

We thank the reviewers and editors for their constructive comments on our manuscript. The manuscript is revised thoroughly by considering all the comments. Besides, Figure 2 have been updated to make the results clearer. Our responses to every comment are listed below with blue.

## Response to Anonymous Referee 2

The manuscript was significantly improved. However, I still list further comments below.

### Specific comments

I checked the code availability. I could download the code but could not uncompress the RAR file. Providing the code in a freeware format like ZIP or others is highly recommended.

All the MATLAB codes and data used for analysis of this study are available at <http://hdl.pid21.cn/21.86116.7/04.99.01720> (ZIP format).

The readability of Figure 2 significantly improved. However, the authors should still reconsider using a diverging colormap in Figure 2 to clearly and intuitively differentiate between positive and negative values (see guideline e.g. in Figure 6 from Crameri et al. 2020). The “viridis” colormap as used in Fig. 2 represents a sequential colormap where the lightness value should increase monotonically with values without centric value though. I let the editor decide on this issue.

Figure 2 is replotted before the resubmission, which is shown below by Figure S1.

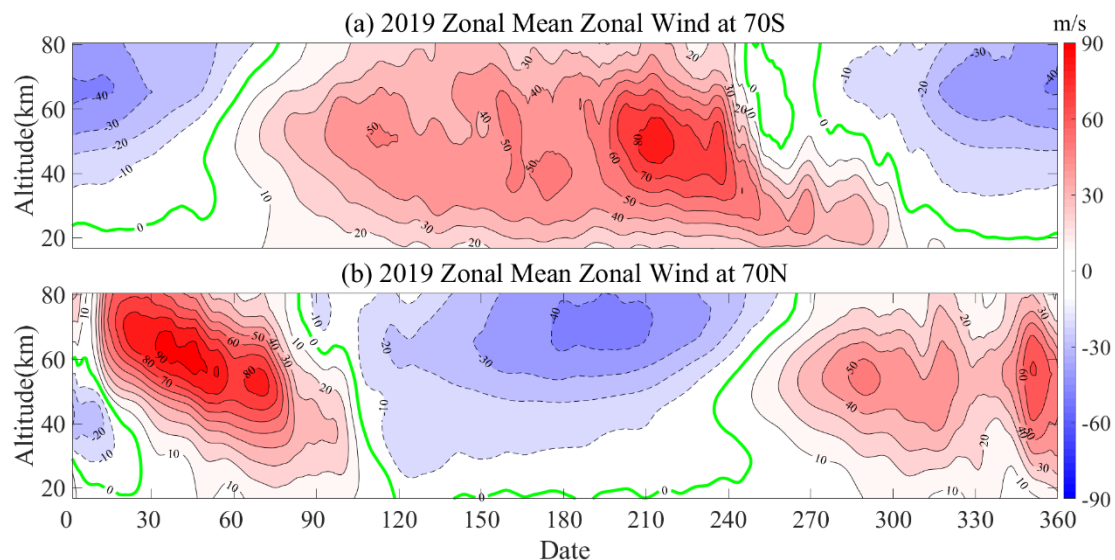


Figure S1. The zonal mean zonal wind variations of (a) 70°S and (b) 70°N during 2019. The dotted line represents eastward wind, the solid line represents westward wind, and the green solid line is 0 m/s.

184 A sentence from the revised manuscript “Some recent studies have discovered significant eastward planetary...” does not correspond with the sentence from the manuscript with revised changes: “Recent studies have found significant eastward planetary waves...” Hopefully, this is the only case. The authors should comment on

this discrepancy.

The manuscript was polished by an English Service before the resubmission. Some of the changes were not included in the final version during the last submission. We double checked the revised manuscript this time, and the tracked version is not consistent with the clean version this time. Sorry for our mistakes.

I still miss a justification why E1, E2, E3 and E4 events only in 2019 are presented in the manuscript. It can be connected with future outlook in the end.

