

We want to thank Alan Griffiths for the review of our manuscript and his helpful suggestions for improving this paper. Our replies are marked in blue.

General comments

This manuscript accompanies a radon-222 dataset (derived from measuring radon's decay product) from eight German monitoring stations with measurements dating back to 2014. Compared with earlier publications, this release handles the effect of very humid conditions on the measurement by flagging out periods when humidity exceeds a particular threshold.

With this additional quality control measure, the data are ready for immediate use in subsequent analyses. In my opinion, because radon-222 is an important natural tracer, and because of the other measurements available from these ICOS stations, this data set is very likely to be used in a range of studies.

The method for determining the humidity threshold is appropriate, the reasoning behind it is transparent, and the one-filter measurement technique is well described in previous publications, which are appropriately cited.

Regarding the linked data set, the data is of high quality, well formatted and well described. Apart from the queries below, which should be simple to address, I consider that the data set will be reused productively in the future and recommend the manuscript for publication.

Specific comments

I have three minor suggestions; two related to the humidity threshold and one observation about the data itself.

First, I am uncertain about whether there is a single humidity threshold, applied to all stations, or if the humidity threshold is different for each station (“We have therefore developed relative humidity (RH) flagging thresholds for the individual stations...”, line 59). Elsewhere, including the dataset landing page, it is implied that data is flagged as passing manual QC only when $RH < 98\%$, which is to say a single threshold of 98% is used across all sites. If this is the case, an unambiguous statement around line 225 (conclusions) and in the abstract is recommended; if the threshold is station-dependent then the threshold (as used during QC of the published data) should be included in Table 1.

It is accurate that certain statements in the paper may lead to the conclusions that different threshold to 98% should be applied to some of the stations or measurement conditions. That was not our intention. During the early stages of the investigation there were some indications that the mountain stations may require a lower RH threshold (95% was discussed), however, as more data became available this assumption was abandoned. The text has now been revised to reflect the final stage of the study (lines 13, 61 and 228).

Second, it seems rather likely that a particular use might require a different humidity threshold. This would be extremely straightforward if the humidity values were included in the data files, or acceptably straightforward if links to the meteorological data were included in this paper (along with instructions about which humidity sensor to use to replicate the published threshold, as there are likely to be many at each site).

The meteorological data used and cited in this publication (line 147) has previously been published elsewhere (TOH, HPB, GAT, STE, LIN, KIT, JUE) or is available upon request from the data providers

(SSL data from UBA, DWD/pre-ICOS LIN, 2015-2017, and HPB, 2014-2015, from). For the ICOS stations, the RH data can be unambiguously associated with the radon data as there is only one RH series per measurement height. For the SSL station we indeed added the humidity sensor designation to the corresponding citation. We added the “citation” and contact persons for the pre-ICOS LIN and HPB RH data. For these reasons, we didn’t deem it to be necessary to include humidity data to the radon data set. Furthermore, we want to encourage the data users to use and cite the original meteorological data sets if they want to use them for e.g. applying different RH threshold than suggested in this publication.

Third, there is a period of data at the beginning of the Schauinsland (SSL) record, from February 2014, which is anomalously high compared with the rest of the record even though it is flagged “O” (Manual QC passed). Since this is at the start of the record, and there is a break in monitoring before ‘normal’ measurements resume, it seems worth double-checking the classification (or making a note in the paper about what may have caused this – if it is thought to be non-instrumental).

We are grateful for attention being drawn to the fact that the initial period of the SSL data displays anomalous behaviour. Indeed, during this measurement period, the HRM in SSL was not connected to the main intake line and was measuring the room air for the calibration purposes. This period is removed from the updated data release.

Previous version of the data can be assessed with the following link:
<https://meta.icos-cp.eu/collections/9wBiDzAqCiELPe2rARbloggZ>

Updated version of the data can be found here:
<https://meta.icos-cp.eu/collections/vlcPkY6KbrblpET1aYq5ps07>

Same DOI was assigned to the updated data set and will be published in the paper:
<https://doi.org/10.18160/Q2M8-B1HJ>

Technical comments

Line 13: “..about 98% RH...”, if the threshold of 98% was used uniformly across all sites then add a comment here.

A clarification was added to avoid misconception about several RH thresholds: “...about 98% RH and was applied uniformly at all measurement sites...”.

L 17: “...flat areas...” I read this as implying that the mountain sites are not useful (at least, not ‘analysis-ready’), even when humidity is low. I’m not sure that this is intended, based on the rest of the paper. In any case, the abstract should provide concrete guidance, to avoid the misuse of this data set, by linking these recommendations to how a new user could get started. For instance, a statement like, “Measurements flagged as passing quality control from the stations GAT, STE, LIN, JUE, and KIT meet these criteria whereas other measurements should be treated with more care”.

As was correctly pointed out, this was not the intention. The emphasis on the stations in the flat area is due to the significant difference in the high RH values in the flat terrain station in comparison to the mountain stations (e.g. 51% of flagged data in TOH during winter). The conclusion drawn is that the HRM, with its progeny measurement principle, may be more suitable for deployment in flat terrain stations where high RH situations are less prevalent. The section regarding the ‘flat areas’ was removed from the abstract to avoid confusion (line 17), and the clarification passage was added to the discussion (line 257).

L19: I think that typical style for isotopes, when the element name is written out in full, is the hyphenated form (Radon-222)

Thank you, changes are applied throughout the paper.

L20: "...as gaseous constituent..." -> "as a gas"

Suggested changes are applied.

L51: "function" -> "functions"

The "function" was correct but "were" was changed to "was".

Dataset

A typo in data headers ("depent" -> "dependent"): Disequilibrium: specifies the sampling height-dependent factor between calculated atmospheric ^{222}Rn activity concentration in air and measured ^{214}Po activity concentration in air

There is a column called "QualityId" – not defined in the data file headers (if this is of no use to the end-user, it could be described in the headers as "Heidelberg University internal use only")

Thank you for bringing our attention to this. The typo was corrected and additional explanation to the "QualityId" column was added to the updated data set.

There is a header describing the Data Format as Version 1.0. Is there a link to this format, for example is it standardised across the ICOS network? If so, is there any sample code in popular analysis languages (R, Python) which would read the data and apply the QC flags? If sample code like this does exist, it could be linked from the data files or from the ESSD paper. This is not necessary, as the data file is in a simple plain-text format, but some users may benefit from some demonstration code and therefore be more likely to access the data and use it correctly.

This is a valid point. However, the long-term plan for these HRM radon data is for them to become part of the official ICOS data. As soon as this happens, the files will be 'ingested' into the Carbon Portal data pool. They can then also be read using the `icoscp` Python library. Therefore, we do not want to create an additional tool that could potentially become obsolete in the near future.