

Interactive  
Comment

## ***Interactive comment on* “Seasonal distributions and fluxes of $^{210}\text{Pb}$ and $^{210}\text{Po}$ in the Northern South China Sea” by C.-L. Wei et al.**

**Anonymous Referee #2**

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General comments: Subtle difference in biogeochemical behavior between  $^{210}\text{Po}$  and  $^{210}\text{Pb}$ , poorly understood, has been proposed especially in oligotrophic seawaters. Targeted researches would improve our better understanding of  $^{210}\text{Po}$  and  $^{210}\text{Pb}$  in such an environment. In this paper, the authors present a clear framework of seasonal variability of both  $^{210}\text{Po}$  and  $^{210}\text{Pb}$  in the whole water column in the South China Sea (SCS). They show the difference between  $^{210}\text{Po}$  and  $^{210}\text{Pb}$  in vertical profiles, partitioning, residence time, and fluxes. Using SS and NSS models, this paper shows the influence of models on the quantification of  $^{210}\text{Po}$  and  $^{210}\text{Pb}$  exports. The findings of consistent  $^{210}\text{Pb}$  fluxes and inconsistent  $^{210}\text{Po}$  fluxes between sediment trap and radionuclide technique reveal the dominant control of biological activities over the disequilibrium between  $^{210}\text{Po}$  and  $^{210}\text{Pb}$ . These results provide supports to the  $^{210}\text{Po}/^{210}\text{Pb}$  as a biogenic particulate flux proxy in the SCS and in other oligotrophic

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settings. Therefore this paper is very welcomed.

The authors propose that sporadic events is responsible for the inconsistency between  $^{210}\text{Po}/^{210}\text{Pb}$  derived  $^{210}\text{Po}$  fluxes and sediment trap values. It could be the truth I believe. Essentially, this difference illustrates the different fluxes over different timescales. Sediment trap is deployed here in a very narrow time-window, while  $^{210}\text{Po}/^{210}\text{Pb}$  disequilibria usually record the information over a much longtime. Stressing on this point could facilitate wide readers' understanding.  $^{210}\text{Po}$  excess in the subsurface waters is the additional difference in behavior from  $^{210}\text{Pb}$ , as shown in Figure 6. This characteristic indirectly supports the close relation between  $^{210}\text{Po}$  and biogenic particles and the application of  $^{210}\text{Po}/^{210}\text{Pb}$  to track biogenic matter. More elaboration would clarify the different biogeochemical behavior between  $^{210}\text{Po}$  and  $^{210}\text{Pb}$  in oligotrophic environments.

Specific comments: The title of Figure 3, the last sentence, change “ $^{210}\text{Pb}$  relative to  $^{210}\text{Pb}$ ” to “ $^{210}\text{Po}$  relative to  $^{210}\text{Pb}$ ”.

Figure 8, the legends of SS and NSS for  $^{210}\text{Pb}$  and  $^{210}\text{Po}$  are the same.

Page 11, line 23, Fig. 8a and b with respect to the relationship between  $K_d$  values and TSM do not seem to be presented in the manuscript.

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