We analyzed the MERRA-2 dataset at the beginning, and found that all the four wave modes are clearly exhibited. We thus presented the analysis results during 2019. The MERRA-2 datasets during other years (2013-2020) are analyzed later. We found that the analysis results during 2019 are representative for all the four wave modes. The analysis during other years exhibits similar seasonal features as that presented during 2019. And the results in the southern hemisphere are shown below as an example. In the future, we would like to study the inter-annual variations of the eastward planetary waves in detail, which may be presented in a new paper.

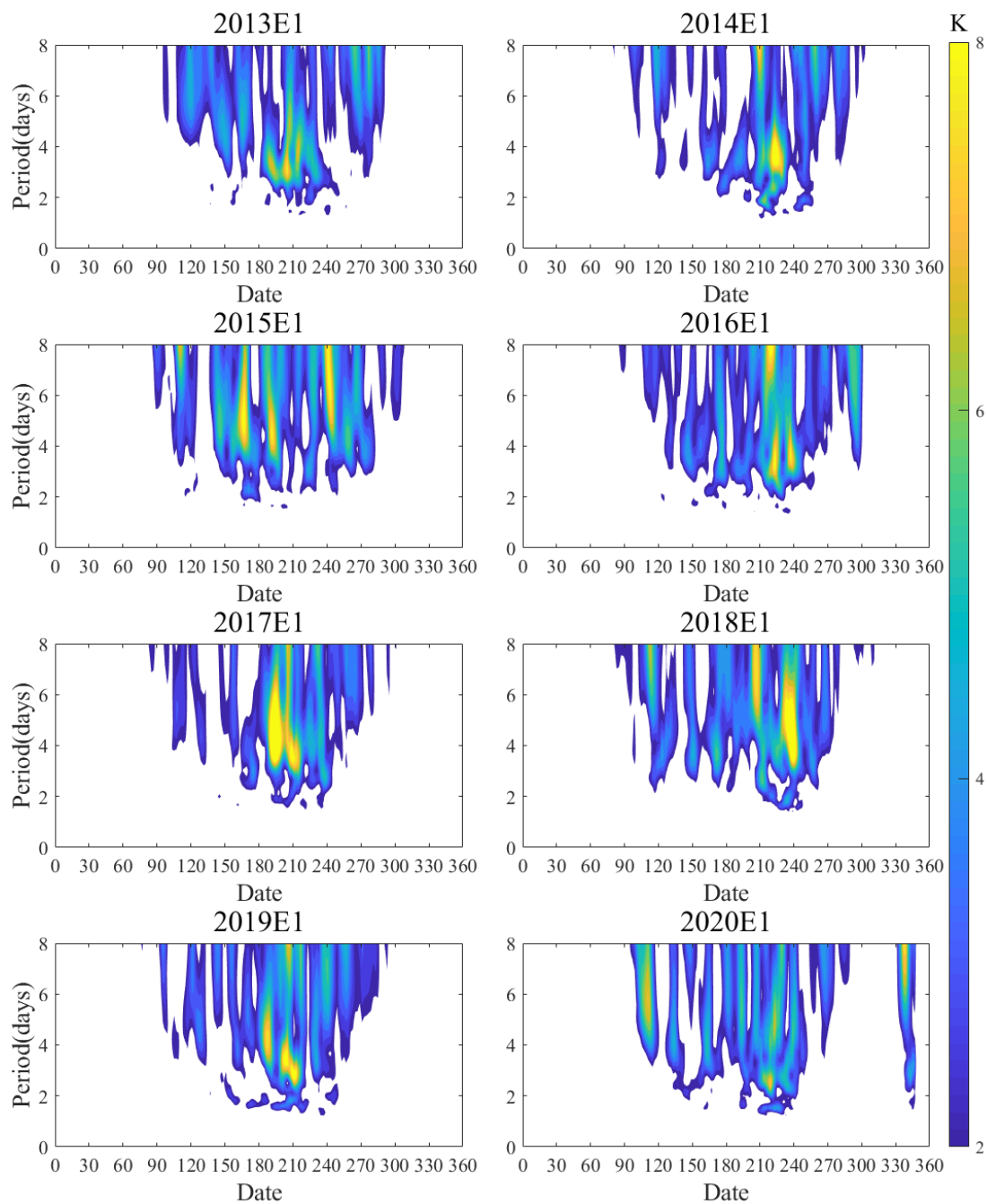


Figure S2. The temporal variations of E1 during 2013-2020 in the SH.

