Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2016-331-AC2, 2017

Atmospheric Measurement Techniques Discussions

Interactive comment on "Fluorescence calibration method for single-particle aerosol fluorescence instruments" *by* Ellis Shipley Robinson et al.

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Received and published: 21 January 2017

Response to RC2 - amt2016-331

We would like to thank the reviewer for their time looking over our manuscript. This feedback really truly very helpful, both in it being thorough and thoughtful. Thank you very much for reading the paper. We have organized our responses to the reviews by using the same numbering as the initial review

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This journal article presents a method for calibrating the response of ïňĆuorescence instruments against a known standard. The work is very timely, with an increase in the

availability of commercial instruments and the increased attention biological material is receiving in the research community. The article is well written and describes very clearly the steps required to perform the calibration. I have a few comments below, but otherwise I think this article is well suited for AMT and should be published.

Figure 1. I agree that performing the calibration at the operating ïňĆow rate is the way forward, but I think a recommendation of the paper should be that ïňĄgure 1 is generated/ checked at regular intervals (start and end of campaigns maybe) with the ïňĆuorescent material. This would give you an operational baseline to check the instrument performance over time. It would also be something that is easily included in supplementary material in publications so different groups can compare sensitivities, if required.

-We agree, and hope that the size calibration and, with this new method, fluorescence calibration, are checked and reported for measurements for the purposes of verifying an instrument's operational baseline, and allowing other users to better interpret their results.

Figure 3a. You have calibration data you are not using. If you know where the Q1 peaks are, you therefore know the location of the Q2 peaks. This is most noticeable at the smaller sizes. You have additional masses from the single mobility diameter. This feature of DMAs is often used when calibrating OPCs with oil drops.

-It is true that the doubly-charged particles can provide additional data points for this calibration and others like it. We, however, did not optimize our sampling to make the Q2 data useful. In short, we didn't sample long enough (collect enough particles) to make high-fidelity histograms that we could then fit well with Gaussian functions for all of the particle sizes used here. In our data analysis, we found it easier to simply focus on Q1 peaks instead of sometimes also using the Q2 data. This is the kind of improvement on the method we present here as a template that other groups may wish to incorporate in their adaption of it, should they choose to.

I have read the comments of the other reviewer regarding the Q- and T- equivalent mass. I tend to agree that it potentially over simpliïňĄes the measurement, but this approach is used elsewhere in science. For example, the Aerodyne Aerosol Mass Spec community report nitrate equivalent mass, which assumes everything has the same ionisation efïňĄciency as nitrate. If they want the mass of a speciïňĄc compound, they need to apply a relative ionisation efïňĄciency correction. I think caveating the use of the Q- and T- with other factors that can affect it is required, but it is still a useful quantity to report. Maybe as more research is done, a database of Relative Fluorescent Factors (RFR) will be generated for different materials.

-The analogue of 'nitrate-equivalent mass' within the AMS community is roughly what we had in mind in presenting these 'Q-units.' We completely agree with the other reviewer that the intensity of measured fluorescent light is complex and governed by many factors, environmentally-dependent quenching being one such example. We still feel that Q-units, or something similar, is a step forward because it allows comparing measures of fluorescence across days (in ambient sampling) and across different instruments (in ambient or lab sampling). That is not currently possible with the arbitrary fluorescence units usually reported in WIBS studies. At least with Q-units, with all of the necessary caveats clearly stated, measurements can be compared across platforms.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2016-331, 2016.