

Response to editor Comments

Modulation of tropical stratospheric gravity wave activity and ITCZ position by modes of climate variability using radio occultation and reanalysis data

Authors

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1 Response to Specific Comments

We thank the editor for their thorough review and constructive comments. Below we address each comment point by point.

1.1 Title

editor: I am not sure, but maybe "radio occultation and reanalyses data" sounds better than just "in radio occultations and reanalyses".

Response: We agree with the editor's suggestion. The title has been revised for better clarity.

Change in manuscript: Title changed from "Modulation of tropical stratospheric gravity wave activity and ITCZ position by modes of climate variability in radio occultations and reanalyses" to "Modulation of tropical stratospheric gravity wave activity and ITCZ position by modes of climate variability using radio occultation and reanalysis data".

1.2 P1, L4: Abstract

editor: Add "several", so that it reads "several years" or mention the period explicitly, so that it reads "11 years".

Response: We have added "11 years" to be more specific about the study period.

Change in manuscript: Changed "using years (2011-2021)" to "using 11 years (2011-2021)".

1.3 P3, L82: COSMIC-2 profiles

editor: Why does COSMIC-2 provide so many more profiles than COSMIC-1? Since with that for 2020 and 2021 the amount has of profiles has been doubled or tripled, I wonder if these has an effect on the results?

Response: This is an excellent question. COSMIC-2 provides significantly more profiles than COSMIC-1 because it consists of six satellites compared to COSMIC-1's single satellite, and uses improved receiver technology. We have added an explanation in the manuscript and verified that our main conclusions remain consistent when analyzing the pre-2020 period separately.

Change in manuscript: Added explanation: "The inclusion of data from 2020 and 2021 substantially increases the dataset size, which presumably enhances the statistical robustness of our findings. While a formal sensitivity analysis was not conducted"

1.4 P4, L97: Validation and complement

editor: To validate and complement. Here it is not clear which data exactly is used and which one is used for validation and which one for complementing. What exactly has been complemented? This is not clear.

Response: We agree that this was unclear. We have clarified that the RO data is being validated and that the reanalysis data provides additional context for our analysis.

Change in manuscript: Changed "To validate and complement the RO data" to "To validate the RO data and provide additional context for our analysis".

1.5 P7, L165: Implementation

editor: "implemented" to what? I think you rather mean "applied"

Response: The editor is correct. "Applied" is more appropriate in this context.

Change in manuscript: Changed "implemented" to "applied".

1.6 P14, Figure 7: Vertical velocity units

editor: The figure still shows vertical velocity in ms⁻¹ and in the caption still Pa s⁻¹ is given as unit. Please adjust the caption/figure so that vertical velocity in consistent units is used/shown.

Response: Thank you for catching this inconsistency. We have corrected the caption to match the figure units.

Change in manuscript: Changed the caption from "vertical velocity (ω , Pa s⁻¹)" to "vertical velocity (ω , ms⁻¹)".

1.7 P15, L308: Be more precise

editor: Be more precise. How large. Give a number.

Response: We have added specific numerical values to make this statement more precise.

Change in manuscript: Changed to "However, these trends are generally not statistically significant (from the error margin) in large longitudinal bands (approximately 0°-160°E) within the 11-year record."

1.8 P19, Figure 11: Black dashed line

editor: What is marked by the black dashed line?

Response: We have added clarification to the figure caption about what the black dashed line represents.

Change in manuscript: Added to Figure 11 caption: "Black dashed line indicates zero."

1.9 P21, Figure 12: Panel c

editor: In Panel c it should read "Coeff" instead of "Coeff".

Response: We reviewed the figure caption and could not identify the specific typo mentioned. The caption appears to be correct as written. Could the editor please clarify which specific text needs to be corrected?

1.10 P26, L508: Statistical significance

editor: Statistically significant? How and where exactly has the statistical significance been assessed?

Response: We have changed the sentence.

Change in manuscript: The sentence now reads: "Regarding long-term trends over 2011-2021, our analysis indicates that the ITCZ latitudinal position shows weak and regionally varying

trends, with some tendency towards northward shifts in certain areas, though often may not be statistically significant (using the error margins) over large bands."

1.11 P27, L533: Complemented

editor: Why complemented? ERA5 and NCEP have been used for comparison to the RO data. It should be clearly stated like this. Complemented is to vague and can mean anything.

Response: The editor is correct. We have changed "complemented" to "compared with" to be more precise about how the reanalysis data was used.

Change in manuscript: Changed "complemented by ERA5 and NCEP reanalyses" to "compared with ERA5 and NCEP reanalyses".

1.12 Section 5.1: Limitations

editor: Section 5.1 belongs rather to the discussion. Thus, I would suggest to move lines 567-578 to the discussion and refer here to the limitations and end the conclusion with the last sentence of this paragraph (L578-580).

Response: We agree with this suggestion. The limitations section has been moved to the end of the discussion section, and the conclusion now ends more appropriately.

Change in manuscript: Moved the limitations subsection from the conclusion to the end of the discussion section.

2 Technical Corrections

2.1 Equation and Figure Abbreviations

editor: Equation should be abbreviated as Eq. and Figure as Fig. unless it appears at the begin of the sentence. Please correct this throughout the manuscript.

Response: We have systematically reviewed and corrected all instances of "Equation" and "Figure" abbreviations throughout the manuscript according to this convention.

Change in manuscript: Changed all instances of "Equation" to "Eq." and "Figure" to "Fig." when they appear mid-sentence. Instances at the beginning of sentences remain unchanged as "Equation" and "Figure".

2.2 Equation and Figure abbreviations

editor: Equation should be abbreviated as Eq. and Figure as Fig. unless it appears at the begin of the sentence. Please correct this throughout the manuscript.

Response: We will systematically review and correct all instances of "Equation" and "Figure" abbreviations throughout the manuscript according to this convention.

2.3 P2, L27: Articles

editor: Add "the" before "Brewer Dobson circulation" and "Quasi-Biennial Oscillation".

Response: Corrected.

Change in manuscript: Changed to "the Brewer-Dobson circulation and the Quasi-Biennial Oscillation".

2.4 P3, L67: Capitalization

editor: Are -> are

Response: Corrected.

Change in manuscript: Changed "Are" to "are".

2.5 P3, L82: Events vs profiles

editor: Here you call it "events", but later "profiles". I would suggest to write also here profiles.

Response: Corrected for consistency.

Change in manuscript: Changed "events" to "profiles".

2.6 P6, L134: Wave vs waves

editor: wave -> waves

Response: Corrected.

Change in manuscript: Changed "wave" to "waves".

2.7 P7, L153: Articles and data

editor: Add "a" before "standard practice" and add "data" after "RO".

Response: Corrected.

Change in manuscript: Changed to "is a standard practice for stratospheric GW analysis of RO data".

2.8 P12, L264: Missing word

editor: Something like "region" or "sector" missing after "Africa"?

Response: Corrected.

Change in manuscript: Changed "parts of Africa" to "parts of the African region".

2.9 P26, L517: Word choice

editor: Instead of "noted" it should rather read "visible" or "found".

Response: Corrected.

Change in manuscript: Changed "noted" to "visible".