Biogeosciences Discuss., 10, C2120–C2123, 2013
www.biogeosciences-discuss.net/10/C2120/2013/

Biogeosciences
Discussions
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Interactive comment on "Export of ^{134}Cs and ^{137}Cs in the Fukushima river systems at heavy rains by Typhoon Roke in September 2011" *by* S. Nagao et al.

Anonymous Referee #2

Received and published: 22 May 2013

This manuscript entitled "Export of 134Cs and 137Cs in the Fukushima river systems at heavy rains by Typhoon Roke in September 2011" investigates the effects of a single heavy rain event on134Cs and 137Cs export in two rivers in the Fukushima Prefecture, after the Fukushima Daiichi Nuclear Power Plant accident. Overall, this manuscript falls well within the scope of Biogeosciences and contributes greatly to the understanding of radiocesium transport in the watershed-river system in this area after the accident. However, there are some concerns about this paper. Some discussions are not so tight in logic or too speculative. There are also some ambiguous statements, which needs to be clarified further. Lastly, there are mistakes of the data presentation (mainly table 1, 2 and 3).

1. The biggest concern is how the authors can verify the high pulse of 134Cs and 137Cs in the river water (mainly in the suspended particles) right after the heavy rain event will reach the ocean? It is true that the radiocesium was transported from land to river, but not necessarily to the ocean eventually. There is ∼10 km distance between the sampling station in Natsui River and the coastal water and maybe less distance between those for Same River. Section 3.4 seems too speculative. The authors need to provide more data, for example, radiocesium activity data in the nearest coastal waters after the heavy rain to support this.

2. The authors kind of ignore the fact that the suspended solids washed from the riverbanks or re-suspended from the bottom sediments not only carried more 134Cs and 137Cs, but also have scavenged Cs from the aqueous phase, as indicated by the much lower radiocesium activity in the dissolved phase after the heavy rain event (Page 2772, line 19-20).

3. The authors did not provide quantitative data of various mineral components of the different size fractions ("deposit", "No. 5A" and "membrane) from X-ray diffraction analysis. They should have expanded more on these, as it will help to explain the different Cs sorption capabilities displayed on Table 3 by different size fractions. For example, why the suspended solids collected from Same River show an increasing Cs specific activity with decreasing size, while this is not the case in the suspended solids in Natsui River? Since the authors already made efforts to size-fractionate the suspended solids and measured the respective Cs activity, why there is no further in-depth discussion on this?

3. The authors used two different size-fractionation methods for the water samples collected under low and high flow conditions, respectively (Page 2771, line 5-13). Is there any specific reason for this?

4. In addition, does radiocesium in the suspended solids under discussion refer to the sum of radiocesium on the fractions of >10 μm, 1 μm and 0.45 μm under the low

flow condition and that of “deposits”, “No. 5A” and “membrane” ? It is not clear to the audience and the authors should make it clear.

5. Issues with Table 1: 1) The authors should make it clear in Table 1 if the radiocesium data are total activity or dissolved fraction; the same for Fig. 3 (I believe both are total activity).

2) The authors mentioned that 134Cs/137Cs ratios are close to 1, however, according to Table 1, column 4 for 134Cs and column 5 for 137Cs, one cannot derive the values listed in column 6. Moreover, in the text it is said “134Cs/137Cs activity concentration”, but in the *note it is said “radioactive concentration”. So is it really an activity ratio or a concentration ratio?

3) “137C” should be “137Cs”

6. Issues with Table 2: 1) It is said “Percentage of 134Cs and 137Cs associated with . . .” but there is no “134Cs” data here.

2) It is very obviously that 137Cs in column 3 of this table are actually data for 134Cs in the Natsui River, not 137 Cs data nor data for Same River (Please look at Table 1). It is a mis-presenting of the dataset.

3) The authors also switched the “High” and “Normal” data by mistake.

4)“137C” should be “137Cs”

7. Issues with Table 3: 1) “134C” should be “134Cs”

2) Ratios of 134Cs/137Cs do not seem right according to the data provided.

3) There are data which are not matched between the text and the table. Page 2773, line 14-15. Those data cannot be found in Table 3.

8. Discussions which are not tight or right in logic:

1) Page 2772, line 11-13. How is the statement “so that radiocesium derived from

the Fukushima Daiichi NPP was transported from deposited surface to rivers" derived from the 134Cs/137Cs ratios which were close to 1? Maybe the authors should provide evidence or reference to state that the contaminants released from Fukushima Daiichi NPP accident had a 134Cs/137Cs ratio close to 1?

2) Page 2775, line 5-8. If the apparent residence time of the particles are short, these particulate Cs would likely settle back to the bottom sediments quickly, then why the river bottom sediments are necessarily a source of radiocesium to the river water?

9. Page 2771, line 9-10. "Filtration was conducted using No. 5A filters and then filtered with membrane filters" is a repetitive statement and should be deleted.

Interactive comment on Biogeosciences Discuss., 10, 2767, 2013.