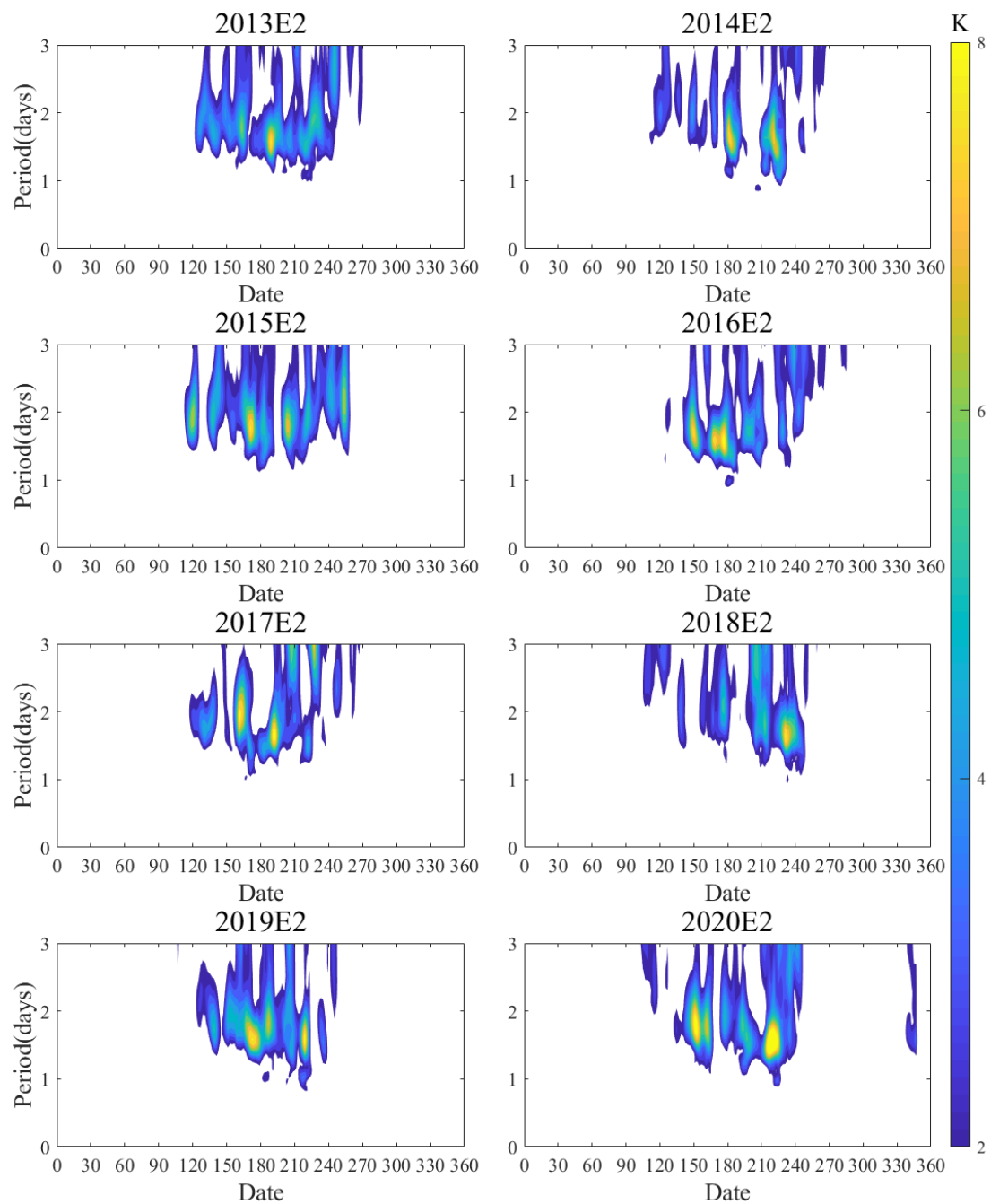


Figure S3. The temporal variations of E2 during 2013-2020 in the SH.

