

## Editor comments on egusphere-2024-3249

*Influence of atmospheric waves and deep convection on water vapour in the equatorial lower stratosphere seen from long-duration balloon measurements* by Carbone et al.

Although this manuscript went already through a round of revisions, there are many things left that need to be corrected before the manuscript can be accepted for publication. Thus, another round of major revisions is necessary.

### General comments:

1. Please consider the ACP manuscript preparation guidelines and prepare your manuscript accordingly.

<https://www.atmospheric-chemistry-and-physics.net/submission.html#manuscriptcomposition>

In the abstract the introductory part and the concluding part is missing, see the specific guidelines for title, abstract and conclusions:

[https://www.atmospheric-chemistry-and-physics.net/policies/guidelines\\_for\\_authors.html](https://www.atmospheric-chemistry-and-physics.net/policies/guidelines_for_authors.html)

Please revise the abstract accordingly. See also my comments given below under specific comments.

2. In the text Section and Figure abbreviated as Sect. and Fig. unless they appear at the begin of the sentence. Please correct this throughout the manuscript.
3. Paragraphs should have a reasonable length. Please check all paragraphs and combine the ones which consists only of 1-3 sentences. The text becomes hardly readable to to this from page 10 on there this has excessively been done,
4. The whole manuscript feels a bit mixed up. Text that belongs to the results is added in the methodology section and text that belongs to methodology is found in the results. Also the data is described in the wrong order. MLS data is used already before the data and instrument are described. Please sort your text and prepare the manuscript according to the manuscript preparation guidelines.

### Specific comments:

P1, L15: An introduction to the field is missing. What is the purpose of this study?

P1, L22 and L26: Using the names you have given your flights in the abstract is meaningless for the reader. Use the dates instead.

P1, L27: The concluding part in the abstract is missing. What are the implications of your study and results?

P2, L60: Has the abbreviation "CPT" been introduced?

P2, L65: change to "that not necessarily reaches the stratosphere, see e.g. Rysman et al., 2017)

P4, L105: Don't make paragraphs consisting of one line. Add this sentence to the following paragraph.

P4, L111: What do you mean with “the environmental cold temperature”? Do you mean “cold environmental temperatures”? Please rephrase/correct the sentence.

P4, L112: What is “TSEN”? The abbreviation has not been introduced.

P4, L117ff: Using the flight names here alone is not helpful for the reader. Please add the dates and also add a table summarizing the names and dates for the flights used in your study.

P4, L122: Who is meant with “They”? The balloons? Please be more precise.

P5, L124: Who or what is meant with “it”?

P5, L126: To which figure are you referring to?

P5, L127: What do you mean with “the balloons evolved”? Please rephrase,

P5, Figure 2: MLS used here, but neither the data or instrument have been described yet. Doesn't this figure rather belong to the result section?

P6, L132: What is “SLDA”? The abbreviation has not been introduced.

P6, L138: “regions of strong absorptions within fundamental bands” not clear. Make an own sentence clearly writing what you mean.

P6, Section 2.2. (and also previous section): A large part of what is written here goes beyond the pure data description and rather belongs to the methodology section. Move these parts to the methodology section and rename this one to e.g. “Balloon flights and methodology”.

P6, L193: It is not clear what kind of methodology you have developed. Is this really new? I have the feeling already known methods are used here.

P6, L197: How do you know that these are caused by overshooting convection and atmospheric waves? Provide an explanation for the impact of overshooting convection and atmospheric waves on the anomalies and also provide some references.

P7, L161: Description of MLS appears after it the data has been used. See my comment above. The sections should be revised and appear in a different order.

P7, L164-165: The sentence “The vertical grid .....” is not clear and should be revised.

P7, L171-172: Remove line break. This sentence should be added to the previous paragraph.

P7, L182: “..... and by using cloud-type data deduced from cloud-type and phase product” not clear and needs to be revised.

P7, L188: Why do you want to evaluate ERA5? Aren't you just comparing these data sets to see if these can be applied together?

P7, L188: Which products are used? List these here explicitly.

P8, L199: Combine the sentences and replace “indeed” by “since” or “because”.

P8, L201: trapped in what? Clouds? Not clear. Please rephrase sentence,

P8, L205: delete “first” and replace “followed” by “based on”.

P8, L205: add the criteria here (again) or refer to the previous paragraph/section where these are stated.

P9, L216: Introducing ERA5 and ECMWF comes here long after ERA5 has already been mentioned and used. This introduction should be made at the begin of Sect. 3.

P9, Figure 4: The green dots and red line are not that good visible. The bullets for the dots should be larger and the red line plotted somewhat thicker.

P10, L240: Why evaluation? This is rather just a comparison between the data sets.

P10, L241-249: This text part belongs to Sect. 2.2 where the balloon instrument should be described. Further make paragraphs with a reasonable length and not one paragraph for just one or two sentences.

