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Atmospheric Chemistry and Physics Discussions

Interactive comment on "High-time resolved radon-progeny measurements in the Arctic region (Svalbard Islands, Norway): results and potentialities" *by* Roberto Salzano et al.

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RC#1: "The authors should try to convert these to activity concentration units, otherwise comparing the data to other radon progeny observations is impossible. I understand the difficulties associated with this, detector efficiency for different nuclides, variations in the radon progeny disequilibrium etc. Still, the authors should do this, even with bold assumptions. One way would be comparing the operated instrument to other type but calibrated instruments. This would allow the comparison of activity concentration results to other observations in the Arctic area."

The calibration of gross-beta counting systems is a critical issue that we are trying to

fix. The logistics is a limiting feature for the definition of a routinely verification of the instrumental calibration. We mentioned in the article about a reference material that supports a preliminary estimation of the detector efficiency, and consequently also the conversion from counts to disintegrations. We preferred to define a more robust and routinely way to estimate efficiency before converting quantities. The paper highlighted at the moment the importance of variations and high-time resolution but further work is required for approaching the disequilibrium issue. This is another problem that avoid comparison between progeny measurements at different sites and conversion to radon and thoron measurements. The best assumption that we can use is the equilibrium between radon progeny (214Pb = 214Bi) and thoron progeny (212Pb = 212Bi).

RC#2: "Hasn't there been a Heidelberg radon monitor at Mt. Zeppelin monitoring station at Ny-Ålesund?"

We found some projects declaring the activity you are mentioning but no data and publications are available. Could you indicate some contacts?

RC#3: "I believe the terms NORM and TENORM are usually used with materials associated with human activities, not radionuclides in the atmosphere. An example is oil drilling sludge containing lead-210 or radium-226."

The definition of NORM in the IAEA glossary (https://www.iaea.org/ns/tutorials/regcontrol/intr is "Material containing no significant amounts of radionuclides other than naturally occurring radionuclides. This includes materials in which the activity concentrations of the naturally occurring radionuclides have been changed by man-made processes. These are sometimes referred to as technically enhanced NORM or TENORM and, as a result, the term NORM is sometimes used in contrast with TENORM, i.e. to refer only to materials in which the activity concentrations have not been technologically enhanced". Mining and drilling produce NORM residues and aerosol can be considered a NORM even if human activities are not involved. We can fix this misleading acronym removing NORMs form the text and refer just to naturally occurring radionuclide.

RC#4: “The terms Sβ, Lβ, and Cβ could be replaced with appropriate IUPAC names after the calibration procedure mentioned above.”

The used terms were defined considering half life of possible radionuclides. We could indicate 214Pb* and 212Pb* instead of Sβ and Lβ where * refers to the equivalent activity assuming an equilibrium between the progeny (214Pb = 214Bi and 212Pb = 212Bi)). This cannot be done for Cβ where 210Bi is probably dominant but we need further analyses for supporting such an assumption. It is probably better to be conservative and homogeneous using a definition based on half-life. The IUPAC definition could be invoked when we will have more robust analytical results. We are focused at the moment to the potentialities of high-time resolution.

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