

Interactive comment on “How significant is submarine groundwater discharge and its associated dissolved inorganic carbon in a river-dominated shelf system-the northern South China Sea?” by Q. Liu et al.

Anonymous Referee #3

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In presenting a large and comprehensive and somewhat complicated dataset on the quartet of Ra isotopes within the Pearl River Estuary and the Northern South China Sea, the authors make a useful contribution to the study of SGD. The general interpretation of the data is valid and the presentation of mixing models is useful. Meanwhile the discussion of the contribution of SGD to DIC is very important. I generally agree with the comments of reviewer number 2 in that the biggest issue is the end member problem, but this is a common theme across Ra studies. I believe this is an exciting contribution to the field, but there remain some items that seem confusing to me:

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1. Why do the authors use the surface 223/228 ratio as the initial activity ratio for understanding upwelling, rather than the deep offshore 223/228 ratio if this is the source of the water?
2. Quantification of SGD is hampered by the uncertainty in the endmember and therefore offshore SGD should not be quantified by a nearshore endmember but rather the Ra activity in offshore porewaters. However this data may be difficult to get.
3. Meanwhile the uncertainty surrounding the desorption of Ra from sediments cannot be understated in a system with high suspended sediment concentration. Therefore the authors should describe the SSC and perform some desorption studies within the system.
4. As stated by the first reviewer, the nutrient data seem to be extremely high. Given all of the uncertainty in the system surrounding endmembers, the authors should clearly state the assumptions in these numbers.
5. How does the fact that there was a major precipitation event directly before the sampling influence the numbers? Is it possible that this is the cause of the discrepancies in the short-lived Ra data? In other words did the increase in fresh surface water dilute the short-lived Ra isotope concentration compared to offshore waters past the plume?
6. Given that DIC is so important to this paper (see title) the authors should at least briefly describe the DIC data rather than just referring to previous articles, especially considering that JGR is not open access.
7. The figures and tables are generally good, but I do not understand what the crosses (plusses) are in Figure 5. Did I miss something?
8. The title is a little too long, can it be cut back

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