

Dear anonymous referee #1,

We very much appreciate your constructive comments, useful information and your time for RC3. Especially, introducing articles which we have not been aware and the grammar corrections were really helpful. Thanks to your review, our manuscript has been substantially improved. Point-by-point responses to your comments are written in blue in this letter.

Best regards,
Mizuo Kajino

General comments:

The paper assesses redistribution events of Cesium from different sources in Japan in the following years after the Fukushima accident. It tackles the scientific topic very well from many different directions and I think it would be suitable for publication to ACP.

Thank you for your evaluation.

I have some minor comments / suggestions that I hope they would help the authors to make this publication more comprehensive to the readers.

Specific comments:

Page 1, Line 20 (hereafter it will be P1,L20): Substitute "the contaminated ..." to "a contaminated"

I changed it.

P1,L22: "The assessment period ... 2012". I don't understand what you mean here. The assessment period is 2013, but the field experiments were carried out in December 2012?? Could you please clarify?

The start of field experiment is December 14, 2012 and it has been continued up to now. Our assessment period is for the full year of 2013, after the start of the experiment. I have modified the sentence simultaneously reflecting the Referee #2's comment (RC1) as follows: "In order to assess the long-term effect, the full year of 2013 was selected to study just after the start of the field experiments".

P2,L3: Correct "to reducing" to "in reducing"

I changed it.

P2,L11: Put a full-stop after "remain unknown". Continue the sentence as: "This is the first study that provides a crude estimation ..."

I changed it.

P2,L12: In the next sentence correct as: "Additional research activities on this direction are needed ..."

Referee #2 (RC1) also suggested correction of the sentence. I modified the sentence combining your and his comments as "Additional research activities should investigate the processes/mechanisms governing the re-suspension over the long term. This could be achieved through conducting additional field experiments and numerical simulations".

P3,L6: Add the recently released reference after Draxler et al.(2015): Kristiansen, N. I., Stohl, A., Olivie, D. J. L., Croft, B., Søvdé, O. A., Klein, H., Christoudias, T., Kunkel, D., Leadbetter, S. J., Lee, Y. H., Zhang, K., Tsigaridis, K., Bergman, T., Evangeliou, N., Wang, H., Ma, P.-L., Easter, R. C., Rasch, P. J., Liu, X., Pitari, G., Di Genova, G., Zhao, S. Y., Balkanski, Y., Bauer, S. E., Faluvegi, G. S., Kokkola, H., Martin, R. V., Pierce, J. R., Schulz, M., Shindell, D., Tost, H., and Zhang, H.: Evaluation of observed and modelled aerosol lifetimes using radioactive tracers of opportunity and an ensemble of 19 global models, Atmos. Chem. Phys., 16, 3525-3561, doi:10.5194/acp-16-3525-2016, 2016.

I added it. Thank you.

P3,L14: "... are of particular concern." Add the reference before the full-stop: Evangeliou, N., Balkanski, Y., Cozic, A., Møller, A. P. (2014), "Global and local cancer risks after the Fukushima Nuclear Power Plant accident as seen from Chernobyl: A modelling study for radiocaesium (^{134}Cs & ^{137}Cs)", Environment International, 64, 17–27.

I added it. Thank you.

P3,L21: Put "Tsukuba" in parentheses instead.

I changed it.

P4,L7: You say that you considered sources (1) and (4) in your study. But source (4) refers to releases from the Chernobyl sarcophagus, which is a different thing comparing to the situation in Fukushima. So, how did you considered this source in your study. I think you must reformulate your sentence here and make it clearer.

I modified the corresponding sentences to "Garger et al. (2012) summarized the re-suspension sources following the Chernobyl accident as (1) dust emission, (2) human activity in fields, and on roads and construction sites, (3) forest fires, and (4) emissions from the power plant (i.e., opening of the Chernobyl sarcophagus). Re-suspension sources (1) dust emission (Ishizuka et al., 2016) and (4) i.e., additional emissions from the reactor buildings of FDNPP (TEPCO, 2012; 2013; 2014a; 2014b; 2015) were considered in the present study."

