

Earth Syst. Dynam. Discuss., referee comment RC1  
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## **Comment on esd-2021-75**

Anonymous Referee #1

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Referee comment on "Consistent coupled total cloud cover – sea surface temperature footprints linked to Pacific climate modes" by Petru Vaideanu et al., Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2021-75-RC1>, 2021

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### **Review of “Dominant influence of Pacific climate modes on global observed and reanalysis cloud cover fields” by Petru Vaideanu et al.**

The authors use Empirical Orthogonal Functions (EOFs) and Canonical Correlation Analysis (CCA) to explore patterns of variability and covariability mainly between sea surface temperatures and total cloud coverage. The results show coherent patterns of co-variability between SST and cloud patterns typical for Central and Eastern Pacific ENSO events, respectively. The manuscript also includes relationships of ENSO variability with other variables such as precipitation, mean sea level pressure, and winds. Lastly, CCA patterns obtained from temporally smoothed data are shown, which show some resemblance of the impact of Pacific Decadal Oscillation on clouds.

There are some unclarities concerning the methodology (Are all involved fields deseasonalized and detrended? What kind of temporal smoothing is applied for the results presented in Figs 2-4? Is the CCA applied to the full spatial fields or to a set of PCs derived from the EOF analysis?), but the results look reasonable. However, I have two more major difficulties with this study: first, it presents a very limited set of diagnostics (3 out of 6 figures show the same diagnostic using different data sets). Second, and this is the biggest problem, the results are not novel at all. There is a huge body of literature documenting the response of various atmospheric fields (including clouds) to ENSO. While probably not many studies have applied CCA to this very specific question (how do SSTs and clouds co-vary?), the method does not reveal anything new.

One example for ENSO-related cloud variability is Wang et al (2015), which in fact includes more up-to-date obs-data (e.g. CERES) than the present manuscript. An example for PDO-related variability of atmospheric quantities is Chen et al. (2019) (using obs and models). A quick online search brought many more papers with similar topics.

The authors do not claim that their results show much new beyond the state of the science, but scientific novelty is nevertheless a criterion for publication in ESD (see criterion 2 here: [https://www.earth-system-dynamics.net/peer\\_review/review\\_criteria.html](https://www.earth-system-dynamics.net/peer_review/review_criteria.html)). I hence have to recommend to reject this manuscript.

I would like to mention that there are journals that only require soundness of methods for publication (e.g. Scientific Reports), which the authors may consider as an option.

### **References:**

Chen, Y. J., Hwang, Y. T., Zelinka, M. D., & Zhou, C. (2019). Distinct patterns of cloud changes associated with decadal variability and their contribution to observed cloud cover trends. *Journal of Climate*, 32(21), 7281-7301.

Wang, H., and W. Su (2015), The ENSO effects on tropical clouds and top-of-atmosphere cloud radiative effects in CMIP5 models, *J. Geophys. Res. Atmos.*, 120, 4443-4465, doi:10.1002/2014JD022337.