

Interactive comment on “The synergistic impact of ENSO and IOD on the Indian Summer Monsoon Rainfall in observations and climate simulations – an information theory perspective” by Praveen Kumar Pothapakula et al.

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Owing to the intense workloads created by the COVID-19 crisis, my review will be brief and will stick to the high level.

Overall, this is a very interesting manuscript and deserves to be published with minor revisions. The technical methods are sound at the level of detail I am able to review them. The possible improvements lie in the communication and interpretation of the results.

I suggest shortening the manuscript dramatically, especially by moving to a supplement the early portions of the results and methods where the authors prove that the metrics capture the kind of information content and synergy that is relevant to this climate coupling. We already know these metrics work, so your validation is important as due diligence but not as an important result of the paper, in my opinion.

I suggest considering and including more concepts and language about coupling, and/or causation (coupling is better in my opinion), as opposed to information content and synergy. Coupling, where appropriately interpretable, is a more intuitive and useful concept that is much more broadly understood than synergy or information content, and is better communication. I believe you are talking about a physical coupling between oceanic processes and the monsoon here, at least in part. Some of my papers get into process coupling concepts and language, including the original Ruddell and Kumar 2009 in Water Resources Research.

The major change I'd like to see is the inclusion of more interpretation of these results in terms of physical atmospheric process dynamics. What does this information content and synergy mean, physically? Can you confirm or reject a hypothesis about the processes that are causing it, using these information statistics? What does this mean? Actually testing a hypothesis would be the best, but more discussion in the conclusions is also very helpful.

I suggest reviewing and possibly including additional work from Bookhagen, Knuth, Brunzell, and Kurths, who have all published on spatially gridded information content and flows; Kurths' work on climate networks may be particularly useful here as a comparison or corroboration because it touches directly on the parts of the world you're studying.

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