P4,L9: Change "low chance of ..." to "low risk of ..."

I changed it.

P4,L22: "The current study is the first but crude estimation of the spatial budget ...". You said the same in a previous line in the ABSTRACT. Please remove or change your sentence.

I removed the sentence and modified the following sentence as "Even though the re-suspension mechanisms still remain unknown, by utilizing observational data ...".

P4,L30: I am not sure if this 4-line paragraph is needed in the beginning of each chapter. Although this style may not often be found in other manuscripts and may rather often be found in the end of Introduction section, I considered the style of guidance is informative to readers. Thank you for your understanding.

P7,L9: Change "... a maximum estimate of 137Cs ..." to "... the upper boundary of 137Cs ..."

I changed it.

P7,L17: Please move the web reference to the list of references at the end of the manuscript

I couldn't find any statements of the web reference treatment in the ACP manuscript preparation guideline page. However, judging from previously published ACP papers, the editorial office seemed to allow inserting web references in the body of manuscript. Thank you for your understanding.

P8,L17: There is a mesh with your figures and the way they are placed in the text. First of all, I think that ACP requires format of the full word inside the manuscript, so instead of "Fig." you should change to "Figure" everywhere in the manuscript. Second, Figure 4a is referred in this line, but Figure 3 is referred after!!! This is completely confusing. Either change the sequence of your figures, or reformulate the text. I noticed this may happen more than once, so you need to scan the manuscript carefully.

In the up-to-date manuscript preparation guideline, it says —The abbreviation "Fig." should be used when it appears in running text and should be followed by a number unless it comes at the beginning of a sentence, e.g.: "The results are depicted in Fig. 5. Figure 9 reveals that...".

As to the order of figures, I intended to do so. The figures are ordered consistently with the sentences "in general", but sometimes it is referring a part of figures behind in advance. I tried to remove all the unnecessary reverse to avoid confounding the readers. In case if I assume it necessary, I modified the phrase from "Fig. 4a" to "as shown later in Fig. 4a", for example.

P8,L30: "Unlike re-suspension from soil, precipitation might not suppress re-suspension from the forest ecosystems since substantial amounts of K-containing particles were observed in the wet season in the Amazon (Pöhlker et al., 2012 and references therein)." Could you please explain this further and link it a little bit more to the paragraph? It does not seem relevant or I am having trouble to understand it.

I removed the sentence as it has no impacts on and rather destroys the context in the paragraph. Also, the sentence is not necessary here because the precipitation effect did not consider either in dust emission nor forest emission equations.

P10,L8: Since you speak about measurements, I think you must be more precise. You only mention that "At both sites, ambient aerosols were collected using a high-volume air sampler and ^{134}Cs and ^{137}Cs concentrations were obtained by γ -ray spectroscopy using a Ge semiconductor detector." YOU MUST MENTION: (1) Relative efficiency of the Ge detector relative to NaI, (2) Resolution energy at the photopeak of ^{60}Co , (3) How the energy calibration was performed, what range of energies was covered and what the resolution per channel was, (4) How the efficiency calibration was performed, what radioactive solution was used, who the provider was, (5) what the geometry was, (6) what the measurement time was, and (7) what the relative statistical error of your measurements was.

In the revised sentence, I removed the instrument parts and just mentioned the elements measured, sampling periods, and sampling intervals.

P11,L13: Change "scattergram" to "scatterplot". In the same sentence change also "the observational and simulation results, respectively" to "the simulation results and observations" and remove "respectively".

I changed it.

P11,L17: Change "employs" to "uses"

I changed it.

P12,L3: Change "a quarter to one third" to percentages

I changed it.

P12,L4: Change "sixty percent" to "60%"

As far as I know, to spell out numbers in the beginning of a sentence is a rule of the English grammar. I couldn't find it in the ACP's guideline but I would like to follow the rule, if any.

P12,L10: "After the screening ...". How did you perform the screening? I am afraid I did not understand that. Could you please explain it better inside the paragraph in order to be clearer?

