

Author's Response

Manuscript: Yessimbet, K., Steiner, A. K., Ladstädter, F., and Ossó, A.: Observational perspective on SSWs and blocking from EP fluxes, EGU_{sphere} [preprint], <https://doi.org/10.5194/egusphere-2023-2916>, 2024.

The structure and content of the referee's and the Editor's comments are duplicated below. The authors' responses are in bold. Line numbers used in our responses refer to the revised ACP Discussions paper. Text updates in the revised manuscript are in grey.

We thank the referees for their review of our manuscript. We also thank the Editor for the handling of our manuscript. We have addressed the technical corrections to the manuscript according to the comments of referees 2 and 3.

Comments by the editor

All 3 referees report that their comments on the first version of the paper have been effectively addressed in revision. I am therefore pleased to accept it for publication in ACP. Two of the referees each recommend one further small change -- those can be addressed as 'technical corrections' prior to publication.

Comments of the referee 1:

Comments on "Observational perspective on SSWs and blocking from EP fluxes" (revised version) by Kamilya Yessimbet, Andrea K. Steiner, Florian Ladstädter, Albert C. Ossó

Recommendation: Acceptable in present form

In this paper, the authors examined eight major boreal Sudden Stratospheric Warming (SSW) events between 2007 and 2019 to understand the vertical coupling between the troposphere and stratosphere, as well as the relationship between SSWs and blocking events using Global Navigation Satellite System (GNSS) radio occultation (RO) observations. They classified the eight SSW events into two types of groups, i.e., "reflecting" events and "absorbing" events; two events fell into the former group, while the other six events fell into the latter one. The reflecting events were found to be displacement-type SSWs with a downward propagation of wave activity from the stratosphere to the troposphere during vortex recovery, accompanying the formation of blocking in the North Pacific region. On the other hand, the absorbing events were found to be split-type or mixed-type ones, showing the subsequent formation of blocking in the Euro-

Atlantic region. The authors also showed an enhancement of the polar tropopause inversion layer as the result of SSWs, which was stronger for the absorbing events. These results are consistent with former studies and can actually reinforce the former results.

The presented results are considered to include new findings and the authors revised the original description and added relevant analyses and discussions, following the reviewers' comments. Hence, I consider that the manuscript should be accepted for publication in ACP.

Thank you.

Comments of the referee 2:

On a minor note: the vertical line in Fig. 3a still appears to this reviewer to not line up with the maximum temperature at 50 hPa as stated in the response. Perhaps a horizontal line at 50 hPa would help.

In Fig.3a, the time-height evolution of the temperature anomaly is shown for the zonal average of the temperature over 65-90° N, while the vertical line indicates the day when the polar (80-90° N) temperature anomaly reaches its maximum, i.e. the start of the SSW recovery phase. This is also stated in the figure caption. Therefore, we decided to leave the figure as it is.

Comments of the referee 3:

The authors have addressed my comments and I find the manuscript to be much improved. I recommend publication.

However, I suggest the authors check line 353: the anomalies of N^2 aren't shown for each SSW, but aren't the absolute values now shown in the supplement?

Thank you for noticing it. Yes, the absolute values of N^2 are now given in the supplement. So, we have corrected this in the manuscript on line 353, and the sentence now reads as follows:

We also note the descending enhancement of static stability from the stratosphere to the tropopause level during the onset of the SSWs, which is observed in the static stability anomalies for the 2009, 2016, 2018, and 2019 SSWs and in its absolute values for all SSWs (Fig.S4a).