.5	1.4 (0.6 – 3.2)	▼-0.1
	<b>SE SWP</b> (Southern Cook Islands, Society Islands, Austral Islands)	1.6	0.5 (0.3 – 1.0)	▼-1.1
	<b>NE SWP</b> (Northern Cook Islands, E Kiribati: Line Islands, Marquesas, Tuamotu Archipelago, Gambier Islands, Pitcairn Islands)	1.1	0.1 (0.0 – 0.5)	▼-1.0

<sup>a</sup> Sub-regional models – where individual island TC climatology shows less than 1.5 TCs per season, geographically neighbouring EEZs have been merged to increase sample size ([Click here](#) for more information).

<sup>b</sup> Average TC counts calculated for November-April TC season.

# 2024-25 SOUTHWEST PACIFIC TROPICAL CYCLONE OUTLOOK

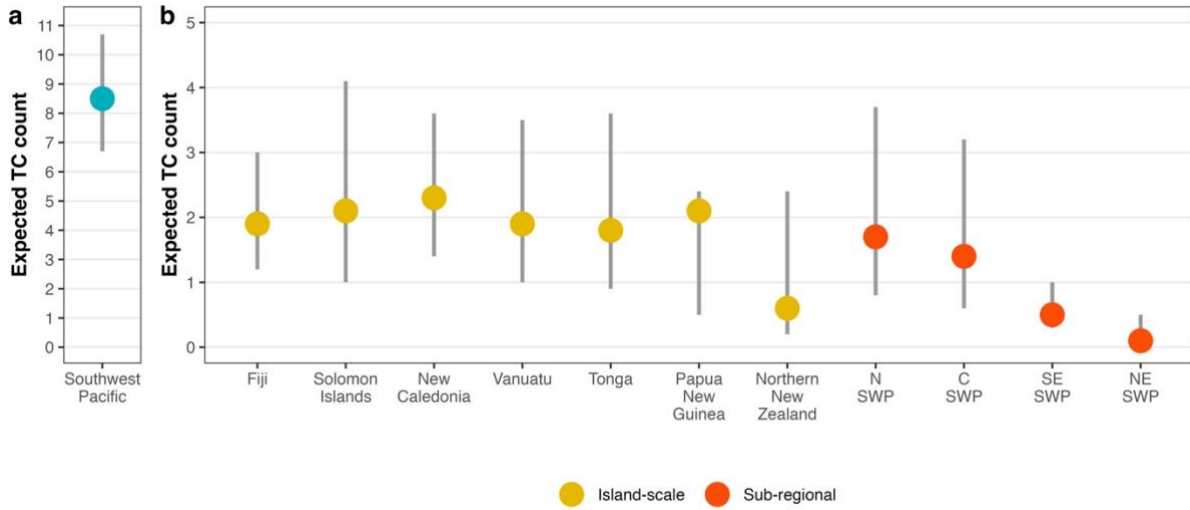


Figure 8: Expected TC count including probable range (95% confidence intervals) for the 2024/25 Southwest Pacific Tropical Cyclone Season based on TCO-SP (Magee et al., 2020). Expected TC counts are summarised for the Southwest Pacific (panel a) and island-scale and sub-regional locations (panel b)