

Interactive comment on “Seasonal distributions and fluxes of ^{210}Pb and ^{210}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}Po and ^{210}Pb , poorly understood, has been proposed especially in oligotrophic seawaters. Targeted researches would improve our better understanding of ^{210}Po and ^{210}Pb in such an environment. In this paper, the authors present a clear framework of seasonal variability of both ^{210}Po and ^{210}Pb in the whole water column in the South China Sea (SCS). They show the difference between ^{210}Po and ^{210}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}Po and ^{210}Pb exports. The findings of consistent ^{210}Pb fluxes and inconsistent ^{210}Po fluxes between sediment trap and radionuclide technique reveal the dominant control of biological activities over the disequilibrium between ^{210}Po and ^{210}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}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}Po excess in the subsurface waters is the additional difference in behavior from ^{210}Pb , as shown in Figure 6. This characteristic indirectly supports the close relation between ^{210}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}Po and ^{210}Pb in oligotrophic environments.

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

Figure 8, the legends of SS and NSS for ^{210}Pb and ^{210}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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