Reviewer #1

Suggestions for revision or reasons for rejection

This study has improved. The authors organize and analyze the water temperature, salinity, DO, pH, and Chl-a data over Korea's coast. They suggest that primary production is the key to affecting pH, while other biogeochemical processes can also affect pH variations.

- ⇨ We sincerely appreciate your time and effort in reviewing our manuscript. Following the incorporation of the first-round reviewers' suggestions and corrections, the manuscript has undergone significant improvement beyond our initial expectations.
- ⇨ This study aims to establish a baseline for pH changes along the Korean coastal waters. The key finding is that there was no significant variation in pH, or in the other environmental parameters measured (except for temperature), throughout the study period. This suggests that pH and the other parameters in Korean coastal waters were not primarily influenced by atmospheric CO2 increase (or global climate crisis), at least, during the study period, but were likely affected by local factors, such as primary production and associated dissolved oxygen dynamics. However, with the accelerating pace of global warming, it is anticipated that pH in Korean coastal waters will be more significantly impacted by climate change in the near future.

Major comments:

"DO depletion %" is rarely used in marine or aquatic studies. Do the authors mean DO saturation? Line 298-Line 300 is the equation or not? I am not sure. How is this subtracting concentration converted to percentage? Equations are needed to clarify this.

- ⇨ We have added an equation to describe DO depletion (or AOU) in Method and Material section as well as in the caption of Fig 6 for DO depletion (%), which represents the proportion of the difference between the dissolved oxygen (DO) concentration at saturation and the in situ DO concentration, relative to the saturation concentration. Since DO saturation is a function of temperature and

salinity, saturation concentrations vary on daily and seasonal timescales. Thus, relying solely on DO concentration comparisons may not accurately reflect actual oxygen consumption. In this context, DO depletion (or consumption) provides a more precise measure of oxygen consumption driven by biological activity (e.g., respiration), which is directly associated with CO2 release and pH variations. Furthermore, expressing DO consumption (or depletion) as a concentration (e.g., in molarity units) may not adequately reflect the severity or extent of oxygen depletion. For instance, during summer, when high temperatures and salinity reduce DO solubility, a lower DO depletion concentration may still indicate significant oxygen consumption. Additionally, we observed that the term DO depletion (either as a percentage or concentration) is used under various names, such as apparent oxygen utilization (AOU). Therefore, we believe that using the term "DO depletion (%)" in this manuscript is the most appropriate way to describe our dataset and its interpretation.

Line 168-170: While the local processes may vary, can authors estimate if this study underestimates or overestimates their pH results by following this assumption?

- ⇨ We clarify the senstence. Biological activities, such as respiration, release CO2, which leads to an increase in [H+] and consequently a decrease in pH. However, in shallow coastal environments, not all of the released CO2 remains in the water column; a portion may escape into the atmosphere through air-sea gas exchange via diffusion, wind, and wave action. As a result, our assumption may overestimate the extent of pH decrease.

Minor comments

Line 326, "DO" alone or "biogenic DO changes" can affect pH?

- ⇨ In the context of cluster analysis, DO alone may be more suitable, as variations in DO result not only from biological production but also from changes in temperature and salinity.

L332-334 These words should be modified as the authors have cited several references to indicate that this pH reduction is nearly 0.0016 per year.

⇨ Thank you for your suggestion. The sentence has been revised to: "...which results in a pH decrease of approximately 0.002 per year (Solomon et al., 2007)."

Line 369-373: A few references are needed to support these two sentences.

⇨ We added several references that were already cited in this manuscript:
Kroeker et al. (2013), Impacts of ocean acidification on marine organisms: quantifying sensitivities and interaction with warming. Global Change Biology, 19(6), 11881-1896.
Lowe, A. T., Bos, J., & Ruesink, J. (2019). Ecosystem metabolism drives pH variability and modulates long-term ocean acidification in the Northeast Pacific coastal ocean. Scientific Reports, 9(1), 963.
Breitburg, D., Levin, L. A., Oschlies, A., Grégoire, M., Chavez, F. P., Conley, D. J., ... & Zhang, J. (2018). Declining oxygen in the global ocean and coastal waters. Science, 359(6371), eaam7240.

⇨ They are discussing about the impact of pH on fish and shellfish (Kroeker et al., 2013; Lowe et al., 2019) and global ocean warming on pH variation (Breitburg et al., 2018).

Line 450, 493, lowercase for 2 and 3

⇨ Thanks for pointing this out. Corrected.

Figure 7. Use dark open circles as the markers.

⇨ Corrected as suggested.

Figure 5. The lowest label on panel B on the Y-axis is missing.

⇨ Thanks for pointing this out. Corrected.

The overall quality of these figures should be improved.

⇨ We have thoroughly reviewed the figure and made several adjustments.

Figure titles are missing except for Figure 1, which lacks real figure captions.

⇨ We included figure titles.