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Atmospheric Measurement Techniques Discussions
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Interactive comment on "Bias caused by water adsorption in hourly PM measurements" *by* Gyula Kiss et al.

Anonymous Referee #1

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Kiss et al. perform an experiment where they take an instrument based on the beta attenuation principle and evaluate potential biases due to water absorption on the filter. Evaluations are based on a site in Hungary and experiments performed over ∼19 days.

This manuscript will need substantial revisions before it can be fully reviewed for publication. Very little detail is provided about the measurement techniques themselves. The reference against which the biases are calculated in Figure 4 are apparently the reported hourly PM10 mass concentration values from the monitoring station. It is unclear by which method these are determined, nor is it clear how accurate these values are to serve as reference. The beta attenuation principle is not really described in the manuscript. It is unclear what corrections, if any have been applied to the raw data.

One of the most puzzling aspects is the principle of the inlet heater. It is unclear by

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what mechanisms inlet heating would remove the bias of absorbed water on the filter or particles. The heating would temporary lower the RH in the inlet, but not the water vapor mixing ratio. However, the temperature in the instrument is unchanged, and this the RH over the filter should not respond to inlet heating.

After browsing through the manual of the used instrument (Thermo Scientific FH62C14), the manual states that an internal heater maintains an RH threshold above the filter tape. This heater is presumably different from the inlet heater. If that is true, then RH effects on particle mass are even more difficult to explain with the information provided. Furthermore, since the commercial instrument used already uses RH correction, the question investigated is a second order effect: to which extent does the RH correction in a specific commercially available instrument fail.

A revised version of the manuscript needs to include (1) significantly more information about the instrumental techniques and how they are applied in this study, (2) a coherent hypothesis on why the instrument internal corrections are insufficient, and (3) some general recommendation on how the bias can avoided in monitoring networks.

Some specific comments Ln 37: However, as PM10 mass concentrations are decreasing, the potential relative bias caused by water interactions is likely becoming more significant.

Why is this the case?

Ln 55: By today these monitors have been standardized

By whom and how?

Ln 57: Obviously, the particulate mass collected in one hour is small thus the bias caused by water may be excessive.

To which technique does this refer to? BAM, TEOM?

Ln 163: It is worth noting that in the case of heated sampling inlet the measured

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apparent PM mass concentrations were generally smaller (in both positive and negative directions) than when non-heated inlet was applied (Fig. 2a.). This clearly indicates that heated inlet can considerably lower the bias caused by fluctuating RH although the temperature should be kept as low as possible in order to avoid losses of semivolatile compounds.

I don't see this in the figure. The two series look about the same. Can this be quantified objectively? What is the mechanism by which the inlet heater should reduce water absorption?

Figures 1-4: The Figures need to be reworked. Blending the data with the time labels is distracting. The font size of the axis elements is too small for print.

Figure 4: If a relative error is given, the type and quality of the data for the reference method must be clearly indicated.

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