This study employs reanalysis data to explore the role of recurrent Rossby wave packets (RRWPs) and blocks in the persistence of southeastern Australia (SEA) heat waves using a combination of statistical analyses and case studies. As is the case with any observational study of a limited set of unique extreme events, understanding and quantifying the role of an individual Earth system component (the atmospheric flow in this case) is a challenging but important research effort. With this in mind, the authors have managed to illuminate aspects of SEA heat waves and provide new evidence on the role of the upper-tropospheric circulation. I have listed below my comments on the presented material - some of which could be deemed as "major issues" - as well as a few suggestions and corrections toward a revised version of the manuscript.

Comments/Issues

1. Lines 96-99 are not that clear. The 1.3 PVU threshold is an upper limit, lower limit, or what? Given the multiplication with -1, anticyclonic anomalies correspond to negative PV anomalies in the SH, right? What does it mean that with a 1.0 PVU threshold there are no blocks found over SEA? Is this a stricter or softer threshold? Is this sentence used to imply that blocking detection is too sensitive to the threshold used? Why is the blocking count over SEA used as an indication for the sensitivity?

2. Figures 4, 6 are not introduced anywhere in the text. There are just references to them and the information contained in their captions. An introductory sentence about the aim of these figures would be good. Furthermore, it is worth noting in the text that these Hovmöller diagrams do not contain information of the flow right over Australia (averaging is done between 35°-65°S). It is also worth mentioning that warm air advection from the desert and semi-arid parts of the continent toward SEA can be rather significant even with weak (lower- and/or upper-level) winds. These two aspects are relevant e.g. when considering the fact that the 2004 heat wave seems to start prior to the passage of strong RWPs over the Australian longitudinal range (Fig. 4).

3. Lines 230-236, 364: The description of the synoptic evolution of these days suggests that RWPs and blocks are independent entities of the flow and that the blocks appear to "initiate" the RWPs. Is this really justified/proved by Figs. 4 and 5? The identified blocks are not really isolated features and waves of certain amplitude do exist upstream and downstream. In addition, it is claimed - I guess unintentionally - that RWP P3 is initiated by both B3 and B4.

4. Section 3.3 investigates the relation between RRWPs and SEA heatwaves. One aspect of the statistical analysis (Lines 272-275, Table C1) - that the authors do acknowledge - is that the list of high R_SEA days contains all days with strong cyclonic PV anomalies over SEA as well. Considering the fact that ridges/blocks are associated with lower R values than troughs (Lines 405-410, Figure D1), it is plausible that the days exceeding the 90th percentile in SEA R are predominantly associated with cyclonic PV anomalies. This creates an undesirable bias in the high R_SEA sample, that can easilly be eliminated in my opinion. The authors could just discard the DJF days when the average PV anomaly over SEA is above 0 (i.e., cyclonic), that is 50% of the days, and calculate the 90th percentile in R based on the remaining (ridge) days.

We will then have a more homogeneous sample of 176 high R_SEA days, X% of which co-occur with SEA HD. It would be interesting to see the new results in the last row of Table C1. What is the HD frequency increase when the ridge over SEA is associated with an RRWP rather than an individual RWP?

5. Lines 286-292: The lack of preferred PV anomaly phase on days that do not feature a SEA heatwave is not that surprising. What is a bit strange is the predominantly negative PV anomalies throughout the hemisphere on these days (Fig. 8b). What causes this? Is it perhaps because years 2011-2018 do not contribute to the mean climatology and PV anomalies in these warmer years are standardized based on a "cooler" DJF distribution?

6. Figure 9: First, the contour values of the kernel density are missing. The preferred phasing in SEA heatwave days is clear and, as mentioned before, not too surprising. It is interesting though that this only occurs in wavenumber 4. Besides, what can be said about the wavenumber 4 amplitude between HD and non-HD? It seems that the mean distance from the complex plane origin (which, if I'm not mistaken, corresponds to the amplitude) is similar in the 2 sets of days. Is there perhaps an increase in the amplitude of larger wavenumbers during SEA heatwave days?

7. Appendix A: It is indeed interesting that Southern Hemisphere R is higher in summer than winter. I wonder whether this is associated with the fact that SH storm tracks are spiralling in winter but remain rather circular in summer (e.g., Hoskins and Hodges 2005; https://doi.org/10.1175/JCLI3570.1). In any case, the fact that SH summer provides a favorable stage for RRWPs is an aspect worth mentioning in a more prominent part of the text. On a technical note, it is not clear how are the R anomalies in Fig. A1 computed and how can we compare the typical R values in the two hemispheres, if the two Hovmöller diagrams (most probably) refer to different mean climatologies.

Minor issues

1. Line 17: ERA-I is also an observation-based dataset. Use instead, e.g., "weather station observations" or similar.
2. Line 30: "extratropics"
3. Line 45: "part of a synoptic-scale"
4. Line 53: "the persistence of"
5. Line 56: This sentence is not really contradicting the previous. So, "however" is not fitting here.
6. Lines 66-67: Is SST and horizontal (I suppose "zonal" was meant here) velocity still used in the revised version of the paper? In addition, Figs. 4, 6, and B1 make use of a "daily maximum 2m temperature". Is this another field from ERA-I that should be mentioned here, or estimated somehow from the 6-hourly 2m temperature?
7. Line 69: Is this reference period (1980-2010) also used for the blocking feature detection?
8. Line 71: "used to quantify the recurrence"
9. Line 90: "the wave packet envelope"

10. Line 91 and elsewhere in the text: "complex plane" (not plain)
11. Line 92: Specify the section in which this phase-amplitude distribution is used.
12. Line 94: "between the 500 hPa and"
13. Line 102: "QRA conditions" should be removed
14. Line 106: What does "high-quality" mean? Has there been a study that evaluates the quality of BoM's monitoring network against others?
15. Line 108: 2019 is not used in the other fields.
16. Line 111: "were on average"
17. Line 114: "a day that is part", "SEA heatwave day (HD)"
18. Line 116: "averaged between 130°E and 153°E, which corresponds to the SEA longitudinal range" ...since "over SEA" is not correct (R is computed over a latitudinal band that lies to the south of Australia).
19. Line 117: "A sensitivity test"
20. Line 124: "1-degree horizontal resolution"
21. Line 133: "Higher numbers of"
22. Line 161: "rejecting the null"
23. Lines 165-171: All the information here is also included in the previous paragraph.
24. Line 232: "(B3 in Fig. 5d)"
25. Line 243: "windy conditions fueled many catastrophic fires"
26. Line 247: "Several RWPs"
27. Line 248: "The RWPs prior to"
28. Line 259: "moving block" sounds strange. Moving ridge perhaps?
29. Line 272: A verb would make this sentence more formal.
30. Line 276: "explore why some"
31. Line 328: "presents the relationship"
32. Line 338: "zonal wavenumber of meridional wind in the complex"
33. Figure D1: The x-axis label should be corrected ("pseudo"). In addition, the time axis direction could be the same as in the other Hovmöller diagrams of the study for consistency. In addition, the domain limits in the caption are different from the ones mentioned in Lines 401-402.
34. Lines 406, 411: The figure references need correction (D1 instead of C1)
35. Line 411: "where DJF blocks show R"