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Interactive comment on "Characterising low-cost sensors in highly portable platforms to quantify personal exposure in diverse environments" *by* Lia Chatzidiakou et al.

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Response to anonymous referee #1

Overall response: Thank you for taking the time to provide valuable feedback. The aim of this paper was to validate the performance of a specific novel personal air pollution monitor (PAM) when capturing personal exposure. While outdoor co-locations next to certified instruments have been widely adopted by researchers and governmental organisations to validate the performance of sensors in the field, this paper goes beyond those current guidelines by validating the PAM in indoor and commuting microenvironments, and thus demonstrating that novel sensing technologies can provide reliable

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Discussion paper

personal exposure measurements. The importance of this work is two-fold: 1) Addressing concerns which remain in the scientific community regarding the suitability of novel sensing technologies for policy purposes and health studies. Such opinions act as a barrier in adopting innovative methods that could have significant societal benefits. In that sense, 2) This paper is the first of a series of publications that, together with detailed medical outcome determinations, aim to identify underlying mechanisms of specific air pollutants on health, and is necessary to validate in the open literature the performance of the PAM. Forthcoming publications will also focus on the modification effects of the indoor environment on personal exposure.

Detailed comments:

(1). OPC corrections: The detailed RH correction algorithm can be found in: Di Antiono, A., et al., 2018. Sensors, https://doi.org/10.3390/s18092790. A constant density was assumed for both, the reference instrument (Fidas Palas 200S, see Table 2, pg 7) and the portable instrument. It is true that in general, scaling to the reference compensates for density effects.

(2). Sensitivity drifts of sensors: The PAMs were co-located at the beginning and at the end of fieldwork with the reference instruments at the Department of Chemistry, UCAM. The change in sensitivities of the gaseous sensors was less than 10% and was therefore not included in the manuscript. The topic has been covered in a previous publication of the group that found similar drifts over an 11-month period (Mead, M.I., 2013, Atmospheric Environment, https://doi.org/10.1016/J.ATMOSENV.2012.11.060).

(3). Figure 2: This figure is an illustrative example of the methodology used to validate the performance of linear models used to convert raw units to physical measurements. The Figure presents calibrated data.

(4) (a) Chinese deployment during the non-heating season: Results are presented in italics due to the exposure of the sensors to very high temperatures. However, such temperatures were not encountered during the deployment to participants. (b) RMSE

and adjusted Rˆ2 for the combined training and testing period. (c) We used a combined training set from the winter and the summer co-locations. The training set was about 1/3 of the total observations. The sensitivities from the outdoor co-locations were then used to calibrate the indoor measurements: This proves that provided there is a diverse enough training set (both in terms of temperature and pollution levels) the linear model performs adequately in different conditions. In that way, the selected training period of each season becomes less important as the variation between seasons is much greater providing the necessary wide range of calibration conditions.

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