

## Editor comments on manuscript egusphere-2024-1927 (revised version)

*Jinbo Xie et al: Disentangling the chemistry and transport impacts of the Quasi-Biennial Oscillation on stratospheric ozone*

### Specific comments:

P1, L22: It is not clear what is meant with “modeled changes temperature”. Please rephrase.

P1, L25: For me it is not clear if these are detected by these changes or if these are caused by these changes.

P2, L35: Add “tropical” before “stratosphere” since this relates to the tropical stratosphere not the entire stratosphere.

P2, L38: Please rephrase the sentence. The QBO itself does not influence the chemical processes in the atmosphere rather the changed composition of the atmosphere due to the QBO is affecting chemistry.

P2, L60: “Nudging of the winds is unphysical and produces an anomalous BDC....”. Is this really true. I had a quick look at the Orbe et al. paper and to my understanding they just state that care should be taken when SD simulations are compared.

P3, L65ff: To my knowledge Linoz is providing only very basic, simplified chemistry which I guess is sufficient for climatic studies. Nevertheless, I would appreciate a statement about the general quality/accuracy of the Linoz scheme.

P3, L83 and 84 and throughout the manuscript: As already stated in my comments before publication in the discussion you should use the Copernicus style and abbreviate write Section beginning with a capital letter and abbreviate it as “Sect.” unless it appears at the begin of the sentence.

P4, L121: Were tuned ? Please specify this. What exactly has been done?

P5, L135: A reanalysis is no observation even if observations have been assimilated!

P7, L186: “QBOw”: I guess you mean here the QBO west. This abbreviation should be introduced.

P8, L220: Please use here a clear writing for dates. Do you mean September 1970 to March 1972?

P9, L255: Please use the Copernicus style. Equation should be abbreviated as Eq. in the text.

P9, L256: Has the abbreviation SSO been introduced?

P9, L266: “The center” not clear. Do you mean the center of the composite is where the NPLA shift is? Please rephrase so that it becomes clear where the center is.

P9, L274-275: Rephrase/Improve sentence.

P10, L287-291: Repetition of what has been said before???

P11, L318: “The TCO patterns exhibits tri-pole pattern of anomalous low in the tropics and high in the extratropics during ....” Sentence not clear since something is missing here. Please correct.

P11, L320: “The magnitude of the negative in QBOe”? Not clear. Please correct/rephrase.

P11, L335: Has the abbreviation “CMZM” been introduced?

P12, L341: "low" -> do you mean "low ozone"? Please clearly write this.

P12, L344: Change sentence as follows: Since the nudged E3SMv2 simulation uses the Linoz-v2 scheme where the chemical species such as ....

P12, L347: Change to "with chemistry of NO2-N2O-CH4-H2O included".

P12, L348: Missing parts of what?

P12, L366: Correct as follows: " .....phase changes in the northern hemisphere."

P14, L398: What is noisier? The temperature? Please clearly state this.

P14, L403: Either singular or plural, thus either "like stratospheric sudden warmings" or "like a stratospheric sudden warming". Further "stratospheric" and "sudden" need to be swapped. It should read "sudden stratospheric warming".

P14, L418: "To further examine the variable responsible for the change, the single specie sensitivity...." Please improve sentence.

P14, L426: Please clearly state which level.

P15, L431-432: Check sentence and rephrase. Add "that is" before controlled? What is meant with "return arm".

P16, L441: Similar than what? Please use clear statements.

P15, L442: Change to ".... Similar prognostic ozone if Linoz were to be implemented....."

P14 and P15: References to the figures are given in a very confusing order. You are jumping here back and forth between the figures which makes it very hard to follow.

P15, L455: Here references should be given. I assume this statement is based on results from previous studies.

P16, L459ff: NH -> northern hemisphere, SH -> southern hemisphere. Please use a consistent writing.

P16, L460: Also here references should be added.

P16, L487: "less field of high wavenumbers" not clear

P17, 489: "with nudging" -> please rephrase

P17, L502: Check sentence and please correct.

Supplement: Check numbering of figures. Figure S7 appears twice.

#### **Figure captions in general:**

These should start with "Figure" and the respective number followed by a colon. "Figure" is only abbreviated in the text!

anomalous -> anomaly

use a readable date formats.

Add degree sign to the given coordinates.

Figure 8 caption: OBS? Do you mean "observations"?

**Technical corrections:**

P2, L33: add “atmospheric” before “circulation”.

P2, L33: that -> and

P2, L55: Write “zero” instead of “0”.

P4, L104: about -> of (?)

P6, L179: QBOs -> QBO

P10, L287: tropics -> tropical

P10, L302: add “the” -> the northern

P10, L303: accordance? Do you mean “agreement”?

P10, L305: extratropics -> extratropical

P11, L307: is -> are

P11, L310: creates more -> creates a more

P11, L334: extratropics -> extratropical

P12, L345: chemistry -> chemical

P12, L354: add “being” so that it reads “being weaker”.

P12, L355: add “the” -> the E3SM-v2

P13, L367: hemisphere -> hemispheres

P13, L375: section 4 -> Sect. 4

P13, L374: equation 2 and 3 -> Eq. 2 and 3

P13, L389 and 392: correspond -> corresponds.

P14, L398: Southern Hemisphere -> southern hemisphere

P15, L439: process -> processes

P16, L483: Add “the” so that it reads “by the two models”.

P16, L439: change -> changes

P16, L462: write “and” instead of using a comma.

P16, L465: Conclusion -> conclusion

P16, L467: Firstly -> First

P16, L468: dynamic -> dynamical

P16, L468: add “the” so that it reads “of the QBO”.

P16, L469: delete “while the”.

P16, L470: profile -> profiles (?)

P16, L 471: Delete “the”

P16, L475: difference -> different

P16, L482: degree sign missing.

P17, L488: Lastly -> Last

P17, L507 and 509: Add “the” so that it reads “the nudged” and “the QBO”, respectively.

P17, L512: process -> processes

P17, L515: Delete “change”.