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Atmospheric Measurement Techniques Discussions

Interactive comment on "Quantification of gas-phase glyoxal and methylglyoxal via the Laser-Induced Phosphorescence of (methyl)GLyOxal Spectrometry (LIPGLOS) method" *by* S. B. Henry et al.

Anonymous Referee #1

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General Comments:

In the submitted manuscript, Henry et al., describe the development of a compact, inexpensive, laser-induced phosphorescence instrument for the simultaneous detection of glyoxal and methylglyoxal. The authors exploit the different phosphorescence lifetimes (12.75 and 7.26us, for glyoxal and methylglyoxal respectively) of the two structurally similar compounds and achieve an instrument that has a detection threshold of 11 ppt (glyoxal, 3sigma, 5min averaging) and 243 ppt (methylglyoxal, 3sigma, 5min

averaging). The paper represents a novel advance in the field and should be published in AMT, although the description of the instrument and the discussion of the retrieved concentrations need to be revised, following the specific comments below.

Specific Comments:

1. The description of the instrument is complicated by discussion of multiple DAQ cards used (Alazar Tech vs. GaGe Applied Tech.) and multiple lasers employed (CW diode vs. Ti:Sapphire). It was not immediately clear that all of these components were not required simultaneously. As I understand, the authors are describing one instrument that can be operated in a number of different configurations using either laser A or laser B (or DAQ card A or B). This should be made clearer. Further, the LODs reported in the abstract are for different lasers, this presumably means that the instrument as described needs to have both lasers on board to achieve these detection limits (for example, if only the CW laser is used the methylglyoxal LOD is high and dependent on the glyoxal abundance). This also, should be clarified. I might suggest describing one system, then adding a separate section discussing the use if an alternative laser to improve the detection of methyl glyoxal.

2. In many places, the authors comment on the feasibility of these devices for inexpensive routine measurements. Could the authors provide some definition of inexpensive, with the optics and DAQ cards used, it is hard to imagine this device is much cheaper than $25k (for the CW diode based instrument). Again I might separate the manuscript into a discussion of the Ti:sapphire based instrument, then a discussion of a less expensive, less precise (for methylglyoxal anyways) CW diode based instrument.

3. On page 6161, it would be nice to have more specifics on the observed concentration ranges for glyoxal and methylglyoxal. It would be nice to have some confidence that a detection limit of 243 pptv in 5min (methylglyoxal), is this good enough to constrain chemical mechanisms using atmospheric observations. Outside of major cities, has this level ever been recorded?

4. I am confused by the use of the histogram (in Figure 1) and in the analysis section. I generally think of a histogram as a probability distribution of a continuous variable. Figure 1, looks to me like an example decay. I would like to see an example of an atmospheric (or laboratory decay) that is fit with Eq4 to determine concentration. I think that the analysis section could benefit from a few additional paragraphs that describe exactly how the "histogram" or Eq4 is used to calculate concentration. Finally, I would also be interested to see a short few lines describing how the LOD was calculated. Is this assuming that the uncertainty in the background is time independent and Gaussian over 5 minutes?

5. The glyoxal comparisons with Mad-LIP are excellent, as is the insensitivity of the instrument to the fraction of methylglyoxal. (Fig. 4 and 5). Is it possible to show a something similar for methylglyoxal (e.g. and x-y plot of glyoxal added vs. methylglyoxal measured for a lab experiment of constant methylglyoxal and varying glyoxal). This has been discussed a bit in Table 2.

6. In table 2, what were the mixing ratios of glyoxal and methylglyoxal used in the "mixed" scenario?

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 6159, 2011.