Biogeosciences Discussions

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# Comment on bg-2021-358

Anonymous Referee #2

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Referee comment on "Interannual variabilities, long-term trends, and regulating factors of low-oxygen conditions in the coastal waters off Hong Kong" by Zheng Chen et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2021-358-RC2, 2022

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The manuscript by Chen et al. provides data analysis (mostly statistical) of the water quality observations in the southeastern part of the Pearl River Estuary (PRE). Several recent studies, such as Hu et al., 2021, and Li et al., 2021, about the de-oxygenation problems in this region, provide background and justification of hypoxia-related study in PRE. Nevertheless, I feel this manuscript fails to connect the new data with the findings of these existing studies and covers only a small portion of the PRE; thus, its potential to convey what can be learned from a regional study to a broader audience is limited.

A critical flaw of this study is the representativeness of the stations that all statistical analyses are built upon. I acknowledge these are valuable (30 yr) monthly data covered by these stations, yet their spatial coverage is mainly surrounding the Hongkong island; it is a challenge to draw any solid conclusion regarding the PRE, even the east part, without a throughout cross-reference with the model and data by the previously mentioned two studies. Instead of using these stations to refer to east PRE, I would say the author should do the opposite—to provide a possible water quality study of the Hongkong coast with impacts from the PRE.

Built on the above point, I see in line 103 (page 4), "the observed DO profiles were interpolated by MATLAB along with the three subregions with a grid resolution of 600 m (length) â□□0.3 m (depth)." But take a look at the distribution of the stations; they are concentrated mainly in the nearshore area surrounding Hongkong; I doubt they can be representative of the condition in the east part of the PRE (e.g., the ECTZ defined by Li et al., 2021). And any conclusion based on such "hypoxia area" analysis (e.g., Fig. 4 ) is thus questionable. In addition, the water depth of these stations varies from 5 m to more than 30m, and the analysis in this manuscript concentrated mostly surface and bottom, which impair the reliability of such analysis in the de-oxygenation study, which is very sensitive to water depth and vertical distribution of variables.

In the abstract, the author indicated that "there is still a lack of quantitative

understanding of the long-term trends and interannual variabilities in oxygen conditions in the PRE as well as the driving factors, which was comprehensively investigated in this study," which I could not agree, I think Hu et al. and Li et al. provided good studies about the mechanism of oxygen dynamics in the PRE. Yet, this manuscript fails to connect what is observed by the stations surrounding Hongkong to what has been reported in a larger geospatial content (PRE and coastal/shelf water).

The author uses wind speed in their statistic analysis which is also questionable. How about wind direction, and does the wind play the same role in low oxygen development over a year? I am asking because Li et al. (2021) indicated that both wind direction and intensity influenced the circulation nutrient flux, detritus, and vertical mixing. Also, as suggested by Li et al., 2021, what is the role of shelf circulation in physics (mixing, etc.) and nutrient and sediment delivery? Li et al. (2021) and Feng et al. (2014) show that the upwelling and downwelling favorable wind condition has different impacts on the low-oxygen development in this area. It is problematic to use the monthly mean wind speed as a predictor without looking into wind's detailed role in this environment.

The author's conclusion that the eastern PRE would "develop into a severe hypoxic state within the next two decades" is too strong to be supported by the analysis provided by this study. For instance, what do the wind, large-scale circulation (cause it affects lateral delivery of water and nutrient, etc.), and river (Pearl plus wastewater from the city) look like in the next two decades? The Pearl River discharged into the PRE from the north, yet if we focus on the spatial scale covered by the stations in this study, what is Pearl River's role in MM stations? Also, what is the impact of overland runoff from Hongkong, such as wastewater discharge, which is also indicated by Hu et al. (2021), and the author briefly mentioned this in Line 250 of page 8.