Atmos. Meas. Tech. Discuss., 4, C1087–C1090, 2011
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Atmospheric Measurement Techniques Discussions

Interactive comment on "Water isotopic ratios from a continuously melted ice core sample" *by* V. Gkinis et al.

Anonymous Referee #1

Received and published: 18 July 2011

Review of a paper submitted to AMTD entitled *Water isotopic ratios from a continuously melted ice core sample* (V. Gkinis et al., AMTD 4, 4073–4104, 2011).

General comments

The paper is generally well written and structured. I have a few comments about the assessment of the measurement precision and accuracy and suggest a few minor changes. These would be helpful for the reader to get a better feeling for the certainly high quality of the presented data.

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Specific Comments

Abstract, line 2 replace *build* with *built*.

Abstract, line 16 .. limits the resolution of the technique. You may want to add that you refer to the resolution in terms of age. It might be confused with resolution in terms of δ-values.

P. 4078, line 12 explain what *mQ* stands for. The unfamiliar reader would have to google..

P. 4078, line 24 replace and correct *purchasecd by* with *purchased from*.

P. 4079, line 14 replace *affects* with *effects*.

P. 4080, line 4 add units to 1281.5–2200.55

P. 4080, line 21 replace a_{18} with α_{18}. same for the D.

P. 4080, line 25 You state that you perform frequent calibrations. The interested reader (like myself) would be keen to learn how often you do calibrations, what the accuracy of the instrument is when you calibrate frequently, and in particular how instrumental drifts affect your correction terms (Eq. 1) regarding humidity. This could be combined with another depiction of the data of Fig. 5 (see my comments there).

P. 4081, line 22 remove the comma.

P. 4081, line 26 why do you use M=300 when a lower number works equally well?

P. 4082, line 5 From the power spectral density of a time series — which is not shown — you determine the precision of your δ^{18}O and δD measurements. The precision is, however, a function of the humidity, and you should at least state at which

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humidity you have determined the precision. It is furthermore a function of the averaging time. This seems to be seen by the increasing spectral density towards lower frequencies. However, the underlying time-series data and a more detailed description would be interesting to show how this measurement was performed (constant humidity and isotopic ratios or not).

P. 4082, line 6–20 and Fig. 5 This is a very important comparison measurement indeed. I think you should present the data in Fig. 5 in a different fashion. If you were to group the IR-CRDS data to the same depth scale than the discrete mass-spectrometer data you could plot them 1:1. Adding respective error bars as well as slope and intercept will give the reader a better feeling for the accuracy of the IR-CRDS in direct comparison with another state-of-the-art technique. Then you can discuss in a more quantitative fashion any differences.

P. 4083, line 8 remove the comma

P. 4082, line 23 remove the comma

P. 4082, line 24 remove the second comma

P. 4084, line 12 replace *on* by *in*

P. 4086, line 13 replace *sceme* by *scheme*

P. 4087, line 15 the term *wavelength of the isotopic signal* is at least confusing when discussing results obtained with a laser spectrometer. Maybe you can find a less ambiguous term.

P. 4089, line 7 As mentioned previously, the precision of the δ-values is dependent on the humidity level and the averaging time. As such, the uncertainty of the deuterium excess is a function of these parameters, too.

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P. 4089, line 9–10 I'm not so sure whether your optimal filtering is the cause for the cleaner D_{xs} signal. I believe a simple low-pass (averaging or running mean) would enhance the signal-to-noise ratio similarly. The optimal filtering seems to be useful to enhance the uncertainty in absolute terms rather than relative, which is what I see in Fig. 9. Furthermore, what is the consequence of your error estimation. Is it sufficiently good enough to do what you want to do?

P. 4090, line 1–5 As mentioned before, the verification of your calibration is not quantitatively shown in Fig. 5. Note that this accuracy is also rather independent of the noise level you determine. Please quantify.

P. 4090, line 14 remove first *the*

P. 4090, line 17–18 Sentence needs to be rephrased

P. 4090, line 17–18 change *The non destructive, continuous and on-line technique, offers the possibility for analysis of multiple species on the same sample, in high resolution and precision and pottentially performed in the field.* to *The non destructive, continuous, and on-line technique offers the possibility for analysis of multiple species on the same sample in high resolution and precision and can potentially be performed in the field.*

Fig. 4 add a legend

Fig. 5 show as direct 1:1 comparison

Fig. 7 in the 2nd line of the caption change *represend* to *represent*

Fig. 9 add a legend

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 4073, 2011.