

Interactive comment on “Water vapor increase in the northern lower stratosphere by the Asian monsoon anticyclone observed during TACTS/ESMVal campaigns” by Christian Rolf et al.

Anonymous Referee #1

Received and published: 13 November 2017

General Comments

This study presents results of the comprehensive analyses on water vapor transport in the upper troposphere and lower stratosphere related to the Asian summer monsoon anticyclone. Quantitative analyses are done by utilizing both the in-situ measurements during the TACTS/ESMVal field campaigns and a Lagrangian chemistry transport model, CLaMS, during the summer of 2012. Although the results are presented in a reasonable manner, I would recommend refining some of the scientific questions and especially improving writing before it is considered to be publishable on the ACP. Below are my suggestions.

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- I think it is necessary to include more background in the introduction. This may include, but not limited to, characteristics of the monsoon anticyclone and why the transport in and near the Asian monsoon anticyclone is important in global scale circulation.
- It is not clear what the scientific goals are. Why is the quantitative analysis of changes in the water vapor amount in the extra-tropical lower stratosphere important? Is 10
- Also, explain why in-situ measurements of chemical species are necessary and unique in this study compared to the previous studies. What are the limitations of using satellite measurements of water vapor in this type of study?
- Explain why water vapor and methane are used and what we can learn from those. What are the lifetimes of water vapor and methane in the troposphere and stratosphere? What other species were measured during the field campaign?
- Why is CLaMS used here? What is unique about this model? And are there any modeling studies on the similar subject?
- Writing can be improved. Careful selection of words should help clarifying some of the ideas. I think simple grammatical errors can easily be avoided by putting more effort into proof reading.

Specific Comments

- P1, L1 – from Asia -> locally
- P1, L2 – water vapor (H₂O) of about 0.5 ppmv (11
- P1, L4 – ‘by in-situ instrumentation in the northern hemisphere’ is redundant
- P1, L4 – What are the full names of TACTS and ESMVal?
- P1, L5 – this water vapor and methane increase -> the increased water vapor and methane, with the help of -> using
- P1, L6 – transport model (CLaMs)

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- P1, L9 – influence of air. . .region. -> influence due to the Asian monsoon anticyclone.
- P1, L10 – remove ‘between’
- P1, L15 – gases like water vapor and methane -> gases, such as, water vapor and methane,
- P1, L19 – with a low -> with low
- P2, L3 – ‘higher values. . .temperature’ – The meaning of this is not clear.
- P2, L10 – by a potential -> by strong potential
- P2, L15 (and others) – Eddy shedding -> eddy shedding
- P2, L18 – AURA-MLS -> the Aura Microwave Limb Sounder (MLS)
- P2, L22 – . . .altitude range -> add a few references here.
- P2, L27 – This study bases on -> This study is based on the (or In this study, the data collected. . . are analyzed. . .)
- P2, L27 – Also what other species were measured during TACTS and ESMVal?
- P2, L28 (and others) – northern hemisphere -> Northern Hemisphere
- P2, L33 – A reference for CLaMS is necessary here. Also, why is CLaMS perfect for this type of research?
- P3, L1 – location -> locations
- P3, L5 – bases -> is based
- P3, L11 – The full name for TRIHOP should be given here. Also bases -> is based
- P3, L20 – is driven by ERA-Interim -> is driven by the European Reanalysis (ERA)-Interim
- P3, L22 – What are the definitions of “emission tracers”?

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- P3, L24 – concentrations -> concentration
- P3, L27 – I do not think PV is measured by the MLS.
- P3, L27 – proxy -> proxies, allow for transport -> allow transport
- P3, L29-30 – Either add references here or explain how this can be done.
- P3, L30 – regions are -> regions considered are
- P4, Table 1 – A map can be added here. Or this table can be replaced by a map.
- P4, L3-4 – that these. . .stratosphere -> that these regions do not make a significant contribution to the lower stratosphere
- P4, L7-8 – In contrast to three -> In contrast to the three, temperature development -> changes in the temperature
- P4, L8 – A reference is needed at the end of this sentence.
- P4, L10 – remove ‘of the ECMWF’
- P4, L22 – ‘the tropical Pacific’ – I am not sure if this has been mentioned previously.
- P5, L1 – ‘reinforce the hypotheses’ – What does this mean?
- P5, L6 – Figures 1a and b -> Figures 1a and 1b (also P9, L8)
- P5, L7 – along equivalent latitude -> along the equivalent latitude. Also explain how ‘equivalent latitude’ is defined.
- P5, L8 – What does ‘tropospheric influenced air’ mean? Does this mean the air is mixed with tropospheric air?
- P5, L11 – have a similar. . .extent. . . -> have similar vertical and horizontal extents
- P5, L16 – at a PV value -> at PV values, remove ‘in the time’
- P5, L19 – All air -> All the air

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- P5, L22 – The distribution -> The frequency distribution
- P5, L25 – vapor concentration -> vapor concentration between the two phases
- P5, L28 – It might be easier to refer a figure in Vogel et al., instead of a page number.
- P5, L32 – Figures 2a, b -> Figures 2a and 2b
- P5, L33 – remove ‘relatively’
- P6, Figure 1 – a)-d) can be written on the top left instead of bottom left (also in other figures).
- P6, L3 – Figure 2d) -> Figure 2d
- P6, L4 – from phase 2 to phase 1 -> from phase 1 to phase 2
- P8, L2 – enhancements -> enhancement
- P8, L5 – Only few -> Only a few
- P8, L7 – Explain what ‘core region’ means.
- P8, L10 – ‘the slope of’ – A linear regression line can be added in Fig. 3a.
- P8, L18 – What does ‘the imprint on water vapor’ mean here?
- P9, L1 – that Eddy shedding -> that the eddy shedding
- P9, L5 – A reference can be added at the end of this sentence.
- P10, L2 – between both phases -> from phase 1 (Aug) to phase 2 (Sep)
- P10, L7 – model study of -> modeling study of
- P10, L20 – gives observational -> gives an observational

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-856>, 2017.