

Interactive comment on “Surface pathway of radioactive plume of TEPCO Fukushima NPP1 released ^{134}Cs and ^{137}Cs ” by M. Aoyama et al.

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Received and published: 2 April 2013

1, Reply to comments by Dr. Honda.

This report documents zonal dispersion velocity of Fukushima nuclear power plant 1 (FNPP1) - derived radionuclides (radiocesium) based on their huge data set coincided well with velocity observed by ARGO float and satellite. The conclusion is very simple and result is no doubtful. Authors have been making big efforts to collect spatially and temporally seawater sample for analysis of FNPP1 - derived radionuclides after FNPP1 accident. It is no doubt that their data set are valuable and should be published or opened. Thus I recommend this article acceptable. However the following minor points (associating legend of Fig. and Table mainly) should be clarified, re-considered and revised before publishing.

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A: Thank you for your kind and positive words on our manuscript.

1. Result's Section 3.2 In the North Pacific (p. 270) (1) Sentences from line 1 to 24 are not “results” but “review”. In this section, results should be introduced mainly and sentences of “review” should support or explain results. (2) Figs. S3-S6 are very impressive and “key” figure of this paper. These should be Figures in body text rather than supplement.

A: Yes, I move sentences appeared in line 1 to 24 in the chapter 3.2 In the North Pacific (p. 270) to in a chapter Introduction as suggested. I also move Figures S3-S6 into main text as Figure 1 -4 as suggested.

2. Satellite based current zonal velocity is smaller than other estimates (P.273 L4 – L17) ?! Although zonal velocity based on dispersion of Cs and Argo float were in good agreement, it is a little hard to say that satellite based current zonal velocity (from Table S3 and Fig. S7) coincided well with Cs-based and Argo-based zonal velocity. Zonal velocity of 6 – 10 cm sec⁻¹ were found only between 160E and 180E based on satellite data and zonal velocity between 140E and 160E were 2 - 6 cm sec⁻¹ (Table S3 and Fig. S7) although average zonal velocity during observation was estimated to be 7 – 8 cm sec⁻¹ by Cs dispersion and Argo float. A: I agree with your comments that it is a little hard to say that satellite based current zonal velocity coincided well with Cs-based and Argo-based zonal velocity. Therefore I changed my statement on this issue as below. The average speed estimated by advection of Fukushima radioactivity was 8 cm s⁻¹ in average and this zonal speed by observation showed slightly larger than satellite derived surface current zonal speed observed at 160 deg. E – 180 deg. E. The average speed estimated by advection of Fukushima radioactivity was also larger than satellite derived surface current zonal speed observed at 140 deg. E – 160 deg. E. The reasons of these differences are not clear at this moments, advanced research/discussion should be done in near future.

Table 1. Please add legend about the followings. (1)What are “BD” and “NA”? (2)Ra-

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radioactive decay was corrected at a time of collection? (3)What is error (one sigma of counting error)?

A: BD means “below detection limit” and below than ca. 0.4 Bq m⁻³ of ¹³⁴Cs activity is stated as BD in this table. Since activity was BD, we did not provide uncertainty, so we put NA as “not available”. Radioactive decay was corrected at the time of collection. Error stated in this table is extended uncertainty which include one sigma of counting error, uncertainty of sum effect correction factor, uncertainty of efficiency and uncertainty of assigned activity of standard material used for calibration of Ge-detectors.

Fig.1 Please add legend about the followings. (1)What is meridional zone? 38 – 42_N? (2)What is difference in colors of bars?

A: All data in table 1 was plotted, not selected for certain latitude band. Since radioactive plume was confine along 40 deg. N , we can see both clear eastward movement by tracking relatively higher activity samples and lower activity samples located in south and north sides of confined radioactive plume along 40 deg. N. Colors of bars represent ranges of activity based on a color scale to provide more clear information on change and eastward movements of Fukushima derived radiocaesium. I add a color scale which gives relatively higher resolution between 1 Bq m⁻³ to 100 Bq m⁻³.

Table S3-1, S3-2 (1) Please add description “meridional zone of 38 – 42_N” to legend.

A: Yes, I add so.

Fig. S1 Sampling in the Atlantic Ocean is special. Please add the description to legend like the following description. “Samples in the Atlantic Ocean were collected in December 2011 (see Table 1).” A: Yes, I add so.

Fig. S2 (1)Please clarify respective positions D, T, F and U. (2)“July 2012 of Fukushima” ?? Legend should be reconsidered. (3)Which data is obtained by authors? A: I add one figure to explain the positions D,T, F and U. I also revised the figure caption and also add about data sources used in this figures..

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Fig. S3-S6 What is black circle (“0” Bq m⁻³)? A: Black circles represent data reported as below detection limit in table 1 or in original literatures.

Fig. S7 Which float # is A, B, C, D, E, F and G? A: I add A-G in table S1 to identify each float.

Fig. S3-S6 How about using respective float alphabet instead of “A” of Argo float because A in Fig. S7 is different from “A” of Argo float? A little confusing. A: A: I add A-G in figure S3-S6 to identify each float corresponding to table S1.

Interactive comment on Biogeosciences Discuss., 10, 265, 2013.

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