

***Interactive comment on* “Evaluation of flushing time, groundwater discharge and associated nutrient fluxes in Daya Bay, China” by Yan Zhang et al.**

Anonymous Referee #1

Received and published: 25 May 2018

The manuscript entitled “Evaluation of flushing time, groundwater discharge and associated fluxes in Daya Bay, China” presents the application of the different isotopes of radium for establishing an improved water budget of Daya bay in China. The authors calculated additional sources and sinks or radium based on several assumptions and partially new data to obtain a more complete overview of fluxes in the study area later applied for estimating the nutrient delivery to the bay. Daya Bay presents serious contamination issues connected with these processes and therefore it might be an interesting case study.

General comments:

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I have doubts about the novelty of this work since it has been published a similar article recently (Wang et al., 2018) . As an example, the title of the work published and this one are very similar indicating almost exactly the same content. I detail these concerns below.

The abstract and introduction point towards two objectives: (1) a global objective referring to models neglecting the effect of rivers, open sea water end member, sedimentary input atmospheric deposit and recirculated seawater and (2) a local objective associated with the improvement of the water budget and the delivery of nutrients to Daya Bay. Nevertheless, I think that the background information provided in both cases is not sufficient to show the relevance of the topics from a global perspective. If the manuscript pretends to show a progress in the application of the methodology, this should be described and presented in the introduction with references to previous studies applying these methods. The methodology applied is not something new and it would be needed to have a better introduction about what is the new contribution of this work. In principle, it seems that the method followed is just a replica of Zhang et al. (2017) in another bay. If the study is oriented to be a local improvement of the water budget in the studied region, previous studies in the area should be clearly presented and a discussion about what can be improved on them. There are data already published in this work that therefore should be properly cited as for example the ^{224}Ra distribution, salinity distribution or the nutrients information with very similar figures and graphs. New and previously published information should be clearly defined to evaluate the novel contribution of this work.

The explanations about the return nutrient fluxes that RSGD takes away from the sea and the overestimation of the nutrients via SGD should be better explained. A simple mention to previous published papers is not enough to understand the problem that requires to be solved. The authors should document better what are the reasons and processes that lead to them to think in this way.

Considering that nutrients samples vary 2 orders of magnitude (3-300 for NO_3), how

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reliable can be considered the estimations based on “the mean concentrations of nutrients”? For example, if I eliminate sample GW2, the arithmetic mean would be around half and that would approximate the results to the previous estimates of Wang et al (2018). Is the objective of the manuscript to provide a much better estimate of this value and not a similar one?.

Since one of the main objectives of the manuscript is to improve the knowledge about the water fluxes and nutrients fluxes in Daya Bay, a full comparison and discussion with previous estimates should be presented to have a more quantitative overview of the improvement acquired with this study. This would be also useful to evaluate the interest of this research as a case study and if enough novel content is presented to be published.

The differences in flushing time for the 7 cases presented are really small for the first 4 cases and it seems that it is only relevant for the connection with the sea and the RSGD, still along the text it is mentioned the impact of the rivers, sediments and atmospheric deposits as key elements for the Ra budget of the area. Seeing the results, this can sound inconsistent and especially since most of these calculations are based on generalizations/assumptions and not based on new collection of data (hence there is not new information other than the calculations).

Lines 181-188. The comparison between SFGD of different coastal systems using the discharge divided by the total area of the bay does not have a physical sense since the freshwater discharge is not taking place at distant locations from the shore. Also the climatic conditions (rain, evaporation) and the size of the catchment on land would be what would play a major role on these numbers, therefore I think that the matching of values is accidental and shouldn't be used as a reference of the quality of the calculations.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2018-207>, 2018.

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