Data Paper

Naohiko Hirasawa, Taku Nakamura, Miyoko Miwa, Kazuma Aoki, Tetsuro Ojio, Kyohei Yamada and Shigeki Tasaka. ^{7}Be concentrations in surface air over the Indian sector of the Southern Ocean and at two Japanese coastal Antarctic stations in the summers of 2014/15, 2016/17, and 2017/18. Polar Data Journal. 2022, 6, p.17–24. https://doi.org/10.20575/00000036.

(Received 1/8/2022; Accepted 4/1/2022)

1st submission

Editor Start Date: 1/12/2022

Editor Stop Date: 3/1/2022

Reviewer #1 (1/13/2022–3/1/2022)

Reviewer #2 (1/15/2022–2/3/2022)

Editor comments to the Author: Ryu Uemura

The comments from the two reviewers regarding errors and measurement methods are very important and should be carefully added or revised. I also add editorial comments as follows.

1. L28 "little to no data"
   Please clarify whether "little" or "no" data.
2. L37 "has with a half-life"
   has a half life
3. L46 "more real world data"
   more observational dat7a
4. L92 "provided in in the "
   provided in the
5. L120 "four types of symbols indicates"
   indicate

Reviewer #1: Anonymous

The authors provide a data set of cosmogenic ^{7}Be concentration in surface air samples collected during multiple JARE programs. Because ^{7}Be data are still very limited in Antarctica, I think that the data set is worthy to be published

in Polar Data Journal. However, some concerns should be addressed before publication.

1. Description on the methods and data processing

I understand with my personal respect that the authors attempted a difficult task regarding the long temporal distance between Antarctica and the laboratory compared to the half-life of the nuclide. On the other hand, I concern that many data are just above, equivalent to, or even below the "detection limit". In such case, quite detailed descriptions on the measurement procedures are required to assess the validity of the data. A brief description such as "The ^{7}Be concentration and the error were estimated using the measured gross and background radioactivity after correcting for attenuation, self-absorption, detection efficiency, gamma-ray branching ratio, and collected air volume." is not enough. The authors should provide the following information:

A) How many were the average (or typical) counts (or counting statics) of both the gross and background radioactivity?

B) Details of the corrections of the attenuation and self-absorption

C) How large is the detection efficiency?

D) How did the author determine the background? For example, procedure blanks were used to estimate the total background? The ^{7}Be concentration in samples appears to be background-subtracted. But how?

E) Details of the error of the ^{7}Be data. I see only at line 112 the words "one-sided confidence interval". Is the interval of 95%, 68%, or 99.7%? What kinds of errors were ultimately propagated to the total uncertainty?

F) Details of the radioactive-decay correction. Please clarify the precise decay constant (or half life) used. If possible, it seems helpful to specify the day of measurement.

2. Detection limit

A detailed description of the procedures to estimate the detection limit is required. Commonly, a "detection limit" represents an upper 3-sigma value of the blank measurements (after blank subtraction). Is it the same in this paper? Please clarify.

3. Volume normalization

Was cubic meter in this paper the value normalized with air temperature and pressure at the sampling site? If not, what were those measurements? The authors should specify this information.

Minor comments are as follows:

Line 37:

^{7}Be is produced not only in the lower stratosphere. One third to one forth of the production (ie. distribution, except for the heavy rain regions) is found in the upper troposphere.

Line 71:

How large is the collection efficiency of the glass filter? Was it washed and sealed before expedition?

Reviewer #2: Anonymous

The paper PDJ-D-22-00001 with the title: "^{7}Be concentrations in surface air over the Indian sector of the Southern Ocean and at two Japanese coastal Antarctic stations in the summers of 2014/15, 2016/17, and 2017/18" provides information about atmospheric ^{7}Be concentration in coastal Antarctic. It is important to report the regional data. However, there are some comments. Therefore, I would recommend publishing the paper after the minor modification.

Authors introduce about how to measure the sample. Please add a relative uncertainty of gamma counting. And if possible, please add elapsed time until measurement. Detection limit is depending on elapsed time. It is better to inform raw data as supplemental information.

Authors Response:

Dear editor and reviewers,

We thank the editor and two reviewers for comments to our manuscript. The comments are listed below in blue followed by our responses in black.

Sincerely,

Naohiko Hirasawa

Response to the editor;

The comments from the two reviewers regarding errors and measurement methods are very important and should be carefully added or revised. I also add editorial comments as follows.

1. L28 "little to no data"

Please clarify whether "little" or "no" data.

We have rewritten as “little data”.

2. L37 "has with a half-life"

has a half life

We have fixed it.

3. L46 "more real world data"

more observational data

We have fixed it.

4. L92 "provided in in the "

provided in the

We have fixed it.

5. L120 "four types of symbols indicates"

indicate

We have fixed it.

