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Ocean Science Discussions

Interactive comment on "Tracer distribution in the Pacific Ocean following a release off Japan – what does an oceanic general circulation model tell us?" *by* H. Dietze and I. Kriest

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General comments

The paper shows the simulated tracer distribution from Fukushima Daiichi by an OGCM at the early time. I agree with the authors" opinion that (P.1443 Line 3) "Such a dataset could be a unique opportunity to benchmark the exchange, or interconnection, between the shelf sea and the open ocean as modeled with todays oceanic general circulation models". On the other hand, these simulated results by an eddy-resolving OGCM can provide useful information for future observation plan. Tracer distribution depended on the distribution of eddy in this model. More discussion of Figure 5 is needed even if the input conditions of the model have large uncertainties. In addition, they did not discuss

about the observed dataset in this study. At least, they should discuss what kind of dataset they need to benchmark the OGCMs. In addition, they also should discuss what kind of information the OGCMs can tell observational researchers.

Specific comments 1) They discussed the particle reactivity of 137Cs in a brief literature review. In this discussion, they should summarize the differences of the cases. They referred the papers of three different input conditions to the ocean (1) Global fallout to the North Pacific, (2) Close-in fallout to Baltic Sea, (3) Direct discharge to English Channel and Irish Sea. And Fukushima case is direct release and close-in fallout off Fukushima and to the North Pacific. Productivity (the concentration of suspended materials), the form of input 137Cs and time scales are different for each case. Vertical transport of 137Cs depends on the forms of 137Cs (particle or dissolved forms). Scavenging effect of 137Cs depends on the concentration of suspended materials. Time scale is also important for vertical transport and scavenging process.

2) They concluded that "However, on longer timescales, or if processes like sediment burial and resuspension or uptake by the benthic biota come into play, the assumption of 137Cs as an "inertial" tracer might well be fundamentally wrong." I don't understand this conclusion. Their simulation shows that released 137Cs was transported to the open ocean by meso-scale eddy and Kuroshio. Therefore, on longer timescales, scavenging effect of 137Cs could be smaller than their rough estimation in 5.3. So I think, on longer timescales, the assumption of 137Cs as an "inertial" tracer might be correct for Fukushima case and "global fallout in the open ocean".

3) They mentioned about the concentration factor in section 5.2 when they discuss about the tracer distribution. They should refer the distribution coefficient (Kd). The Kd of 137Cs is quite smaller than other particle reactive radionuclides such as Pu isotopes. 137Cs is as an inertial tracer in the ocean in comparison with Pu isotopes (i.e. K. Hirose, M. Aoyama and P. P. Povinec, 239,240Pu/137Cs ratios in the water column of the North Pacific: a proxy of biogeochemical processes, J. Environ. Radioact., 100 (2009) 258-262.).

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