Comments on "Multiple mechanisms for chlorophyll-a concentration variations in coastal upwelling regions: A case study east of Hainan Island in the South China Sea" by Junyi Li et al.

The manuscript is well structured and the figures are clear. In this work, the authors investigated various mechanisms behind the spatiotemporal variability in chlorophyll-a (Chl-a) concentrations east of Hainan Island using multiple satellite and *in situ* observations. Statistical analyses indicated that southwestward along-shelf coastal currents and river runoff, rather than wind-driven coastal upwelling, regulate the variability of Chl-a concentration. Additionally, the study pointed out that the Chl-a variability has a negative (positive) correlation with El Nino (La Nina) events. In general, the study gives significant insights into mechanisms for the Chl-a variability in this region. However, some results and conclusions are not convincing. My comments are listed below.

Major comments

1. The methods of EOF analysis and trend estimation were not presented in Section "Materials and methods".
2. Why did the authors use two wind datasets? the results related to the surface wind are merged from the two datasets? If so, it should be mentioned in the text.
3. Linear trends of wind upwelling index (UI), wind stress curl, SST and upwelling areas were estimated without assessing statistical significance of the trends. The trends of SST, wind stress curl and upwelling areas might be insignificant in statistics because the r coefficients are small. Also note that the decreasing trend of UI from 2003-2020 was not presented in Fig. 2a.
4. Line 223-230: "Comparing the time series of Chl-a concentration shown in Figure 3 to the time series of upwelling characteristics shown in Figure 2, one can see that low UI values coincide with high Chl-a concentration in the UEH, and vice versa…". For the sake of visual comparison, the time series of Chl-a concentration and UI should be presented in the same figure. On the other hand, to gain a convincing result the out-of-phase relationship between the two time series should also be quantified.
5. Line 470-490. "In the upwelling season, i.e., summer, the wind stress was smaller during El Nino events (Table 2) than during La Nina events (Figure 2a)...". I am confused. Previous studies (e.g. Wang et al (2001), Fang et al (2006), Huynh et al (2020)) showed that an anomalous anticyclone (cyclone) develops over the western North Pacific during El Nino (La Nina) years and the summer southwesterly surface wind in the northwestern South China Sea can be enhanced after the El Nino peak. In Fig 2a, one can observe that the UI increased in 2005, 2010, and 2019, which correspond with the 2004-2005, 2009-2010 and 2018-2019 El Nino events. Therefore, the statement that the wind stress was smaller in the upwelling season during El Nino events might be incorrect. Did the authors discuss the relationships between Chl-a/wind stress and ENSO during the developing phase of ENSO, i.e. before ENSO peaks?
6. Line 496-499."The Chl-a concentration in summer was mainly regulated by upwelling processes (Jing et al., 2011), with a negative correlation (Figures 2–3). Therefore, the increased precipitation and weaker upwelling processes could have

induced the increased Chl-a concentration in the HEC (upward arrow in Figure 12)." Why does the summer upwelling have a negative correlation with the Chl-a concentration in the HEC?

7. Line 533-536. "There was a positive correlation between the Chl-a anomalies and the La Nina events…". The quantitative correlation between Chl-a and ENSO should be estimated.

Minor comments

1. Line 182-189. The caption does not totally correspond to Fig. 2.
2. Line 215. Change "climatologic" to "climatological"
3. Line 244-246. "... (d) euphotic depth and TSS in the study area…" should be "...(d) euphotic depth, TSS and Chl-a concentration in the study area…"
4. Line 227-228. "Moreover, one can see that the Chl-a concentration is unexpectedly low in the upwelling season, as shown in Figures 2a-b" should be "... in Fig. 3"
5. Line 484-485. An El Nino (La Nina) often takes place between two calendar years. However, most of the El Ninos listed in Table 1 are single year events, for example the 2015 El Nino which actually occurred from October 2014 to April 2016 (https://origin.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ONI_v5.php). Please correct the data in Table 1.

References

1. Fang, G., Chen, H., Wei, Z., Wang, Y., Wang, X., and Li, C. (2006), Trends and interannual variability of the South China Sea surface winds, surface height, and surface temperature in the recent decade, *J. Geophys. Res.*, 111, C11S16, doi:10.1029/2005JC003276.
2. Huynh, HN.T., Alvera-Azcárate, A., and Beckers, JM. Analysis of surface chlorophyll-a associated with sea surface temperature and surface wind in the South China Sea. *Ocean Dynamics* 70, 139–161 (2020). https://doi.org/10.1007/s10236-019-01308-9
3. Wang, Y., Wang, B., Jo, J.H., 2001. Impact of the preceding El Nino on the East Asian summer atmospheric circulation. *Journal of the Meteorological Society of Japan* 79, 575–588, https://doi.org/10.2151/jmsj.79.575