Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2019-240-RC1, 2019

Atmospheric Measurement Techniques Discussions

Interactive comment on "First data set of H_2O/HDO columns from TROPOMI" *by* Andreas Schneider et al.

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Received and published: 7 September 2019

The manuscript "First data set of H_2O/HDO columns from TROPOMI" by Schneider et al provides a first glimpse into the excellent data quality of novel isotopologue measurements from the TROPOMI instrument. As a "first data" paper, it provides a well rounded overview of validation and a few examples of HDO/H2O δD distributions. Overall, this paper is well suited for AMT and should be published after minor revisions. I also apologize for the late review. Please find some comments (High level first, then detailed aspects) below:

High Level:

- I would really like to see at least one spectral fit in a first data paper but am missing a discussion on fit quality, spectral residuals and the like in this manuscript. Please provide a figure showing typical fits, potentially systematic residuals and locations of HDO and H2O lines (e.g. plot Jacobians and spectral fits + residuals, a few examples are enough but this being a "first data" paper, I consider this a must).

- The averaging kernels for H_2O could be an issue for some of the data analysis, especially if parts of the lower column might be blocked by fractional cloud cover. I understand that the authors strictly filter data to alleviate this problem but I am also wondering whether you can make the averaging kernel more uniform for H_2O. There might be a few options. A profile fit could help achieving this, even if the degrees of freedom won't be necessarily high (did you ever try)? You might also try to block out the strongest H_2O lines in the retrieval, which might help (the weaker the lines, the more uniform the averaging kernels). In the long run, this could/should be a focus for further retrieval work as it would allow you to relax filter criteria. However, I realize that this is a bigger endeavor and will require more work in potential future papers.
- In many plots, you always discuss and show "biases", which are additive in nature. However, your analysis uses scaling factors, which are multiplicative. Multiplicative biases are natural, as line strengths in databases can be wrong but it also means that additive biases depend on the amount itself. I would change all bias discussions/plots into relative terms (% bias is basically multiplicative). For fits, provide slope and intercept (e.g. in Figure 5).
- I am missing a Rayleigh plot to be honest, maybe pick a few regions and plot H2O column amount vs delta-D? Would be good just to show the general dependence. Could also be plotted along a typical transect.

Detailed minor comments:

- Abstract: Maybe start with a more general scientific scope sentence in the very beginning
- around line 45: make clear that thermal and SW satellites have very different sensitivities.
- line 57: data "are" (data is plural)
- line 65 "with an order 1 Lambertian albedo", be more specific (I know what you mean). Also, is order 1 enough? Did you try higher orders? If not, why not?
- Line 69: Do I see it correctly that your delta-D prior profile is 0?
- Line 77: Diffraction effects are not really the biggest problem I would say (generally more scattering at higher angles, longer light-paths, etc...)
- Figure 1: Plot with pressure on Y-axis would be more representative.
- Figure 2: Again, bias is misleading here. Express it in %, not absolute terms.How about intercept issues?
- Line 126: molcec
- Line 135: "is plain": What do you mean?
- Figure 6: show relative biases, not absolute

Again, I congratulate the larger TROPOMI team for this excellent satellite mission, providing impressive results at a very early stage.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-240, 2019.