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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Simulation of the isotopic composition of stratospheric water vapour – Part 2: Investigation of HDO/H_2O variations" *by* R. Eichinger et al.

Anonymous Referee #1

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Review of "Simulation of the isotopic composition of stratospheric water vapour – Part 2: Investigation of HDO/H2O variations" by R.E. Eichinger et al.

General: this is a nice study evaluating a global climate model with isotopic fractionation for HDO. The goal of the manuscript is to better understand the mechanisms by which air gets into the stratosphere. The paper in its present form is only partially successful in this regard. It needs major revisions to be publishable in ACP.

The sensitivity study of methane effects is good.

My general critique of the manuscript is two fold. First, the description of monsoon

impacts is confusing, and second the summary is more confusing with a discussion of lofted ice. I think the authors should think about a sensitivity study to remove the isotopic effects of lofted ice to prove their point.

I think a further sensitivity study of lofted ice effects on delD could be conducted to clarify this: perhaps both globally and over the ASM region: lofted ice delD could just be set to the environmental delD to remove any lofted ice effect, and then differences performed.

Page 29460 L8: no comma necessary

Page 29460 L13: effects...have a damping....(plural)

Page 29463 L23: can you add a sentence on how realistic the energy budget and hydrologic cycle is relative to observations? Nudged climate models need not represent reality very well. This is probably in the other paper, but please state here.

Page 29464 L22 : for figure 1, what is the correlation coefficient?

Page 29465 L5: 'determining' : not proper grammar. "Both determined by Tropospeher-stratosphere exchange processes" would be better

Page 29465 L9: is anticorrelated (not opposing).

Page 29466 L25: I do not think the tape recorder figures are helpful : you could remove figure 3 &4 and just show figure 5.

Page 29467 L15: affected more strongly

Page 29470 L5: but lower temps would imply more negative DelD.

Page 29470 L11: but the rest of the hemisphere also has relatively high delD at these altitudes and latitudes: could it be that the ASM is just making a region of low delD on a high delD background because it is warmer?

Page 29470 L16: but these two monsoons have very different structures and water

vapor signals : I believe randel and park among others deal with this. I do not think simple averages can be compared in this way.

Page 29470 L25: but the earlier figure shows that the high values are adjective from the lower stratosphere around the ASM anti-cyclone. Would that not be the cause?

Page 29472 L7: to me they look pretty similar up to 23 km or so. I do not think this supports the argument that one is more influential than the other: they are similar. Also: you correlate the NAM over the anticyclone with the ASM downstream.

Page 29473 L16: please explain here the mechanism: does this mean there is more lofted ice in the N hemisphere. I also think and analysis of DJF would be useful to see if the asymmetry holds in the cold season with low delD (large depletion).

Page 29474 L19: the enhancement is at 18 km in figure 12. Does convection in the model penetrate to this altitude? You must have some convective mass flux output from the model available. What can you say about the relative mass of ice injected from delD?

Page 29476 L7: but you just said it was due to horizontal transport, and now it is due to ice lofting? I think a bit more analysis is warranted here. Or clarification, it sounds like you are talking about the same region.

Page 29476 L22: how do you NSNOW the convection scheme is in error. You are discussi discrepancies with observations: please show the discrepancies.

Page 29477 L3: since you have done this for methane HDO sources, I was expecting you to do the same thing for convective HDO: why not run a sensitivity test to determine what the lofted ice does to HDO? You could revert ice coming out of convection to the environment, and that would allow you to discern the signal.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 29459, 2014.