Response to reviewer #1;

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1. Description on the methods and data processing

I understand with my personal respect that the authors attempted a difficult task regarding the long temporal distance between Antarctica and the laboratory compared to the half-life of the nuclide. On the other hand, I concern that many data are just above, equivalent to, or even below the "detection limit". In such case, quite detailed descriptions on the measurement procedures are required to assess the validity of the data. A brief description such as "The ^{7}Be concentration and the error were estimated using the measured gross and background radioactivity after correcting for attenuation, self-absorption, detection efficiency, gamma-ray branching ratio, and collected air volume." is not enough. The authors should provide the following

information:

Thank you very much for your comments. We have added the description in line with your point. We explain one by one below.

A) How many were the average (or typical) counts (or counting statics) of both the gross and background radioactivity?

We used two types of Ga detectors, so we revised the text (line 79). Without separating the two detectors, the average gross count is 0.0120 cps (counts per second) and the average background count is 0.0063 cps. We added this description to the text (lines 103-104). We also added these values for each measurement to the published data.

B) Details of the corrections of the attenuation and self-absorption

We have added the following description to the text (lines 104-114):

The physical attenuation of radioactivity is corrected to the value of radioactivity at the time of sample collection using

the half-life of ^{7}Be. Calculations are divided into three categories: during measurement, from sampling to measurement, and during sampling. Self-absorption correction was performed using a standard source of the same shape as the PP vessel U-8 used in the measurements to correct for detection efficiency. The standard source and container corrections are based on calibration data published by the Japan Radioisotope Association. For the absorption correction of the sample, the glass fiber filter material was specified as silicon dioxide (SiO2) and the self-absorption correction count calculated from the density, γ-ray energy, and interaction cross section, approximately 1, was used. The detection efficiency is 3.74% for both detectors. ^{7}Be decays by orbital electron capture, and 10.5% of it decays to 7Li with γ-rays of 478 keV. When calculating the radioactivity concentration, the counts are divided by this branching ratio.

C) How large is the detection efficiency?

The detection efficiency is 3.74% for both detectors. (line 112)

D) How did the author determine the background? For example, procedure blanks were used to estimate the total background? The ^{7}Be concentration in samples appears to be background-subtracted. But how?

We did not perform background measurements using blanks. The following description is included in the text. (lines 92-102)

The background is determined analytically using the measurement results of the samples, respectively. The following procedure was used to determine the radioactivity concentration: 1) Peak search for the signal using the information of γ-ray energy and branching ratio of ^{7}Be; 2) Determination of the peak channel for the obtained peaks; 3) Determination of the background value for the obtained peaks; 4) Determine the γ-ray energy from the channel information. Then, 5) peak area calculation, 6) Detection efficiency calculation, and 7) radioactivity calculation. The background value is obtained by fitting a linear function using the count values in the left and right baseline regions outside the peak region and integrating this function according to the channels in the peak region. In this measurement, radioactivity is considered detected when its measured count (peak area) is greater than three times the measurement uncertainty (Standard deviation of population fitted with Gaussian function).

E) Details of the error of the ^{7}Be data. I see only at line 112 the words "one-sided confidence interval". Is the interval of 95%, 68%, or 99.7%? What kinds of errors were ultimately propagated to the total uncertainty?

The error we describe here is not a statistical error for the counts. The word "one sided" was misused because we got we got confused with the uncertainty in data counting. We have replaced the "one-sided confidence interval" with "error". (lines 141-142)

And the error width is expressed as the standard deviation. Therefore, the percentage is 68%. We have added “(standard deviation, one-sigma)” to the line 90.

F) Details of the radioactive-decay correction. Please clarify the precise decay constant (or half life) used. If possible, it seems helpful to specify the day of measurement.

Attenuation correction was calculated based on a half-life of 53.3 days for ^{7}Be. And we have added information on the

date and time the sample was measured to the database. The correction calculation of the decay is divided into three periods: during measurement, from sample collection to measurement, and during sample collection. This is described in the text. (lines 105-107)

2. Detection limit

A detailed description of the procedures to estimate the detection limit is required. Commonly, a "detection limit" represents an upper 3-sigma value of the blank measurements (after blank subtraction). Is it the same in this paper? Please clarify.

Yes, that is correct. In a measurement, radioactivity is considered detected when its measured value (peak area) is greater than three times the measurement uncertainty. Assuming that the population is Gaussian, the standard deviation σ is defined as the uncertainty (detection limit). (lines 100-102)

3. Volume normalization

Was cubic meter in this paper the value normalized with air temperature and pressure at the sampling site? If not, what were those measurements? The authors should specify this information.

The amount of air is converted under the conditions of 25°C, 1 atm. We have added the information to the text. (line 79)

Minor comments are as follows:

Line 37:

^{7}Be is produced not only in the lower stratosphere. One third to one forth of the production (ie. distribution, except for the heavy rain regions) is found in the upper troposphere.

