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Atmospheric Measurement Techniques Discussions

Interactive comment on "Increasing the accuracy and temporal resolution of two-filter radon–222 measurements by correcting for the instrument response" *by* A. D. Griffiths et al.

Anonymous Referee #1

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The authors explain and develop a mathematical methodology for improvement the accuracy of the accuracy and temporal resolution of two-filter Rn-222 monitor developed previously by the same group.

The improvement in the accuracy is based on the solution of a set of differential equations, in which the parameters are difficult to know with accuracy, i.e, the deposition parameter (λp), the efficiency on the screen (εd) and the alpha detection efficiency (εd). Furthermore, this parameters can vary with humidity, pressure and flow rate. Therefore, it seems that the way to work on improve the accuracy of the system would be to carry out a set of experiments with a constant radon concentration and modify the different parameter that can change the "final calibration factor" in order to ana-

lyze its sensitivity. The authors should justify the use of the mathematical in contrast of an experimental calibration procedure, which considering the uncertainties in the parameters seems a more proper approach.

Regarding the equations presented in the model, there are some specific questions: âĂć Why the possible changes in the density in equation (1) were not considered? âĂć In equation (2) the variation in temperature was considered, but density also varies with pressure, why pressure was not taken into consideration? âĂć In equations (3), (4) and (5), why the authors not considers the remove processes of collection in the screen and the progenies that are removed from the volume due to the out flow rate? âĂć The authors should justify why they use the same efficiency for Po-218 and Po-214 alpha particles and the possible consequences.

The authors indicates that the ratio of Po-214 to P-218 counts tend to be higher on days when humidity inside the detector is low. They indicates that possible reason is the recoil factor, but they should consider that diffusion of unattached particles change with humidity and charge and, therefore, deposition and collection on the screen can be different for both radionuclides.

Regarding the increase of the temporal resolution, the presented method improves it as can be seen in Figure 6. It is clear that the gross alpha counts shift about 1-hour the concentrations (which can be easily corrected with no need of the presented mathematical procedure) and smooth the concentrations. The presented method seems to improve the temporal resolution of the air radon concentration measurements. The reviewer would like to ask the authors that the monitor can be improved by substituting the gross alpha system with a PIPS detector that can discriminate the energy of alpha particles. This would solve the temporal resolution, the thoron problem and also the different detection efficiencies of alpha energies. This system is commonly used in the radon monitors based on electrostatic collection. Therefore, considering that this would solve temporal problem the authors should indicate why they do not implement it in the measuring system and have tried to solve the situation with the mathematical model

which have still a lot of gaps?

As a summary the reviewer does not seen clearly the effectiveness to use the mathematical model instead to carry out study an experimental sensitivity analysis and improve the design of the monitor. Furthermore, there are some specific questions in the equations and parameters that should be explained.

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