

[General comments]

This study examines how ENSO-related teleconnection patterns are linked to extratropical cyclone activity around Australia during austral spring. The authors identify persistent teleconnection pattern periods using daily low-frequency circulation fields and compare cyclone activity during all extended SON days, teleconnection pattern days, and non-pattern days. They find more pronounced cyclone day frequency anomalies over the Tasman Sea during teleconnection pattern days, with increases during La Niña and decreases during El Niño. They also examine changes in local cyclogenesis frequency and cyclone residence time, and decompose eastern Australian rainfall anomalies into components associated with Tasman Sea cyclone and non-cyclone days.

An important question addressed here is how ENSO teleconnections are linked to synoptic weather systems. However, several issues limit the strength of the conclusions. Stronger anomalies during the selected periods do not, by themselves, demonstrate an improved ENSO-related signal-to-noise ratio. The connection between these conditional results and the weak seasonal cyclone signal therefore needs clearer support. The Monte Carlo significance test for cyclone day frequency also needs to account adequately for temporal dependence within persistent events. In addition, the rainfall decomposition does not distinguish changes in the frequency of cyclone days from changes in mean rainfall on cyclone days, which limits the interpretation of the contribution of cyclone activity changes to rainfall anomalies.

These issues should be addressed through further analysis and more careful interpretation to ensure that the main conclusions are adequately supported.

[Major comments]

1. Stronger conditional anomalies do not necessarily demonstrate an improved ENSO signal-to-noise ratio. Figure 4 shows that each teleconnection pattern occurs more frequently during the corresponding ENSO years, while Fig. 7 shows that cyclone day frequency (CDF) anomalies are more pronounced during pattern days than in the seasonal composites. These results support a link between ENSO, teleconnection patterns, and cyclone activity. However, conditioning also changes the sample being

analysed, so larger composite anomalies do not automatically imply an improved ENSO signal-to-noise ratio. Please provide further quantitative support for the statements in L373–374 and L559–563. For example, the proportions of pattern and non-pattern days could be combined with their respective CDF anomalies to assess their contributions to the seasonal anomaly over the Tasman Sea. This would help explain why the anomalies are less pronounced in the seasonal composites. It would also be useful to examine whether the results are dominated by a few ENSO events. If the term “improved signal-to-noise ratio” is retained, its meaning and evaluation should be clearly defined. Otherwise, the conclusions should be limited to the finding that cyclone anomalies are more pronounced under particular circulation conditions, without treating the larger conditional anomalies as evidence that an ENSO signal has been recovered from noise.

2. The CDF significance tests need to account adequately for temporal dependence within persistent events. Section 2.6 evaluates the significance of CDF anomalies using a Monte Carlo method that randomly selects the same number of days as in the target sample. However, pattern days belong to teleconnection events lasting at least 10 consecutive days. Days within the same event are therefore not independent, and an individual cyclone may also affect the region for several days. If random sampling breaks this temporal dependence, the resulting samples may be less variable than the actual event samples. This could underestimate uncertainty and overstate statistical significance. Please clarify how the current CDF tests account for this dependence. If it has not been considered, a resampling method that preserves the temporal structure of persistent events should be used to reassess the statistical significance of the key CDF anomalies and provide appropriate uncertainty estimates in Fig. 7. The specific method can be chosen according to the sample characteristics. In addition, please directly test the CDF difference between pattern and non-pattern days within each ENSO category. A significant anomaly relative to climatology in one group, but not in the other, does not establish a significant difference between the two groups.

3. The rainfall decomposition does not distinguish changes in the proportion of Tasman Sea cyclone days from changes in mean rainfall on those days. Section 3.3 (L506–523)

decomposes mean rainfall anomalies into components associated with Tasman Sea cyclone and non-cyclone days (Fig. 13). This helps identify which category of days is associated with the rainfall anomalies. However, a change in the cyclone-day rainfall contribution may arise from more or fewer cyclone days, a change in mean rainfall per cyclone day, or both. Similar spatial patterns and magnitudes between the cyclone-day component and the total anomaly therefore do not establish how much of the rainfall anomaly is explained by changes in cyclone-day frequency. Given the study's aim of explaining the contribution of cyclone changes to ENSO-related rainfall anomalies, please separate these sources and provide quantitative estimates and uncertainties for the key regions. If the current decomposition is retained, its interpretation should be limited to the importance of the cyclone-day rainfall component, while acknowledging that the analysis does not determine whether this contribution mainly reflects changes in cyclone-day frequency or conditional mean rainfall. The discussion and conclusions should also distinguish rainfall anomalies occurring on cyclone days from rainfall anomalies caused by changes in cyclone activity.