Thank you very much for the valuable comment. We have rewritten the description. (lines 37-38)

Line 71:

How large is the collection efficiency of the glass filter? Was it washed and sealed before expedition?

We used a glass fiber filter that collects aerosols is capable of capturing particles larger than 0.6 μm in diameter, and we assumed 100% collection efficiency (we did not consider any correction for the collection efficiency). A new glass fiber filter is used each time, and there is no contamination before installation. After collection, each sample was shielded with aluminum foil and stored.

We have added the above description in the text. (lines 73-76)

Reponse to reviewer #2;

The paper PDJ-D-22-00001 with the title: "^{7}Be concentrations in surface air over the Indian sector of the Southern Ocean and at two Japanese coastal Antarctic stations in the summers of 2014/15, 2016/17, and 2017/18" provides information about atmospheric ^{7}Be concentration in coastal Antarctic.

It is important to report the regional data. However, there are some comments. Therefore, I would recommend publishing the paper after the minor modification.

Thank you very much for the valuable comments. Please see below.

Authors introduce about how to measure the sample. Please add a relative uncertainty of gamma counting. And if possible, please add elapsed time until measurement. Detection limit is depending on elapsed time.

We have added description about how to measure the sample in section 4 (lines 92-114).

We add a description about the uncertainty in the text. (lines 100-102)

And please see the questions and answers to the Reviewer#1 1) and 2).

It is better to inform raw data as supplemental information.

We have revised the database. The new database contains supplemental information such as raw data, measurement date (the observation date and this information are used to evaluate the elapsed time) and so on. Please see it.

2nd submission

Editor Start Date: 3/23/2022

Editor Stop Date: 3/24/2022

Editor Comments to the Author: Ryu Uemura

The author responded to most of the comments and the manuscript has improved. However, point 1 below is important and should be clarified. Please check again editorial mistakes before submitting the revised version (e.g. following points 2, 3, 4).

1. The author did not respond to reviewer 1's comment E. Please specify what percentage is the confidence interval. Usually 95%, but sometimes 99% or other numbers.
2. In this connection, regarding the explanation of the line name of the data in line 141, you noted a column called "CONFIDENCE INTERVAL", but I cannot find it in the excel file. Perhaps the row called ACCURACY corresponds to "CONFIDENCE INTERVAL" . Please correct this.
3. Line 36

207/18 > 2017/18

4. line 38 and many parts

Please remove underlines for reference numbers.

Authors Response:

Dear the editor,

We thank the editor for comments to our manuscript. The comments are listed below in blue followed by our responses in black.

Sincerely,

Naohiko Hirasawa

Response to the editor;

The author responded to most of the comments and the manuscript has improved. However, point 1 below is important and should be clarified. Please check again editorial mistakes before submitting the revised version (e.g. following points 2, 3, 4).

Thank you very much for your careful reading. We have checked the manuscript.

1. The author did not respond to reviewer 1's comment E. Please specify what percentage is the confidence interval. Usually 95%, but sometimes 99% or other numbers.

This is a description of the error width and is expressed as the standard deviation. Therefore, the percentage is 68%. This is reflected in the response to Rev # 1, 1), E.

2. In this connection, regarding the explanation of the line name of the data in line 141, you noted a column called "CONFIDENCE INTERVAL", but I cannot find it in the excel file. Perhaps the row called ACCURACY corresponds to "CONFIDENCE INTERVAL" . Please correct this.

Thank you for the pointing out. We simply express it as “error”. We have replaced the following phrase with "error". This is reflected in the response to Rev # 1, 1), E.

Line 90 : “confidence interval (or error)”

Lines 141-142 : “confidence interval”

Lines 147-148 : “confidence interval” (two parts)

Data file : “Accuracy” (three parts)

3. Line 36

207/18 > 2017/18

We have fixed it.

4. line 38 and many parts

Please remove underlines for reference numbers.

We have fixed them.

3rd submission

Editor Start Date: 3/31/2022

Editor Stop Date: 4/1/2022

Editor Comments to the Author: Ryu Uemura

There is still a misunderstanding regarding the description of the error. The reviewer and I are simply asking for a clear description of the definition of "error". In fact, 2-sigma and standard error are also conventionally used as "errors". As far as I have read, there is still no statement in the text that the error is a standard deviation. If you are using standard deviation(one-sigma), for example, please state it clearly in the text below.

>Line 90 "...^{7}Be concentration and the error were estimated"

Line 90 "...^{7}Be concentration and the error (standard deviation, one-sigma) were estimated"

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>Line 90 "...^{7}Be concentration and the error were estimated"

Line 90 "...^{7}Be concentration and the error (standard deviation, one-sigma) were estimated"

We are sorry to bother you. We have added “(standard deviation, one-sigma)” to the line 90.

Editorial Office’s note

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