Atmos. Chem. Phys. Discuss.,
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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Baffin Bay sea ice extent and synoptic moisture transport drive water vapor isotope (δ^{18}O, δD, d-*excess*) variability in coastal northwest Greenland" *by* Pete D. Akers et al.

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Dear Dr. Akers,

Thank you for making available such a long record of atmospheric water vapor isotopes from one of the regions of the world where climate change is most manifested.

When reading your manuscript a question about your calibration came up, which is not clearly explained by your discussions in the text.

You write that from August 2019 a calibration dry air system was installed (Line 164). No information about the dry air system is given in the text such as the humidity level

of the dry air produced.

But you also write that you perform a humidity-isotope-calibration function estimation in July 2019. I therefore must assume that this calibration is carried out using a Drierite system. You carried the humidity-isotope calibration curve between 500 and 7000 ppmv and you show in the supplementary material a strong influence of the humidity on the isotopic composition. However as shown clearly in Bastrikov 2014 there is an effect on the humidity-isotope-calibration function when using dry air produced using Drierite as the material using in the Drierite column creates some amount of isotopic fractionation. The conclusion from Bastrikov 2014 is that you cannot use the humidity isotope correction function below 3-5000 ppm when using drierite. I have attached the figure below.

Would it not be more correct to flag the data below 5000 ppm as potentially biased by the humidity-isotope correction function, or have you in other ways corrected for the use of Drierite?

I had a look at the data which you uploaded to the Arctic Data Center. I assume that this is the calibrated data, which you have uploaded, but would it be possible to also upload the non-calibrated data and information or a script to see the effect of each step of the calibration.

It is not clear if you have calibrated and how you have performed the calibration of the humidity (ppmv) of the picarro. Maybe you could add a figure similar to Bastikov 2014 as also shown below.

Could you in the supplementary data also add a plot showing the measurements of the calibration pulses and the estimate VSMOW-SLAP slope. I do notice that a great deal of your measurements are outside your range of the standards used, so it would be very useful to get an estimate of how stable and accurate the VSMOW-SLAP slope is.

Thank you for your help making such a valuable dataset extra useful for the community.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-340, 2020.

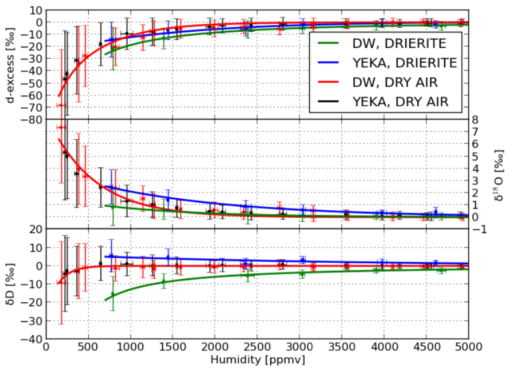

Figure 4. Picarro humidity–isotope response functions. Green error bars: calibration performed using DW standard and DRIERITE column, blue error bars: calibration performed using YEKA standard and DRIERITE column, red error bars: calibration performed using DW standard and dry gas, black error bars: calibration performed using YEKA standard and dry gas. Solid lines represent linear fits to the data. For the measurements of DW and YEKA standards using dry air one conjoint fitting line is shown in red. The *y* axis shows a bias with respect to the mean value measured at 12 000 ppmv.

Fig. 1.

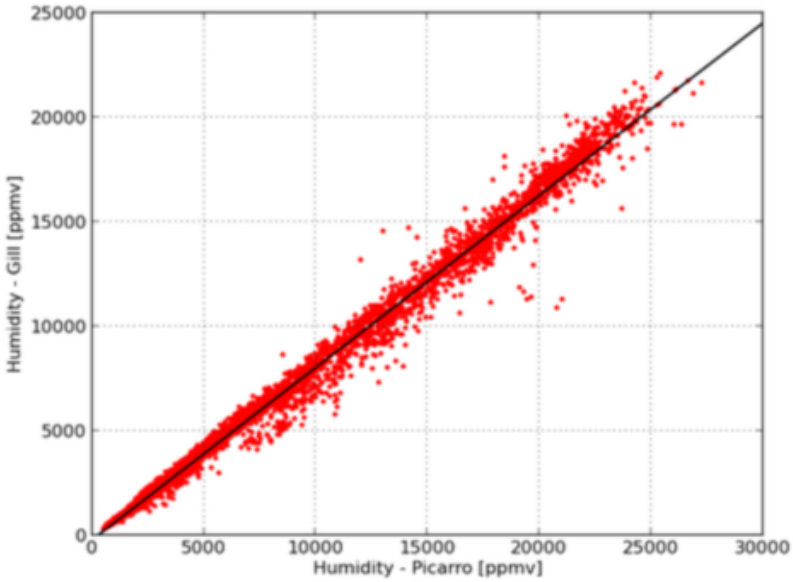

Figure 3. Humidity measurements: meteorological sensor (Gill Instruments) vs. Picarro. Black curve: linear fit (Eq. 3).

Fig. 2.

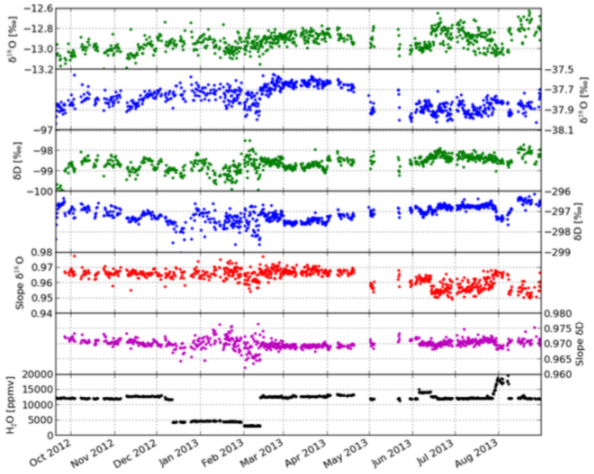

Figure 5. Picarro calibration data. Top to bottom: measured $\delta^{18}O$ and δD values in ‰ for DW standard (green dots) and YEKA standard (blue dots), calculated calibration slope for $\delta^{18}O$ measurements (red dots) and δD measurements (purple dots), humidity concentration in ppmv (black dots).

Fig. 3.