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Atmospheric Measurement Techniques Discussions

Interactive comment on "Development of an automated high temperature valveless injection system for on-line gas chromatography" *by* N. M. Kreisberg et al.

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This is a follow-up review (referee 2) to an initial review. It takes into account notes and changes made in response to referee #1. The authors show convincing arguments and data for their instrumental development, backed up by real sampling deployments at two different locations in two differing instrument versions, both showing superior performance over valved systems.

The authors have tightened up their manuscript nicely since the initial submission. It reads and flows much better now, with the introduction and methods being populated

by the correct text blocks. The one exception is still the abstract which may have experienced too much cutting to be concise, it leaves some ambiguities in understanding to the reader.

Below are detailed comments and suggestions (intended constructive) - great paper and research, I hope some of these suggestions help.

Detailed comments:

ABSTRACT

p. 7532 line 6: before "interface" maybe clarify if you describe a "sampling interface" or a "detector interface".

line 8: "parameters" is a bit of a rubbery term - not wrong, but maybe you can find a synonym, like variable? Not mandatory.

line 8: clarify "ambient-pressure detector", since you are not talking about temperature.

line 11: "three times greater reproducibility" - greater than what?

line 13: "trending" - do you mean drift? Are you referring to p.7544 line 10-11? Or p.7546 line 4?

INTRODUCTION

p. 7533 lines 1-2: "low bundance". It's a relative term but really you refere to instrumental detection limits. Maybe you could state it more explicitly, like "...at abundances below the typical GC detection threshold range of xx-xxxppbv, ..." or something like that.

line 7: I disagree that it MUST be isolated. splitless injection with cryogenic focussing at continuous carrier gas flow in the analytical column's head works too, which is a separation but not from the analysis components.

line 8: "2-position, 6-port valves". (suggestion)

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line 16: graphite is a carbon polymer but not a composite?

line 18: "inevitably leads to leaking" - I understand what you are trying to say, but it's not always the case. What you might want to say is that it "inevitably bears the risk of leaking".

line 23: "avoid" - maybe say "significantly reduce"? Some problems do occur with valveless systems as well. I agree your system is far superior, but maybe that statement is a bit strong.

GAS FLOW MODEL

p7537 line 10, 22: "assumed ideal gas behavior", "non-continuum, entrance and wall effects" - no surface interactions, no molecular mass dependency? Gas mixtures traveling through an orifice (or experiencing expansion) fractionate by molecular weight at varying escape velocities. This could be tested for using the exisiting data in Figure 6 (internal standards mentioned on p.7544 line 4, and line 25 are not typical SOA precursors, but at least vary in molecular weight enough to test for this. p.7545 lines 24-28 at least contain some reactive polar compounds). Secondly, if no wall interactions could be assumed then no coatings would be neccessary in heated parts of the injection system. In practise, this has to be validated with each instrument using multi-component standards and recovery tests, which you did, routinely. Non-continuum behavior is discussed on p.7549 line 4.

line 11-13: Sentence "These equations...is adequate)." - I would remove the entire sentence, it doesn't add any significant information, it's educational but I think that's not the purpose of this paper.

line 13: Maybe write "The expressions we derive..." instead of "are"

line 14: "...applications." Maybe refer to appendix here, otherwise this sentence is floating out of context.

line 24-25: I disagree with that sentence but it's up to you if you leave those statements

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in here. I would reformulate them by stating that such effects are controlled for using adequate multi-component standard runs.

line 26-27: "now employed in the TAG family of instruments" - what are you trying to convey? You mean in your lab, or with the company selling them? State it here, so the reader doesn't have to guess what you mean. In fact, you mention the same thing again on p.7541 line 14-17, so best to remove that statement here, since it's a paper not a brochure.

line 28f: I am confused about this sentence, please clarify.

p.7538 line 4: That's for capillary columns only.

line 10: maybe insert a comma after "P_SPLIT"

line 11: "atmospheric pressure based"

line 11: Your assumption of 0kPa, did you calculate that for values not equal to zero, but in the range of typical MS vacuums? I.e., a maximum pressure. I agree that your conclusion in the next sentence is still valid (lines 12-13), even if one is not assuming perfect vacuum. (same in p7539 line 16).

line 23: "recondenses": cryogenic under continuous flow? Not sure I recall seeing that detail on how you do that.

p.7540 line 10, 19, 27-28: No coating is perfect - what method did you use to validate survival of polar SOA precursors?

p.7541 line 6-7: were this SS block and further mentioned fittings coated as well, internally?

p.7542 line 8: "reduces" should be "reduce" (because "flows" is plural) EXCELLENT paragraph.

line 20: "if the vent were closed" is not subjunctive mood I believe, and the vent can

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indeed be closed, so it should be "was"

line 21: "encountered" - circular argument. You are introducing VLI-TAG here in this paper, but are now invoking typical VLI-TAG applications. Maybe reword this.

p.7543 line 14: air injection: 1 um at ambient P? Specify ambient P maybe

p.7544 line 6: "judged", maybe better "evaluated"?

p.7545 line 14: "directly)"?

line 16: "metal fiber filter cell" - the previously invoked polar SOA precursors (Intro) might not experience degradation here?

p.7546 line 4: still not sure what you mean by "trending" here.

line 13: "MS" did you define it previously (Mass Spectrometer)?

RESULTS

p.7547 line 16: "...test data set in which the model was 'tuned'" - either 'to' or 'with', but probably not 'in'

line 17,19,22: "ID" is lab prose unless defined

p.7548 line 9-10: this is a copyediting issue, not the authors: "diameter" should be line broken as "dia-meter", not "di-ameter" (it will look different in the final version anyways)

line 9-10: here you spell out ID again... maybe mention it spelled out at first occurrence and be consistent after (either acronym or spelled out, throughout)

line 22-23 "resulting" - remove this word (I guess it's leftover from editing)

p.7549 line 16-17: Maybe state calibration of what here (flow, volume, pressure...), to be clear.

p.7551 line 21: remove "in volatility"?

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p.7552 line 20: are these ’contaminants’ column bleed?

CONCLUSIONS

p.7553 line 8: "data set", or "method"?

line 18: "that greatly facilitates", maybe "which greatly facilitates"?

FIGURES

Figure 7: put "Tr" in brackets in the caption, at first mention

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Interactive comment on Atmos. Meas. Tech. Discuss., 7, 7531, 2014.