Response to comments by the co-editor

Dear Michael Schutte et al.,

thank you for the additional revisions in response to the additional comments by referee 1 (Nili Harnik). I have thoroughly assessed all points and think that your applied changes to the manuscript are mostly adequate, but I do have a few minor suggestions that I hope will further improve the presentation.

We would like to thank the co-editor for handling the manuscript and for the following feedback. This has helped us to highlight the main messages and to clarify several points more precisely. We greatly appreciate your thorough and constructive assessment and provide our answers below, addressing each point individually. Line numbers and figures refer to the track-changes version.

1. Regarding main point 1) by the referee (~misleading portrayal of role of stratosphere in the abstract and introduction): I share the sentiment by the referee that the abstract and introduction don't spell out sufficiently that the reflection events under consideration here are different from the "classical" reflection events where the full (zonal-mean) wave activity flux changes from upward to downward. I encourage the authors to emphasize this distinction a bit more in the abstract and introduction. Specific places are:

- near the beginning of the abstract (the first sentence seems to refer to "classical" events, while the third sentence at first seems to suggest a direct reference to these "classical" events but then switches to partial wave reflection over a region)
- lines 47-50 (line numbers here and in the following refer to the track-changes version) where the regional index is first mentioned, but the distinction of the resulting events from the "classical" events is not spelled out
- perhaps below the event definition (Eq. 1)

BTW, since Fig. A9 (current version, previous Fig. A8) shows anomalies and not full fields, it cannot be used as evidence for changes in the phase tilt. However, regional changes in phase tilt can be seen in Fig. 12 of Messori et al. (2022) and perhaps this could be pointed out with some of the suggested clarification regarding regional versus full wave reflection.

We agree with your suggestion and revised the abstract and introduction to more clearly distinguish our analysis from "classical" reflection events:

- *The third sentence in the abstract reads now:'Here, we investigate **a set of** wave reflection events characterised by an enhanced difference between poleward eddy heat flux over the Northwest Pacific and equatorward eddy heat flux over Canada.'*
- *The beginning of the paragraph in lines 46-49 reads now: 'To overcome this challenge, Matthias and Kretschmer (2020) proposed an index based on regional averages of the meridional eddy heat flux that is able to capture wave reflection events over the North Pacific. **This new index, unlike more traditional reflection events based on zonal-mean diagnostics, builds on** the climatological pattern of the meridional eddy heat flux **that displays upward** wave activity flux over […]'*

- *In line 97, we have added the following sentence after the definition of reflection events: '**This definition of reflection events differs from traditional approaches relying on zonal-mean metrics.**'*

Additionally, we removed Fig. A9 and instead reference Fig. 12 from Messori et al. (2022) as evidence for changes in the phase tilt in line 306.

2. Regarding main point 2) by the referee (daily timescales implied in Fig. 6): I appreciate the example Hovmöller diagram (Fig. R1) and encourage the authors to include a statement in the text related to the caveat about temporal resolution and why you find Fig. 6 to offer robust insights into the broader temporal wave activity evolution.

Figure 6 provides a comprehensive perspective on the broader temporal evolution of wave activity, illustrating how Rossby wave activity differs between the troposphere and stratosphere during reflection events. While space-time spectra, such as those in Fig. 5 and Fig. A8, capture detailed changes in specific wave-phase speed harmonics, Fig. 6 serves as a complementary tool by emphasizing temporal scales and vertical variations in wave activity. We further clarified its role after its discussion in line 298.

We further adjusted the discussion about temporal resolution in lines 318–328 at the end of Section 3.1.3 and included Fig. R1 (a Hovmöller diagram of the January-February 1981 reflection event) in the appendix as Fig. A11 to demonstrate the ability of space-time spectra to capture relevant changes on shorter time scales.

3. Statistical significance: please specifically refer to "statistical significance" (as opposed to "physical significance") wherever this is the intended meaning of "significance" (incl. instances of "[something] is/is not significant").

Thank you for highlighting the distinction between statistical and physical significance. We revised the manuscript to explicitly refer to "statistical significance" where appropriate.

4. Large number of additional figures in appendix: since it could indeed be distracting to readers to frequently be referred to additional figures, I would encourage a related statement (about the role of the appendix) at the end of the introduction (where you outline the structure of the paper), perhaps emphasizing that these figures are not instrumental to the main points in the paper.

*We incorporated this clarification at the end of the introduction as recommended: '**Additional figures in Appendix A provide further context for and verification of our findings, but all core results are presented in the main body of the paper.**'*

5. line 407: "A mechanism ..." - suggest to change to "One mechanism ..." to highlight that there could be others (as stated in your response to the referee)

Good point, thank you. We changed the wording here.