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Interactive comment on "Contribution of low-frequency climatic/oceanic oscillations to streamflow variability in small, coastal rivers of the Sierra Nevada de Santa Marta (Colombia)" *by* Juan Camilo Restrepo et al.

Anonymous Referee #1

Received and published: 21 January 2019

A review of the paper "Contribution of low-frequency climatic/ocean oscillations to stemflow variability in small, coastal rivers of the Sierra Nevada de Santa Marta (Colombia)" by Juan Camilo Restrepo, Aldemar Higgins, Jaime Escobar, Silvio Ospino and Natalia Hoyos.

The present manuscript addresses an important and current subject in Hydrology. The influence of large-scale oceanographic/atmospheric processes on streamflow variability is a research question of high importance in Hydrology. The understanding of how low-frequency oscillations identified in climate indices can drive the variability in the

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flow regime in rivers allows us to count on a valuable tool for the construction of statistical models. Spectral analysis was undertaken to determine the nature and magnitude of the relationship between monthly streamflow of 6 rivers and large-scale atmospheric/oceanographic circulation patterns. The study focused on basins that have special characteristics, are small, tropical, coastal mountain rivers localized in Colombia. Continuous wavelet transform and Hilbert Huang transform were the methods selected to identify the modes of variability in the rivers and climatic/oceanographic indices. Cross-wavelet analysis and wavelet coherence that are powerful methods for testing a proposed linkage between two time series were also used by the authors in the paper. The results exhibit that streamflow variability are strong associated with modes of variability in the Atlantic Meridional Oscillation (AMO), Pacific Decadal Oscillation (PDO) and Tropical North Atlantic (TNA).

Due to the complexity that can exist in the teleconnection between climatic indices and flow regime in a river the authors selected the appropriate tools. The tools selected to carry out the study, allows to overcome the problem of linear analysis when evaluating the relationship between low-frequency phenomena and streamflow variability of rivers.

The manuscript is reasonable well-structured, the methods are well described, and the research is within the scope of HESS. However, the manuscript requires a more in-depth discussion of the results and it is necessary to be incorporated some missing important information.

The paper deserves to be published on Hydrological and Earth Science Systems, after some minor changes. I am reporting below some specific comments, which I hope the authors will find useful while revising their manuscript.

Comments:

It's necessary to highlight the novelty of the work because it's no clear. If this work would not be published, what would the international hydrology community miss? Novelty can reside in a new data set which is of importance to the international hydrology

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community, in new methodological development, in new conceptual ideas or novel interpretation and insights. The paper applies established methods and it follows the ideas that many papers have developed/applied. The conclusions seem not to add new findings to the already existing knowledge.

I recommend that the authors specify the type of regimen (natural or altered) in the flow gauge stations. This point is highly important for the results.

It's important to know if the flow gauge stations are in the upper, middle or lower part of the basins. I recommend that the authors should incorporate the spatial location of flow gauging stations in Figure 1A.

Wavelet power relations and phase relations between monthly streamïňĆow of the rivers and large-scale circulation patterns are relatively stable in the longer periods (> 2 years band) and are very unstable in the shorter periods (< 2 year band). This can demonstrate that from longer periods, the monthly streamïňĆow could be controlled by the slowly changing climate. During shorter periods, the monthly streamflow is not only controlled by large-scale ocean–atmosphere patterns.

One point that is not discussed in depth in the results is the phase changes in the relationship between the time series of flows and the climatic indices. The phase relationship between climatic indices and streamflow is changing in shorter and longer periods. The different phase relationships between AMO, TNA and PDO and monthly streamïňĆow could be show the different inïňĆuences of variables of the atmospheric system.

It's necessary and very helpful for readers to indicate in the cross-wavelet transform and squared wavelet coherence that the relative phase relationship is shown by dark arrows.

Due to the short length of the flow gauge stations records, it is risky to explore the statistical presence of decadal oscillations. Specifically, the variability mode C8, which

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do not seem to have enough statistic evidence.

Page 3, line 23: ". . ...which was designated a RAMSAR site because. . ..." What is the meaning of RAMSAR?

Page 5, line 34: "Data series with a non-normal distribution were transformed prior to applying . . .. . ." What type of transformation was used?

The research results of this paper present apparent opportunities for improving forecasting of streamïňĆow along the coastal rivers of the Sierra Nevada de Santa Marta, which, in turn, will improve water resources management.

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