

## General comments

The authors investigate the role of resuspension in the persistence of airborne radio-cesium in the formerly contaminated city of Fukushima. They focus on dissolved vs particulate fractions of <sup>137</sup>Cs as a supplementary reason to explain the change in the effective half-lives of airborne radio-Cs and its seasonal variation. Airborne concentrations, deposition and size distribution analyses are consistent and relevant. This study adds novelty in the fate of airborne radionuclides and their apparent environmental half-lives.

The height at which some of the used aerosol sampler and impactor were installed may be not perfectly propitious to reveal the exact signature of the resuspension process because this height is too high as compared with ground level where the resuspension process originates. The possible bias could have been investigated. The respective contribution of the fine-mode particle on the airborne concentration may suffer from this particular settlement. I suggest to install a sampler at ground level for a period of one year in parallel with the sampler already installed on the roof of the building to check if the location height has a significant influence on the airborne concentration (what is expected given the vertical profile of aerosol usually observed). This could also be mentioned in the remaining issues to investigate.

It is not clear if large particles have indeed being evidenced by microscopy on the backup filter. It is clear on the other hand that a sampling period as long as 3 weeks may favor particle bouncing when using high-volume impactors. Usually, impactor trials last about 2 weeks subject the particle number is very low.

The role and characteristics of biotite are highlighted and the role of the gradual decontamination is scrutinized and show that this sole parameter cannot explain the shift in the half-lives of airborne Cs, thus suggesting the bioavailability of the different chemical forms of Cs in soils as an important factor.

## Detailed comments

Page	Lines	Comment	Example
Abstract	Line 4	Use « effective half-lives » instead of « half-lives »	
	Line 5	Convert all durations in year and add respectively after	(0.75 and 1.11 yr, respectively)
		Abbreviation for « year » is « yr »	Change it everywhere in the document
	Line 6	I suggest to cut the explanation given line7 and 8 about the shorter half-lives and paste it just after line 5	
	Line 11	« an evaluation method » instead of « a method of evaluating »	
Main text Page 3	Line 8	« by precipitation (wet deposition) or during dry weather conditions (dry deposition)» instead of « via precipitation in addition to via dry Deposition »	
	Line 11	Terada et al., 2020). First parenthesis is missing. Remove the period after the final parenthesis	
	Line 13	I suggest to replace « may not be substantial » by « is not expected to be significant »	
	Line 20	since several papers have been published give some references	

	Line 22	Replace « surface activity concentrations » by « airborne surface concentrations » here and in hereafter in the rest of the document when it refers to concentration of radio-Cs in the atmosphere	Change it everywhere in the document when needed
Page 4	Lines 14, 15	The reason is just because in Kinase et al. (2018) the air mass did not pass over the observational sites. You cannot let this sentence as it is since it could led to a misinterpretation (i.e. a fire cannot re-emit formerly deposited radio-Cs). Numerous researches performed in the Chernobyl environnement give evidence that fire can re-emit radio-Cs	I would suggest to be very cautious with the role of biomass burning
	Line 20	« (Steinhauser et al., 2015 « instead of « (Steinhouse et al., 2015) »	
Page 5	Line 6	You can remove the second « located »	
	Line 7	Put the « m » of mountains in captal	Ou Moutain
	Line 12	Replace « where the peaks are » by « where the summits are »	
Page 6	Line 1	Same remark	
		Replace « at a height of 25 m from» by « at a height of 25 m above»	
	Line 19	« gas-state aerosols » is meaningless. Aerosols are liquid or solid particles. Prefer « volatile or semi-volatile compounds » or « gaseous and volatile or semi-volatile compounds ». Ithink the exact reason of a charcoal cartridge is not for Cs, may be to track possible <sup>129</sup> I revolatilization ?	
	Line 6	I have never heard about « gaseous radioactive cesium ». Cs may be volatized only at temperatures above 650°C but will condense again rapidly as temperature falls. Thus it is considered that it exist only as particle in the atmosphere.	
Page 8	Line 4	You write « official method ». Is it a national or international method ? Please give a reference	
	Line 29	Instead of « which are usually larger than the submicron size range » you can use « which are usually in the supermicron size range »	
Page 9	Line 13	Prefer « the decreasing trend » instead of « the decreasing tendency »	
		I suggest « which is much higher that the radioactive hal-life of <sup>137</sup> Cs » instead of « thus, the decrease rate was higher than the rate of radioactive decay of <sup>137</sup> Cs. »	
Page 10		Because of the numerous data in this plot I strongly suggest to downsize the circles on Figure 2 to see the line between the circles	
Page 11	Line 2	202200 should be written 202,200 or 202.2 10 <sup>3</sup>	
	Line 9	Convert ( <i>Th</i> = 275 - 756 d) in year.	
	Line 9	« It is tricky... » (or use difficult) instead of « It is hard... »	
	Line 18	Give a reference for the 72.6%	

