**Atmospheric
Measurement
Techniques
Discussions**

Interactive comment on "Comparison of one- and two-filter detectors for atmospheric ^{222}Rn measurements" *by* Y. Xia et al.

Anonymous Referee #1

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Review report for

Comparison of one- and two-filter detectors for atmospheric 222Rn measurements

by

Y. Xia, H. Sartorius, C. Schlosser, U. Stöhlker, F. Conen, and W. Zahorowski

Atmos. Meas. Tech. Discuss., 3, 675–695, 2010

General comments (following the AMTD evaluation criteria):

- Does the paper address relevant scientific questions within the scope of AMT?

Yes, as 222Rn is used as an atmospheric tracer and its measurement is not easy.

- Does the paper present novel concepts, ideas, tools, or data?

Yes, the comparison between data produced by different instruments at the same location and their combination with meteorological data and a numerical evaluation of their influence is new.

- Are substantial conclusions reached?

Yes, the influence of forest canopy on Rn progeny is demonstrated quite clearly and the influence of rain appears probable and justified. The calculated trajectories also support the results. However, as with the abstract (see my comment below), the conlusions could be made clearer in the text (especially in the "conclusions" chapter).

- Are the scientific methods and assumptions valid and clearly outlined?

Yes, except for a weakness in the description of the detector in the one-filter instrument (see my comment below in section "references").

- Are the results sufficient to support the interpretations and conclusions?

Yes. However, I would recommend to add a remark clarifying that the obtained results are site-specific. The "disequilibrium factor" between one- and two-filter instruments is only valid for the two instruments used in this study. The reference quoted by the authors (Schmidt 1999) gives different values for other stations.

- Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)?

Yes, apart from some lack of information on the radiometric device used in the 1-filter-detector and the related data analysis the experiments are described concisely.

- Do the authors give proper credit to related work and clearly indicate their own new/original contribution?

Yes, the list of references is comprehensive and the experimental and theoretical work

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of the authors can be clearly discerned.

- Does the title clearly reflect the contents of the paper?

Not completely, apart from the comparison of detectors it should also mention the incorporation of meteorological conditions into the study.

- Does the abstract provide a concise and complete summary?

Not really – it names the experimental facts and the results, but the main conclusions do not become clear: data from the two instruments are closely correlated and can be assumed identical after mathematical correction; differences between (corrected) data from the two instruments are well correlated to meteorological conditions (wind direction and rainfall); these differences can be explained by scavenging of radon progeny by forest canopy and rain and the response of the instruments to different quantities (radon gas for the two-filter-, radon progeny for the one-filter-instrument).

- Is the overall presentation well structured and clear?

Yes. However, I would propose to insert paragraph breaks within the sections of the paper where appropiate, in order to improve the readability. Furthermore, I propose to change the numbering of chapter 3 to a scheme identical to the other chapters, i.e. starting the text with section 3.1, not 3.

- Is the language fluent and precise?

Yes.

- Are mathematical formulae, symbols, abbreviations, and units correctly defined and used?

Generally, yes. No explicit equations appear, and most values for data, correction factors etc. are given within the text (see next paragraph below).

- Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced,

combined, or eliminated?

I would propose to move some of the numeric material from the text into additional tables, e.g. one for technical data of the detectors.

- Are the number and quality of references appropriate?

Yes, except the reference for the detector used in the one-filter-instrument (Stockburger & Sittkus 1966). The paper is old, difficult to get and written in German. A more recent reference would be desirable in order to be able to understand the rather complicated construction of the detector (3-layer "sandwich") and the subsequent data treatment (it seems that a weighting and summing procedure takes place to extract count rates for alpha emitters of different energies). This might also reveal an explanation for the "unphysical" offset shown in Fig. 4, possibly due to methodological problems in background correction.

- Is the amount and quality of supplementary material appropriate?

n.a.

In summary, I consider the manuscript suited for publication in AMT after minor revision.

Specific comments

p. 667, line 3: A line break should be introduced here, as the text moves from the description of the item to be measured to measurement techniques.

p. 667, line 10: "It is ..." should be replaced by "The station is ..." to avoid ambiguity.

p. 679, line 2: "adjacent sectors" is misleading as the main wind sectors used in the study are not adjacent to this control sector.

Section 2.2.1:

In contrast to the one-filter instrument described in section 2.2.2, filter type and characteristics are not mentioned for the two-filter device. This description should be added.

Values for technical characteristics and oprerating conditions should be harmonized between the two instruments, e.g. air flow expressed in m3 s-1.

The value for the instrumental background is given as "1 count per second". This appears to be either a rounded or approximate value and should then be named as such ("roughly ..."), or an exact value which should then be written with significant digits plus error.

p. 679, lines 7 and 8: replace "(alpha)'s" by "alpha particles".

p. 680, lines 20/21: the sentence "The background ..." is a repetition of information given in line 16.

p. 684, line 19: shift words "by 9% and 21%" behind "in the analyzed air".

Technical issues

p. 684 line 6: the reference in parentheses should read 3.1 instead of 3.3.1 (or 3.2, if sections are renumbered as proposed earlier). I would also replace "point" by "section".

Fig. 1: The asterisk which denotes the measurement station should be made bigger, as it is hardly visible. The location of the meteorological station could also be marked.

Fig. 3: I would recommend to add symbols to the graph in order to make it legible in black-and-white printouts.

Fig. 4: This figure represents the calibration curve derived experimentally by the authors from their own measurements, and this does not become clear. I would recommend to add something like "2-filter-device" to the x-axis and "1-filter-device" to the y axis legends. Moreover I would make clear in the figure legend that the data stem from own measurements, e.g. by writing " ... as determined by our two independently ...".

Fig. 6: I would recommend to use identical x and y axis scaling in all six graphs. In this way, it would be much easier to visually compare the effects of different situations, as represented by the different graphs.

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