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Biogeosciences Discussions

Interactive comment on "Reviews and syntheses: ^{210}Pb-derived sediment and carbon accumulation rates in vegetated coastal ecosystems: setting the record straight" *by* Ariane Arias-Ortiz et al.

Anonymous Referee #4

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The review paper presented by Arias-Ortiz discuss the use of the 210Pb dating technique to estimate the rate of mass accumulation in vegetated coastal ecosystems. Such information is indeed very important in considering the significant role of vegetated coastal habitats (tidal marsh, mangrove, seagrass) as sinks of carbon. Over the last 150 years, 210Pb is the only tool that permits to calculate sediment and carbon accumulation rates (SAR/CAR) in such environments. However, the application of the 210Pb-based method is not tricky in these environments. The authors aim to illustrate the models usually applied to calculate SAR or MAR in these setting. This article is extremely timely as there is a growing interest in better estimate C source/sink. The authors are presenting in a correct way the principle and the conditions of the 210Pb

method. Although the article is mostly dedicated to the models, there are some recommendation on the 210Pb determination and a comment of the interest of additional time marker (like 137Cs) or normalisation. In fact I regrets that the authors do not develop the experimental section. Indeed, it would be of great interest to provide recommendations about sampling: core description, porosity determination etc. It is also important to precise more clearly the advantage of gamma counting compared to alpha counting. In addition to avoid chemistry step, gamma spectrometry has the major advantage to determined simultaneously 210Pb and its supported parent (226Ra), 137Cs, 228Th, 7Be, 40K among others I am surprised that the authors mentioned 228Th as a potential dating/bioturbation tracer. In such coastal environment, I usually use 228TH as 232Th its grandfather to trace the detrital fraction. It is a good way to normalize also radionuclide activities. I think it is also important to point out the need to well consider the samples. In the case of sediments presenting coarse fraction or vegetal debris, it could be useful to separate the fine sediment fraction, that supports 210Pb, from the other fractions (that dilute its activity). In fact it is the first step to do : how to obtain the best 210Pbxs profile depending of the sediment. It could help to reduce variability in the 210Pbxs profile. The authors need to develop this aspect. In fact I am convinced that some model adaptions are not required if sampling and measurements are done in an appropriate way (see figure panel D why measure with the sandy fraction).

Other comments: - the authors need to check the manuscrit in order to verify the terms and acronyms (like Db and not D for bioturbation) . - Page 2 line 24: "210Pb is not affected by interannual variability" : to moderate 210Pbxs fluxes could have some variability although moderate - Page 3 line 3: and subsequent fallout - Page 4 (and in all the text): be careful to use correctly concentration and activity - CIC model/ I disagree with the statement CIC is not appropriate. This model could be useful in some sediment core presenting event-deposit (like flood). Such deposits could be sand, but also fine sediments that could present lower 210Pbxs (compared to surrounding layers). In fact case, CIC could be useful to check dating when it is difficult to precisely define the thickness of such deposits. - page 7 type II: lower activities could be also

explained by dilution by roots for example, so it is important as indicated previously to provide recommendations for sampling. - 13 line 30-34: the presence of large OC concentration or vegetal (like leaves) could promote high concentration of Cs due to mobility. So care is required with 137Cs - page 15 line5-7: not clear, it seems there is a confusion between alpha (that requires to assume the rather constant 210Pb activities correspond to the supported 210Pb) and gamma (that determines both 210Pb and 226ra)).

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