

Comment on acp-2021-591

Anonymous Referee #3

Referee comment on "Eight-year variations in atmospheric radiocesium in Fukushima city" by Akira Watanabe et al., Atmos. Chem. Phys. Discuss.,
<https://doi.org/10.5194/acp-2021-591-RC3>, 2021

[General comments]

This paper observed valuable data with long and steady efforts and showed important and new knowledge (such as change of solubility of Cs containing aerosols in deposition) which can be useful in environmental radioactivity science and various atmospheric science. They aimed to clarify sources of Cs containing aerosol particles, their activities in the environment, and their future estimations. This paper can contribute to the understanding of the environmental cycle of aerosols such as aerosol production, transporting, and deposition by using Cs as a tracer. In addition, this paper rose an important suggestion for the model improvements through improvements of aerosol deposition estimations. Therefore, I think this paper is appropriate for publishing from ACP.

However, this paper remains a large uncertainty to the aerosol size measurements. They are making great efforts to evaluate the performance of the 6-stage impactor with the cyclone/impactor instrument. They discussed Cs containing aerosols on the backup filter using a large part of this paper, however, the bouncing effects of large particles had not been denied. Rather, significant bouncing effects on both instruments were shown, but there was no evidence to deny bouncing effects. Therefore, I think a large contribution of bouncing effects will be quietly significant. These results and discussions about the particle sizes make this paper confusing. If authors suggest that the significant contributions of fine aerosol particles, more accumulation of reliable and accurate evidence for this point should be required (such as parallel observations using the same impactors with normal filters and adhesive material applied filter (such as vacuum grease), microscopic observation, and others).

Other common comments are below.

- Please check the significant figures (such as P8 L6) and make the numbers easier to see.
- Please clarify the relationship between river sediments and this paper more. This observation does not seem to contribute to the paper significant
- "surface air concentration", "atmospheric radioactivity concentration", and "surface concentration" were confused (atmospheric radioactivity concentration?).
- This paper calculated radioactivity decreases using data from 2011 (the early stage after the accident). In the early stage, resuspension is not dominant. It is necessary to distinguish periods of primary stages and resuspension stages. This point will affect the

- results of future estimations and the rate of Cs discharges.
- Please check again for the referencing.

[Specific comments]

P6 L15: "The range of particle sizes..." can be shortened as "The 50% cut of particle sizes...". Then, "(Note..." can be deleted.

P7 L5: Were carbon filters used for gaseous Cs analysis? Isn't the purpose such as measuring iodine?

P7 L12: Coarse mode samples were collected on the quartz fiber filter. This point is inconsistent with the L8 paragraph.

P13 L14: Also impactor sampling is "time-resolved measurement".

P13 L24: 2016 and 2017? Or 2015 DJF and 2015 DJF? Also, the opposite trend can be seen in 2013.

P13 L25: Is the seasonal trend of 1.3-2.1 μm particles significant? It looks quietly stable.

P15 L3: Too long sampling intervals (recommended operating time is up to 24 hours). Were some parallel observations using the same impacter instruments with and without oil? Were some microscopic checks or any other checks had done?

P22 L: Is the wording "difficult -to-return zone" is right? I could find "Areas where it is expected that the residents have difficulties in returning for a long time" in the Japanese governmental report.

P22 L26: 2017? 2018?

P24 L17: Authors showed a paper (Okuda et al., 2015) as a reference indicating the rebounds of large particles using the impactor/cyclone instrument with long sampling periods in P7.

P27 L13: At the city site, some references showed the same results of seasonal variations (such as Kitayama et al., 2016; Kinase et al., 2019).

P28 L3: As mentioned above, these results include high risks of misunderstandings about Cs containing particle sizes.