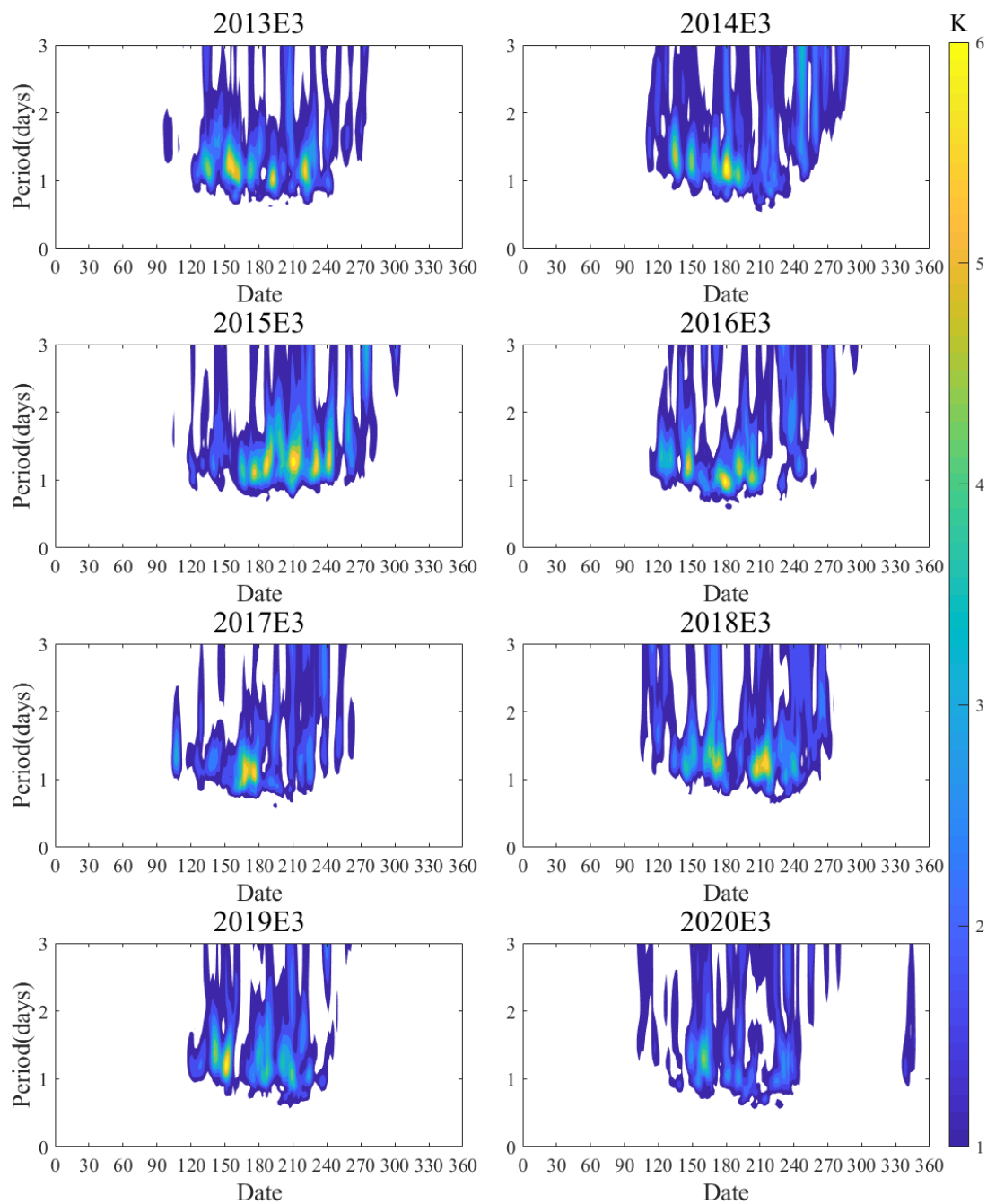


Figure S4. The temporal variations of E3 during 2013-2020 in the SH.

