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Review of the Manuscript "A Waveform Skewness Index for Measuring Time Series

Nonlinearity and its Applications to the ENSO-Indian Monsoon Relationship" by Justin SchulteSchulte et al.

The authors propose a new measure for nonlinearity using waveform index.The paper is well written and informative. Indeed, the paper is of great interest to NPG readers. But before acceptance, the authors should provide valid responses for the following comments. There are several other nonlinearity measures available, and the author can use them to compare the results. Page 2, lines1-2, there could several other manifestations of the nonlinearity in a time series, may measure such as transfer entropy could capture them.

The reviewer offers several useful and appropriate suggestions for refining the methods used to identify associations between ENSO and Indian rainfall. We quite agree with the spirit of these comments. In this case, however, we specifically intend for this paper to respond to an active debate in the literature regarding the randomness vs. non-randomness of shifting ENSO-Monsoon relationships. As this literature has generally used linear correlation methods to diagnose associations and has considered generalized indicators of monsoon strength like All-India Rainfall (AIR), we feel it is important to hew to these established approaches wherever possible. We want for this paper to be as accessible as possible for researchers in this field, and for our results to be readily comparable to other studies. In the revised manuscript we will add text to the introduction to make this motivation clear. Specific reviewer recommendations on statistical approaches will also be addressed in the text, as noted in our responses to specific comments below.

3. Page 8 lines 1-2, it is not clear, please elaborate 4. Fig 6 and 7, state the reasons why the authors have chosen 10 and 20 year sliding window.

The authors agree that some justification for the selection of the 10-year and 20-year intervals are needed. The main reason why we used the 20-year segments is because that interval length is close to that used in previous works whose focus was on the AIR-ENSO relationship. The 10-year sliding interval was chosen because it is half of the 20-year interval. Although the main conclusions of our results do not change if other interval lengths are chosen, we will note in the revised manuscript that other interval lengths were considered.

5. The authors have used correlation and sliding correlation to measure the relationship between the nonlinearity in ENSO and AIR anomalies, they could have very well used other measures such as mutual information. That would be more appropriate.

While the authors agree that there are other ways of measuring the association between two variables, correlation is the most frequent way AIR has been related to ENSO in the debate about the randomness of the AIR-ENSO relationship. As such, the authors feel that using the more common correlation method would allow researchers to more directly compare our results to those of previous works.

6. The author have chosen AIR for the analysis, many studies have shown that the relationship between ENSO and indian rainfall is spatially variable, in that context how the application of AIR is justified and the results are meaningful.

Although the authors agree that considering the spatial variability is necessary for all full understanding of the Indian monsoon, the inclusion of a spatial variability analysis is beyond the scope of the paper. This study is focused on the well-studied relationship between AIR and ENSO and contributes to the ongoing debate about the randomness of the AIR-ENSO relationship. However, because the omittance of a spatial variability does represent an important limitation of the study, a dedicated discussion of the limitation will be added to the discussion section of the revised manuscript.

Other minor comments, The author refer to the paper Schulte 2020 many times in the introduction, but I could not find it in the references Please correct the Eq.4 denominator.

Thank you for the identifying the reference issue. The reference issue will be corrected in the revised manuscript.