

Interactive comment on “Development and characterization of a High-Temperature Proton-Transfer-Reaction Mass Spectrometer (HT-PTR-MS)” by T. Mikoviny et al.

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The authors would like to thank the referee for her/his helpful remarks.

Page 190, line 6: As far as I read, the authors first produced dry zero air and then humidified by a water bubbler. This sentence should start with "dry zero air" rather than "humidified zero air". Page 190, line 9: What is humidity range? Is this variable or fixed? Please clarify.

We have modified this paragraph to read as follows:

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“Zero air (2000-3000 ml/min) was produced by passing dried compressed air from the in-house supply over a Pt/Pd catalyst (Pt/PtO₂/Pd/PdO, EnviCat[®] VOC5528, Süd-Chemie, Munich, Germany) operated at 380° C. The air was subsequently humidified using a water bubbler at 20° C. The humidity was kept at constant levels (~95% RH) throughout the experiments.”

Page 190, line 22: The authors should state what compounds correspond to 20 ms to 1 s, respectively.

Signal integration times have been included (see also comment from referee 1). “Ion signal dwell times were compound specific and chosen as follows: dimethyl sulfoxide (m/z 79: 0.1 s), ammonia (m/z 18: 20 ms), monoethanolamine (m/z 62: 0.5 s), levoglucosan (m/z 85: 0.5 s), oxalic acid (m/z 91: 0.5 s), cis-pinonic acid (m/z 167: 1 s).”

Page 191, line 9: How the authors improve the detection efficiency at high-m/z region? Please add more details.

We have added a short description of the optimization procedure.

“In addition, the quadrupole mass spectrometer was optimized for the detection of high m/z-signals by increasing the reference potential of the mass spectrometer lenses (V1 in the Pfeiffer IS 420 supply) from ~ 50 V to ~ 70 V. This resulted in a ~ 25% higher detection efficiency for ion signals with m/z > 100, but also in a ~ 10% drop of the primary ion signal.

Page 192, line 20: “oxygenated VOCs” should be more specifically compound names. In our experience, acetone has humidity dependence in sensitivity, likely due to differences in reaction rates with H₃O⁺ and H₃O⁺(H₂O). Don't you see any dependence in your experiments?

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In our experience, the sensitivity for acetone is NOT humidity dependent. The instrumental response for acetone in dry and humid air is within $\pm 5\%$. This holds for both high E/N and low E/N operation, and for standard PTR-MS instruments as well as the HT-PTR-MS. Our acetone measurements have been validated in several field and laboratory intercomparison exercises over the past decade. If a humidity dependence is observed, this may be a result of the normalization procedure (primary ion variation with humidity) or the formation of protonated acetone water clusters (which needs to be suppressed).

We think it is not useful to report individual compounds since the concept generally applies to oxygenated VOCs. However, to be more specific, we now give examples of functional groups. "... oxygenated species (e.g. analytes containing hydroxyl, carbonyl or carboxyl groups)"

Page 193, line 10: The authors noted the signal at $m/z=106$. What could this "even number" be?

Unfortunately, at this stage we cannot even give an educated guess.

Page 193, line 19: The authors stated that standard PTR-MS instruments have a response time of approx. 0.15 s for pure hydrocarbons. Is this the case with 1/16-inch heated silico-steel tube that is used for recent Ionicon instruments or without a heated inlet? For what hydrocarbons? Please clarify.

The requested information has been included in the manuscript.

"Wisthaler et al. (2006) reported a response time of ~ 0.15 s for pure hydrocarbons (benzene, toluene) using the commercial standard PTR-MS instrument equipped with a low-volume (1.59 mm OD) Silcosteel[®] (Restek, Bellefonte, MA, USA) inlet line kept at 40° C. A minor tailing effect was observed for small oxy-hydrocarbons such as methanol or acetone (unpublished data)."

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Page 193, line 27: The authors stated here "published and unpublished". Please add appropriate references for published data.

The reference has been added.

"Most of the tested compounds are of atmospheric relevance and have been previously studied using the standard instrument (Norman et al, 2007; and unpublished data from our laboratory)."

Figure 2: What x- and y-error bars represent for? Sensitivities should be associated with +/- 95% confidence limit.

We have added the requested information in the figure caption.

"The error bars in the x-axis represent the combined uncertainty from the accuracy of the gas standard and the error associated with the dilution of the standard. The error bars in the y-axis represent the standard deviation of the observed count rates."

The $\pm 95\%$ confidence limit has been added.

Figure 4: It is difficult to distinguish between vertical dotted lines. They can be shown in different colors, i.e., in black, red, and green.

The figure has been modified as suggested.

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