Hydrology and
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Discussions

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Interactive comment on "A Skewed perspective of the Indian rainfall-ENSO Relationship" *by* Justin Schulte et al.

Anonymous Referee #2

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GENERAL COMMENTS The manuscript investigates the relationship between rainfall and ENSO index using wavelet analysis and a wavelet coherence method is proposed to explain the changes of temporal correlation between two time series. The topic of the study is interesting may be outside the scope of the journal. This appears more so as almost all references are from climate journals where this paper sits more naturally. I think this paper should be withdrawn and submitted to an appropriate climate journal, or else reformatted to represent better arguments as to why it is of interest to hydrology directly. I have, however, read through the paper and have some comments that may help the authors publish this succesfully.

COMMENT1: Section 2, the way authors computed the monthly anomaly by subtracting the data from the whole period is not the recommended and standard way. It is

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recommended by WMO that a fixed reference period is defined as the 30-year period 1 January 1961 to 31 December 1990. Authors should consider use this as baseline period, especially when compared SST and Nino indices over different regions. COMMENT2: Section 3.1, there is no such Reference Schulte and Lee (2019). More importantly, the reason of adapting Event Decomposition is not well explained and how it helps quantifying the nonlinearity (i.e. skewness) of rainfall and ENSO index is not demonstrated. In the end of Method section, authors considered a synthetic example to illustrate the concept of nonlinear coherence using original time series but following your methodology it should be transformed to event spectra before calculating the coherence. The impact of Event Decomposition on the wavelet analysis and coherency is unknown. COMMENT3: Section 4.2, the relation between skewness and correlation is not explicitly demonstrated. There is a sharp decrease of skewness of June-September rainfall around 1991. Is there any particular reason? And what is the implication of this change? "A comparison of Figures 5a and Figures 5c reveals that the weakening and reversal of the relationship occurs during the time period when the Niño 1+2 index is especially skewed, suggesting that ENSO skewness changes could be contributing to changes in the time-domain correlation between ENSO and All-India rainfall. " This conclusion is in doubt, Figure 5a doesn't include the skewness of August-September rainfall. COMMENT4: Section 4.2 and 4.3, through the global and local auto-bicoherence analysis, they show the nonlinearity of ENSO indices and India rainfall in the frequency and spatial space individually. But how these two related to each other, authors do not explain explicitly. Using the nonlinear wavelet coherence method to test your hypothesis should be the major contribution of your work, however it is only briefly discussed in the very end of Section 4.3.2. There are lots of redundant information in the manuscript, which makes the paper long and difficult to read.

SPECIFIC POINTS: 1. EL Nino or El Nino, please keep it consistent throughout the paper. 2. Line 104, keep the numbering format consistent. 3. Please have a careful look of the format of your references. 4. Line 274, keep the equation numbering format consistent. 5: Line 175, Because theory supports a casual link...Authors do

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not explain this point well. Does strong coherence or association mean causality in nonlinear system? More details are needed. 6. Figure 7, what monsoon rainfall is used, full monsoon or late monsoon? 7. Line 447, what is the abbreviation of AIR standing for? 8. Line 135-137, keep the font format consistent.

I recommend authors to do a search on [hydrology and wavelets and precipitation and "el Nino"] or maybe "low frequency variability" and see how they have established the link of their paper to the hydrology audience they are presenting to. It may give authors a good idea of how they could improve their pitch.