

# Review of Diekmann et al, ESSD

April 16, 2021

## 1 General comments

This paper presents a re-processed dataset of paired water vapor and  $\delta D$  retrievals from satellite observations with the IASI instrument. This is very useful dataset for the community of people working on water vapor isotopes. To date, this dataset will become the isotopic dataset with the highest spatio-temporal sampling (twice daily) at the global scale with the longer time period (six years). This submission is thus well-suited for publication in ESS.

The article is well-written and well-illustrated.

I expect that many users will be interested in using this data. However, the complexity of the dataset and of its use may be dissuasive. I propose a few suggestions in the specific comments.

Note that I'm just a data-user. I'm not expert in the satellite data processing, so I cannot comment on this aspect. I hope that at least another reviewer will be such an expert.

## 2 Specific comments

### 2.1 Optional: what about adding a user-friendly, fully gridded product?

The full dataset is extremely heavy. IASI is not the first global dataset of water vapor isotopic composition by satellite, and my impression is that previous such datasets have been under-exploited. I can feel that many users would like to use such datasets, but the size of the data, and the complexity of its processing by users, is dissuasive for many people.

Therefore, I think it would be very useful for the community to build a simpler, lighter, regularly-gridded, user-friendly product. For example, it could be one netcdf file for each month, with a daily resolution, a 1x1 resolution, and with a coarse, horizontally-uniform vertical grid in altitude or pressure. It would contain quality filtered humidity and  $\delta D$  profiles and just a few ancillary information. Maybe you already made such a product, for example when plotting some gridded maps for this article?

Have you ever considered making such a product publicly available?

### 2.2 Clarify how the data should be used

I downloaded the dataset on the link given line 436 and tried to use it myself to test if the article was clear enough for users. I had several difficulties.

- Table 1: it is indicated that the flag *eumetsat\_cloud\_summary\_flag* should be 1 or 2. However, l 337, the condition is written as *eumetsat\_cloud\_summary\_flag* ≤ 2. So should we select or discard values of *eumetsat\_cloud\_summary\_flag* that are 0?
- I don't understand what is the *musica\_species\_id* dimension in the data files. For example, how do you plot figure 7 using the variable *musica\_wvp\_dofs*?
- If I want to compare model outputs to the IASI data, is there a simple formula that would allow me to convolve model outputs with the IASI averaging kernels? I expect that I would have to use *musica\_h2o\_apriori*, maybe *musica\_wvp\_apriori*, but how should I use them in a formula? Which variable in the data files represent the averaging kernels and how should I use them?

I think this technical information is important for data users. Could be explained in this article, or in a easily-accessible documentation?

### 3 Minor comments

- l 12: sensitivity -> sensitive
- l 14-15: grammar issue. Try removing “there is a ... data”
- l 30: constrained to -> interpreted in terms of the
- l 39: inevitable -> necessary
- l 43: missing citation
- l 44: missing , before Schneider
- l 45: TES did not end in 2012. It goes at least up to 2017, though with a reduced spatio-temporal sampling after a few years. See for example <https://tes.jpl.nasa.gov/data/plots/averages/monthly-mean-hdo-681hpa>
- l 45: you should also mention the AIRS data ([Worden et al., 2019]), which goes from 2002 to 2019 with a very good spatio-temporal sampling as well. See the AIRS  $\delta D$  data publicly available on <https://avdc.gsfc.nasa.gov/pub/data/satellite/Aura/TES/.AIRs/TROPESs/HDO/>
- l 60: what is CF?
- l 109, 115: problem with this citation: why is the first name in the citation?
- Regarding data availability, I was able to download the data from [https://ncview.scc.kit.edu/thredds/musica\\_iasi/H2Oiso\\_v2/catalog.html](https://ncview.scc.kit.edu/thredds/musica_iasi/H2Oiso_v2/catalog.html) . However, at some point after following links I arrived on the page <https://radar.kit.edu/radar/en/dataset/dpYpVSBLOLrJZjxZ> and there, all I could download was land-masks: is it normal?

### References

[Worden et al., 2019] Worden, J. R., Kulawik, S. S., Fu, D., Payne, V. H., Lipton, A. E., Polonsky, I., He, Y., Cady-Pereira, K., Moncet, J.-L., Herman, R. L., et al. (2019). Characterization and evaluation of airs-based estimates of the deuterium content of water vapor. *Atmospheric Measurement Techniques*, 12(4):2331–2339.