Some comments on “Full characterization and calibration of a transfer standard monitor for atmospheric radon and thoron measurements” by Curcoll et al., currently being considered for publication in Atmospheric Measurement Techniques.

Abstract

- For better transparency (considering readers who may not be familiar with ISO 11929-4), it would be good in the abstract to provide the reader with context for the claimed ARMON v2 detection limit of 0.132 Bq m^{-3} that would be directly comparable to other radon measurement systems. For example, some studies have shown the hourly measurement uncertainty of commercial AlphaGuard units at their nominal detection limit (of around 3 Bq m^{-3}) is 50 – 60% (in other cases the quoted uncertainty has been higher), and the radon concentration at which the 200 L ANSTO dual-flow-loop monitor has an hourly measurement error of 30% is around 0.14 – 0.16 Bq m^{-3} (Chambers et al. 2022; doi:10.5194/adgeo-57-63-2022). Based on the results of Figure 5a of this manuscript, the hourly ARMON v2 measurement uncertainty for ^{222}Rn in a dry, ^{220}Rn-free environment (i.e., best case scenario) at an ambient ^{222}Rn activity concentration of around 0.6 Bq m^{-3} is ≥ 30%. Guided by the shape of the curve in Figure 5a, the hourly measurement uncertainty at the claimed detection limit of 0.132 Bq m^{-3} would likely exceed 100%. Stating the hourly measurement uncertainty along with the claimed detection limit in the abstract would be a better guide for the reader.

- Furthermore, since the ARMON v2 is introduced here as being able to separately quantify radon (^{222}Rn) and thoron (^{220}Rn), it would be good to state in the abstract the expected detection limit and hourly measurement uncertainty both with, and without, the presence of ^{220}Rn in the sampled airstream (assuming a representative ^{220}Rn activity for the surface layer – such as the value quoted on Line 430).

- Lastly, the suitable measurement range of the ARMON v2 is quoted to be 1 – 100 Bq m^{-3}, but the measurement uncertainty is given only for a concentration of >5 Bq m^{-3}. Would it not make sense to quote the measurement uncertainty at 1 Bq m^{-3}? Or at least report this value also?

Line 100: For completeness, the authors should also consider including the following paper in this summary: Wada, A., Murayama, S., Kondo, H.,Matsueda, H., Sawa, Y., and Tsuboi, K. (2010). Development of a compact and sensitive electrostatic Radon-222 measuring system for use in atmospheric observation. J. Meteorol. Soc. Jpn. 88, 123–134. doi: 10.2151/jmsj.2010-202.

Section 2.4: Regarding the uncertainty and application of the STP correction for ARMON v2 measurements: according to Figure 1, the temperature measurements of the ARMON v2 are not made in the measurement sphere, but a long way downstream of the sphere and some other instruments. The location of the pressure measurements is not indicated in the figure, it would be good to see where they are made. Given the separation between the sensors and measurement volume, and the fact that the temperature sensor is in a separate, ventilated compartment of the ARMON’s transport case, can the authors give any indication of the expected additional uncertainty in the derived STP correction parameter? At the moment, it seems that only the instrument manufacturer uncertainty values for temperature and pressure are being considered.

General: Consider revising the text for grammatical accuracy.

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