

***Interactive comment on* “Estimating total alkalinity for coastal ocean acidification monitoring at regional to continental scales in Australian coastal waters” by Kimberlee Baldry et al.**

Anonymous Referee #2

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Review of the paper “Estimating total alkalinity for coastal ocean acidification monitoring at regional to continental scales in Australian coastal waters” by Kimberlee Baldry, Nick Hardman-Mountford, and Jim Greenwood, submitted to Biogeosciences for possible publication.

The manuscript “Estimating total alkalinity for coastal ocean acidification monitoring at regional to continental scales in Australian coastal waters” by K. Baldry and co-workers reports and discusses an approach to estimate total alkalinity (TA) in coastal waters with the intention to characterize vulnerability or resilience of such waters with respect to ocean acidification. The authors employ field data of TA and of further ocean water

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properties to derive a suite of models to parameterize TA. In summary I have serious concerns and reservations with the paper, such that I unfortunately cannot recommend publication of the paper at its present state. I do see some potential to improve the paper, however this would require a major overhaul of the paper. I hope the authors could make some use of my comments in order to do so.

1: In fact the paper stops, where it should start. As far as I understood the paper, the paper only takes TA and related properties to derive a suite of algorithms/models to re(!)compute TA. The following discussion then compares the TA computation with the observed TA, but nothing goes beyond the use to the variables, which have been used to train the regressions. Thus, there is no estimation of TA, so far it appears to be a recompilation only. I was searching for some time for the application of these regressions, which goes beyond training, and eventually discovered a 2-line statement about figure 6 – which is for illustrative purposes only? Frankly, what is the usefulness of a colorful figure for illustrative purposes?

In my view this is the point where the paper should start, including detailed validation with respect to data, including data, which have not been used to train the regressions. In essence, anything prior to figure 6 is an extended methods section.

2: The application of the newly obtained regressions to independent data is particularly relevant to such an approach, as the causal relationship between TA and the regression properties is not clear or even not given. The extrapolation of pure empirical relationships, i.e., regression coefficients, bears the massive risk, that these only hold true within their framework of training, or trained data. It might well be the case that the extrapolation does work very well, it could also be the opposite. Figure 6 should have been the first step to open this discussion.

Along these lines the justification or even explanation of regression parameters falls short, specifically with respect to the non-conservative parameters:

A: Amongst the most powerful characteristics of TA is its temperature INDEPEN-

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DENCE. Open ocean TA vs. temperature relationships are not much more than masked TA-depth relationships, if at all. If you refer to temperature as (partial) TA proxy, please explain and justify, why it is used. What about seasonality, and which processes does such a relationship mimic?

B: In a similar manner the used of Chla as partial TA proxy should be discussed. What thought does support this? Why are water column inventories used rather than actual concentrations? The satellites do not sense the water column inventory of Chla, they “see” the upper most layer? Also an important point to be considered here are the problems of remotely sensed Chla values in coastal waters (case 1 vs case 2 waters). The authors mention initially that Australia’ coastline spans 33degrees in latitude, which likely causes vastly different organic matter composition of such coastal waters.

C: The use of nitrate should be justified here as well. What does it stand for, maybe as runoiff proxy, or proxy for biological metabolism?

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