Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2019-378-RC1, 2019
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Atmospheric Measurement Techniques Discussions

Interactive comment on "Inter-comparison study of atmospheric ^{222}Rn and ^{222}Rn progeny monitors" *by* C. Grossi et al.

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Received and published: 2 December 2019

General comments

This study further highlights the problems faced when making measurements of 222Rn activity concentrations with different techniques and highlights some of the major issues which affect the comparability of the different measurement techniques (e.g. sampling height, aerosol loading, and atmospheric humidity). The study builds upon previous Inter-comparison studies between 222Rn and 222Rn progeny monitors (e.g. Schmithüsen et. al., 2017) through the introduction of a second "direct" measurement technique, the ARMON monitor. The agreement between the ANSTO and the ARMON monitors is very good at different sampling heights and in changing meteorological

conditions. This is good news for the atmospheric radon monitoring community due to the portability of the ARMON monitor when compared with the ANSTO monitor. However, the ANSTO monitor still outperforms the ARMON monitor and has a lower limit of detection and less noise as demonstrated in this manuscript. Therefore this must be taken in to account in very clean conditions. The manuscript highlights that there is a need for "a more statistically robust evaluation" of the discussed influences on the 222Rn activity concentration measurements and highlights that a longer dataset is needed. I feel that this brings the story up to date as efforts are increased across Europe to improve and expand the radon monitoring activities and this manuscript will act as an important steer to any decision making. I recommend that this manuscript is published with some minor revisions.

Specific comments

1. I feel that a solid aspect of this paper is that the ARMON monitor performs extremely well and has excellent potential for deployment in radon networks. The other instruments have all been components of previous inter-comparison studies. Therefore, I suggest that the manuscript should be ARMON centric rather than being an inter-comparison study. I think that there is huge value in the work presented herein and the ARMON should be showcased. Perhaps change the title of the manuscript to reflect this?

2. In the abstract, the author mentions that this paper evaluates "correction factors between monitors". I think that the author needs to highlight that the slopes from the scatter plots are the correction factors.

3. I would like to see a section which compares the outcomes of this study with those from previous instrument comparisons (e.g. Schmithüsen et. al., 2017) to put the findings into context. How well do they agree? How site-specific are these corrections and what can be done to overcome this? What needs to be considered in future inter-comparison studies?

4. I think it would help to rearrange the methods section to clearly state that “direct” and “non-direct” methods are being compared. As highlighted above I feel that this is the really strong part of the manuscript as this brings in a second “direct” measurement.

5. Section 2.1.2. Can you add a little bit of information to describe how the measured progeny from the HRM one-filter monitor is related to 222Rn activity concentration? This is discussed in Schmithüsen et al (2017) but it would be good to see it repeated here.

6. Section 2.1.3. It is stated that the ARMON is portable. Can you elaborate and possibly give the dimensions?

7. I suggest an additional figure with a synthesis of the slopes between the different monitors that are summarised in Table 2. This could be in the form of ANSTO vs. all of the other monitors for each site. However, keep table 2 as it contains all of the detail, it’s just not easy to picture and visualise. I have added a figure to demonstrate what I mean.

Technical comments Figures: Sometimes hard to distinguish between the blue traces (ANSTO) and the black traces (ARMON) on the figures. However, this may be due to my eyes? Line 42: replace “because of the” with “from the”. Lines 200 – 201: “method C”. It’s unclear what this means. Line 251 and 252: I don’t understand this sentence. Line 251 - 257: Switched tense after the first sentence. Line 255: Replace “Fine” with “fine” Line 261: Replace “in order to” with “To” Line 353 – 358: This long sentence is hard to follow. Please revise. Line 383: Remove “compared” Use “α” or “alpha” Use “progeny” or “daughters”.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-378, 2019.

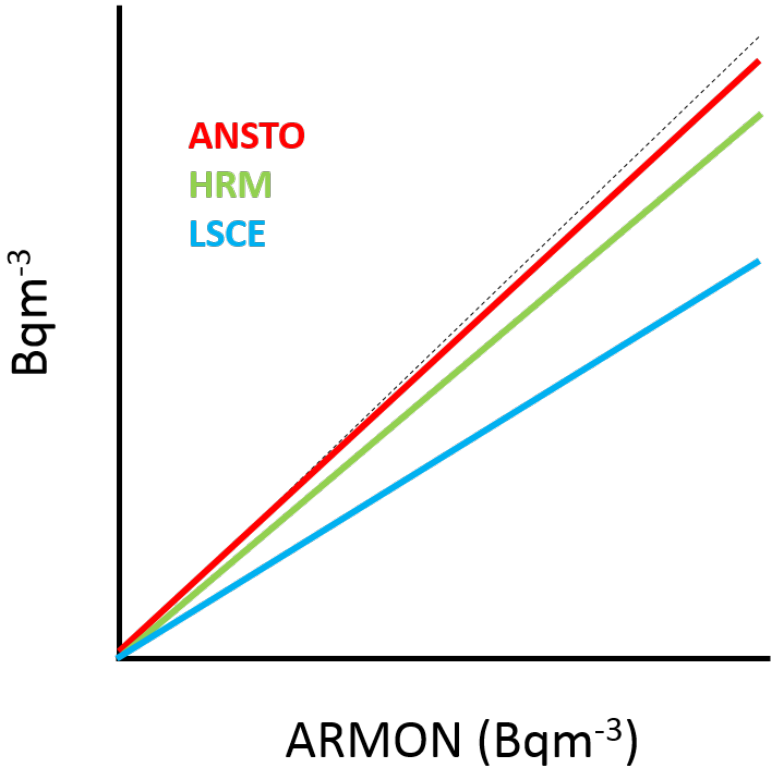

Fig. 1.