

**RC2:** 'Comment on essd-2023-325', Anonymous Referee #2, 06 Nov 2023

This paper offers a valuable dataset encompassing decadal marine inorganic carbon chemistry observations in the northern Gulf of Alaska (NGA). The NGA, with its diverse ecosystem, including significant commercial fisheries, serves as a crucial intersection for discussions on ocean acidification (OA) processes in high-latitude coastal waters. The assembled decadal time-series product presented in this study provides a resource for researchers aiming to comprehend OA under climate change, assess the drivers of coastal OA, and evaluate biogeochemical performance. The paper meticulously describes the dataset, covering aspects of data collection, quality control, and uncertainty estimations. While the overall presentation is robust, I have a few specific comments regarding the manuscript:

Major Comment:

why pH (even calculated values) is not included in this dataset.

We chose to include only measured variables in the data product. Users of the data product can choose to use CO2SYS, as we have demonstrated, or other packages, which include various input choices depending on the version history. Regarding input choices, work on dissociation constants is constantly being updated (e.g. [Waters et al., 2014](#)) and certain input variables are more appropriate for coastal data influenced by freshwater (e.g. [Millero et al., 2010](#)).

Minor Comments:

1. Clarify  $\Omega_A$  and  $\Omega_C$ , different forms of calcium carbonate mineral saturation state in Line 37, following the definition of  $\Omega$ , given their use in subsequent contexts. [Done.](#)
2. In Table 4,  $f\text{CO}_2$  and  $\Omega_A$  should be represented as calculated parameters, while TA and DIC should be indicated as measured variables. Please adjust the variable names in the first column accordingly. [Done.](#)
3. Please provide an explanation of how mean uncertainties in Table 4 were calculated (also mentioned in Line 251). If these uncertainties are derived from Equation (2), it would be helpful to present this equation earlier. Additionally, include a sentence explaining the mean uncertainty of calculated parameters. [Done.](#)
4. Section 2.4 of the Methods is not entirely clear. Specify whether  $f\text{CO}_2$  refers to sea surface  $f\text{CO}_2$ . It is confusing to add "not ocean-atmosphere flux" in Line 300 because the flux is typically represented by  $F\text{CO}_2$ . In addition, is  $f\text{CO}_2$  the same as

fCO<sub>2</sub>(ocean). Also, the subscripts of this session should be consistent. Some are subscripts (like T), and some are like annotations with/without “()”. [Done](#).

5. Line 317, What physical parameters? [Done](#).
6. Lines 330-337: Specify whether the 'top 50m' refers to the mixed layer depth. If this depth pertains to the mixed layer, clarify this term, as '50m' appears multiple times. When referring to surface water, it would be helpful to specify that it suggests the water mass above the mixed layer depth. [Done](#).
7. Line 393: The DOI link provided does work.

**Citation:** <https://doi.org/10.5194/essd-2023-325-RC2>