P 16	Line 2	Something seems to be missing in « Thus, compared the cascade impactor and the impactor/cyclone measurement data, as shown in Fig. 5. »	
	Lines 15-16	Could you give some evidence of the presence of coarse particles found on the backup filter or explain how you detect them ?	
P17	Line 23	I do not understand what represents « The eight » in « The eight compositional correlation coefficients »	Introduce the eight compounds before
P19	Line 14	I suggest « concentrations in Tsushima and Tsukuba (MRI), » instead of « concentrations at Tsushima and the MRI, »	
P20	Line 8	« factor < 0.1 %. » instead of « factor for < 0.1 %.»	
	Line 10	« From Fig. 9, the value of <i>b</i> for observations is close » instead of « From Fig. 9, <i>b</i> of observation is close »	
	Line 11	The notion of « climatological deposition velocity » which is not conventional should be explained since it differs from what is consensually used as deposition velocity which refers to dry deposition only	
P 21	Line 5	« overestimation of simulated airborne <sup>137</sup> Cs concentration from forests during summer» instead of « overestimation of simulated <sup>137</sup> Cs from forests in the summer»	
	Line 18	I think you can be more categorical : which demonstrates the efficacy of wet deposition as compared with dry deposition and which plays ... » instead of « but it seems that wet deposition plays... »	
	Figure 10	It would be better to have the same magnitude for the Y-axis and X-axis scales. Currently, at first glance, one could interpret the figure as if deposition at both sites are equal. Please start from 10 <sup>-1</sup> to 10 <sup>6</sup> for both axis.	
Page 22	Line 5	Unless I am misunderstood, I dont agree with « The slope of the regression indicates that the ratio of deposition at Fukushima University to that at the MRI did not change significantly from the initial ratio during the eight years, ». This seems contradictory with what can be seen on fig. 10 (right plot) from where it can be conclude that from the first ratio to the last one there is about a factor of 20 based on the regression line	
	Line 7	202200 should be written 202,200 or 202.2 10 <sup>3</sup> . the same for 23100	
	Line 7	« which is approximately 8-9 times higher at the Fukushima University than at the MRI » instead of « which is approximately 8-9 times »	

	Line 9	Could you please add the average <sup>137</sup> Cs integrated concentration in soils with depth or at the topsoil layer, at both sites	
	Line 11	« January peak is typical at Fukushima city » instead of « January peak is a feature of Fukushima city »	
	Line 16	« the surface air activity concentration of <sup>137</sup> Cs <b>has</b> not fallen to the level <b>prior to</b> the » instead of «the surface air activity concentration of <sup>137</sup> Cs <b>had</b> not fallen to the level <b>before the</b> »	
	Line 23	« and low from » instead of « and lows from »	
	Line 28	What is « the Pacific high. » ?	
P 23	Line 2	« and Fukushima city is downwind of Tsushima, » is already mentioned line 1	
	Line 7	I do not see the interest to mention the case of aerosol with a such a high diameter since they are exceptionnally detected or correspond to very specific activities or at coastal sites. Without refering to such extrem value, it could be more interesting to give an example of more « common » aerosol sizeslike 20 or 30 µm even if again they remain much less abundant than 10 µm	
	Line 12	Aside from the diameter which is sensitive to gravitational deposition, the efficient deposition onto the ground can be attributed to rain deposition. While dry deposition is almost permanent this suggest that wet deposition is also more or less regular if not permanent (this cannot be seen based on the precipitation amount which is on a monthly basis	
P 24	Line 5	« If the bouncing effect occurred only in the cascade impactor, » The place of this sentence seems strange. Does it already correspond to the second possible explanation ? Isf so the « 2) » should be placed before the sentence	
	Line 3 to 10	The reading is not straightforward and the text would gain to be more intelligible.	
	Line 13 - 30	The suggestion of an enhanced dust emission during snow period (even if it does have an effect given the short distance between the sampling location and the roads) would worth to be investigated before asserting. May be this idea could be developped in another paper.  After line 13, I would suggest to shift to line 30 starting with « Unfortunately, analyses of the surface meteorological observational data for Fukushima City from the JMA, such as temperature, precipitation... »	In order to keep with what has been measured and what can be interpreted with a relative high confidence. I would skip this snow section because it is too uncertain
P27	Line 15	Convert 456 d in year	

	Line 18	« changed approximately in 2015 » or « changed around 2015 » instead of « changed in approximately 2015 »	
	Line 19-20	Convert 272 d and 825 d in year	
	Line 23	In the conclusion, no need to repeat « This is consistent with the findings of Manaka et al. (2016). »	
P28	Lines 9-12	I would shift this item in the remaining unresolved issues if not deleted (see my previous comment about snow and mud	