P11, L266: Which data is shown here? MLS? Please clearly state which data is shown.

P11, Figure 5 caption: You mean the respective balloon trajectory with the MLS water vapour color coded?

P11, Figure 5: Which data sets have been used to derive the Hovmöller diagram is not clear. Maybe it would also be good to mention somewhere what a Hovmöller diagram is and for what it is used.

P12, L268-270: This sentence belongs to the data description section. Rephrase the sentence and refer to the respective section and only point here out the limited resolution of the ERA5 data.

P12, L274ff: The entire remainder of the page belongs to the methodology section. Also revise here the paragraphs so that each has a reasonable length.

P13, L306: add the date.

P14, L314: What is “VGWV”? The introduction has not been introduced.

P15, L327: Sentence should be added to the previous paragraph.

P15, Table 2: This table appears in the middle of the text (last part of the paragraph appears between table and table caption).

P16, L358-361: These sentences should be added to the previous paragraph.

P16, L381-382: Add this paragraph either to the previous or following paragraph.

P17, L394-395: Again one paragraph for just one sentence.

P17, L396: Which data? MLS? The balloon data?

P17, Figure 8 caption: Add that the dates for the flights are given in the figure legend.

P18, L407-408: Again one paragraph for just one sentence. This sentence also rather belongs to the figure caption than in the main text.

P18, L412: Do you mean colored in the figure? Be more clear.

P18, L412: Sentence “displacement of the balloons in the vertical gradient of water vapour “ not clear. What do you mean? Another flight showing a different case? Please rephrase.

P18, L422-425: Where is this shown? To which figure are you referring to?

P18, L426: Sentence “Another case of flight C1\_15\_TTL4 should be underlined” not clear and should be rephrased.

P19, L435: What is HIMAWARI? The abbreviation has not been introduced.

P19, L441: The abbreviation CALIOP has not been introduced. Also it should be mentioned what kind of instruments these are.

P19, L457: Add some more details on the storm Rai (when did it form, how long did it last, from where to where did it move and what implications had this storm).

P19, L460: The abbreviation ICARE has not been introduced. Also a reference should be added.

P19, L463: Which figure? Figure 9?

P19, L463: Abbreviation HYSPLIT has not been introduced.

P20, Figure 9: The point and lines are difficult to see. Please try to improve the figure (by e.g. using different colors than the ones currently used).

P21, L473-474: I don't see any blue dots. Do you mean green crosses?

P21, L481-485: This four line paragraph should be combined with the previous or following one.

P21, L482: Add reference to the respective figure.

P21, L500: Which figure? Figure 9 or Figure 8?

P22, L505-514: Combine paragraphs.

P22-23, Conclusion: Make real paragraphs and not one paragraph each 1 or 2 sentences!

P23, 550: What are the implications of your study? A concluding paragraph stating this is missing.

P23, L585: Add this sentence to the previous paragraph.

P24, Figure 10: This figure should be labelled "Fig. A1".

P24-25: Make real paragraphs!

P25, Figure 11: This figure should be labelled as Figure A2.

P25, Figure 11 caption: Provide the date additional to the name of the flight.

P26, L625-626: empty line between the references is missing.

#### **Technical corrections:**

P1, L31: Hydroxyl -> hydroxyl

P1, L33: space between comma and year missing

P2, L34: Add "e. g." before the references.

P3, L87: Section 2 -> Sect. 2

P3, L97: A last objective -> Another objective

P4, L101: lower the troposphere -> the lower troposphere

P4, L103: add comma before "respectively"

P4, L103-104: replace “in” by “for” and add “campaign” so that it reads “A third campaign is planned for 2026/2027.”

P4, L113: Figure 1 -> Fig. 1

P6, L150-151: Avoid separation of unit and number at the line break.

P6, L133: space between number and unit missing.

P7, L163: add “a” -> a microwave limb sounding system

P7, L176 and 178: add “the” before naming the institutions.

P7, L177: including -> rather “consists of”

P7, L178: add a comma and “respectively” after “2 km”.

P10, L232: Change sentence as follows: Once the balloon has passed the convective system, it returns to the initial altitude.....

P16, L335: influences -> influence

P17, L400: Figure -> Fig.

P18, L421: delete “of”

P19, L462: flight -> balloon

P20, L466: flew -> was transported

P20, L49-470: Avoid separation between number and unit.

P20, Figure 9 caption: The dots are rather crosses.

P20, Figure 9 caption: HIMAWARI or Himawari? Use a consistent way of writing.

P21, L467: Dots -> crosses?

P21, L482: add “diagram” after “Hovmöller”

P21, L487: Himawari or HIMAWARI? See my comment on P20, Figure 9 caption.

P21, L488: line break obsolete.

P21, L499: Himawari or HIMAWARI? See my previous comments on this. Use a consistent way of writing.

P22, L514: necessities -> necessary