

## ***Interactive comment on “On the data-driven inference of modulatory networks in climate science: an application to West African rainfall” by D. L. González II et al.***

**D. Erickson (Referee)**

d.j.erickson@tds.net

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May 24, 2014 Review of “On the data-driven inference of modulatory networks in climate science: an application to West African rainfall” by Gonzalez et al. General comments: This contribution employs a portfolio of statistical approaches including LASSO, CHARM and Dynamic Bayesian networks that are applied to climate data sets. The aim of this manuscript is to apply novel statistical techniques that have been developed and utilized on many domain applications and are extended here to issues of climate. These approaches are sequentially applied to a set of fixed climate data sets obtained from various climate data centers. There is an assessment of the pathway significance

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and computational complexity of each of these 3 approaches. Then after individual analysis of these independent approaches, they are fused into a merged approach. For some reason lots of italicized words are used. The observational and climate-derived descriptors such as quantified models of climate variability are examined within the context of the interestingness of the relationships between the independent methods of CHARM, Bayesian, LASSO and the fused model. The new approaches employed here reinforces some, if not much, of the conclusions derived from more classical climate statistical analysis. Modes of variability and correlation apportionment of those modes of variability identify the IOD, ENSO, MSEA and AMO via various applications of the individual 3 modeling approaches as well as in the fused model. As is common, causal relationships suggested but not yet derived and explained. Promising discoveries await and the use of the algorithms identified here on a suite of climate variables and indices may prove useful. It is suggested that an approach that follows from this work be employed for a full data sweep of climate model Big Data output on the order of a Peta-byte.

Specific comments: Sahel rainfall was studied here and many other climate process could be examined. Perhaps different climate variable time series and spatial series could be optimized for each of the Bayesian, CHARM and LASSO. Perhaps depending on the spatial temporal characteristics of a variety of climate variables one may find that different of the 3 approaches work better under different circumstances...ie Sahel rainfall may be better characterized by LASSO and Siberian drought better characterized by CHARM. More specific comments emerge from the Technical comments below. Technical comments: CHARM p. 480 What are the ‘promising discoveries’ mentioned in the abstract. These should be specifically stated in the abstract. p. 481 Not sure that the Sahel rainfall, or anomaly thereof, is a ‘functional response’. It could be a driver not a response. Why does meningitis epidemic occur when dry? What about wet season epidemics? Could this manuscript take this thread further and make some predictions/e of how meningitis may evolve as the climate variables and modes of variability? p. 482 The ECI score is mentioned here but does not seem central to this

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manuscript. p. 483 The use of italics is over done, and seems to indicate a desire to come up with some new 'term' for a variability model in statistics and/or climate. .... Well, on line 1-14, what are those previously-undiscovered relationships??? p. 484

So, is there support of a climate relationship with antecedent climate variables? Lines 26-27 are an understatement. p. 485 Miss-aligned is not the correct term. Parts of the globe are not miss-aligned. Algorithms used to examine different parts of the globe may be miss-aligned for the climate domain usage. Figure 3 and the associated caption pretty much sums it up. p. 486 Every, before and relationships in lines 14-15 do not to be italicized. p. 487 The definitions attributed to NOAA are arbitrary. Not set in stone or convention defined. Interestingness is a great word in usage and intent. p. 488 Possibly does not need italics. But multiple inciters is exactly what geophysically is going on. p. 489 Itemsets, inciters and should be defined. Many things are embarrassingly parallel. p. 490 Stronger physical rationale of what??? p. 491 Lines 17-23 are only temporal issues? No space component? p. 492 What is temporally-infeasible edges? p. 493 Is there an example of a DAG? p. 494 Lines 1-21 could be recast so a domain scientist could move forward and understand the specific methodology implied. p. 495 Not sure what was not available from NCAR. I bet it is there in some form or manner but immersed in a vast amount of other data. p. 496 A further, detailed definition of an 'EATL8 coupling inciter' would be useful. p. 497 So, Sahel Rainfall variability is correlated, or related to the NAO. Thus has been reported. So, these new CHARM techniques reproduce and confirm earlier studies. What is the new Geophysical Insight?? p. 498 So an increase in edges means more cumulative knowledge when the fused technique is used than individual models/apporahce. I guess that that is good. p. 499 Information fusion is normally useful since there are more constraints on the simulated result and the positive geophysical interpretation gleaned usually outweighs the new negatives introduced. Not always. p. 500 More geophysically germane conclusions and specific climate-related scientific advancement should be high-lighted. This manuscript would have benefited greatly by a more detailed and intense interaction with climate domain scientists.

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Does the paper contain new and significant results? Yes. Is the paper of an international standard? Yes. Is the presentation clear and concise? More or less. Conclusions could be more geophysically relevant and convey that knowledge discovery on climate science. Does the paper put the obtained results into context, with relevant references? Yes. Is the length of the paper appropriate? Yes. Is the text fluent and precise? Yes. Are the title and the abstract pertinent and understandable to a wide audience? Yes. Are all figures necessary, and of appropriate quality? No. Figs 2, 4 and 8 could be removed.

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Interactive comment on Nonlin. Processes Geophys. Discuss., 1, 479, 2014.

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