

Interactive comment on “Study on the measurement of isoprene by Differential Optical Absorption Spectroscopy” by Song Gao et al.

Anonymous Referee #2

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The manuscript entitled “Study on the measurement of isoprene by Differential Optical Absorption Spectroscopy” by Song et al. reports the application of DOAS technique on isoprene measurement. This study details the setup, laboratory experiments, and field applications of the DOAS. Intercomparisons of isoprene concentrations measured by the DOAS and a commercial GC-MS shows a good consistency. The content and novelty of the manuscript align well with the requirements of AMT. However, English could be improved throughout the paper as it is not easy to follow. Overall, I recommend the manuscript for publication if the authors can address the following comments.

General Comments: 1. In the calibration experiments described in Sect. 2.2, the actual concentrations (CM) must be measured more than once with parallel experiments for different cell lengths, and measuring error should be added in Table 1 and Figure 3.

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The equation (1) should be recalculated accordingly. In addition, it seems that the difference between CE and CM increased as the increase of cell length in Table 1. Could authors provide an explanation about the phenomenon?

2. Some important information is missing in the comparison experiments. Firstly, it is not given how reference spectrum was recorded during field applications. As reference spectrum plays a role in spectral fitting, uncertainty caused by reference spectrum should be discussed. Secondly, calibration methods as well as calibration frequency of the on-line VOCs (TH-300B) are not provided. Compared with the DOAS measurements, the on-line VOCs measurements seems to have a 0.1 ppb offset during the period from 07/21 to 07/24. Could the offset be caused by the calibration of on-line VOCs? Thirdly, providing wind parameters (measured by weather station) and benzene and toluene concentrations (measured by on-line VOCs) when the comparison is inconsistent will be more persuasive, as authors speculated that wind directions and benzene and toluene concentrations would influence the comparison consistency.

3. As authors introduced in Sect. 1, PTR-MS and CIMS can also be used to measure isoprene concentrations. The manuscript would benefit from a critical comparison of the best available performance of these four methods (i.e., DOAS, GC-MS, PTR-MS, and CIMS) together given in a table. Characteristics in the comparison could be time resolution, accuracy, precision, appropriate platforms, etc. Such a comparison would be useful to the readership and meaningful to the community.

Specific Comments: Line 15: “202.71-227.72nm” → “202.71-227.72 nm”. Blank space should be inserted between number and unit. Such irregular expressions were used frequently elsewhere in the manuscript and should be revised.

Line 26: The “B” in BVOCs is usually the abbreviation of “Biogenic” instead of “Biological”.

Line 42: “In the daytime, the oxidation by OH is the main chemical process of isoprene.” The sentence should specify “whose oxidation” and “what kind of chemical process” to

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avoid ambiguous meaning.

Line 44-47: These contents are given here without references.

Line 52: "BVOCs also has [...]" → "BVOCs has [...]"

Line 59: "GC-MS is using the high separation ability of gas chromatography to separate the [...]". Simple Present Tense should be used here.

Line 61-64: "Although GC-MS [...] But the complex [...]" These sentences should be rephased.

Line 63ff: A comma should go before the conjunction "and" in a list of three or more items. "[...] in power, temperature control and special carrier gas [...]" → "power, temperature control, and special carrier gas". "[...] requires sampling, preservation and pre-treatment [...]" → "requires sampling, preservation, and pre-treatment".

Line 67, 77, and 78: The meaning of the abbreviations (i.e., PTR-MS, GC, and CIMS) has already been given in the previous paragraph and so it need not be defined again here.

Line 69-71: The sentences should be rephased.

Line 104: "[...] as light source, the aperture [...]" → "as light source. The aperture"

Line 106: "while, the aperture of the" → "while the aperture of the"

Line 109: "1024-pixel photodiode array as detector was used to record spectrum" → "1024-pixel photodiode array was used as detector to record spectrum"

Line 158: "Fig. 3" → "Figure 3"

Line 215: "[...] so higher measurement points will catch higher concentration of isoprene. [...]" Reference or detailed explanations should be given here.

Line 217: "[...] will be more or less lost during the sampling process." Sampling loss of on-line VOCs is an important parameter which should be quantized here by performing

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experiments or referring to a similar research.

Line 241-243: The authors should provide an explanation or references on the method that they used to calculate detection limit.

Line 247-249: As the stability of light source and spectrometer will influence the fitting residual and instrumental performance, sensitivity experiments of temperature (or other relative parameters) for light source and spectrometer should be conducted.

Line 293: "CIMS methods, The" → "CIMS methods, the"

Line 304-306: The sentences should be rephased.

Line 308: "the paper proposes [...]" → "this study proposes [...]"

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