

Note, I'm referencing line and page numbers from the version found in the author's response.

ABSTRACT

Change “Our focus is on stratospheric altitudes” to “Our primary focus is on stratospheric altitudes”

Change “of the isotopic ratio, which primarily concerns the comparisons of the MIPAS and ACE-FTS

data sets to the SMR data set.” To “of the isotopic ratio, mainly in regards to comparisons between the SMR data and both MIPAS and ACE-FTS.”

Change “, this data set” to “, the SMR data set”

On line 15, delete “typically”

On line 19: change “the biases in δD are a combination of deviations in both HDO and H₂O.” to “the biases in δD are the result of deviations in both HDO and H₂O.”

Line 24: delete “typically”

Line 29: change “The differences between the MIPAS and ACE-FTS data come from different aspects,” to “The differences between the MIPAS and ACE-FTS data have multiple causes, “

This sentence is confusing “Overall, if the data sets are combined, the δD differences among them in key areas of scientific interest (e.g. tropical and polar lower stratosphere, lower mesosphere and upper troposphere) make it currently rather difficult to draw robust conclusions on atmospheric processes affecting the water vapour budget and distribution, e.g. the individual contribution from different transport mechanisms of water vapour into the stratosphere.”

Rewrite instead to (assuming I've interpreted your analysis correctly) to

“The differences in δD between the various data sets are sufficiently large to be able to draw robust conclusions on atmospheric processes affecting the water vapour budget and distribution. The bottom line is we can't make definitive statements regarding possibly transport mechanisms of water vapour into the stratosphere based upon the δD data assessed here.”

INTRO

page 14: line 8, change “to a large part” to “in a large part”

page 15: line 2/3, change “is preserved up to about 30 km before it dissipates.” to “ is traceable up to ~30 km in the isolated tropical pipe region, above which it mixes out.”

page 15, line 19/20: change “Despite their low abundance, these minor isotopologues are important for atmospheric science, as they eventually can provide additional information in the form of isotopic ratios relative to the main isotopologue, H₂¹⁶O (hereafter named H₂O).” To “Although found in low abundance, the minor isotopologues can provide information on the process history of air parcels from their isotopic ratios relative to the main isotopologue (H₂¹⁶O) (hereafter called H₂O).”

page 16, line 12-14: this sentence isn't clear “If the dehydration due to the slow ascent of air through the TTL is considered on its own (which corresponds to a Rayleigh fractionation process), a δD value around -900 per mille would be expected near the tropopause.” I'd rewrite

as “If air dehydrates to the saturation mixing ratio as it slowly ascends through the TTL, undergoing a Rayleigh fractionation process, a δD value around -900 per mille would be expected near the tropopause.”

page 16, line 20: change “with primary” to “with a primary”

page 16: line 32/33: change “In terms of δD no such comparisons exist among the satellite observations.” To “There are not published comparisons of δD between available satellite observations.”

page 17: line 8/9: text states “This observational discrepancy remains unresolved up to now.” Are you going to resolve that discrepancy in this paper?

2: DATA SETS

Can you add a statement akin to your answer to a reviewer that you consider multiple versions from the same satellite instrument because they have been published in the past and this provides context for older studies as well as future studies?

2.1 Odin/SMR page 18, line 2/3 I would change “ from pole to pole. This particularly concerns the boreal winter time.” To “from pole to pole, mainly during boreal winter.”

2.1 Odin/SMR page 18, line 11. Change “with one orbit covering HDO, followed by one orbit covering the H₂O” to “with one orbit measuring HDO, followed by one orbit measuring the H₂O”

2.1 Odin/SMR page 19, line 2 change “shall” to “should” (and, can you say what the quality categories mean?)

2.1 Odin/SMR page 19, line 17, change “drift, which are” to “drift, which is”

2.2 Envisat/MIPAS...page 20, line 21, add a comma after “(Flaud et al., 2003)” (before the “which”)

2.2 Envisat/MIPAS...page 20, line 27,. Add a comma after “Steinwagner et al. (2007)”

2.2 Envisat/MIPAS...page 20, line 32, add a comma after “For δD ”

2.2 Envisat/MIPAS...page 21...line 1, this is first note of the visibility flag”. Can you say what it is (as you did for the screening for SMR at the top of page 19)?

2.2 Envisat/MIPAS, page 21, line 9. You can delete “However, the impact on this work is negligible.”

2.3 SCISAT/ACE-FTS page 22 line 21, change “utilized” to “used”

3: APPROACH

page 23 line 1 / 2 change “stratosphere. As a complement, we also use data for the upper troposphere and lower mesosphere.” To “stratosphere, although we use data for the upper troposphere and lower mesosphere where available.”

page 23 line 6-10; rewrite as

(1) Calculate δD from the individual H₂O and H₂O profiles, then average. Here we denote this approach as “individual.”

(2) First calculate average H₂O and H₂O profiles, and then calculate δD . Here we refer to this approach as “separate”.

3.1 profile to profile comparisons page 25, line 14..change Haymsfield to Heymsfield

3.1 page 25, line 10-17....I understand that you can't use equation 3 for delta-d, but can't you use it on the HDO and H₂O before calculating delta-d?

3.1.4, line 8, change "concerns mostly" to "impacts mainly"

3.3, page 29, line 17, delete "in particular"

4: RESULTS

4.1, page 30, This rewrite is what was needed to add more science to the comparisons. Similarly the addition on page 33/34 was needed.

Page 35, line 9, delete "typically"

Page 36, delta-d section, first paragraph...I'm confused by the discussion here. Some referencing to the figures for the seasonal as well as the figure 2 in the profile comparisons might help.

(also, in captions where you show biases, even though you say in the text, also say in the caption that the bias is A-B (or B-A) rather A vs B.

Page 38, line 21...instead of "more suited" just say "shown" (you need to say "more suited to something", not just "more suited")

5 DISCUSSION AND CONCLUSION

page 41, line 8/9 states " This concerns primarily the comparisons to the SMR data set." which is awkward. I suggest "These quantitative differences are largest with comparisons to the SMR data."

page 41, line 11-14 says " In the profile-to-profile comparisons (Fig. 2), the SMR data set shows in the lower stratosphere a significantly higher depletion in δD than the MIPAS and ACE-FTS data sets, which however is close to its lower limit, thus correspondingly the uncertainties are larger." Also, pretty awkward sentence construction. I suggest "For the profile-to-profile comparisons (Fig. 2), in the lower stratosphere the SMR data set shows significantly higher δD

depletions than for the MIPAS and ACE-FTS data sets. However, we note that this is close to the SMR lower limit, which has larger uncertainties."

page 46, line 17/18 says " As described in Sect. 3.1.2, the differences in the vertical resolution of the MIPAS and ACE-FTS data sets can cause biases if they are not considered like in climatological comparisons." See my question above regarding section 3.1 " page 25, line 10-17". It really seems that you need to consider the resolution differences for any type of comparison. (and, if you leave this sentence alone, change "like in climatological comparison" to "as with the climatological comparisons".

page 49, line 6, change "data we have at hand the least number of systematic errors" to "data currently available, fewer systematic error"

page 49, line 10, change "principal" to "principle"