The screening is to find runs that satisfied the criteria described in the previous sentence. In order to make it clearer, I changed the sentence as "Only one combination $(E_c, v_d) = (0.04, 0.1 \text{ cm/s})$ satisfied the criteria, and thus ..."

P13,L5: "The model successfully reproduced ...". I think you need a more moderate sentence here. Your results are in a logarithmic scale and the discrepancies are rather large to say that your model reproduced the plumes well. I am quite sure that if you perform the same comparison as a scatterplot and not as 2 time series, you will see that there is no correlation at all. But I admit that it is rather difficult to reproduce the plumes much better. Please reformulate though!

I removed the word "successfully".

P13,L16: "Note that resuspension flux ...". This is a bit obscured or I have miss it from the text. Please explain and rationalise your decision to multiply by a factor of 10 here.

This is elaborated in the last paragraph in Sect. 2.2. I changed the sentence to “As discussed in Sect. 2.2, note that the re-suspension flux ...”.

There is no rational reason that the result is multiplied by 10 but simply there is evidence that the simulation is underestimated by a factor of 10. As discussed in Sect. 2.2, the dust emission scheme contains parameters obtained at a single location and under a fixed atmospheric condition. It could be one of the reasons for this underestimation. We could have been added the tuning parameter to Eq. (1) to adjust to the observed concentration, but we decided to use the original dust emission module as they were because it was the fact. However, in order to derive the quantitative budget analysis (crude, though), we did the simple multiplication. Certainly, as mentioned in the last sentence of Sect. 2.2 and as listed in Sect. 5.4 (previously Sect. 5.3), the improvement of the dust scheme is one of the key future issues. Also please note that the value has been changed from 10 to five in the revised simulation.

P15,L1: Change "... total deposition amount ..." to "... total deposited amount ...". Please do the same in the next sentence as well.

I changed it.

P15,L7: Please explain the unit %/y². I do not understand its meaning.

The “2” indicates the footnote number, not a square of year.

P17,L23: Change "Eighty to 90% ..." to "80 to 90%"

Same to the previous comment—As far as I know, to spell out numbers in the beginning of a sentence is a rule of the English grammar. I couldn't find it in the ACP's guideline but I would like to follow the rule, if any.

P18,L27: Put the web reference to the list of references.

Same to the previous comment—I couldn't find any statements of the web reference treatment in the ACP manuscript preparation guideline page. However, judging from previously published ACP papers, the editorial office seems to allow inserting web references in the body of manuscript. Thank you for your understanding.

P18,L31 and everywhere in the text: Change "... toward ..." to "... towards ..."

I changed it.

P19,L7: Change "... from the biota ..." to "... from biota ..."

I changed it.

P20,L7: The conclusion number 2 starts with a sentence that goes on for more than 3 lines. This huge sentence makes the meaning being hard to follow for the reader. Please reformulate this sentence and split it to smaller sentences.

I divided the conclusion #2 into three (#2 – #4). Also, divided the previous conclusion #4 into two (#6 and #7).

P21,L3: "toward" should be changed to "towards"

I changed it.

FIGURES

Figures 1 & 2: Please make them coloured like the rest of the contour plots you have in the manuscript.

I changed it.

Figure 5: Change "scattergram" to "scatterplot" in the caption

I changed it.

Figure 7: Could you please sum up all the resuspension sources (blue, red, green) and compare the result with the observations? It would be good to show this in a scatterplot IN ADDITION to the existing Figure 7. You can plot it below or on the right of Figure 7.

I added the scatterplot on the right of Figure 7 together with a new table (Table 3) showing the statistical measures between them.

Figure 9: Change "Time series of (black) the observed and (colors) the simulated 137Cs ..." to "Time series of observed (black) and simulated (colors) 137Cs ..." in the caption

I changed it.

Figure 11: Change "... were run ..." to "... ran ..." in the caption

I changed it.

Figure C1: You should probably consider putting Figure C1 as Figure 12 or include it to a supplementary chapter together with the Appendix, but this is up to the ACP journal.

According to Referee #2 (RC1) and #3 (RC2), Appendix C has been moved to the main text as Sect. 5.3 and Figure C1 has been moved Figure 14, accordingly.