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Interactive comment on "A regional hindcast model simulating ecosystem dynamics, inorganic carbon chemistry and ocean acidification in the Gulf of Alaska" *by* Claudine Hauri et al.

Anonymous Referee #1

Received and published: 30 March 2020

General Comments:

This manuscript evaluates the performance of a new implementation of the ROMS model for the Gulf of Alaska region that includes ocean biogeochemistry and a high resolution terrestrial hydrological model. The article is well organized and the writing is clear. The authors evaluate model biogeochemical performance against a suite of observed parameters and dataset types. I have only minor comments for the authors to consider as well as a few technical corrections.

Specific Comments:

Is the model run time period (1980-2013?) noted explicitly anywhere?

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Page 6, Line 6: Does this mean that you do not correct tracer values for dilution effects caused by precipitation?

Figure 11: The TA/DIC colorbar seems to oppose intuition (high = red, low = blue).

Page 17, Line 9: The April pH range is 0.02 (8.08 to 8.10) while the August pH range is 0.09 (8.07 to 8.16). These values are not similar. The latter represents a 77% larger $[H^+]$ range, which agrees well with the 74% larger omega range in August than in April. As written, the manuscript text is not incorrect; however, it also does not precisely describe the differing chemical conditions (ranges) between months.

Section 5: This section is not very clear. I would avoid using "positive effect" and "negative effect" and instead state whether decreases in salinity lead to decreases or increases in the parameter of interest. Additionally, on Page 17, Line 12, you could summarize your finding to assist in clarifying the point: "Thus, the influence of salinity on pH works to counteract the influence of low TA/DIC freshwater input on pH such that the observed pH exhibits no correlation with the observed salinity."

Figure 12: August is a productive time period along the coastline based on Figure 3. Why then does "Biogeochemistry" in Figure 12 cause pCO_2 to be higher nearshore than offshore? Also, wouldn't "Mixing" with low TA/DIC freshwaters cause pCO_2 to increase relative to the offshore domain rather than decrease?

Page 21, Line 1: This should be altered to something like: "The observed seasonal relationships between omega, pH, and pCO_2 in freshwater influenced coastal waters off of Alaska are different from those found in other regions, such as the open ocean." The actual relationships in your domain are the same fundamental thermodynamic relationships that apply everywhere. The unique drivers in your domain lead to less commonly observed variations in these parameters, however.

Page 21, Line 4: You might consider adding a sentence similar to this one ("This decoupling. . .") to section 5.

Page 22, Line 2: Wouldn't this be "omega sensitive" organisms?

Page 22, Line 4: Can you provide a reference for the pteropod comment?

Technical Corrections:

Page 1, Line 17: Remove "simultaneously" or "also".

Figure 1: Text on the map is too small. Should there be blue regions on land?

Page 4, Line 24: This text indicates that the southeast model domain extends to the Canadian-US border but this is not shown in Figure 1. Southeast does not need to be capitalized.

Table 1: There seems to be an issue with the symbols. It was not immediately clear what the small text below the table had to do with the table. Perhaps if the scalers were listed just below (closer to) the Table, or different symbols were used, it would be more obvious.

Table 2: Does "very small number" mean the magnitude of number or the number of observations constraining the model?

Figure 2: Does it make more sense to compare the observations in this figure to the same years of model output rather than the full model climatology (1980-2013)?

Page 17, Line 12: In contrast, rather than in contrary.

Page 18, Line 1: In contrast, rather than in contrary.

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