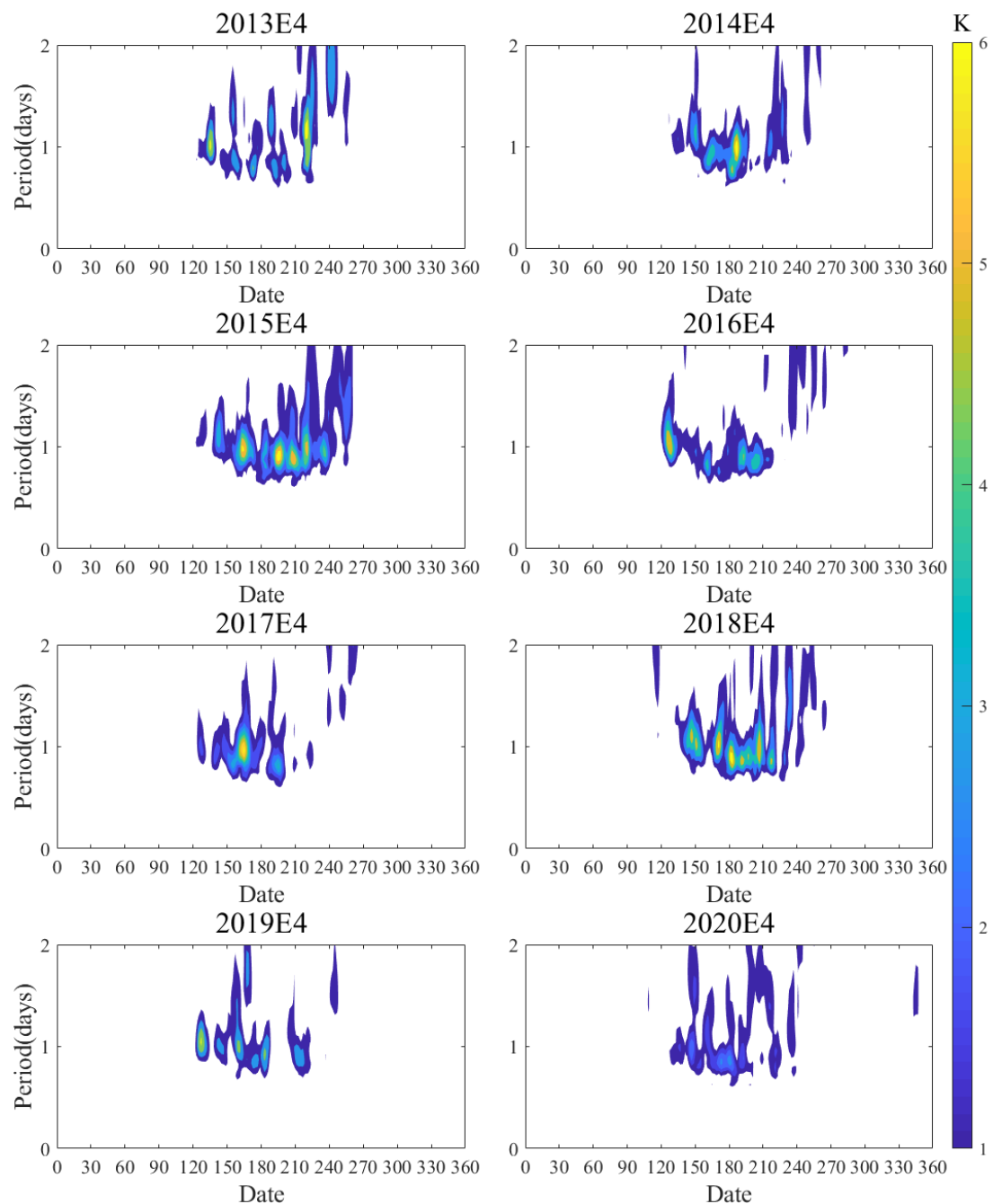


Figure S5. The temporal variations of E4 during 2013-2020 in the SH.

### Technical comments

l75 missing word (verb?) behind “Gu et al. (2019) have...”

Revised in the revision.

### References

Crameri, F., Shephard, G.E. & Heron, P.J. The misuse of colour in science communication. Nat Commun 11, 5444 (2020). <https://doi.org/10.1038/s41467-020-19160-7>