

Interactive comment on “Impact of major volcanic eruptions on stratospheric water vapour” by M. Löffler et al.

Anonymous Referee #2

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The paper investigates the impact of past volcanic eruptions on stratospheric water vapour. The subject of the paper is suitable for ACP and understanding long-term variability in climatic gases, in particular water vapour, is of importance for our understanding of the Earth system. However, I do have some concerns regarding the paper, which I hope can be rectified.

1) Experimental setup: I understand that all nudging methods have to compromise. However, it is not clear to me why the authors have chosen to exclude the optical but not the chemical impact of volcanic aerosols on the system. Presumably the heating change will be the leading order effect, but changes in composition might counteract our support the heating rate changes (e.g. ozone anomalies will impact heating rates as well). Please explain in more detail what you can or cannot conclude from the

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experimental setup.

2) Observational backing: The paper lives in the “model world” only. I really miss some direct links to observations (apart from sometimes confusing citations of observational evidence in the text, see example below). It would be good to know if the model with the aerosol effect fully included captures the observed variability well. At the moment the paper is a nice technical sensitivity study without a solid link to the real world. This in itself is not a problem, but the authors sketch out a mechanism, which might not have a link to the “real world”.

In summary: I feel the paper requires a significant re-work with a better link (illustrated with one or two figures) to observational evidence and a contextual link to the data used to “drive” the model: How freely can the temperature structure evolve compared to the reanalysis? What is the water vapour signal in the reanalysis? Unfortunately I found the paper hard to read. Here are some examples of what could be improved:

P34408, I18: Everything is know? Please rephrase . . .

P34408, I20: Please avoid negations (“not only”) . . .

P34412, I25: What does “in some parts” mean?

P34417, I19: What has this to do with the stratospheric fountain?

P34420, I23: Not sure what the message of this paragraph is. Different peaks in different plots? Please simplify (short sentences, direct comparison, is it your model or the reanalysis you are using that is causing the differences?)

P34422, I6: Why not use Figure 10 to summarise in a concise way what you think is going on?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 34407, 2015.

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