

Recommendation:

General comments: The authors are attempting to show how total column water vapor (TCWV) can be used to reveal the presence of atmospheric teleconnections seen in other datasets. This method is certainly interesting and could be of value, at least in the context of demonstrating the utility of TCWV in revealing existing teleconnections. However, the presentation in this paper was extremely difficult to follow as the authors jumped from one analysis to another with no clear direction as to why. There were many different technical approaches employed within this study, and while these likely have value in the context of what the authors' research goals are, the reasons for using the methods they employ were not well established. Further, the authors state early in the study that they are going to compare the results with similar results from pressure, temperature, etc. fields more traditionally utilized in teleconnection studies. I did not see these comparisons. In general, the authors focused too heavily on the significance of the relationship between their empirical estimates of the TCWV using the teleconnection index and the TCWV itself. It read more like a study attempting to predict monthly TCWV using teleconnections, not a study linking TCWV to teleconnections. Either the study should be reframed in that context or the authors need to do a better job of linking their results back to the teleconnections they are trying to predict. Which teleconnections were predicted well? Which were predicted poorly? Why? Such discussion was absent from this study and seems directly relevant to the research objectives outlined therein.

Specific comments:

Most of the work done in PCA-based teleconnection studies in pressure/geopotential height is confined to midlatitude and Arctic regions in the Northern Hemisphere owing to the barotropic conditions in the tropical latitudes. This should be better specified by the authors.

If multiple indices characterizing the same phenomena exist (e.g. MJO, ENSO), why include them all? How do you reconcile the differences in how those indices are characterizing their teleconnection and relate those differences back to your results? (Lines 135-137).

In the fit functions, how were the quantities  $c$  and  $b$  determined? Were they based on a fit with the satellite data, the ERA, etc.? Nothing is provided in the text in this regard.

The authors discuss the use of "reversed datasets" in section 5.1. However, they provide no discussion of what was reversed. Was it just the teleconnection time series? Was it the TCWV time series? Were they reversed in time? Did you just reverse the index numbers directly, as is done frequently in pattern recognition and database type work? I don't see why, if the reverse was temporal, why the correlations didn't simply change sign but remain the same magnitude. The authors need to provide a lot more explanation on this aspect of their study as they do not really describe it in much detail. Why did you do this?

The main crux of what the authors were doing here was attempting to show significance of fit between teleconnection indices and the water vapor datasets they employ. However, while the fits may be "significant", how much of that is a result of sample size and how much is a result of the true quality of fit? In other words, how "good" are those fits? What are the  $R^2$  values for those fits? A model can have

a significant fit with a very low variance explained result if the sample size is large enough. It is unclear how the “significance” of the results tie into the quality of the fit and the RMS values themselves.

In section 8 the authors state they “orthogonalized” their indices. What method was used to do this? Why did they do this?

Technical corrections:

The e.g. on line 51 can be removed.

What is a “time series like index”? (Line 78)

In Figures A1 and A2, are the times over which these averages were computed the same 1995-2015 time period? The ERA have a longer period of record so it would be good to specify this.

It is not clear why Figure A3 is included in the text. There are too many time series and their individual value in the study is not clear.

Figure A4 is almost impossible to read. There should be a compelling reason why this figure is included in the text as it includes well over 200 maps. The authors should choose which of those figures best illustrate their point and include those instead of including them all.