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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 #2

Received and published: 15 December 2011

General comments:

This manuscript presents a method for simultaneously measuring glyoxal and methylglyoxal. The two molecules are distinguished by their phosphorescence decay lifetimes. Three-sigma detection limits of 11 pptv and 243 pptv are reported for glyoxal and methylglyoxal, respectively. This work improves upon a previous version of the instrument, reported by Huisman et al 2008, which used a wavelength-tunable Ti:Sapphire laser to determine glyoxal concentration.

This manuscript includes three new and interesting results:

- Measurement of methylglyoxal by phosphorescence.

- Simultaneous retrieval of glyoxal and methylglyoxal by fitting their time-dependent phosphorescent decays.

- Replacement of the Ti:Sapphire laser with a much cheaper CW laser in the phosphorescence instrument.

The paper addresses a relevant scientific question and is within the scope of AMT.

Major comments:

- The primary purpose of this paper is to describe a new instrument, but no schematic is shown. Please add a figure for this.

- The authors refer to LIPGLOS both as an instrument and as a data retrieval technique. The authors compare the Mad-LIP instrument to the LIPGLOS instrument, and they also use the LIPGLOS data retrieval technique with the Mad-LIP instrument. I agree with the first reviewer's concern that the description of the instruments and their configurations is confusing and should be clarified. One improvement would be to give the data retrieval technique a name that is separate from the instrument (such as "multiple phosphorescence decay fitting" or something similar).

- Pg 6160: The first sentence of the introduction ("glyoxal and methylglyoxal are nearly ubiquitous products of the HOx/NOx cycle") is strange. Glyoxal and methylglyoxal are VOC oxidation products, not products of HOx/NOx.

- Pg 6161: The introduction should include a list of the major precursors for glyoxal and methylglyoxal. When highlighting the importance of isoprene, it would be useful to add the measured first-generation yield of glyoxal and methylglyoxal from isoprene.

- Is the methylglyoxal measurement sensitive enough for ambient atmospheric measurements? Or is it necessary only to correctly quantify the glyoxal concentration?

- For Table 1, please add a column with the laser wavelengths and FWHM. The references for the absorption cross-sections are not given here and should be included as a footnote. In Section 2.2.1, the importance of the relative cross sections are discussed, but the cross-sections are not stated. Add a sentence to this section indicating that the reader can find a summary of the laser wavelengths and absorption cross-sections in Table 1.

- The cavity ringdown spectrometer described in Section 2.2.4 appears to be identical to that presented by Huisman 2008. If so, that should be stated with a reference to the previous Huisman paper.

- Pg 6168 line 7: Clarify what "until no more data was recorded" means. Is there a signal-level threshhold?

- Pg 6170 line 9: Give the chemical structure for biacetyl. Add a reference for the quoted cross-section.

- Pg 6171 line 15: Give the actual slope and intercept values here. The 29.8 pptv intercept for the lambda_T:S,L fit is large and significant. Please add a comment about this, and about the significance of the intercept for lambda_T:S,H as well.

- Presumably, the reason for using the LIPGLOS fitting method at the Mad-LIP lambda_T:S,L wavelength is to achieve a more sensitive measurement of methylglyoxal. This is unclear until the conclusions, and left me wondering about why you would use this poorer wavelength and show it in Fig. 4.

- Pg 6172 line 5: Why is the standard deviation extrapolated?

- Pg. 6172 line 21: The conclusion about slope of 0.98 and r2 of 0.87 is not consistent with Fig. 5.

- Fig. 1: I concur with Referee #1's confusion regarding the use of "histogram" to describe the signal decay as a function of time. A histogram usually represents a frequency distribution.

- Fig. 4: A few comments - Please add error bars. What is the source of the outliers? It looks like the scale was intended to be in color.

Minor comments:

Pg 6163 line 9: "If there are" should be "If there is".

Pg 6163 lines 27 - 28: Incomplete sentence.

SLM and SCCM are not defined.

Pg 6167 line 4: "is based on to the instrument"

Pg 6168 line 4: "speices"

Pg 6171 line 14: Change "blind" to "insensitive to".

Pg 6172 line 9: "dirunal"

Pg 6173 line 3: "speicies"

Fig 5: "respectivly"

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