

Review of Henze et al, ESSD

November 19, 2021

This article presents a dataset of humidity and water vapor isotopic composition during aircraft flights during the ORACLES campaign in the subtropical South-Eastern Atlantic.

The vertical and latitudinal variations in isotopic composition for 3 different years documented by this dataset are unprecedented. I expect that this dataset will be very precious to the isotopic community interested in understanding how boundary layer, cloud, convective and large-scale transport processes impact the water vapor isotopic composition. In particular, vertically-resolved isotopic observations are critically lacking and this dataset fills an important observational gap.

Therefore, I think that this dataset strongly deserves to be published, after a few minor revisions.

1 Comments on the balance between data, instrument and campaign description, data analysis

I was asked to specifically comment on whether the balance is right (instrument description, campaign description, versus data description), because ESSD tries to “avoid being a back door for analysis, or instruments”. I have several comments and suggestions on this.

- Section 2 describes the campaign and climatology of the sampling region. As a potential data user, I felt this was very useful. However, I think **more information on the altitude of the flight tracks would be very useful**. For example, on fig 1, add colors to indicate altitude along tracks? Or plot the different tracks in a latitude/altitude diagram? Fig 2 gives information about the altitude but I felt this was not enough because we cannot see the connection with the latitude.
- Sections 3, 4 and 5 describe the instrument, calibration details, and uncertainties. I’m not an expert in isotopic measurements, so I’m not able to comment on these sections. I can imagine that measurement experts would find useful information there.
- As a data user, what I am missing at this stage is some section explaining the data format. I went on the links provided in the “Data availability” statement, and it took me some time to understand where to go, and then what archive to unzip, and then which file to look at to find the isotopic data. And once I eventually found the isotopic data, I was still missing the latitude, longitudes and altitudes of the measurements, which are probably described in yet another file? **A paragraph and/or schematic would be useful to guide the users to actually use the data.**
- Section 6 presents some illustration of the data. Maybe this is where the article could be suspected to use ESSD as a “back-door for analysis”. As a potential data user, I found this section very useful to be convinced that this dataset provides plausible isotopic signals that can be used for science purpose. The altitude-latitude cross sections and individual profiles allow to have a better idea of the vertical and latitudinal resolutions. Yet, **this section could be shortened**, to leave room for a more solid data analysis paper in the future. The angle of this section could be slightly re-oriented to demonstrate the soundness and plausibility of the data. Section 6.2.1 is chronologically organized. What I gather from this section is that (1) to first order δD is correlated with q , especially when looking at altitude and latitude gradients at low levels, and (2) some deviations from this correlation arise because air mass origin also impacts δD , as supported by its correlation with CO. Maybe this section could be shortened by focusing on these two aspects?

- Finally, I expect that many data users would actually be most interested in the cross sections and profiles illustrated in Figs 7-12. For example, as a modeler who wants to use this data for model evaluation, I would like to have this kind of Level-3 data, without bothering re-doing all the co-location and interpolation work. It is possible to **make this Level-3 data publicly available as part of the dataset**? In this case, section 6 would be even more in line with ESSD editorial policy, because it would describe this Level-3 dataset.

2 Miscellaneous comments

- Lines 11-15: The two first sentences could be switched, so that the primary purpose of the article is to describe the dataset rather than the instrument, in better line with ESSD editorial policy.
- Fig 1: what is the unit of the vertical velocity contours? Can you write the numbers for all contours? Also, it would be more intuitive to give values in hPa/d.
- Fig 2 is not referenced in the text. It would be useful in section 2.
- l 406: do you mean fig 7?
- Figs 7, 8, 9: it would be useful to add markers or lines to show the flight tracks, to have an idea what comes from actual observations and what comes from the interpolation.
- l 421: what is misleading? Clarify.
- Fig 7: I don't understand the profiles on the right. Can you clarify the difference between "maximum and typical standard deviation"? Why no dashed line for q?
- Fig 7: why no dot-dashed line as in Fig 8 and 9?
- Fig 8: the blue segment and blue point are arbitrary. I'm not sure they help much.
- Figs 10-12: what do these profiles represent? Are they individual profiles? Or averages over several profiles? What latitudes do they represent? Can the latitude positions be indicated in Figs 7-9?
- l 480: "higher": than what?
- l 481: unclear: do you mean that the standard deviation is three times larger than the instrument precision?
- l 488-489: I don't understand this sentence. "evident in the figure" should also be replaced by a more specific and objective statement.