

Interactive comment on “Can we use sea surface temperature and productivity proxy records to reconstruct Ekman Upwelling?” by Anson Cheung et al.

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Cheung et al. analyzed modern satellite observations to address the question of whether records preserved in marine sediments can be used to reconstruct Ekman Upwelling in Earth’s history. This paper is well written. Deep-water upwelling is important in regulating global climate and biogeochemical cycles, and understanding the modern, instrumental records is paramount for paleo-applications. The take home message is that multi-site and multi-variable reconstructions are the preferred way of evaluation ancient upwelling. I’d like to see more studies like this published on Climate of the Past, and recommend publication of this manuscript after addressing a few

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comments.

I understand that the available satellite-based observations include SSTs, chlorophyll-a and alongshore wind stress. And the authors realized that these factors do not directly translate into proxy-derived information ("Although CHL does not equate precisely to primary productivity, and also differs from productivity inferred from proxy records"), I'd appreciate more elaborations on how to build connections between these two types of variables. Anyhow, this is a ms for *Climate of the Past*, and the audience would want to know.

For example, SST would be less of a problem. But common proxies for productivity (e.g., Ba, opal accumulation etc) are actually looking at export productivity. How are they expected to be different from CHL data and are they better in tracking upwelling? Also, I know that one paper cannot address everything, but recent studies have suggested that the carbon cycle might be more sensitive than SSTs to equatorial upwelling (Keller et al., 2015, GRL). Zhang et al., (2017, EPSL) used air-sea disequilibria of CO₂ and export production to infer deep-water upwelling in the eastern equatorial upwelling, which reached very different conclusions from the SST results. Can this modern study weigh in to help people disentangle what is "upwelling" and what is not from the sediment data?

There are a few other issues. For examples, I'm also confused like the other Referee about how Fig. 8-10, the pseudo-proxy time-series were generated.

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