[Minor comments]

1. L28–33: The paragraph moves from ENSO influences on Australian rainfall to droughts, floods, and wildfires, before returning to the typical rainfall response. Please consider first describing the basic ENSO–rainfall relationship, then briefly noting its socioeconomic importance, and finally introducing the circulation mechanisms. This would improve the flow of the paragraph.
2. L48–49: The statement that direct evidence linking ENSO to Australian extratropical cyclones is absent is too absolute, given previous studies on ENSO-related cyclone and weather-system variability. Please clarify that the difficulty mainly concerns detecting robust ENSO-related changes in regional cyclone frequency under conventional seasonal analyses.
3. L97–98: Austral spring is described as the season with the strongest Southern Hemisphere extratropical circulation response to ENSO, but no supporting reference is provided. Please add appropriate references.
4. Section 2.3: Given the small numbers of EP and CP El Niño events, please discuss

the potential sensitivity of the event classification to the chosen ONI thresholds. In particular, the statement that the results are not expected to be sensitive to the choice of ENSO index should be justified or expressed more cautiously.

5. Table 1: The wording “SON-based Niño-3–4 index method” in the caption could be mistaken for a method based on the Niño-3.4 index. Please clearly distinguish the use of the Niño-3 and Niño-4 indices from the Niño-3.4 index.

6. L165–176: The extended SON season is defined as 16 August–15 December and stated to contain 121 days per year. However, this interval contains 122 days if both endpoints are included, while Fig. S1 refers to 15 August–15 December. Please clarify the actual date range and verify that the corresponding sample sizes and calculations are consistent throughout the manuscript.

7. Figure 5: Please check the panel labels. The two RWS panels in the La Niña section are labelled (h) and (k), duplicating the labels in the CP El Niño section above.

8. Table 2: Please clarify whether the spatial correlation coefficients were calculated using area weighting.

9. Figures 6, 8, 11, and S2: Please consider adding the Tasman Sea analysis box, as shown in Figs. 7 and 9, to facilitate comparisons of cyclone activity, baroclinicity, and local environmental anomalies over the study region.

10. L403–405 and L429–436: The relatively weak EGR anomalies over the Tasman Sea suggest that changes in local low-level baroclinicity may not fully explain the CDF anomalies. However, this does not establish that local diabatic or other processes dominate cyclone development in this region. Please present these processes as possible explanations rather than established mechanisms, and acknowledge that their relative importance has not been quantified.

11. Figure 10c and L457–460: The term “significant” may imply statistical significance, although no corresponding statistical test is presented. Please use a more descriptive expression, such as “no clear systematic differences”, unless a statistical test is provided.

12. L466–483 and Fig. 11: The authors use vertical velocity, moisture flux divergence, and low-level relative vorticity to explain the differences in Tasman Sea cyclone activity between El Niño and La Niña. These fields are physically consistent with the

CDF anomalies. However, the local environmental anomalies may partly result from changes in cyclone activity. Concurrent composites alone cannot establish that these anomalies precede the cyclone changes. I suggest examining the background environment several days before cyclone formation. Evidence that the relevant anomalies are already established before formation would strengthen the proposed environmental influence on cyclogenesis.

13. L493–494 and Fig. 12: Describing the pattern-day rainfall anomalies as having spatial patterns consistent with the seasonal composites but stronger magnitudes does not fully capture the regional changes. For example, the CP El Niño pattern-day composite shows marked increases in the magnitude of negative anomalies over northern and southeastern Australia. These changes should not be described simply as an overall amplification of the seasonal pattern.

14. Please use a consistent format for units throughout the manuscript. For example, “Pa/s” should be written as “Pa s⁻¹”.