

The manuscript entitled ‘The lapse rate cold point tropopause in the Asian Summer Monsoon Anticyclone’ uses high altitude aircraft measurements from the StratoClim campaign in 2017 to explore the lapse rate and cold point tropopause characteristics in the Asian summer monsoon anticyclone (ASMA). This manuscript uses water vapour, ozone, and temperature measurements from multiple research flights, including convective flights. They find the lapse rate tropopause to better distinguish between the tropospheric and stratospheric air masses. In convective cases, there is hydration near and above the lapse rate tropopause. In strong convective cases, dehydration occurs near the cold point tropopause. I found this to be an interesting study, and section 3.3.5 to be particularly insightful. My main comments are bulleted below, and I recommend minor revisions prior to publication.

Minor Comments

Abstract

In the abstract, L3-4 state that this study finds the lapse rate tropopause, rather than the cold point, to be a good estimate of the upper boundary of the troposphere. However, the remainder of the abstract focuses on the cold point when referencing water vapour mixing ratios, ozone mixing ratios, as well as hydration and dehydration patches. If the lapse rate tropopause better serves as the boundary, why is there more focus given to the cold point?

Introduction

L25: The impact to the radiation budget is an important part of the transport of water vapour to the lower stratosphere in the referenced papers, it could strengthen this point to mention that specifically.

L95-98: Could you include a reference for the differences between the lapse rate and cold point tropopause regarding water vapour in the ASMA?

Methods

It would be beneficial to have further information about the StratoClim campaign here. Including some details such as where the campaign took place, what aircraft was used, how many flights total versus what will be examined here, and what the objective were of the flights analyzed here would all provide helpful context to the reader.

L101: Please specify what the “research aircraft” is.

L137: Omit the “.” in “particles. (Khaykin et al., 2022) are...”.

Results

L176, L179: Including some additional, but brief, context about the mentioned flights (ex: convective or not) would be helpful to the reader when certain flights are mentioned but not the main flight of the sub-discussion (ex: 4 August flight) to know why certain flights are focused on and what attributes may be similar to flights that receive more discussion.

L215: More clearly distinguishing why the authors choose to focus on the cold point tropopause for water vapour in the results after stating that the lapse rate tropopause better separates between the troposphere and stratosphere would help emphasize the novelty of the results here. I find it can be less clear why the focus switches between tropopause definitions for different results discussion otherwise (similar to abstract comment above).

L225: This subsection is focused on a different flight, what is the nature of the 8 August 2017 flight? Is it similar to the 29 July 2017 flight?

L228: Is “this day” referencing the 8 August 2017 flight?

L252: Typo with “14 km ; they”.

Conclusions

L360: The discussion of future work in this paragraph is nice; it would be beneficial to add some mention of limitations to this work within the Discussion or Conclusions sections as well.

Figures

All Figures: Each figure has a .nc file name above it as a title. These titles do not seem to be needed, and the small text size makes it challenging to read. I recommend omitting these titles and replacing them with a descriptive title or omitting the titles altogether.

Figure 1: Typo in caption with extra parenthesis in “(16.8 km and (383.2 K, respectively).”

Figures 3,5: What do the red and blue dots represent?

Figure 5: What is grey versus black for the upper right plot?